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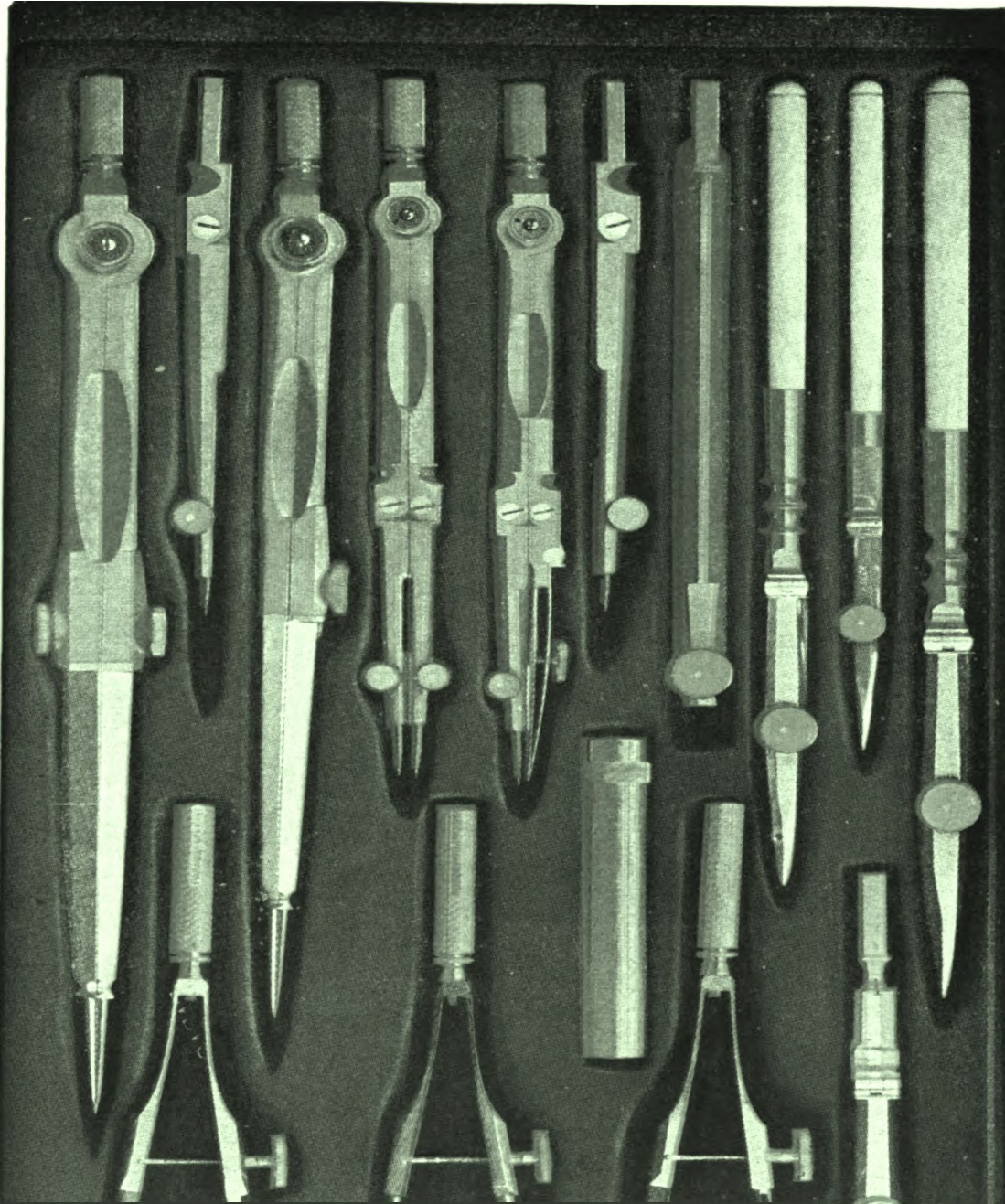
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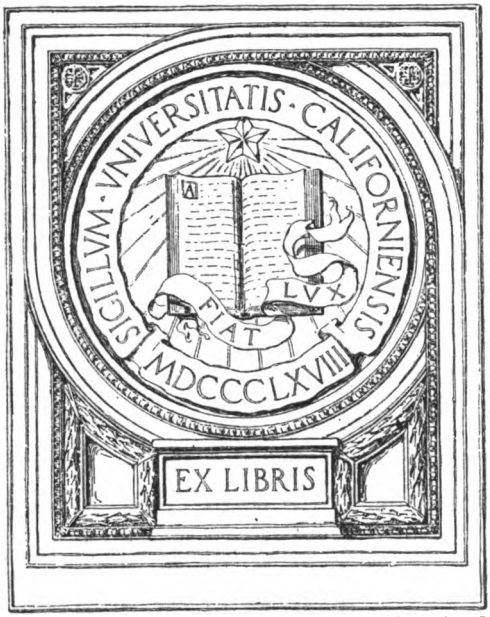
Catalogue and price list of Keuffel & Esser co, manufacturers and ...

Keuffel & Esser Co

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Page	84	Cut No. 333. Blue lines should be red. Red lines should be blue.
"	147	Cut numbered 1007 S should be numbered 1007 H.
"	180	No. 1396 R is a Boxwood Scale, not Paragon as stated.
"	446	No. 5778 furnished with Socket No. 5348-6 not 5348-2 as stated.
"	452	Cut numbered 5395 should be numbered 5935.
"	459	6020 P. Correct Price $ 10 75
"	461	6028 N. " " 65
"	461	6028 O. " " 30
"	480	Cut numbered 6956 should be numbered 6954.
"	481	" " 6954 " " 6956.
"	489	" " 7008 " " 7010.
"	513	33 ft. Re-fill divided to 10ths of feet should be numbered 7461 D.
"	520	No. 7510 D should be 7610 D.
"	520	7612 C.—5 meters, should be 25 meters.

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DEAR SIR:—

Being located in the territory of our

SAN FRANCISCO BRANCH HOUSE,

you will insure prompt service and economical deliveries by addressing your orders and correspondence to

KEUFFEL & ESSER CO.
of New York

48-50 Second St., SAN FRANCISCO, CAL.

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KEUFFEL & ESSER CO.

MANUFACTURERS AND IMPORTERS

DRAWING MATERIALS

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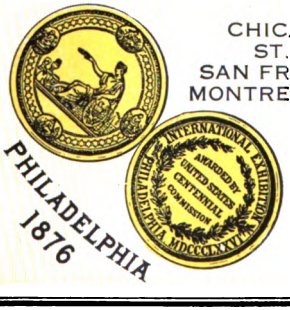


127 FULTON ST. **NEW YORK** 42 ANN ST.

GENERAL OFFICE AND FACTORIES, HOBOKEN, N. J.

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CHICAGO: 68 WEST MADISON ST.
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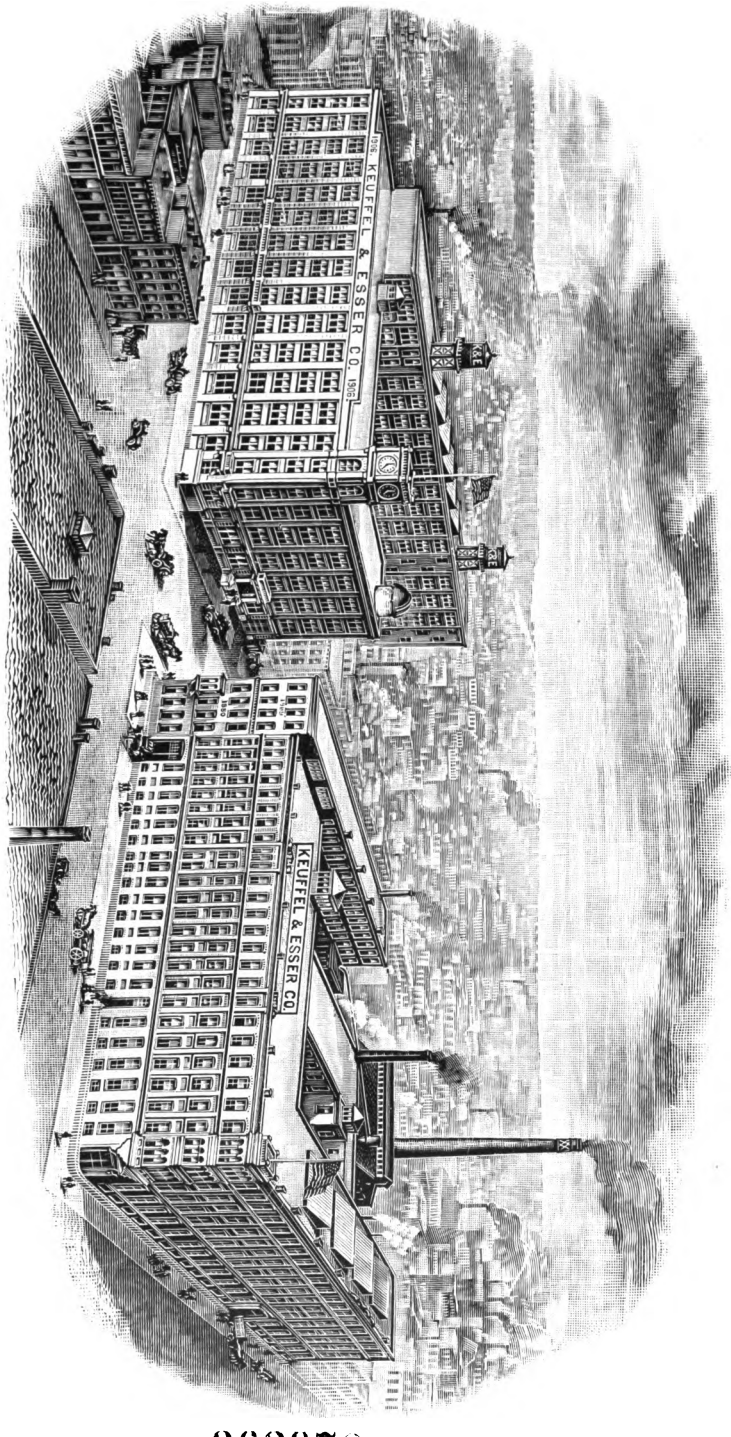
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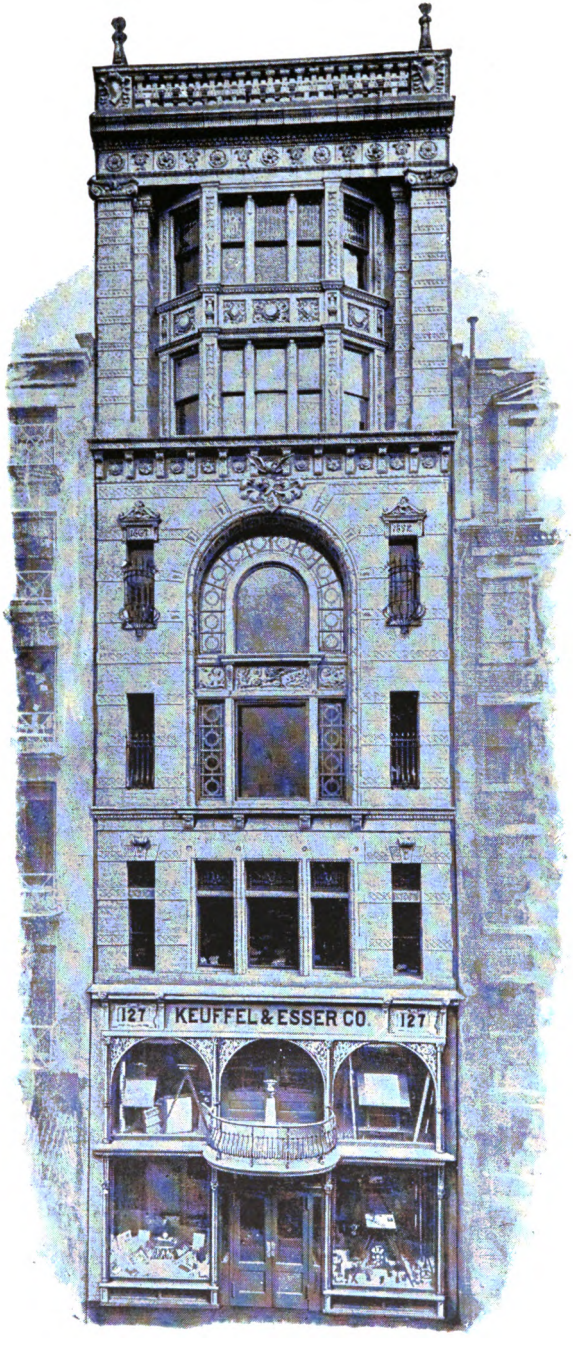
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Completed 1907.

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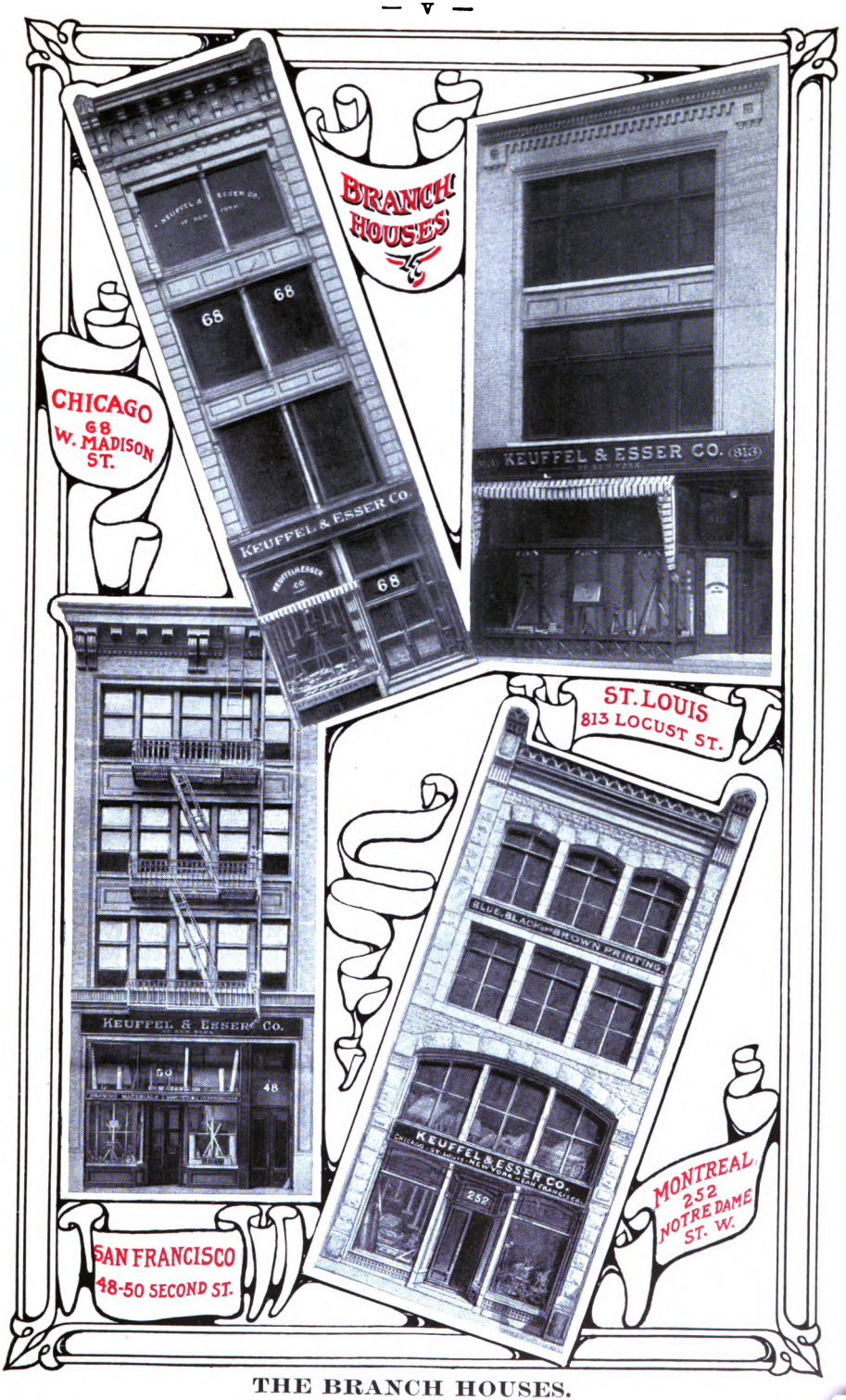
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Our goods always bear either one of our two general trade marks ( , K & E) or our name. Goods not bearing these marks are not our goods as listed in this catalogue.

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January, 1913.

To our Patrons:

In submitting this, the 34th edition of our catalogue, we bespeak for it the same kind reception which has been accorded the preceding editions.

This new catalogue continues the record of the history of our House and of its progress, not only in the development of its organization and its facilities, but also in the improvement of those of our products which permitted of it. New goods have been added, either to increase the selection or to replace those which have become obsolete.

Our **New York** establishment includes the Retail, City Order and Blueprint Departments, which occupy the entire building, thus enabling us to display our goods in the most advantageous manner, and most convenient to our patrons.

We have Branches at **Chicago, St. Louis, San Francisco,** and **Montreal,** Canada. All our Branches carry an ample line of our goods and are equipped with a modern plant for preparing Blueprint and Brownprint papers, so that the stock obtained from them is always fresh and orders can be filled immediately. We have workshops at all our Branches for making minor repairs to our instruments.

Conscious of the standing which more than 45 years of progress and success have given our House, we shall make it our foremost duty to maintain our reputation for the absolute reliability of our goods as well as for strictest fairness and broad good will in our dealings with those who favor us with their patronage.

Very respectfully,

KEUFFEL & ESSER CO.

Besides this General-Catalogue, we publish separately

CATALOGUE OF NAUTICAL INSTRUMENTS,

TRADE PRICE LIST, SUPPLEMENTAL TO THE GENERAL CATALOGUE,
(Instruments for schools, trade grades of drawing tools, etc.)

TRADE PRICE LIST OF MEASURING TAPES (for the Hardware Trade.)

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NOTICE.

THIS 34th edition of our catalogue supersedes all previous editions.

The prices in this Catalogue are Net Cash in New York, Chicago, St. Louis or San Francisco* and are subject to change without notice. For our Branch at Montreal, Canada, we issue a separate catalogue.

In ordering by this Catalogue, it is necessary to give the number with the price of the article and in some cases the sub-number, size, color, etc.

Remittances can be made either by bank-draft payable to our order, by Cash sent through any of the Express Companies, or by Post-Office or Express Money-Order. If Cash is sent by mail, the letter should be registered.

Remittances are in all cases at the risk of the sender.

New accounts can be opened only with firms rated in the commercial reference books, unless the order is accompanied by other satisfactory references. We mention this because **new** industrial enterprises, even when very important, are often not listed in the reference books, which causes much delay in obtaining information.

For goods ordered to be sent by express, the **bill to be collected on delivery,** a remittance to cover packing and expressage both ways is required with the order. **Express-charges for collection will be added to the amount of the bill.**

By sending full remittance with the order, buyers will save the charges for collecting the amount of the bill, and will avoid delay in delivery.

For special goods to be made to order and not listed by us, we invariably require payment when the order is placed.

Small articles can be sent by mail in open packages at 1 cent per ounce, and this postage must be added to the price of the goods so ordered, **but we are not responsible for goods lost or injured in transmission by mail.**

Registering mail matter lessens the risk of loss.

The "Home Ins. Co." insures the delivery of mail packages in the U. S. and Canada at the rate of 3 cents for each $5.00 of value. We insure in this way when so ordered or when insuring seems advisable.

As we use every precaution in packing goods, no allowance can be made if goods are damaged in direct shipment or in enclosure through other houses.

Boxes, which may be required for packing, will be charged at cost.

We must decline to send goods on approval, but we hold ourselves accountable for the correctness of the descriptions of our goods in this catalogue.

Should any of our goods not prove satisfactory, we solicit prompt information; any complaints shall have our careful attention, as we aim to satisfy our patrons in every respect, in order to maintain the reputation we are now enjoying.

*The prices of some of the more bulky or heavy goods are slightly higher at our Branches than in New York, on account of the very high transportation charges. Such exceptions are mentioned in this catalogue.

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DRAWING PAPERS

IN SHEETS.

WHATMAN'S HAND-MADE.

Whatman's Drawing Papers "**Selected Best**" and "**Retree**" are made as one quality and the sheets are afterwards examined and separated at the mill. The sheets without imperfections are called "**Selected Best.**" Both bear either the watermark "WHATMAN" or "WHATMAN TURKEY MILLS."

These papers are made with three different styles of surface:

HP. signifies "**Hot Pressed,**" has a smooth surface; mostly used for pencil and very fine line-drawings.

N. signifies "**Not Hot Pressed,**" has a finely grained surface; used for general purposes and water-color drawing.

R. signifies "**Rough**" (Torchon Paper), has a coarsely grained surface; used for very bold drawing, sketching and water-color drawing.

In ordering please state Catalogue NUMBER, SIZE and SURFACE (HP. N. or R.)

1. Whatman's, with "**HP**" or "**N**" surface.

Cap	13 × 17 in.	per quire	$	60
Demy	15 × 20 "	"		90
Medium	17 × 22 "	"	1	25
Royal	19 × 24 "	"	1	55
Super Royal	19 × 27 "	"	1	85
Imperial	22 × 30 "	"	2	60
Atlas	26 × 34 "	"	3	55
Double Elephant	27 × 40 "	"	4	80
Antiquarian	31 × 53 " ...per sheet $ 80	"	14	75

1A. Whatman's, with "**HP**" or "**N**" surface. **Selected Best.**

Cap	13 × 17 in.	per quire	$	80
Demy	15 × 20 "	"		95
Medium	17 × 22 "	"	1	40
Royal	19 × 24 "	"	1	80
Super Royal	19 × 27 "	"	2	10
Imperial	22 × 30 "	"	3	00
Atlas	26 × 34 "	"	4	60
Double Elephant	27 × 40 "	"	5	75
Antiquarian	31 × 53 " ...per sheet $1 50	"	27	00

2. Whatman's, with "**R**" surface.

Royal	19 × 24 in.	per quire	$ 1	55
Imperial	22 × 30 "	"	2	60
Double Elephant	27 × 40 "	"	4	80

2A. Whatman's, with "**R**" surface. **Selected Best.**

Royal	19 × 24 in.	per quire	$ 1	80
Imperial	22 × 30 "	"	3	00
Double Elephant	27 × 40 "	"	5	75

3. Whatman's, Extra heavy, with surface as below. **Selected Best only.**

Royal	19 × 24 in.	N. or R.	per quire $ 3 45	per sheet	$	18
Imperial	22 × 30 "	HP., N. or R.	" 6 90	"		35
Double Elephant	27 × 40 "	HP., N. or R.	" 10 35	"		55

For Mounted Whatman's papers see page 15.

For shipping sheet papers packed flat, the packing charges are about 5 cents per sq. ft.

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Reduced fac-simile of the label of Universal Paper in Sheets.

4. **Universal** Paper. **Each sheet watermarked *Universal***

For Universal Paper in continuous rolls, see page 11.

Universal Drawing Paper is of pure stock, free from adulterations, of natural white color and very carefully sized. A perfect, porous, soft and uniform pencil mark can be produced on it. It takes ink and color well, and its erasing properties are perfect, making it the best and most popular paper for **Colleges** and **Schools**. It is also a very good paper for water colors.

The several sizes are of different thickness, the smallest size being the thinnest and the others progressively thicker.

Cap	13½ × 17 in.	per ream	$ 5 75	per quire	$ 33
Demy	15 × 20 "	"	8 70	"	50
Medium	17 × 22 "	"	11 50	"	66
Royal	19 × 24	"	14 60	"	84
Super Royal . .	19 × 27	"	17 40	"	1 00
Imperial . . .	22 × 30 "	"	22 60	"	1 30
Double Elephant	27 × 40 "	"	43 50	"	2 50

Ream prices apply also to ½ reams Royal and ¼ reams Imperial and Dbl. Elephant.

5. **Normal** Paper. Each sheet stamped 

A drawing paper of very superior quality of natural white color, with smooth surface for LINE DRAWINGS in ink or pencil. It stands erasing perfectly and is very tough. The 3 sizes are of the same thickness.

We highly recommend this paper for elaborate or complicated line drawings on account of its hard and smooth surface, and for working drawings on account of its strength and durability. It is used to a great extent in schools where machine drawing is taught.

Royal	19 × 24 in.	per ream	$28 75	per quire	$ 1 65
Imperial . . .	22 × 30 "	"	41 00	"	2 35
Double Elephant	27 × 40 "	"	62 75	"	3 60

Ream prices apply also to ½ reams Royal and ¼ reams Imperial and Dbl. Elephant.

5½. **Blanca** Paper. Each sheet stamped 

A drawing paper of very superior quality of pure white color, with a fine grain similar to Whatman's "Hot Pressed." It is very tough and hard and will stand erasing to the greatest extent. The 3 sizes are of the same thickness.

We highly recommend it for fine or crowded line drawings, and on account of its strength for record drawings.

It is especially well adapted for drawings which are to be reproduced by photo process.

Royal	19 × 24 in.	per ream	$30 60	per quire	$ 1 75
Imperial . . .	22 × 30 "	"	43 75	"	2 50
Double Elephant	27 × 40 "	"	66 50	"	3 80

Ream prices apply also to ½ reams Royal and ¼ reams Imperial and Dbl. Elephant.

6. **Lava** Paper. For Lava Paper in continuous rolls, see page 11.

Lava is a pearl-grey drawing paper of good quality with slightly grained surface. Its soft color lends a fine effect to pen and ink drawings. The 3 sizes are of the same thickness.

Royal	19 × 24 in.	. . . . .		per quire	$ 1 10
Imperial	22 × 30 "	. . . . .		"	1 60
Double Elephant	27 × 40 "	. . . . .		"	2 60

Samples sent on application, or general sample book for 15c.

For shipping sheet papers packed flat, the packing charges are about 5c. per square ft.

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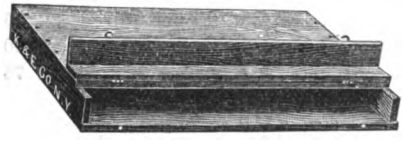
7. **Selecta** Paper. Each sheet stamped

For Selecta Paper in continuous rolls, see page 13.

A paper for the most fastidious, pure white and of hitherto unattained uniformity and firmness of surface, combining practically all the advantages of hand-made paper with the uniformity of the machine made. It is of the very best material and almost homogeneous in texture although the strength of the fibre has been preserved. Recommended for specially fine drawings. The 3 sizes are of the same thickness.

Royal	19 × 24 in.	per quire	$ 2 10
Imperial	22 × 30 "	"	3 75
Double Elephant	27 × 40 "	"	6 00

7B. Boxes for Drawing Paper, to hold one-half ream.



(Light but substantial box, well finished, with hinged front, for storing paper flat.)

for Royal	19×24 in.	each	$ 2 25
for Imperial	22×30 "	"	2 60
for Dbl. Elpht.	27×40 "	"	3 25

8. **Paragon** Paper, rough, medium. Each sheet stamped

For Paragon Papers in continuous rolls, see page 12.

Paragon Paper is a natural white drawing paper of very fine quality, excellent for any kind of drawing, pen, pencil or water color, will not turn brittle with age and has erasing qualities which are possible only in a paper of this high grade. We warrant every piece of Paragon paper to fully bear out our recommendation. The three sizes are of the same thickness.

Royal, ...	19 × 24 in.	per quire	$ 2 25
Imperial	22 × 30 "	"	3 25
Double Elephant, ...	27 × 40 "	"	5 25

9. **Paragon** Paper, smooth, thick. Each sheet stamped

See description under No. 8.

Double Elephant, ...	27 × 40 in.	per quire	$ 6 00

10. **Duplex** Paper, medium, cream color. Each sheet stamped

For Duplex Papers in continuous rolls, see page 10.

Duplex Papers are tough and hard, with slight grain, stand erasing very well and take pencil, ink and colors perfectly. Their tint is agreeable to the eye and permits of much handling without soiling.

Royal	19 × 24 in.	per ream	$ 18 70	per quire	$ 1 10
Imperial	22 × 30 "	"	27 20	"	1 60
Double Royal . . .	24 × 36 "	"	35 70	"	2 10
Double Elephant . .	27 × 40 "	"	44 20	"	2 60

Ream prices apply also to ½ reams Royal, and ¼ reams Imperial and Db'l Elephant.

11. **Duplex** Paper, thick, drab color. Each sheet stamped

Double Elephant	27 × 40 in.	per quire	$ 3 10

Samples sent on application, or general sample book for 15c.

For shipping sheet papers packed flat, the packing charges are about 5c. per square ft.

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15. K & E Ledger Paper.

An excellent white ledger paper of medium weight, with smooth surface. The 2 sizes are of the same thickness.

16 × 21 in.	per quire	$ 60
18 × 23 "	"	75

16. K & E Bond Paper.

An exceedingly tough paper of light weight, of natural white color, permits of folding (creasing) to nearly any extent, and is therefore specially well adapted for maps and drawings which are to be carried in the pocket. The 3 sizes are of the same thickness.

Royal	19 × 24 in.	per quire	$ 75
Imperial	22 × 30 "	"	1 00
Double Elephant	27 × 40 "	"	1 75

17. Reynolds' Bristol Board, white, smooth surface. Blank (not printed).

			2 ply	3 ply	4 ply
Cap	12½ × 15¼ in.	per doz. . . .	$ 60	90	1 20
Demy . . .	14⅝ × 18¼ "	" . . .	90	1 35	1 75
Medium . .	16½ × 20¾ "	" . . .	1 20	1 80	2 40
Royal . . .	18¼ × 22⅜ "	" . . .	1 50	2 40	3 10
Imperial . .	21½ × 28¾ "	" . . .	——	——	6 00

17P. Reynolds' Bristol Board. Printed (with border, etc.), for U. S. Patent Office drawings. 10 × 15 in., 3 ply, gross, $11 35, doz. $1 05

17PL. do. do. do. 10 × 15 " 2 " " 8 10, " 75

PARCHMENT.

18. English Parchment, best quality. (Genuine parchment, made of animal skin.)

	14 × 18	16 × 20	18 × 24	24 × 28
per sheet . .	50	70	90	1 25

GELATINE SHEETS.

19. Gelatine or Glasspaper.

	thin	medium	thick
13 × 19 in., per sheet $	20	25	30

TRANSFER PAPER.

20. Polygraph Transfer Paper, black, blue, vermilion, graphite.
10 × 15 in. . . . . per quire $ .40, per sheet $ 02

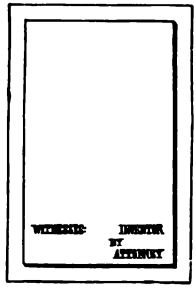
Samples sent on application, or general sample book for 15c.

For shipping Bristol Board flat, the packing charges are about 5c. per square foot.

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K & E SUPERIOR BRISTOL BOARDS.

No. 22.



Stamped with Trade-Mark



BLANK (NOT PRINTED)

21. K & E Patent Office Bristol Board, 3 sheet, blank.
10 × 15 in. (U. S. size) . . . . per gross $ 6 00, per doz. $ 60
15 × 20 " (English size) . . . " " 12 00, " " 1 20

21L. K & E Patent Office Bristol Board, 2 sheet, blank.
10 × 15 in. (U. S. Size) . . . . per gross $ 5 00, per doz. $ 50

PRINTED (WITH BORDER, ETC.)

22. K & E Patent Office Bristol Board, 3 sheet, printed
10 × 15 in. . . per gross $ 7 50, per doz. $ 75

22L. K & E Patent Office Bristol Board, 2 sheet, printed
10 × 15 in. . . per gross $ 6 50, per doz. $ 65

K & E Bristol Board has a hard surface, possesses almost unlimited erasing properties and can be rolled without injury. It has the thickness, color, quality and size required by the U. S. Patent Office and is preferable to other Bristol Boards, because it does not have their high glossy surface. As it is less opaque than other Bristol Boards, photoprints can be made from it with fair results. Nos. 21 L and 22 L are thinner than Nos. 21 and 22 and are therefore better adapted to print from.

PARAGON DRAWING CARD.

Each sheet stamped 

23. *Paragon* Drawing Card, rough, 19 × 24 in. . . . per sheet $ 20
do. do. " 22 × 30 " . . . " 30
do. do. " 27 × 40 " . . " 90

24. *Paragon* Drawing Card, smooth 19 × 24 in. . . . per sheet $ 20
do. do. " 22 × 30 " . . . " 30
do. do. " 27 × 40 " . . . " 90

This excellent Drawing Card is adapted for fine drawings, perspectives, water-color drawings, etc. The slightly rough surface of No. 23 is similar to Whatman's "Not Hot Pressed."
No. 24 is like No. 23, but with smooth surface, similar to Whatman's "Hot Pressed."

TINTED CARD BOARD.

25. Tinted Cardboard, for drawings,
Grey . . . 22 × 28 in. . . . . per dozen $ 2 50 per sheet $ 25
Black . . . 22 × 28 " . . . . " 2 00 " 20

Nos. 23 to 25 must be packed flat for shipment, as they would be injured by rolling.
Packing charges are about 5c. per square foot.

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WHITE MOUNTING BOARD.

26. White Mounting Board.

	22 × 28 4 ply.	22 × 28 6 ply.	22 × 28 8 ply.	22 × 28 10 ply.	30 × 40 in. 10 ply.
per doz. . .	$ 75	1 00	1 20	1 50	4 00
per sheet . .	08	10	12	15	40

Mounting Board must be packed flat for shipment. Packing charges are about 5c. per square foot.

RUBBER CLOTH.

28. Rubber Cloth, black, 36 in. wide . . . . . per yard $ 70

This fabric is pliable and impervious to moisture, so that it makes an excellent cover for the drawing board and a good wrapper for drawings.

BINDING STRIPS.

31. Adhesive Binding Strips (Crowell),
¾ in. wide, 50 feet, in practical paper box . . . . . per box $ 25

DETAIL PAPERS
IN CONTINUOUS ROLLS.

(For Drawing Papers see page 10.)

SMOOTH MANILLA PAPERS.

The smooth Manilla papers, intended mainly for stencils and patterns, are occasionally used for detail and preliminary drawings. While we exercise all possible care in their selection, we can not assume any responsibility for their being suitable for drawing.

40. Smooth Manilla, three weights: X, XX, XXX, in rolls of about 100 pounds, 36, 40, 48, 54 in. wide, ... per pound $ 10

MANILLA TISSUE PAPER.

46. Manilla Tissue Paper. 48 in. wide, ... per roll of 50 yards $1 60
" " 100 " 3 00

This Paper stands erasing, is strong and tough, and can be used for coarse tracings.

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ECONOMY SKETCHING & DRAWING PAPERS

(TRANSPARENT)





Reduced fac-simile of labels of Economy sketching papers.

Economy Sketching Papers are excellent all-around **detail papers.** They are of natural white color, stand erasing by knife or rubber, take pencil, ink and colors well, and while tough and strong, are sufficiently transparent for coarse tracings, such as details. These many useful qualities, together with their moderate price, make the Economy papers superior detail papers and the best all-around sketching papers. Fair blueprints can be made from them. Each roll water-marked *Economy*

TRANSPARENT SKETCHING PAPERS.

47 L. *Economy* Transparent Sketching Paper, white, light weight.

36 in. wide, in rolls of 50 yards, ...	per roll	$ 1 75
42 " " " " " 50 "	" "	2 25
60 " " " " " 50 "	" "	2 90

47. *Economy* Transparent Sketching Paper, white, medium.

36 in. wide, in rolls of 50 yards, ...	per roll	$ 2 00
42 " " " " " 50 "	"	2 50
60 " " " " " 50 "	"	3 25

TRANSPARENT DRAWING PAPER.

Economy Transparent Drawing Paper is of natural white color and has a fine even grain. It is equally well adapted for pencil, ink or colors, and stands much erasing by knife or rubber. It is very tough and durable and bears frequent folding (creasing.)

While the Economy Transparent Drawing Paper is of sufficient thickness to class it as a drawing paper, it has retained enough transparency to permit of taking fair blueprints direct from the drawing, thereby often saving the making of tracings. Each roll water-marked *Economy*

47 H. *Economy* Transparent Drawing Paper, white.

36 in. wide, in rolls of 20 yards	per roll	$ 1 50
42 " " " " " 20 "	"	1 80
60 " " " " " 20 "	"	2 50

No. 47 H. can be furnished also in rolls of 50 yards at proportionate prices.

Samples sent on application, or general sample book for 15c.

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SIMPLEX DETAIL PAPERS.



Reduced fac-simile of label of Simplex Papers.

Simplex Detail Papers are made especially for us by one of the most expert manufacturers and possess the qualities of a drawing paper as far as they can be attained in manilla papers. The surface is slightly grained, rough enough to take the pencil readily and smooth enough for ink work. The color is a shade deeper than that of ordinary manilla paper, making it less liable to appear soiled. Special attention has been paid to the erasing qualities of these papers, and we recommend them as a considerable improvement over the manilla papers ordinarily used.

48 L. *Simplex* Detail Paper, **Light Weight,**

in rolls of about 100 pounds, 36 or 42 in. wide, per pound $ 12

36 in.	wide,	per roll of	50	yards	$ 1 80		per roll of	100	yards	3 25
42 "	"	"	" 50	"	2 10		"	" 100	"	3 75

48. *Simplex* Detail Paper, **Medium,** in rolls of about 100 pounds,

36, 42, 48 or 54 in. wide, ... per pound $ 12

36 in.	wide,	per roll of	50	yards	$ 2 25		per roll of	100	yards	4 00
42 "	"	"	" 50	"	2 60		"	" 100	"	4 70
48 "	"	"	" 50	"	2 95		"	" 100	"	5 35
54 "	"	"	" 50	"	3 25		"	" 100	"	6 00

49. *Simplex* Detail Paper, **Heavy,** in rolls of about 100 pounds,

36, 42, 48 or 54 in. wide, ... per pound $ 12

36 in.	wide,	per roll of	50	yards	$ 2 75		per roll of	100	yards	5 00
42 "	"	"	" 50	"	3 10		"	" 100	"	5 75
48 "	"	"	" 50	"	3 65		"	" 100	"	6 75
54 "	"	"	" 50	"	4 00		"	" 100	"	7 50

Samples sent on application, or general sample book for 15c.

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DRAWING PAPER.

Good drawing paper must combine many different features, and these the buyer should be able to distinguish, to be in a position to discriminate between various kinds, so as to make a selection suitable to the purpose for which he intends to use the paper.

First in importance is the material from which the paper is made, and second the mode of manufacture, both of which become manifest when the finished article is used. Good drawing paper should be strong, of uniform thickness and surface, stretch evenly, and should neither repel nor absorb liquids. It should admit of considerable erasing without detriment to its surface, should not become either brittle or discolored by reasonable exposure and age, and should not wrinkle when stretched or when inks or colors are applied to it.

It is impossible to combine all these features in one paper, so that all may be apparent in their utmost degree of perfection; thus, the greatest strength cannot be combined with the finest surface, as is particularly exemplified in the case of manilla fibre, which, although one of the strongest materials used in the manufacture of paper, cannot be made into *drawing* paper.

The careful draftsman is therefore compelled to select that paper which unites to best advantage those qualities which are most adapted to his special requirements. To make a personal selection every time he is in need of paper is generally impracticable. He is therefore mostly obliged to rely upon the descriptions of the papers offered him, and then to trust that the one selected will be as described and can be obtained again in the same quality at any future time.

Each one of the papers listed in this catalogue possesses certain special and distinctive features of its own, which are set forth accurately and with a view to enabling the buyer to make a selection satisfying his wants. **Every one of our papers is made solely and specially for us, and can in no case be procured except from us, or from dealers who purchase their supply from us.** The qualities and distinctive features of each paper are strictly maintained and successive orders can be given with the assurance that the same article will invariably be furnished. **All our drawing papers are watermarked along the edge with their name.**

The following assortment has been made after careful study of the draftsman's wants, based on more than forty years' experience, and we believe it will be found to meet all requirements. It has been made comprehensive enough to answer all purposes, but no more so, in order that selection may be facilitated. No two of these papers possess all the same features, nor are different designations and descriptions applied to the same paper, with a view to apparently increasing the assortment. Each paper has its own characteristics and will be found satisfactory, if selected with due regard to its special qualities.

The Hellos and Parchmine Papers listed on page 26, although specially made for blueprinting, are also good drawing papers and are very often used as such. They take ink, pencil and water colors and have good erasing qualities.

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The good results of such a policy are manifested by the reputation gained by our

Paragon, Duplex, Universal, Anvil, Normal &c.

papers, whose trade-marks are looked upon by draftsmen all over the country as standards of excellence.

In consequence of this a great many imitations, especially of PARAGON UNIVERSAL and DUPLEX papers have been put on the market; they are offered under similar names and are palmed off as identical with our papers. *To protect our customers, we repeat that our papers cannot be obtained under another name or without their name along their edge.*

DRAWING PAPERS
IN CONTINUOUS ROLLS.



Reduced fac-similes of labels of some of our Drawing Papers.

50-52. *Duplex* A Detail Drawing Paper, which stands in a class by itself and is now so well known that it hardly requires description. It is excellent for any kind of drawing. The cream or buff color is agreeable to the eye and permits of handling without soiling.

Nos. 10 and 11 (on page 3) are the same papers in sheets.

Each roll water-marked *Duplex*.

50. *Duplex* medium, cream color.

width in inches . .	30	36	42	56	62
rolls 35 to 40 pounds, per lb. . .	$ 29	29	29	29	29
per 10 yard piece . .	1 15	1 35	1 70	2 15	2 50
per yard . .	13	15	20	25	30

52. *Duplex* thick, drab color.

width in inches	36	56
rolls 35 to 40 pounds, per lb.	$ 29	29
per 10 yard piece	1 60	2 65
per yard	18	30

Samples sent on application, or general sample book for 15c.

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55. *Universal* A natural white paper of good quality with slightly grained surface, suitable for work in ink, color, pencil or crayon. It is used for general office work, and on account of its price also for preliminary drawings, and probably more than all other papers in Technical Schools and Universities. Similar paper, generally offered under the name of "German Drawing Paper," should not be confounded with the "Universal."

No. 4 is the same paper in sheets, but of graded thickness, proportionate to each size.

Each roll water-marked *Universal*

55. *Universal*, medium.

width in inches,	36	42	56	62
rolls 35 to 40 pounds, per pound,	$ 36	36	36	36
per 10 yard piece,	1 70	2 00	3 00	3 40
per yard,	20	24	35	40

57 *Lava* A pearl-grey drawing paper, quality, texture and surface similar to the Universal. The neutral grey color lends a fine effect to pen-and-ink drawings. No. 6 is the same paper in sheets.

Each roll water-marked

57. *Lava*, medium.

width in inches,	36	62
rolls 35 to 40 pounds, per pound,	$ 36	36
per 10 yard piece,	1 70	3 40
per yard,	20	40

60-62. *Anvil* A very tough and hard natural white paper, matchless for working-drawings used out-of-doors or in the workshop where drawings are subject to rough handling. This paper has a slightly grained surface, similar to Whatman's "Not" and stands erasing to the greatest extent.

Each roll water-marked *Anvil*

60. *Anvil*, medium.

width in inches,	36	42	62
rolls 35 to 40 pounds, per pound,	$ 45	45	45
per 10 yard piece,	2 15	2 65	4 00
per yard,	25	30	45

62. *Anvil*, thick.

width in inches,	62	72
rolls 35 to 40 pounds, per pound,	$ 45	45
per 10 yard piece,	4 80	5 60
per yard,	55	65

Samples sent on application, or general sample book for 15c.

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Paragon papers No. 70—77 are so well and favorably known, that there is but little to say about them; their excellence is universally acknowledged.

We warrant Paragon Paper and exchange all which does not give perfect satisfaction.

Paragon Papers are of natural white color and are highly recommended for elevations, perspectives, maps and most kinds of finished drawings.

We list some of these Paragon papers in sheets under Nos. 8 and 9, page 8.

Each roll water-marked *Paragon*.

Nos. 70—71—72—73 have a sand-grain or pebbled surface (similar to eggshells) adapted for general drawings, either in line or in wash.

70. *Paragon*, rough, thin. . . . . . width in inches **58**

rolls 35 to 40 pounds, per pound . . . . . $ 50

per 10 yard piece 4 00

per yard 45

71. *Paragon*, rough, medium, . . . width in inches **36** **42** **58**

rolls 35 to 40 pounds, per pound $ 50 50 50

per 10 yard piece 8 00 8 50 4 50

per yard 33 38 50

72. *Paragon*, rough, thick . . . . . width in inches **58**

rolls 35 to 40 pounds, per pound . . . . . $ 50

per 10 yard piece 5 75

per yard 65

73. *Paragon*, rough, extra thick . . . . . width in inches **58**

rolls 35 to 40 pounds, per pound . . . . . $ 50

per 10 yard piece 7 20

per yard 80

Nos. 75—76 have a grain like Whatman's "not hot pressed" on one side, while the other side is smooth, adapting them for drawings to be reproduced by photographic process. No. 77 has a slightly coarser grain than Nos. 75-76.

75. *Paragon*, smooth, medium, ... width in inches **36** **58**

rolls 35 to 40 pounds, per pound. . . . $ 50 50

per 10 yard piece 8 00 4 50

per yard 33 50

76. *Paragon*, smooth, thick. . . . . . width in inches **58**

rolls 35 to 40 pounds, per pound . . . . . $ 50

per 10 yard piece 5 75

per yard 65

77. *Paragon*, medium smooth, medium . . . . . width in inches **72**

rolls 35 to 40 pounds, per pound . . . . . $ 50

per 10 yard piece 6 25

per yard 70

Samples sent on application, or general sample book for 15c.

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80. *Selecta* paper is the nearest approach to hand-made paper ever attained in a roll paper. It combines practically all the advantages of hand-made with the uniformity of machine-made paper. It is of the very best material obtainable and no expense has been spared to make it the **best paper that can be produced.** It is nearly homogeneous in texture, although the strength of the fibre is fully preserved, giving it a surface of hitherto unattained uniformity and firmness, equally well adapted to pencil, ink and colors and of excellent erasing quality. We recommend this paper for competitive drawings, fine maps, engrossing, etc. No. 7 (page 3) is the same paper in sheets.

Each roll water-marked *Selecta*

80. *Selecta*, smooth, medium.	width in inches		**58**
rolls 35 to 40 pounds, per pound		$	**60**
per 10 yard piece			**5 75**
per yard			**65**

MOUNTED DRAWING PAPERS.

MOUNTED ON MUSLIN, IN ROLLS OF 10, 20, 30, 40 OR 50 YARDS.

We list mounted papers in 10-yard rolls but can furnish, at proportionate price, any of our mounted papers also in 20, 30, 40 or 50 yard rolls except those 62 in. and 72 in. wide which we furnish in rolls not longer than 20 yards.



Reduced fac-similes of labels of some of our mounted papers.

Our papers are mounted stretched, and air-dried. This refers also to 20, 30, 40 and 50 yard rolls and to papers in sheets of any size. They are much superior to papers mounted by compression between rollers and dried by passing over heated rollers. The rollers distort and strain the paper and destroy the surface, while drying by heat injures the paper and the adhesive.



To protect our customers against faulty mounting or mounting on inferior muslin, we stamp the muslin side of our papers, when mounted by us, with their trade-mark name and "Keuffel & Esser Co.—Mounted Paper" as shown above.

No 100 is No. 55 Mounted. For description see page 11.

100.	*Universal*	36 in.	wide, per 10 yard roll	$ 6 20	per yard	$	75
	do.	42	" "	7 80	"		90
	do.	56	" "	10 80	"		1 25
	do.	62	" "	13 00	"		1 50

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MOUNTED DRAWING PAPERS.

MOUNTED ON MUSLIN.

(CONTINUED.)

No. 103 is No. 50 mounted. For description see page 10.

103.	*Duplex*	36 in. wide,	per 10 yard roll	$ 5 85	per yard	$	70
	do.	42 "	"	7 50	"		90
	do.	56 "	"	9 95	"	1	15
	do.	62 "	"	12 10	"	1	40

No. 104 is No. 57 mounted. For description see page 11.

104.	*Lava*	36 in. wide,	per 10 yard roll	$ 6 20	per yard	$	75
		62 "	"	13 00	"	1	50

Nos. 105-106 are Nos. 60-62 mounted. For description see page 11.

105.	*Anvil*	36 in. wide	per 10 yard roll,	$ 6 65	per yard	$	80
	do.	42 "	"	8 45	"	1	00
	do.	62 "	"	13 60	"	1	60
106.	do.	62 "	"	14 40	"	1	70
	do.	72 "	"	17 35	"	2	10

Nos. 110, 111, 112, 113, 115, 116, 117, are Nos. 70, 71, 72, 73, 75, 76, 77 mounted. For description see page 12.

110.	*Paragon*	58 in. wide,	per 10 yard roll	$11 75	per yard	$ 1	35
111.	do.	36 "	"	7 50	"		90
	do.	42 "	"	9 30	"	1	10
	do.	58 "	"	12 50	"	1	45
112.	do.	58 "	"	13 75	"	1	60
113.	do.	58 "	"	15 70	"	1	80
115.	do.	36 "	"	7 50	"		90
	do.	58 "	"	12 50	"	1	45
116.	do.	58 "	"	13 75	"	1	60
117.	do.	72 "	"	18 00	"	2	15

No. 118 is No 80 mounted. For description see page 13.

118.	*Selecta*	58 in. wide,	per 10 yard roll	$ 13 75	per yard	$ 1	60

FOR MOUNTED PAPERS IN SHEETS SEE NEXT PAGE.

Samples sent on Application, or general sample Book for 15c.

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MOUNTED DRAWING PAPERS IN SHEETS.

MOUNTED ON MUSLIN.

125. *Unchangeable Drawing Board*

This Board consists of two sheets of drawing paper mounted on one side of strong muslin and so selected and chemically prepared that they form a flat and hard board which is very resistant to changes in atmospheric conditions. For drawings which require extreme accuracy or are to be preserved on record, there is no other material that will equal our Unchangeable Drawing Board.

The drawing surface is Paragon drawing paper.

Royal	19 × 24 in.	per sheet	$ 75
Imperial	22 × 30 "	"	1 10
Double Elephant.	27 × 40 "	"	1 65
Antiquarian . . .	31 × 53 "	"	2 75

Intermediate and larger sizes furnished to order.

130. **Whatman's** Drawing Paper, mounted

Royal	19 × 24 in.,	Selected Best	per sheet $ 30
Imperial	22 × 30 "	"	" 45
Double Elephant.	27 × 40 "	"	" 80
Antiquarian . .	31 × 53 "	"	" 1 90

131. **Whatman's** Antiquarian Retree, 31 × 53 in. " 1 40

135. *Paragon* Drawing Paper, in sheets, mounted.

Mounted Paragon Papers in sheets Nos. 135 and 137 are made of paper No. 71, (rough) unless No. 75 (smooth) is ordered.

Royal	19 × 24 in.	per sheet	$ 32
Imperial	22 × 30 "	"	50
Double Elephant.	27 × 40 "	"	75
Antiquarian . . .	31 × 53 "	"	1 20

The prices for mounted papers in sheets, **except Whatman's papers**, are for muslin trimmed to the size of the sheet. If the muslin on Paragon papers is wanted larger than the paper, on one or more edges, this must be explained in the order. Mounting on larger muslin slightly increases the price of the mounted sheet.

137. *Paragon* Drawing paper in sheets, **MOUNTED ON BOTH SIDES** of the muslin ("muslin between") for record books, etc.

Royal	19 × 24 in.	per sheet	$ 65
Imperial	22 × 30 "	"	1 00
Double Elephant.	27 × 40 "	"	1 50
Antiquarian . . .	31 × 53 "	"	2 50

Mounted sheets of other size or of others of our papers furnished to order.

Price of sheets mounted on both sides of the muslin, with the direction of the grain of the two sheets **crossing**, quoted on request.

EXTRA LARGE SHEETS

for city, county, mine, etc., maps mounted to order. They are built up of two or more widths of paper. The joining edges are accurately beveled by a special machine and overlapped, producing a hardly perceptible and very durable seam. Our facilities in this line are unequalled and we have furnished perfect sheets as large as 20 × 30 feet, which were highly satisfactory and proved durable in use. Prices on application.

Samples sent on application, or general sample book for 15c.

For shipping sheet papers flat, the packing charges are about 5 cents per square foot.

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TRACING CLOTHS (VELLUM).

EXCELSIOR.

The Excelsior Tracing Cloth is far superior to any other, extremely transparent, and very uniform. It is therefore particularly well adapted for tracing faint or intricate drawings, and it is superior to any other cloth for tracings which are intended for copying by the blue, black or brown-printing process.

150. Excelsior, in rolls of 24 yards, **one side glazed, the other dull.**

	30	36	42	in. wide
per roll	$ 9 50	10 25	13 25	
per yard	50	55	65	



No. 156.

IMPERIAL.

156. Imperial, in rolls of 24 yards, **one side glazed, the other dull.**

	30	36	38	42	48	54	in. wide
per roll	$ 8 10	9 00	11 10	12 10	16 00	17 00	
per yard	40	45	55	60	80	85	

The 30, 36 and 42 in. widths are furnished also with **both sides glazed, if so ordered.**

SAGAR'S.

158. Sagar's, in rolls of 24 yards, **one side glazed, the other dull.**

	30	36	42	in. wide
per roll	$ 8 10	9 00	12 10	
per yard	40	45	60	

DOWSE'S.

159. Dowse's, in rolls of 24 yards, **one side glazed, the other dull.**

	30	36	42	in. wide
per roll	$ 6 40	7 40	10 00	
per yard	35	40	50	

UNION.

160. Union, in rolls of 24 yards, **one side glazed, the other dull.**

	30	37	40	43	in. wide
per roll	$ 6 00	6 80	8 00	9 50	
per yard	30	35	40	50	

The Union Cloth is heavier and less transparent than the others.

TRACING CLOTHS IN SHEETS.

We furnish Tracing Cloths in sheets, up to 41 x 59 inches with border lines, titles, diagrams, etc. printed absolutely opaque and indelible, so that they will blueprint like the drawing. Prices, according to specifications, on request.

Samples sent on application, or general sample book for 15c.

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POUNCE

FOR TRACING CLOTH.



166. Pounce for Tracing Cloth, in tin shakers . . . each $ 15

When cloth will not take ink readily, dust on a small quantity of the pounce and rub it in evenly with a soft fabric until the cloth has lost its excessive gloss. The pounce must be thoroughly removed before applying the ink.

TRACING PAPERS

in Sheets.



Reduced fac-similes of labels of our tracing papers.



170. *Vegetable* (not prepared) very tough and transparent.

Cap	13 × 17 in.	per quire	$ 90
Demy	16 × 20 "	"	1 25
Royal	19 × 25 "	"	2 00
Imperial	22 × 28 "	"	2 50
Double Elephant.	29 × 42 "	"	10 00

176. *Cupola* very tough and transparent, well adapted for photo-printing, 28 × 39 in. . . . . per quire $ 3 20

178. *Sermes* one side with slight grain.

20 × 30 in.	per quire	$ 95
30 × 40 "	"	1 90

180. *Ceres* (not prepared) tough and transparent, thin.

20 × 27 in.	per quire	$ 80
27 × 40 "	"	1 50

182. *Corona* (not prepared) like No. 180 but medium thick.

27 × 40 in. . . . . per quire $ 2 00

The **Vegetable, Ceres** and **Corona** Papers listed above, are **natural** (not prepared) tracing papers. They will not discolor nor become brittle with age.

Samples sent on application, or general sample book for 15c.

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TRACING PAPERS

in continuous rolls.





Reduced fac-similes of labels of our tracing papers.

190. *Parchment* (not prepared) **medium,** very tough.
39 in. wide in rolls of 20 yards . . . . . per roll $ 3 50

191. *Parchment* (not prepared) **thick,** very tough.
39 in. wide, in rolls of 20 yards . . . . . " 4 25

192. *Macus* very thin and transparent.
42 in. wide, in rolls of 10 yards . . . . . " 2 75

194. *Patera* stout, very tough, suitable for machine shops.
42 in. wide, in rolls of 20 yards . . . . . " 3 75

195T. *Colonna* **thin,**

	30	36	42	in. wide,
per roll of 20 yards	$2 25	2 75	3 25	

195M. *Colonna* **medium thick**

	30	36	42	in. wide,
per roll of 20 yards	$2 60	3 20	3 80	

195 T. and M. **COLONNA,** bluish white, very tough and transparent, are excellent tracing papers, which can often be substituted for tracing cloth (vellum). They make fine photo prints.

Samples sent on application, or general sample book for 15c.

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TRACING PAPERS IN ROLLS.—Continued.



Reduced fac-similes of labels of our tracing papers.



196. *Corinthian* very tough and transparent, well adapted for photo-printing.
39 in. wide, in rolls of 20 yards per roll $ 3 20

197. *Ionic* medium

	30	36	42	in. wide
per roll of 20 yards	$2 60	3 20	3 80	

197. **IONIC**, ivory tint, very tough and transparent, an excellent tracing paper which can often be substituted for tracing cloth (vellum).

198. *Gothic* very tough and transparent.
42 in. wide, in rolls of 20 yards per roll $ 3 40

200. *Doric* medium.
42 in. wide, in rolls of 20 yards " 2 60

202. *Alba* (not prepared) for transferring.

	42	57 in. wide,
rolls of 44 yards . . . . . per roll	$3 60	4 60
" " 22 " . . . . . "	1 80	2 30

204. *Lotus* (not prepared) transparent and tough, **thin.**
42 in. wide, in rolls of 20 yards . . . . . per roll $ 1 50

206. *Livra* (not prepared) like No. 204 but **medium thick.**
42 in. wide, in rolls of 20 yards . . . . . " 2 00

208. **BANKNOTE** (not prepared) mediun thick,

	36	42	in. wide
per roll of 20 yards	$1 20	1 50	

208. **BANKNOTE** Tracing Paper, an exceedingly strong tracing paper similar to Bond paper. It will give good blueprints.

47. *Economy* Transparent Sketching Paper, see page 7.

Samples sent on application, or general sample book for 15c.

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PHOTO-PRINTING.

There are three different processes in general use for copying drawings by means of light, namely:

Blue print Process, negative, white lines on **blue background,**
Black print Process, positive, black lines on **white background** and
Maduro Process, negative, white lines on **black-brown background.**

Maduro prints on thin paper can be used as negatives for printing, like tracings, when they will make positive prints (lines on white background) on negative paper. When many prints are to be made from one tracing, negative Maduro prints will save time and wear of the tracing.

Other processes are either too complicated in their manipulation, or uncertain in result, or they necessitate a darkroom and other appliances forbidding their general use.

The results obtained by the above processes depend upon the careful selection and application of the chemicals and essentially upon the **quality of the paper** employed. It has therefore always been our endeavor to maintain the high quality of our papers and improve our formulas for coating these papers, and to produce papers best adapted for their purpose The reputation which our several brands of photo-printing paper enjoy, proves that our efforts have been successful, and that our papers may be depended upon for the work for which we recommend them.

For use in the Tropics we furnish our Photo-printing Papers packed in zinc-lined cases, and each roll in extra tinfoil wrapper. Prices on request.

We can furnish our prepared papers also in sheets, if ordered in reasonably large quantities but we do not list sizes as they are cut to order only.

OUR PAPERS ARE WATERMARKED WITH THEIR NAME, ALONG THE EDGE.

Please note, that each roll of our Photo-printing Papers bears a serial number along the edge of the label. Should the results obtained with any of our papers not be quite satisfactory, our customers are requested to send us a sample print together with a piece of unexposed paper, protected from light and moisture and ROLLED, (not creased or folded); also that part of the label which bears the SERIAL NUMBER of the roll. This will enable us to ascertain where the fault lies and to explain or correct the trouble.

Our book "Photo-Printing from Tracings," giving full directions, will be mailed free on application.

PRINTING FOR THE TRADE.

We have plants fully equipped with the most advanced appliances for sunlight and electric light printing, in charge of expert printers, at our establishments:

Hoboken, New York, Chicago,
St. Louis, San Francisco, Montreal.

Orders for printing, large or small, will have our careful attention. Tracings called for and prints delivered in the above cities.

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PRINTING SPEED
OF BLUEPRINT PAPERS

IMPORTANT NOTICE!

To insure the best results from blueprint papers and cloths, the order should state the desired speed, and whether they are intended for sunlight or electric light exposure or for use in an electric printing machine.

Our blueprint papers are furnished as follows:

Regular, requiring from 4 to 8 minutes exposure in bright sunlight. This will be found the most satisfactory in keeping, handling and in regard to quality and appearance of prints.

Quick, intended for use where prints are required quickly, or where no good light is available. Quick papers require more careful keeping and protection from light and dampness before exposure, than the regular.

Electric Quick, for use with electric light, in electric printing machines.

When blueprint paper is required for printing from negatives (blue lines on white ground) we request that this be stated in the order.

We can furnish also paper of other speeds to meet unusual conditions but in such cases the exact conditions should be explained in the order, to obtain the best possible results.

TRANSLUX.

(Makes negatives more transparent.)



No. 218.

		quart,	half-gallon,	gallon,
218.	Translux, in Tins:	$ 1 00	1 75	3 00

Translux, a liquid applied to drawings, brownprint negatives, old opaque tracings etc. makes them translucent and thereby saves time in exposing, thus reducing the consumption of current where electric light is used. Prints may be taken direct from regular drawings when **Translux** is used. **Translux** will not injure print nor drawing.

TUBES FOR STORING PREPARED PAPER.



These tubes are of tin, with well fitting covers, and are the best and most practical receptacles for storing cut rolls of prepared paper, because they exclude both light and moisture. They are well adapted also for storing tracings, plans, drawings, &c

No. 219 has screw cap. No. 219X has pull-off cover.

	Tubes for Storing Paper,	for 24	30	36	42 in.
219.	for 10 yard rolls, each	$ 80	95	1 00	1 10
219X.	" 50 " " "	95	1 10	1 25	1 35

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HELIOS BLUEPRINT PAPERS.



Reduced fac-simile of label of Prepared Helios Paper.

Helios Paper, the first Blueprint Paper introduced by us, is still acknowledged to be the best and most reliable. For fine blueprints, it has no equal.

Helios Paper, medium, **prepared,**

		24	30	36	42	54* in. wide,
220.	per roll of 10 yards	$ 95	1 20	1 45	1 70	2 30
220X.	" " " 50 "	4 50	5 65	6 80	7 95	10 75

Helios Paper, thick, **prepared,**

		24	30	36	42	54* in. wide,
221.	per roll of 10 yards	$ 1 15	1 45	1 70	2 05	2 75
221X.	" " " 50 "	5 50	6 90	8 05	9 70	13 00

*The 54-inch width is prepared to order only.

E. T. BLUEPRINT PAPER. (Mailing Weight.)



Reduced fac-simile of label of Prepared E. T. Paper.

E T. Paper is of the same high quality as Helios, but is very thin and tough and is intended for prints for mailing, saving postage by its light weight.

E.T. Paper (extra thin, mailing weight), **prepared,**

		24	30	36	42 in. wide,
225.	per roll of 10 yards	$ 80	95	1 15	1 40
225X.	" " " 50 "	3 75	4 40	5 30	6 45

We can furnish our prepared papers also in sheets, if ordered in reasonably large quantities but we do not list sizes, as they are cut to order.

Sample Prints sent on application.

For unprepared papers see page 26.

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Reduced fac-similes of labels of prepared Parchmine and Columbia Papers.

PARCHMINE BLUEPRINT PAPERS.

Parchmine Papers are fine blueprint papers, which will often be found useful on account of their great strength and toughness which adapt them for prints intended to be filed for record or to stand much handling.

PARCHMINE PAPER, light weight, **prepared,**

		30	36	42	54 in. wide,
222 L.	per roll of 10 yards . . . . $	90	1 10	1 30	1 75
222 LX.	" 50 "	4 15	5 05	5 95	8 00

PARCHMINE PAPER, medium thick, **prepared,**

		30	36	42	54 in. wide,
222.	per roll of 10 yards . . . . $	1 15	1 35	1 60	2 25
222 X.	" 50 "	5 40	6 30	7 45	10 50

PARCHMINE PAPER, thick, **prepared,**

		30	36	42 in. wide,
223.	per roll of 10 yards . . . . $	1 30	1 50	1 80
223 X.	" 50 "	6 15	7 05	8 45

COLUMBIA BLUEPRINT PAPERS.

Columbi Papers are intended for the more general employment of blueprints, where the price is a consideration, as for distribution, proposals, etc. They compare favorably with the papers generally put on the market as "First-class blueprint paper."

COLUMBIA PAPER, light weight, **prepared,**

		24	30	36	42 in. wide,
224 L.	per roll of 10 yards $	55	65	75	90
224 LX.	" 50 "	2 50	2 95	3 40	4 10

COLUMBIA PAPER, medium thick, **prepared,**

		24	30	36	42	54* in. wide,
224.	per roll of 10 yards $	70	80	90	1 10	1 50
224 X.	" 50 "	3 25	3 70	4 15	5 10	6 85

*The 54 in. width is prepared to order only.

COLUMBIA PAPER, thick, **prepared,**

		24	30	36	42 in. wide,
224½.	per roll of 10 yards $	80	95	1 10	1 30
224½ X.	" 50 "	3 75	4 45	5 15	6 10

COLUMBIA PAPER, thin, **prepared,** (mailing weight.)

		24	30	36	42 in. wide,
225½.	per roll of 10 yards $	55	65	75	90
225½ X.	" 50 "	2 50	2 95	3 40	4 10

Sample prints sent on application.

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COLUMBIA BLUEPRINT CLOTHS.



Reduced fac-simile of label of Columbia Blueprint Cloth.

Columbia Blueprint Cloth on account of its strength is preferred for prints intended for rough handling, especially in out-door work.

COLUMBIA CLOTH, **prepared**, light weight,

		36	42	in. wide,
228L.	per roll of 10 yards	$ 4 00	5 00	
228LX.	" " 50 "	19 60	24 50	

COLUMBIA CLOTH, **prepared**, medium,

		30	36	42	54* in. wide
228.	per roll of 10 yards	$ 2 90	3 20	4 40	6 00
228X.	" " 50 "	14 15	15 60	21 50	29 40

*The 54 in. width is prepared to order only.

BLACKPRINT PAPERS.

NIGROSINE PAPER.

Positive Prints: Black Lines on White Background.

Nigrosine Paper gives a positive black print of the tracing on a white background. These prints can be colored, added to, altered etc., like a drawing. This paper requires a chemical developing bath.

226. *Nigrosine* Black Process Paper, **prepared**.

	30	36	42 in. wide,
per roll of 10 yards	$ 1 50	1 80	2 10

227. *Nigrosine* Developer for Nigrosine Process (powder).

	4	8	16-ounce jar,
per jar	$ 50	90	1 60

Directions for printing and developing furnished with each roll.

Sample prints sent on application.

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Maduro Paper heavy, **prepared,** 30 36 42 in. wide,

229½. per roll of 10 yards. $ 2 10 2 50 3 00

229½X. " " 50 " 10 15 12 00 14 40

Maduro Cloth, light weight, **prepared** 36 42 in. wide,

229 CL. per roll of 10 yards. $ 5 50 6 60

Maduro Cloth, medium, **prepared,** 30 36 42 54*in. wide,

229 C. per roll of 10 yards. $ 4 00 4 50 5 75 9 50

Maduro Cloth, like Columbia Cloth, is very strong and tough, and adapted for prints for out-door use or rough handling.

*The 54 in. width is prepared to order only.

Maduro Fixing Salt, 4 8 16 oz box.

229 S. . . . . per box, 15 25 40

Sample Prints sent on application.

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BLACK PROCESS PAPERS.

(Require water bath only.)



The **Umbra** is a positive paper, giving an exact fac-simile of the original drawing in clear Black lines on a white ground. As the prints are positive, they do not reverse light and shading like a blueprint does. **Umbra** prints can be colored, shaded, altered, etc., just like an original drawing.

The **Umbra Paper** requires no chemical bath, but is developed in a waterbath, like blueprint paper.

Umbra Black Process Paper, **prepared**, medium,

	30	36	42 in. wide
227½. per roll of 10 yards	$ 2 00	2 50	3 00

Umbra Black Process Paper, **prepared**, thin,

	30	36	42 in. wide
227½T. per roll of 10 yards	$ 2 25	2 75	3 25

Sample prints sent on application.

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MADURO PAPERS AND CLOTHS.

Negative Prints: White Lines on Black-Brown background.
Positive Prints: Black-Brown lines on White background.

(Maduro Prints serve also as Negatives for making Positive Prints.)



Reduced fac-similes of labels of Maduro Paper and Cloth.



Maduro Paper and Cloth give a negative, white-line copy of the original on black-brown background. As this background is impervious to light, these prints can, when made on THIN MADURO PAPER or CLOTH, be used as negatives from which any number of POSITIVE PRINTS of the original can be taken. When many prints are to be made from one tracing, a number of Maduro prints on thin paper can be made, and used as negatives to make many positive prints simultaneously and without risk of damaging or wearing the original tracing.

BLUEPRINTS OR MADURO PRINTS FROM A (NEGATIVE) MADURO PRINT ON THIN PAPER OR CLOTH, WILL BE FAC-SIMILES OF THE ORIGINAL DRAWING OR TRACING, i. e. BLUE OR BLACK-BROWN LINES ON A WHITE BACKGROUND.

A box of Fixing Salt, 229 S., and directions furnished with each roll.

Maduro Paper, thin, **prepared,** (also for negatives.)

	30	36	42	54*in. wide
229T. per roll of 10 yards.	$1 75	2 00	2 25	4 00
229TX. " " 50 "	8 40	9 55	10 70	19 25

Maduro Paper, medium, **prepared,** 30 36 42 54*in. wide,

229M. per roll of 10 yards.	$1 75	2 00	2 25	4 00
229MX. " " 50 "	8 40	9 55	10 70	19 25

*The 54 in. width is prepared to order only.

Maduro Paper heavy, **prepared,** 30 36 42 in. wide,

229½. per roll of 10 yards.	$ 2 10	2 50	3 00
229½X. " " 50 "	10 15	12 00	14 40

Maduro Cloth, light weight, **prepared** 36 42 in. wide,

229CL. per roll of 10 yards.	$ 5 50	6 60

Maduro Cloth, medium, **prepared,** 30 36 42 54*in. wide,

229C. per roll of 10 yards.	$ 4 00	4 50	5 75	9 50

Maduro Cloth, like Columbia Cloth, is very strong and tough, and adapted for prints for out-door use or rough handling.

*The 54 in. width is prepared to order only.

Maduro Fixing Salt, 4 8 16 oz box.

229 S. . . . . per box, 15 25 40

Sample Prints sent on application.

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Papers and Cloth for Blueprinting.

(UNSENSITIZED).



Reduced fac-similes of labels of (unsensitized) Helios and E. T. Papers.



230. *Helios* Paper, medium thick, **unsensitized.**

	24	30	36	42	54 in. wide,
per roll of 50 yards .	$ 3 35	4 20	5 05	5 90	8 15

231. *Helios* Paper, thick, **unsensitized.**

	24	30	36	42	54 in. wide,
per roll of 50 yards .	$ 4 35	5 45	6 30	7 65	10 40

235. *E. T.* Paper, very thin and tough, **unsensitized,** mailing weight.

	24	30	36	42 in. wide,
per roll of 50 yards .	$ 2 60	2 95	3 55	4 40

232 L. PARCHMINE PAPER, light weight, **unsensitized**

	30	36	42	54 in. wide,
per roll of 50 yards	$ 2 70	3 30	3 90	5 40

232. PARCHMINE PAPER, medium thick, **unsensitized.**

	30	36	42	54 in. wide,
per roll of 50 yards	$ 3 95	4 55	5 40	7 90

233. PARCHMINE PAPER, thick, **unsensitized.**

	30	36	42 in. wide,
per roll of 50 yards	$ 4 70	5 30	6 40

234 L. COLUMBIA PAPER, light weight, **unsensitized**

	24	30	36	42 in. wide,
per roll of 50 yards .	$ 1 85	2 10	2 40	3 00

234. COLUMBIA PAPER, medium thick, **unsensitized.**

	24	30	36	42	54 in. wide,
per roll of 50 yards	$ 2 50	2 85	3 15	3 95	5 35

234½. COLUMBIA PAPER, thick, **unsensitized.**

	24	30	36	42 in. wide,
per roll of 50 yards	$ 3 10	3 60	4 15	5 00

238 L. COLUMBIA CLOTH, light weight, **unsensitized.**

	36	42 in. wide,
per roll of 10 yards	$ 3 60	4 20

238. COLUMBIA CLOTH, **medium thick, unsensitized.**

	30	36	42	54 in. wide
per roll of 10 yards	$ 2 50	2 70	3 80	4 60

Samples Sent on application, or general sample book for 15c.

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ERASING FLUIDS

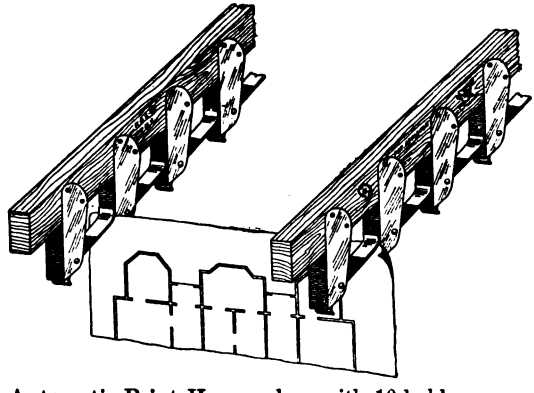
for making Alterations and Additions on Prints.

240 W.	**HELIOS** Erasing Fluid, for Blueprints, **white**, per bottle				$ 20
240 R.	do.	do.	**red**,	"	" 20
240 Y.	do.	do.	**yellow**,	"	" 20
240 M.	**MADURO** Erasing Fluid, for Maduro prints, **white**,			"	" 20

For white pencils for marking on blueprints see page 280.

K & E AUTOMATIC PRINT HANGER,

Patented.



249-4	K & E	Automatic	Print	Hanger,	bar	with	10	holders,	each	bar	$1 50
249-5	"	"	"	"	"	"	20	"	"	"	3 00
249-6	"	"	"	"	"	"	25	"	"	"	3 75
249-7	"	"	"	"	"	"	30	"	"	"	4 50
249-8	"	"	"	"	"	"	35	"	"	"	5 25

We quote single bars, as it depends on the size of the print whether it requires 1 or 2 or more bars to prevent sagging of the wet print between the points of suspension.

This automatic hanger for blueprints, etc., economizes space, saves much time and labor in drying prints, will not tear the paper and avoids crumpling of the prints. The metal holders are attached to a wooden bar, each holder having a loosely jointed tongue. When a print is inserted it raises the tongue which, dropping back, firmly locks the print. To remove the print, the tongue is raised by extending one finger under it. The metal holders are about 2½ inches apart, giving ample circulation of air between the suspended prints.

SPRING CLIPS.



No. 249-3.

249-3 Spring clips, for clamping prints when drying . . . . . **doz.** $ 25

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KEUFFEL & ESSER CO. NEW YORK.

STANDARD
(TRADE MARK)
PROFILE AND CROSS SECTION PAPERS AND CLOTHS.



Reduced fac-similes of labels of Standard Profile Papers



We call attention to the quality of the paper we use for our "Standard" Profile and Cross Section Papers, which is a fine tough drawing paper.

Standard Profile and Cross Section Cloths are recommended in preference to mounted Profile paper for outdoor use, as they will stand much rough handling and suffer less in unfavorable weather.

Standard Profile and Cross Section Tracing Cloths are Imperial Cloth.

STANDARD PROFILE PAPERS AND CLOTHS
(TRADE MARK)

In sheets and in continuous rolls.

Please order by number.

Plate A, 4 × 20 to the inch.

			SHEETS.			sheet
250 G.	green,	engraving	15×42 in.,	Drawing Paper	quire	$6 00	$ 30
250 R.	orange	"	15×42 "	do do	"	6 00	30
			CONTINUOUS.			yard
253 G.	green,	engraving	20 in. wide,	Drawing Paper . .	50 y'd roll	$10 00	$ 24
253 R.	orange	"	20 " "	do. do. . .	50 " "	10 00	24
254 G.	green	"	10 " "	do. do. . .	50 " "	6 25	15
254 R.	orange	"	10 " "	do. do. . .	50 " "	6 25	15
255 G.	green	"	20 " "	mounted on muslin,	20 " "	10 00	60
255 R.	orange	"	20 " "	do. do.	20 " "	10 00	60
256 G.	green	"	10 " "	do. do.	20 " "	6 75	40
256 R.	orange	"	10 " "	do. do.	20 " "	6 75	40
257 R.	orange	"	20 " "	Tracing Paper, . .	50 " "	10 00	24
257½ R.	orange	"	10 " "	do. do. . .	50 " "	6 25	15
258 R.	orange	"	20 " "	Tracing Cloth, . .	20 " "	12 50	75
259 G.	green	"	20 " "	Columbia Cloth, . .	20 " "	10 00	60
259 R.	orange	"	20 " "	do. do.	20 " "	10 00	60

All "Standard" Profile Papers and Cloths bear this trade-mark along the margin.

Samples sent on application, or general sample book for 15c.

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STANDARD PROFILE PAPERS AND CLOTHS.

(TRADE MARK)

In sheets and in continuous rolls.

Please order by number.

Plate B, 4 × 30 to the inch.

			SHEETS.					sheet
260G.	green, engraving	13½×42 in.,	**Drawing Paper,**	. . . .	quire	$6 00	$	30
260R.	orange "	13½×42 "	do.	do.	"	6 00		30
			CONTINUOUS.					yard
263G.	green, engraving	20 in. wide,	**Drawing Paper,**	. . 50	y'd roll	$10 00	$	24
263R.	orange "	20 " "	do.	do. . . 50	" "	10 00		24
264G.	green "	9 " "	do.	do. . . 50	" "	6 25		15
264R.	orange "	9 " "	do.	do. . . 50	" "	6 25		15
265G.	green "	20 "	" mounted on muslin,	20	" "	10 00		60
265R.	orange "	20 " "	do.	do. 20	" "	10 00		60
266G.	green "	9 " "	do.	do. 20	" "	6 75		40
266R.	orange "	9 " "	do.	do. 20	" "	6 75		40
267R.	orange "	20 "	" **Tracing Paper,**	. . . 50	" "	10 00		24
267½R.	orange "	9 " "	do.	do. . . . 50	" "	6 25		15
268R.	orange "	20 "	" **Tracing Cloth,**	. . . 20	" "	12 50		75
269G.	green "	20 "	" **Columbia Cloth,**	. . 20	" "	10 00		60
269R.	orange "	20 " "	do.	do. . . 20	" "	10 00		60

Plate C, 5 × 25 to the inch

			SHEETS ONLY.				
270G.	green, engraving	15 × 42 in.,	**Drawing Paper,**	quire	$6 00,	sheet	$ 30
270R.	orange "	15 × 42 "	do.	do.	"	6 00,	" 30

All "Standard" Profile Papers and Clothes bear this trade mark along the margin.

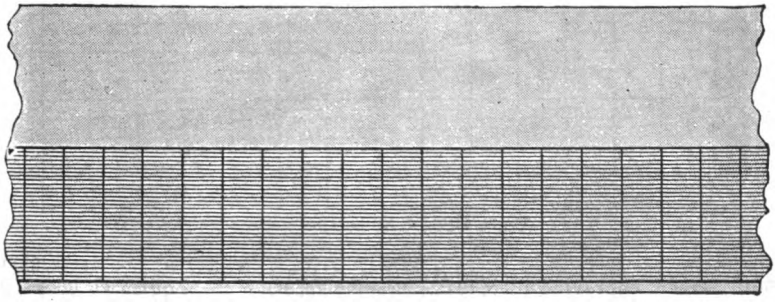
Samples sent on application, or general sample book for 15c.

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STANDARD
(TRADE MARK)
PROFILE-PLAN PAPERS AND CLOTHS.

In continuous rolls.

Width of paper 22 in.



In Profile-Plan Paper, the profile ruling with its margin is only half the width of the paper, the other half being left blank for sketching difficult cuts or fills, embankments or excavations etc. and for explanatory notes, so that they are connected for ready reference. This is a very convenient and accurate method, which saves referring to several maps for the same information. In mapping complicated cuts, fills, embankments, etc., it is indispensable.

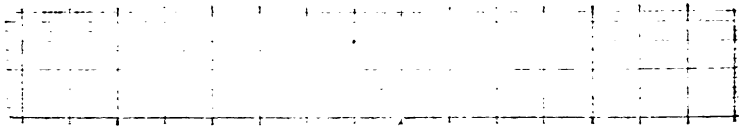


Plate A. 4 x 20 to the inch.

	Standard Profile-Plan Papers and Cloths,					yard
253 H.G.	green, engraving	10 in. wide,	**Drawing paper,**	50 y'd roll	$10.00	$ 24
253 H.R.	orange, "	10 " "	**do. do.**	50 " "	10.00	24
257 H.R.	orange, "	10 " "	**Tracing paper,**	50 " "	10.00	24
258 H.R.	orange, "	10 " "	**Tracing cloth,**	20 " "	12.50	75



Plate B. 4x30 to the inch.

	Standard Profile-Plan Papers and Cloths,					yard
263 H.G.	green, engraving	9 in. wide,	**Drawing paper,**	50 y'd roll	$10.00	$ 24
263 H.R.	orange, "	9 " "	**do. do.**	50 " "	10.00	24
267 H.R.	orange, "	9 " "	**Tracing paper,**	50 " "	10.00	24
268 H.R.	orange, "	9 " "	**Tracing cloth,**	20 " "	12.50	75

All "Standard" Profile Papers and Cloths bear this trade mark along the margin.

Samples sent on application, or general sample book for 15c.

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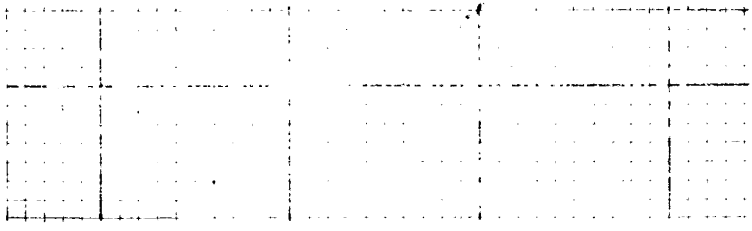
KEUFFEL & ESSER CO. NEW YORK.

STANDARD CROSS SECTION PAPERS AND CLOTHS.

(TRADE MARK)

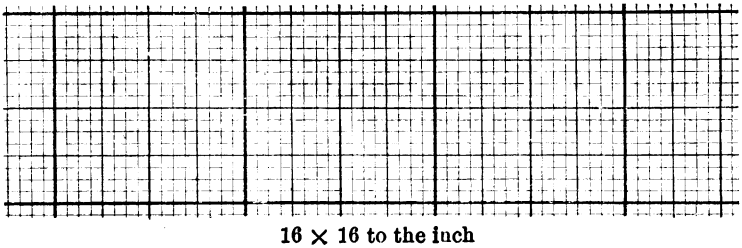
In sheets and in continuous rolls.

Please order by number.



10 × 10 to the inch.

				SHEETS.					sheet
280 G.	green,	engraving	16 × 20	in.,	Drawing Paper,	. . .	quire	$3 50	$ 20
280 R.	orange	"	16 × 20	"	do.	do.	. . . "	3 50	20
280 B.	blue	"	16 × 20	"	do.	do.	. . . "	3 50	20
281 R.	orange	"	16 × 20	"	Tracing Paper,		. . . "	3 50	20
				CONTINUOUS.					yard
283 G.	green,	engraving	20	in.	wide, Drawing Paper,		50 y'd	roll	$10 00	$ 24
283 R.	orange	"	20	"	"	do.	do.	50 " "	10 00	24
285 G.	green	"	20	"	" mounted on muslin,			20 " "	10 00	60
285 R.	orange	"	20	"	"	do.	do.	20 " "	10 00	60
287 R.	orange	"	20	"	" Tracing Paper,			50 " "	10 00	24
288 R.	orange	"	20	"	" Tracing Cloth,			20 " "	12 50	75
289 G.	green	"	20	"	" Columbia Cloth,			20 " "	10 00	60
289 R.	orange	"	20	"	"	do.	do.	20 " "	10 00	60



16 × 16 to the inch

				SHEETS.					sheet
290 G.	green,	engraving	17×22	in.,	Drawing Paper,	. . .	quire	$ 3 50	$ 20
290 R.	orange	"	17×22	"	do.	do.	. . . "	3 50	20
290 B.	blue	"	17×22	"	do.	do.	. . . "	3 50	20
291 R.	orange	"	17×22	"	Tracing Paper,		. . . "	3 50	20
				CONTINUOUS.					yard
293 G.	green,	engraving	20	in.	wide, Drawing Paper,		50 y'd	roll	$10 00	$ 24
293 R.	orange	"	20	"	"	do.	do.	50 " "	10 00	24
295 G.	green	"	20	"	" mounted on muslin,			20 " "	10 00	60
295 R.	orange	"	20	"	"	do.	do.	20 " "	10 00	60

All "Standard" Cross Section Papers and Cloths bear this trade-mark along the margin.

Samples sent on application, or general sample book for 15c.

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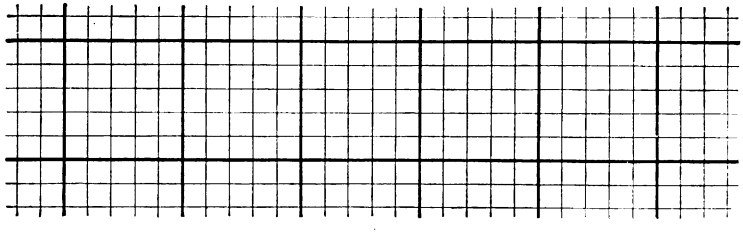
STANDARD CROSS SECTION PAPERS AND CLOTHS.

(TRADE MARK) In sheets and in continuous rolls.

Please order by number.

Millimeters.

					SHEETS.					sheet
300 G.	green,	engraving	40×50	cm.	Drawing	Paper,	quire	$3	50	$ 20
300 R.	orange	"	40×50	"	do.	do.	"	3	50	20
300 B.	blue	"	40×50	"	do.	do.	"	3	50	20
301 R.	orange	"	40×50	"	Tracing	Paper,	"	3	50	20
					CONTINUOUS.					yard
303 G.	green,	engraving	50	cm. wide,	Drawing	Paper,	50 y'd roll	$10	00	$ 24
303 R.	orange	"	50	" "	do.	do.	50 " "	10	00	24
305 G.	green	"	50	" "	mounted on muslin,		20 " "	10	00	60
305 R.	orange	"	50	" "	do.	do.	20 " "	10	00	60
306 G.	green	"	75	" "	Drawing	Paper, .	50 " "	21	00	50
306 R.	orange	"	75	" "	do.	do. .	50 " "	21	00	50
308 G.	green	"	75	" "	mounted on muslin,		20 " "	17	00	1 00
308 R.	orange	"	75	" "	do.	do.	20 " "	17	00	1 00
307 R.	orange	"	50	" "	Tracing	Paper, .	50 " "	10	00	24
307½ R.	orange	"	75	" "	do	do. .	50 " "	21	00	50
308½ R.	orange	"	50	" "	Tracing	Cloth, .	20 " "	12	50	75



8 × 8 to the inch, fifth lines heavy.

										sheet
310 G.	green,	SHEETS	engraving	16¼×21⅞	in.,	Drawing	Paper, quire	$3	50	$ 20
310 R.	orange	"	"	16¼×21⅞	"	do.	do. "	3	50	20
310 B.	blue	"	"	16¼×21⅞	"	do.	do. "	3	50	20
311 R.	orange	"	"	16¼×21⅞	"	Tracing	Paper, "	3	50	20

All "Standard" Cross Section Papers and Cloths bear this trade-mark along the margin.

Samples sent on application, or general sample book for 15c.

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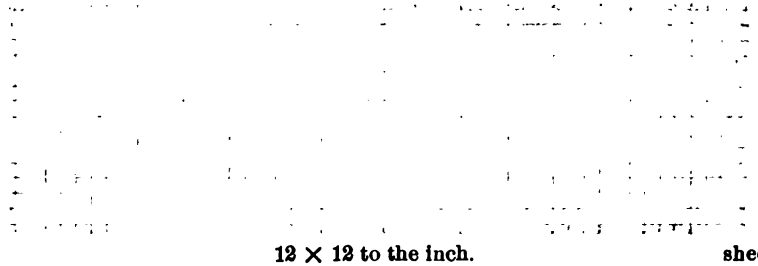
STANDARD CROSS SECTION PAPERS IN SHEETS.

(TRADE MARK) Please order by number.



5 × 5 to the half-inch.

								sheet
320G.	green, SHEETS,	engraving	16×20 in.,	Drawing Paper,	quire	$3 50	$	20
320R.	orange	"	16×20 "	do.	do.	"	3 50	20
320B.	blue	"	16×20 "	do.	do.	"	3 50	20
321R.	orange	"	16×20 "	Tracing Paper,		"	3 50	20



12 × 12 to the inch.

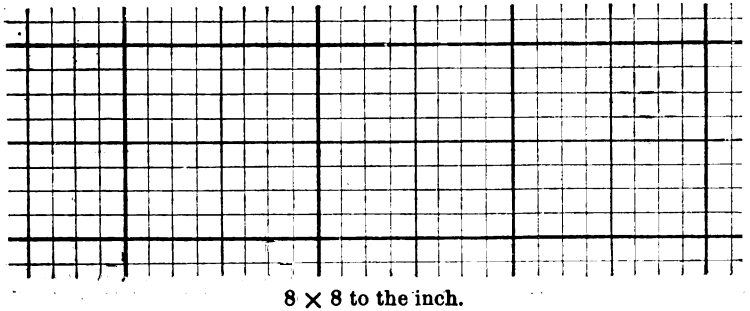
								sheet
322.	green, Sheets,	engraving	16 × 20 in.,	Drawing Paper,	quire	$ 3 50	$	20

All "Standard" Cross Section Papers bear this trade-mark along the margin.

SIMPLEX CROSS SECTION PAPER.

In continuous rolls.

Simplex Cross Section Paper is intended for architectural and mechanical full-size detail sketches.



8 × 8 to the inch.

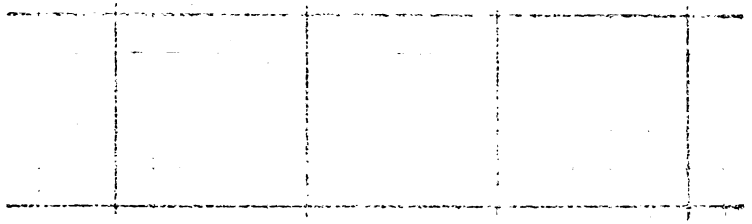
326R.	orange, CONTINUOUS,	engraving 30 in. wide,	Simplex Detail Paper,	50 y'd. roll,	$ 6 00	yard	$	14
326D.	do.	do.	White Detail Paper,	50 y'd. roll,	8 00	"		18

Samples sent on application, or general sample book for 15c.

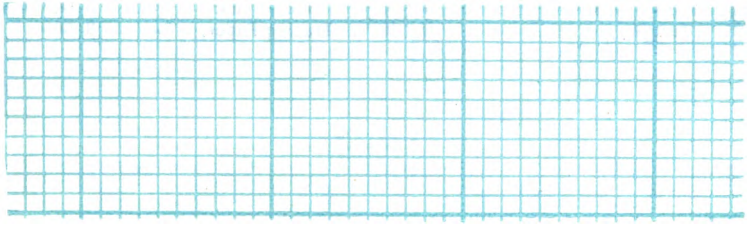
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RULED CROSS SECTION PAPERS

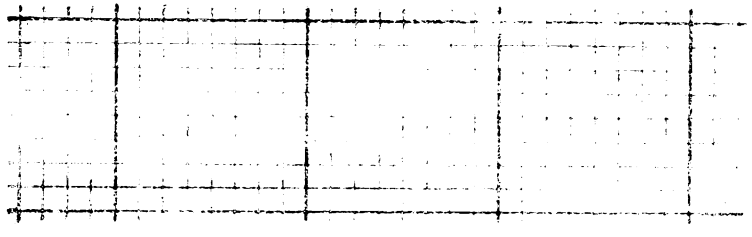
IN SHEETS. DRAWING PAPER.



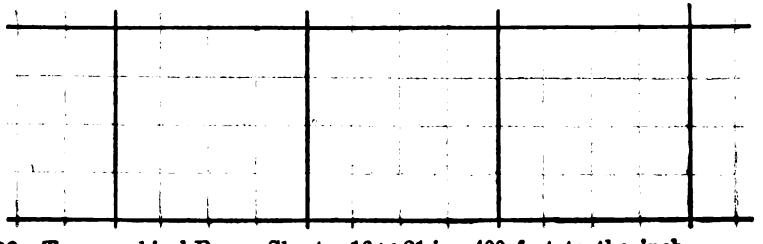
330. Sheets, 16 × 21 in., 5 × 5 to the inch, ruled blue . . . . quire $ 1 00
ream 17 50



331. Sheets, 16 × 21 in., 10 × 10 to the inch, ruled blue . . . quire $ 1 00
ream 17 50



332. Sheets, 16 × 21 in., 8 × 8 to the inch, ruled blue . . . quire $ 1 00
ream 17 50



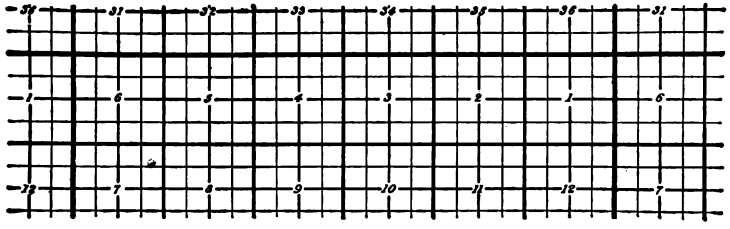
333. Topographical Paper, Sheets, 16 × 21 in., 400 feet to the inch, ruled red and blue . . . . . quire $ 1 00
ream 17 50

Samples sent on application, or general sample book for 15c.

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TOWNSHIP PAPER

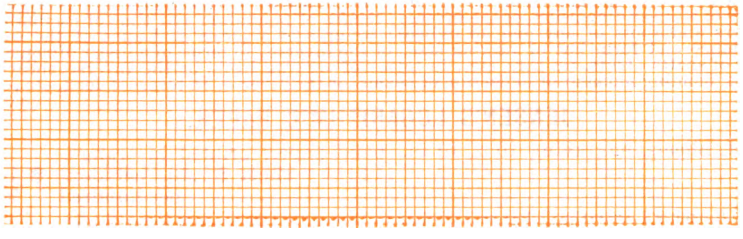
PRINTED. Black only.



335. Sheets, engraving 15 × 18 in., **Drawing Paper,** quire $ 3 00 sheet $ 15

CONSTRUCTOR'S SKETCH PAPER

PRINTED.



10 × 10 to the half-inch, fifth lines heavy.

334A.	Sheets,	neutral tint	engraving	5 × 7½ in.,	Tracing	Paper .	quire $	25
334AR.	"	orange	"	5 × 7½ in.,	"	" .	"	25
334B.	"	neutral tint	"	5 × 7½ in.,	Drawing	" .	"	25
334C.	"	neutral tint	"	7½ × 10 in.,	Tracing	" .	"	30
334CR.	"	orange	"	7½ × 10 in.,	"	" .	"	30
334D.	"	neutral tint	"	7½ × 10 in.,	Drawing	" .	"	30
334E.	"	neutral tint	"	10 × 15 in.,	Tracing	" .	"	75
334ER.	"	orange	"	10 × 15 in.,	"	" .	"	75
334F.	"	neutral tint	"	10 × 15 in.,	Drawing	" .	"	75

This paper is printed in a neutral tint and in orange. The lines are indelible, and can be photo-printed. We recommend it for the use of mechanical engineers, students, &c.

CROSS SECTION PAPERS

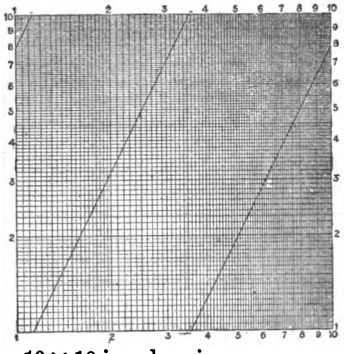
RULED OR PRINTED, OF OTHER DESIGNS THAN HERE LISTED, MADE TO ORDER IN REASONABLE QUANTITIES. PRICES QUOTED ON INQUIRY.

Samples sent on application, or general sample book for 15c.

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LOGARITHMIC CROSS SECTION PAPERS

DURAND'S LOGARITHMIC PAPER.



336. Sheets, engraving 10 × 10 in., drawing paper, neutral tint, sheet, $ 08
doz. 75

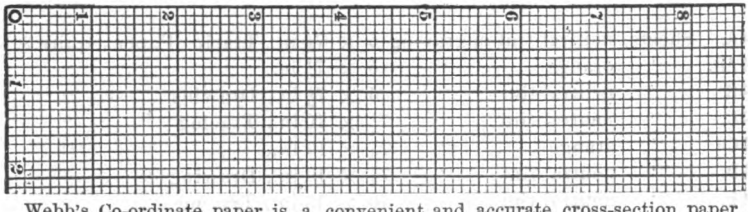
On this paper the scales in each direction are logarithmic instead of uniform as in other cross section papers. The numbers and divisions marked are placed at such points that their distances from the origin are proportional to the logarithm of such numbers instead of to the numbers themselves. Among the various relationships which may be represented by means of this paper, are: Circumferences and diameters of circles in terms of their radii or diameters, or the inverse; moments of inertia and radii of gyration in terms of a linear dimension, or the inverse; length of pendulum and time of oscillation; powers and roots of any and all indices; weights of a series of bodies of the same substance and form but of varying size, or the inverse, in terms of a linear dimension; sizes of shafts, struts, tie-bars, etc., in terms of varying load, or the inverse; shearing stress, bending moment or deflection of beams, or the inverse, in terms of load, etc., etc.

JENSEN'S LOGARITHMIC PAPER.

336 J. Sheets, engraving 10 × 10 in. bond paper, printed in orange,
sheet $ .10 per doz. $ 1.00
per hundred 7.50

Jensen's Logarithmic Paper is similar to Durand's, but has two logarithmic scales in each direction, instead of one.

WEBB'S CO-ORDINATE PAPER

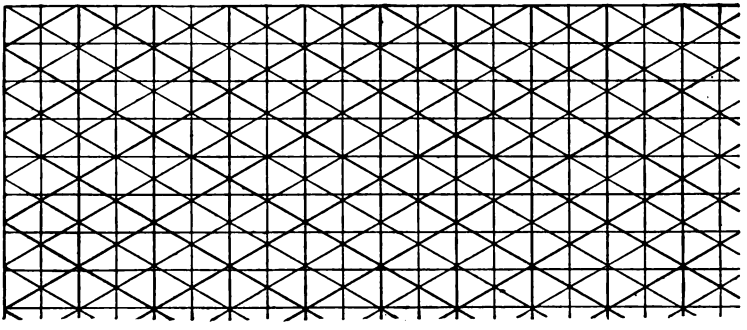


Webb's Co-ordinate paper is a convenient and accurate cross-section paper for drafting rooms, technical schools, laboratories, etc. It is printed from accurate engravings in a neutral olive tint which can be photographed or photo-printed. The scale of the rulings is between the English and French (½ inches and centimeters) subdivided 10 × 10. The lines of Nos. 337 to 337-1L are numbered in two directions for ready reference to any point on the paper and the sheets are punched for portfolio binding. A table of natural tangents is printed on the margin of some of the larger size sheets, for laying off angles.

337.	Best Linen Record Paper,	8¾ × 11⅛ in.,	180 × 220	squares,	sheet	$ 04
337 L.	" " " "	11⅜ × 17¼ "	240 × 350	"	"	07
337-1.	Best thin Bond Paper,	8¾ × 11⅛ "	180 × 220	"	"	04
337-1L.	" " " "	11⅜ × 17¼ "	240 × 350	"	"	07
337-2.	" " " "	8 × 10½ "	160 × 220	"	"	03
337-2L.	" " " "	10½ × 16 "	220 × 330	"	"	06
337-3.	Smooth Drawing Paper,	8 × 10½ "	160 × 220	"	per block of 50 sheets	75

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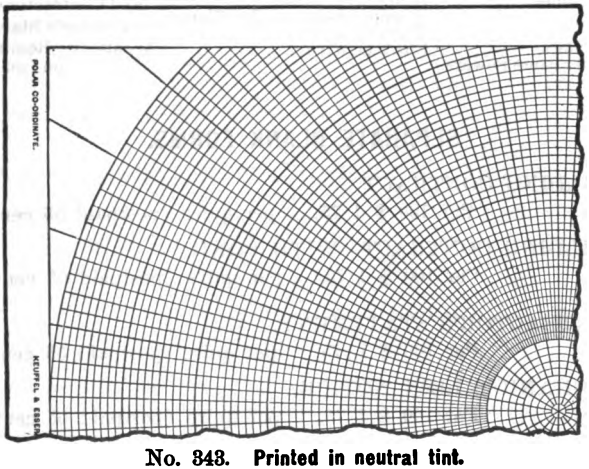
ISOMETRIC CROSS-SECTION PAPER.



No. 342. **Printed in neutral tint.**

342A.	Isometric Cross-section paper, sheets, engraving 6 × 9 in. Drawing Paper	per quire	$ 15
342B.	Isometric Cross-section paper, sheets, engraving 9 × 12 in. Drawing Paper	" "	30
342C.	Isometric Cross-section paper, sheets, engraving 12 × 18 in. Drawing Paper	" "	55
342AP.	Isometric Cross-section paper, Pad of 40 sheets, No. 342 A, 6 × 9 in. . .	each	30
342BP.	Isometric Cross-section paper, Pad of 40 sheets, No. 342 B, 9 × 12 in. . .	"	60
342CP.	Isometric Cross-section paper, Pad of 40 sheets, No. 342 C, 12 × 18 in. . .	"	1 10

POLAR CO-ORDINATE PAPER.



No. 343. **Printed in neutral tint.**

343A.	Polar Co-ordinate Paper, sheets, engraving 7 × 10 in., Drawing paper	per quire	$ 30
343B.	Polar Co-ordinate Paper, like No. 343 A., but Tracing Paper	" "	30

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"STANDARD"
(Copyrighted)

BLANKS FOR THE BUILDING TRADES.

BLANK FORM SPECIFICATIONS AND REMINDER.

For Frame and Brick Buildings, costing from $500 to $15,000.

The attention of Architects and the Building Trades is called to these **IMPROVED FORMS** of SPECIFICATIONS, CONTRACTS, etc. We call special attention to the fact that this revision of the form of Contract, including Bond and Contractor's Statements, etc., is based upon the revised Lien Laws. The appreciation of the previous editions has induced us to spare no expense for legal and architectural talent to bring the new edition up to date. The fly-leaf "Reminder" is highly appreciated by the profession in general.



338A. STANDARD SPECIFICATIONS.

Single sets . .	(postpaid 28 cents)	$ 25
Dozen sets . .	(postpaid $2 75)	2 50
100 sets		17 50

The "Standard" Blank Form Specifications consist of fourteen sheets in strong manilla cover, containing the following blank forms:

Preamble, Masons, Cut Stone Plasterers, Carpenters, Painters, Glaziers Plumbers, Gas Fitters, Sewers	Galvanized Iron, Iron, (Structural) Heating, Steam or Hot Water Heating, Furnace, Electric Wiring	Agreement between Owner and Contractor (with Bond) Contractor's Statement Architect's Reminder (on inside of cover)

SEPARATE BLANK FORMS.

338C. BUILDING CONTRACT,
Per 100 $ 1 75, per quire (postpaid 55 cents) $ 50

338D. BUILDING CONTRACT—WITH BOND,
Per 100 $ 1 75, per quire (postpaid 55 cents) $ 50

338F. CONTRACTOR'S STATEMENT,
Per 100 $ 1 75, per quire (postpaid 55 cents) $ 50

338G. MECHANIC'S LIEN NOTICE,
Per 100 $ 1 75, per quire (postpaid 55 cents) $ 50

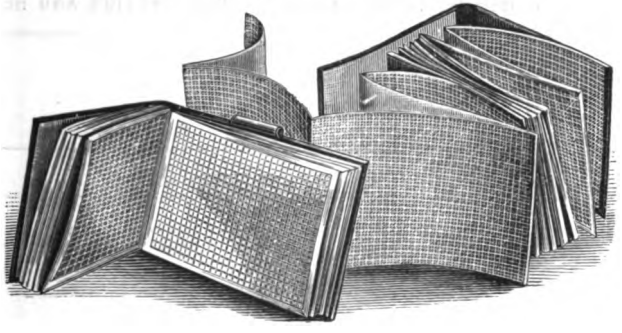
338H. WAIVER OF LIEN,
Per 100 $ 1 75, per quire (postpaid 55 cents) $ 50

339. ARCHITECT'S CERTIFICATE BOOK,
Per book (100 blanks with stubs). . . . . (postpaid 47 cents) $ 40

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PROFILE AND CROSS SECTION BOOKS AND BLOCKS.

PRINTED IN GREEN.





No. 355. 350. 350 closed.

PROFILE BOOKS, CONTINUOUS.

Flexible morocco Covers with Flap and Clasp.

Thin, tough paper mounted on muslin and folded like a map, so that these books take the place of the continuous (roll) profile paper.

Each double page contains six thousand feet—a "Section," as generally laid out for the construction of a road.

350.	Plate A. 4 × 20 to the inch, engraving 5 × 7½ in.	12	25	50	100	miles,
	each	$ 2 00	3 25	5 25	9 50	
351.	Plate B. 4 × 30 to the inch, engraving 4⅛ × 7½ in.	12	25	50	100	miles,
	each	$ 2 00	3 25	5 25	9 50	
351 M.	Metric, green, engraving 10 × 20 cm.	25	50	100	200	pages,
	each	$ 2 00	3 25	5 25	9 50	

PROFILE BOOKS, NOT CONTINUOUS.

Board Covers, morocco, drawing paper, both sides printed.

355.	Plate A. 4 × 20 to the inch, engraving 5 × 7½ in.	25	50	100	leaves,
	each	$ 1 75	2 25	3 00	
356.	Plate B. 4 × 30 to the inch, engraving 4⅛ × 7½ in.	25	50	100	leaves,
	each	$ 1 75	2 25	3 00	
356 M.	Metric, engraving 10 × 20 cm.	25	50	100	leaves,
	each	$ 1 75	2 25	3 00	

Cross Section Blocks.

357A.	5 × 7 in., 10 × 10 to the inch,	24 sheets, ...	each $ 50
357B.	5 × 7 " 8 × 8 " " "	24 "	" 50
357C.	12½ × 20 cm., metric,	24 "	" 50
358A.	7 × 10 in., 10 × 10 " " "	24 "	" 80
358B.	7 × 10 " 8 × 8 " " "	24 "	" 80
358C.	20 × 25 cm., metric,	24 "	" 80

Cross Section Books.

FLEXIBLE COVERS, WITH FLAP AND PENCIL LOOP, 60 LEAVES.

359A.	10 × 10 to the inch, engraving,	4 × 8 in., both sides . . .	each $ 2 00
359B.	8 × 8 " "	4 × 8 " " " . . .	" 2 00

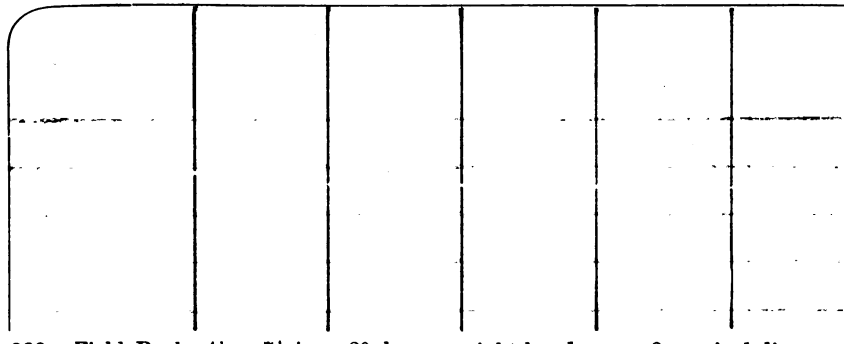
For Cross Section Books with board covers see page 42.

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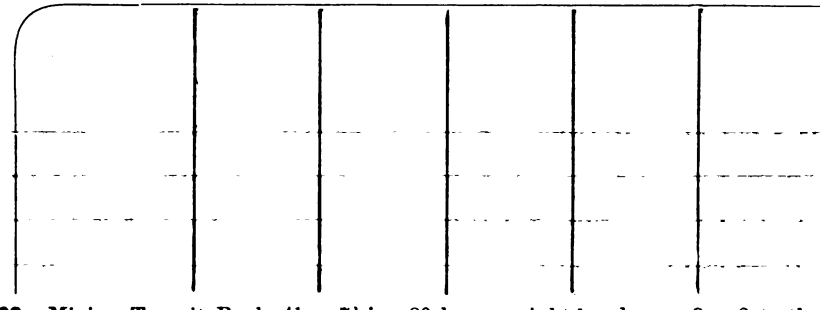
ENGINEER'S

Our Field and Cross-section Books are superior to all others. The paper is of excellent quality They are bound in sheepskin in the best and most substantial manner

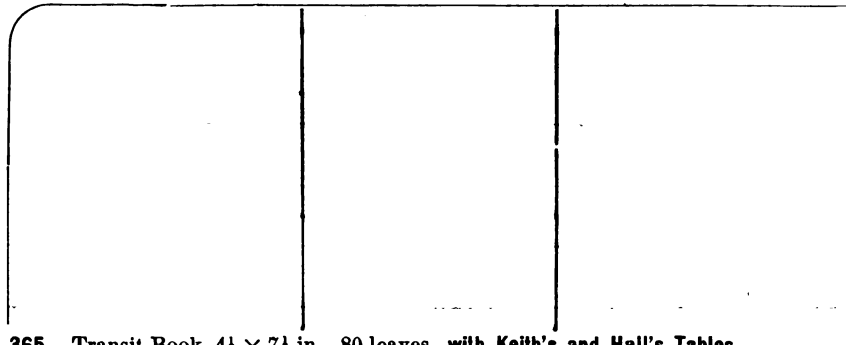
OTHER PATTERNS OF FIELD, CROSS-SECTION AND RECORD BOOKS



360. Field Book, $4\frac{1}{2} \times 7\frac{1}{4}$ in., 80 leaves, right-hand page 8 vertical lines to
361. Field Book, like No. 360 but 60 leaves **with Keith's and Hall's Tables** . . . .



363. Mining Transit Book, $4\frac{1}{2} \times 7\frac{1}{4}$ in., 80 leaves, right-hand page 8×8 to the for each 10 minutes of arc, and **Hall's Tables** . . . . . .



365. Transit Book, $4\frac{1}{2} \times 7\frac{1}{4}$ in., 80 leaves, **with Keith's and Hall's Tables** . . . . .
366. Transit Book, like No. 365, but 60 leaves. **do.** **do.** **do.** . . . . .

Keith's Tables (for R. R. Engineers) consist of: Minutes in decimals of a degree, Inches in decimals of and Externals to a 1° curve, Table of Deflections for Sub-chords, General Curve Formulas, Table of Natural Sines

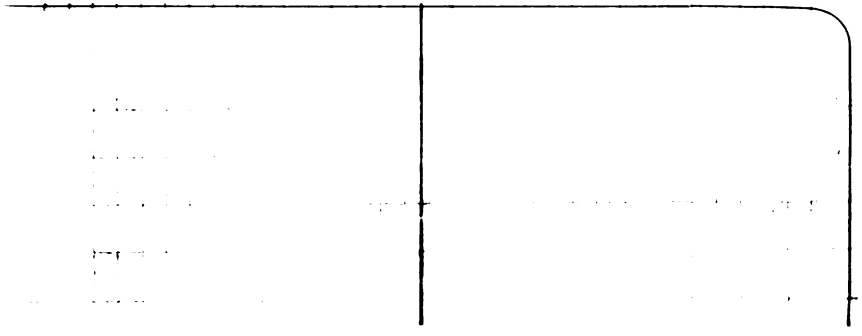
Hall's Tables for Excavations and Embankments comprise:

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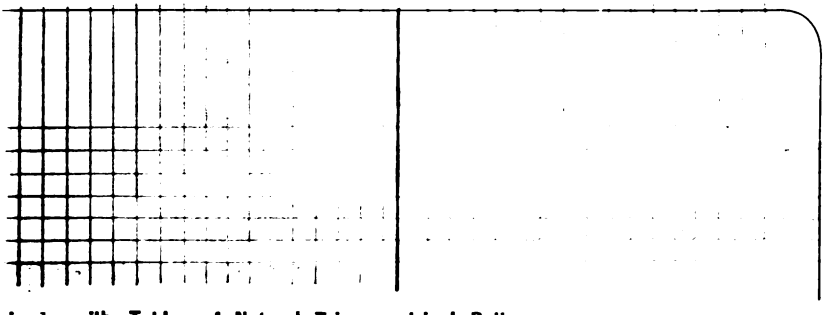
FIELD BOOKS.

and good weight, taking pencil or ink, and the rulings are correctly spaced and weather-proof. and have round corners, board covers and round back, so as to open flat.

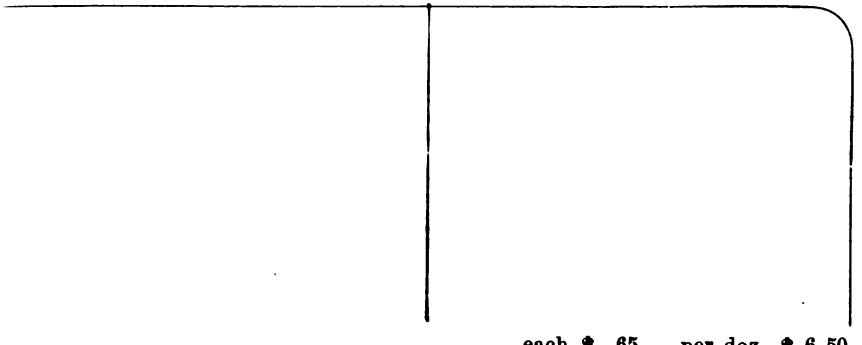
MADE TO ORDER IN LOTS OF NOT LESS THAN 6 DOZ. OF A KIND.



the inch, with Keith's and Hall's Tables . . . . . each $ 65 per doz. $ 6 50
. . . . . " 55 " 5 50



inch, with Tables of Natural Trigonometrical Ratios
. . . . . each $ 65 per doz. $ 6 50

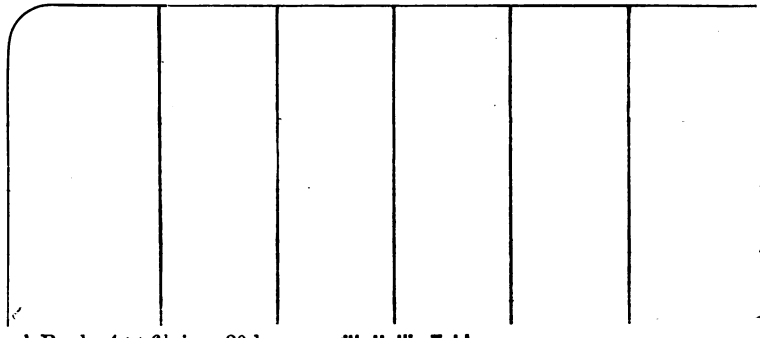


. . . . . each $ 65 per doz. $ 6 50
. . . . . " 55 " 5 50

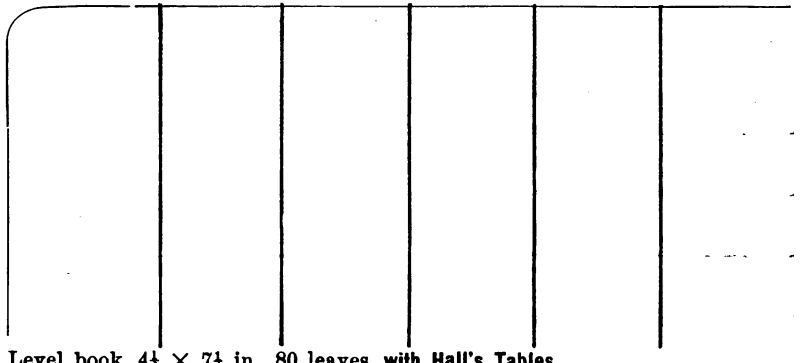
n foot, Radii, Ordinates and Deflections, Tangents and Externals to a 1° curve, Corrections for table of Tangents to every 10 minutes of arc, Table of Natural Tangents to every 10 minutes of arc.

Roadway 18 feet, Slope 1 : 1, and Roadway 14 feet slope 1½ to 1.

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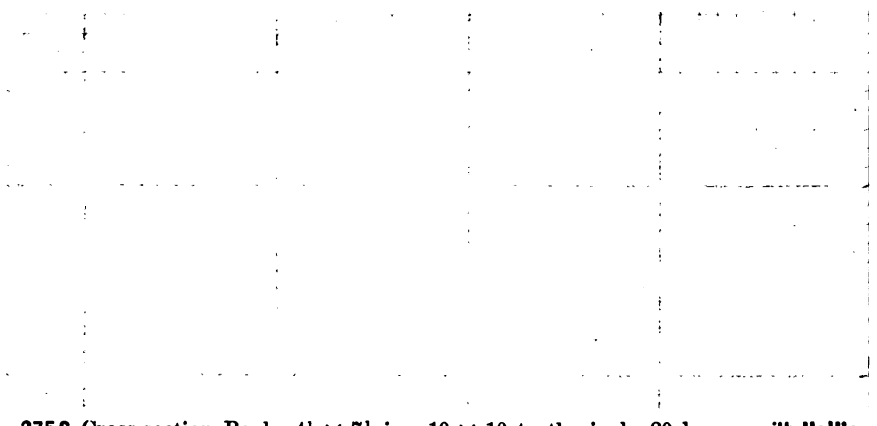


370. Level Book, 4 × 6½ in., 80 leaves, **with Hall's Tables** . . . . . .
371. Level Book, like No. 370, but 60 leaves **with Hall's Tables** . . . . . .



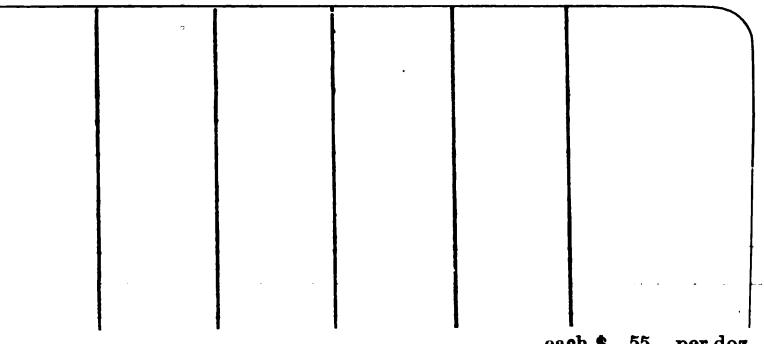
373. Level book, 4½ × 7¼ in., 80 leaves, **with Hall's Tables**. . . . . .
374. Level book, like No. 373, but 60 leaves **with Hall's Tables** . . . . . .

CROSS SECT

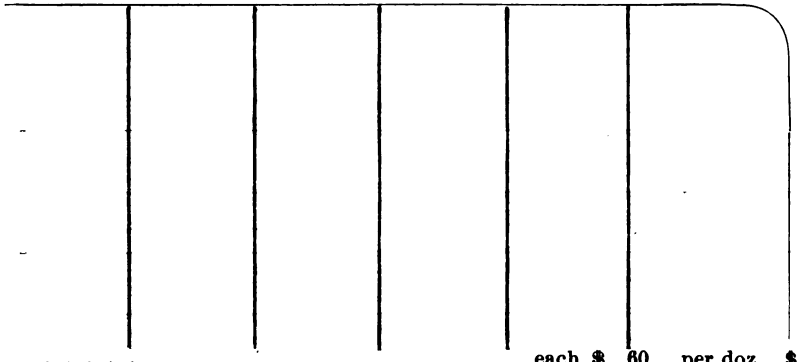


375 S. Cross-section Book, 4½ × 7¼ in., 10 × 10 to the inch, 80 leaves, **with Hall's**
375. Cross-section Book, 5½ × 7½ in., 10 × 10 to the inch, 80 leaves, **with Hall's**
376. Cross-section Book, 6½ × 8½ in., 10 × 10 to the inch, 80 leaves, **with Hall's**

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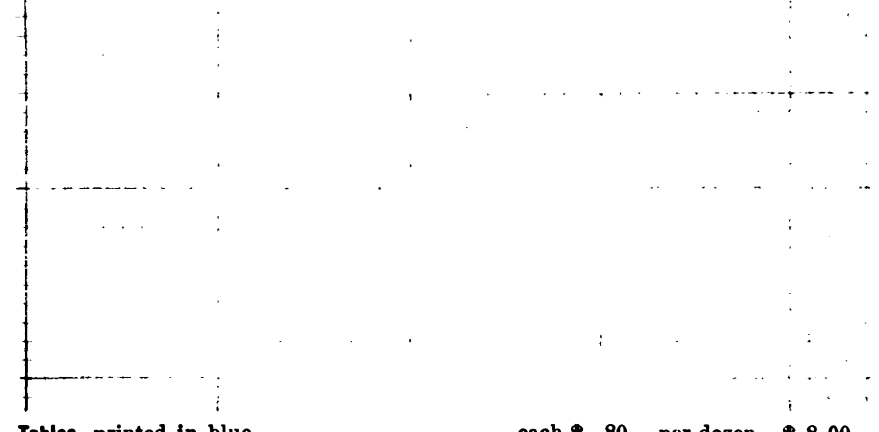


. . . . . each $ 55 per doz. $ 5 50
. . . . . " 50 " 5 00



. . . . . each $ 60 per doz. $ 6 00
. . . . . " 55 " 5 50

ION BOOKS.

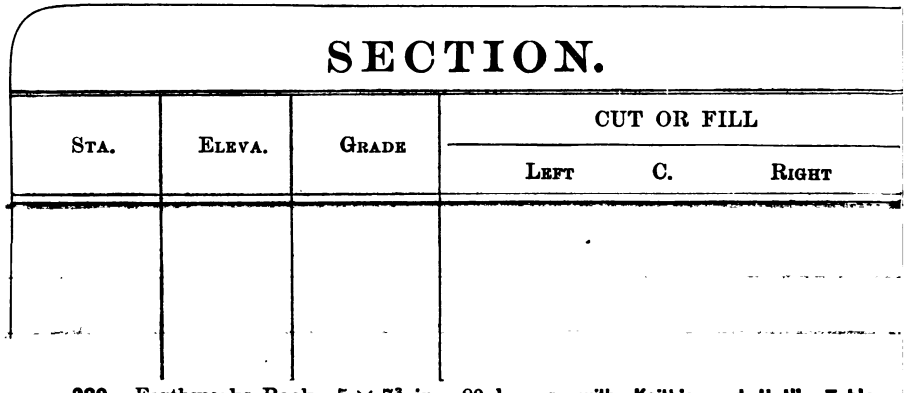


Tables, printed in blue . . . . . each $ 80 per dozen $ 8 00
Tables, " " " . . . . . " 90 " " 9 00
Tables, " " " . . . . . " 1 15 " " 11 50

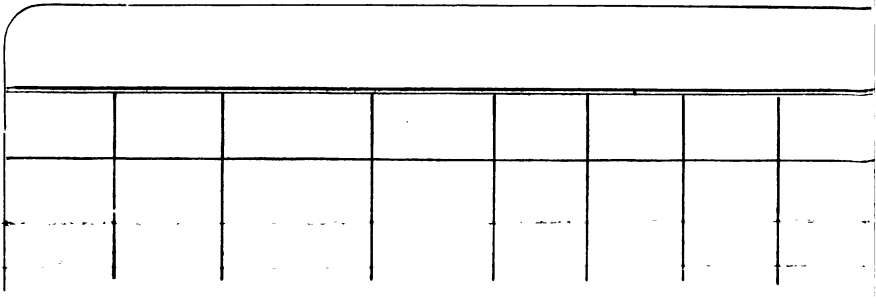
Roadway 18 feet, Slope 1:1, and Roadway 14 feet, Slope 1½ to 1.

flexible covers see page 39.

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380. Earthworks Book, 5 × 7¾ in., 80 leaves, with Keith's and Hall's Tables



385 Topographical Book, 5 × 8 in., right-hand page 4 × 4 to the inch, 80

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AREAS		Cubic Yds.		Remarks
EXCAVATION	Embankment	Excav.	Embank.	

(see page 40) . . . . . each $ 1 00 per dozen $ 10 00

leaves . . . . . each $ 1 25 per dozen $ 12 50

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HOW TO SELECT

DRAWING INSTRUMENTS.

Since the founding of our house (in 1867) we have sought to introduce progressively better drawing instruments in place of the often inefficient and unpractical instruments then offered. We described them in a manner until then unknown, we explained their advantages by word, pen and demonstration, and thus created for them a demand much greater than there had been previously for even the cheapest kinds. Our close study of the requirements and wishes of our patrons and their advice and suggestions, coupled with our intimate and expert practical and theoretical knowledge of drawing instruments, has led to the production of our

PARAGON INSTRUMENTS,

which are specifically and emphatically the

AMERICAN PATTERN

of instruments, unlike any used elsewhere and, we venture to say, of superior construction and design.

Unfortunately for us, the quality of instruments, which is obvious and evident when they are in actual use, can be determined from mere inspection by but very few experts, so that dealers, with rare exceptions, are unable to tell just what quality of tools they are handling, and are obliged to rely upon the assertions of those who supply them. To add to the difficulty, importers and dealers are sometimes met with, who try to make illegitimate profits by misrepresenting their goods, and they nearly always find it expedient to represent them as being identical with ours, or as good as ours. Furthermore our cuts, illustrating our instruments, have been copied again and again, even by photo-process, our descriptions have been pirated and the very appearance and arrangement of our Catalogue, which was unique when we originated it, has been imitated to the verge of counterfeiting. The several important improvements which we have made from time to time, representing actual progress in design and construction, have been imitated, but only in outward appearance, not in scope and effect, mainly because we have protected the essential features by letters patent.

These several considerations have induced us, in our own interest and for the protection of our patrons, to place a special quality mark, the word **Paragon**, on every one of our **best** instruments besides stamping them with our name or its initials, or K & E.

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Our position as the leading house in our line, and the nature of our business, which has grown to such great proportions, embracing large domestic and foreign markets, require us to make and keep in stock all kinds of instruments, —good, fair and ordinary, but we include *in our Catalogue* only what we can recommend, except the

LOW-PRICED INSTRUMENTS

No. 1006S to 1012H, which are unsuitable for professional work, and are intended for beginners only, thus, by reason of their moderate price filling a recognized want. With this exception all instruments described and illustrated in this catalogue are good, *better*, and **best.** Under such circumstances we can have no object in misrepresenting any particular style or grade of instruments; on the contrary, we describe all accurately, so that it may be at once apparent to each buyer which grade of instruments is best adapted to his particular requirements.

It is, however, advisable and in the end more economical, to buy the best instruments one can afford. **Good instruments will meet all requirements,** and the saving of time and the satisfaction obtained by their use, the better work they will do and their permanence, will amply justify the paying of the higher price. **Instruments, which on account of their inferior quality prove unfit for the intended work, are absolutely worthless to the purchaser,** who will find himself obliged to replace them by better ones.

MATERIAL.

The metals usually employed for drawing instruments are German silver of varying quality, and steel or iron. While it is evident that the steel must be of good quality and properly tempered, a few remarks about the German silver seem more called for. Its quality depends not alone on the proportions of the ingredients of the alloy, but also on the density and hardness of the metal.

While formerly only instruments of the highest grade, like Paragon, were cut from rolled sheet German silver, the more general use of machine tools has made it possible to employ this material to some extent also for the intermediate grades. This makes it still more important to be careful in selecting the instruments, as even the best material will not make a good instrument unless the workmanship is the best and most conscientious.

FINISH.

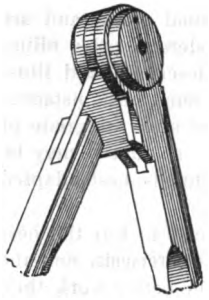
The finish of the finest mathematical instruments is so peculiar, that it is often referred to as "mathematical instrument finish", without any attempt at describing it. It is the *only* finish which leaves perfection of workmanship and form visible, because it hides no fault nor flaw, and thus it represents the acme of mechanical beauty. The finish produced by buffing drawing instruments which pretend to be of fine quality, is a barbarism which is excusable only when the obscuring effect of the glossy buffing is necessary to save appearances or to lessen the cost of production. Nobody who can appreciate mechanical beauty will consider it a proper finish, and the polished surfaces and partly effaced edges and angles produced by the buffing wheel, give instruments a glossy and cheap appearance which catches the eye of only those who are totally inexperienced.

The most important instruments are Compasses, (including Dividers), Ruling Pens and Bows, which we shall therefore describe in detail.

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COMPASSES.

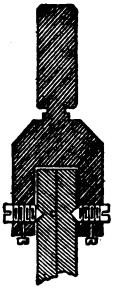
The most essential part of a pair of compasses is the head, which forms the joint. There are two kinds of joints recognized: the **tongue joint**, in which the head of one leg has a tongue, generally of steel, which moves between two lugs on the other leg, and the **pivot joint**.



Tongue Joint.
(No. 401, &c.)
(No. 700, &c.)



Tongue joint with handle
(No. 9020, &c.)



Pivot joint.
(No. 831, &c.)

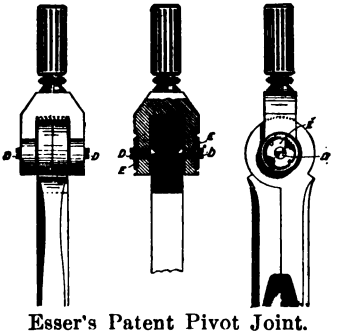


Esser's Patent
Pivot joint.
(No. 600, &c.)

ESSER'S PATENT PIVOT JOINT

combines all the advantages of the ordinary pivot joint with some additional ones.

In the ordinary pivot joint the head of each leg is made in the form of a disc and the two discs are held in apposition in a brace (or fork) by means of two pivot-screws. The brace is provided with a handle, because its shape and bulk forbid holding the compasses by the head in the usual manner. The two pivot-screws are held or locked by two slender screws passing through the free ends of the brace and *impinging against the thread of the pivots*. The risk of breaking the small set screws, the *certainty of their gradually spoiling the thread of the pivot-screws* and their liability to collect dust, are disadvantages of the ordinary pivot joint.



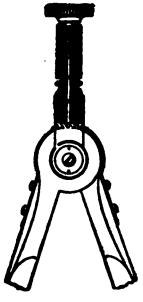
Esser's Patent Pivot Joint.

The essential features of Esser's Patent pivot joint, *which is applied only to* **PARAGON** *instruments*, are the following:

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The pivots, *D*, *D*, as shown in the figure, are held securely by means of steel *lock nuts E*, *E*, which fit nicely in circular recesses in the arms of the brace (fork), and which are tapped to correspond to the screw threads of the pivots. By the sinking of the lock-nuts in the recesses as shown, the joint presents a well-proportioned and beautiful appearance, all risk of injuring the screw-thread of the pivots or of breaking the set screws is avoided, there is no place for collecting dust, and the lock nuts are much *more efficient* than the small set screws. The re-adjusting of this joint is as simple as that of the old style. **To insure proper adjustment of our Paragon Instruments, we will re-adjust them at any time without charge.**

ESSER'S PATENT LOCKING DEVICE.



(No. 613, &c. page 87.)



This pivot joint admits of applying a very practical device for locking or clamping the joint in any position.

This is accomplished by means of two steel bands, each passing up from one of the legs, to which it is attached, around the head and well beyond the median line, so that in the median line these bands overlap in opposite directions. At this point they can be firmly locked against the compass head and each other, by a screw bolt operated by a **milled head** at its upper end, beyond the handle.

Where the same opening of dividers or compasses is to be used repeatedly, or where great accuracy is required, this attachment will be found of value. It adds practically nothing to the bulk of the instrument, nor does it in any way interfere with any of its other uses, nor detract from its appearance.

We call special attention to the fact, that Esser's Patent Pivot Joint and the Locking Device have been very closely imitated, but only in their outward appearance.

STRAIGHTENING DEVICES

for maintaining the vertical position of the handle when spreading or approximating the legs of compasses or dividers, are not required by the expert draftsman, and are of very doubtful advantage to the beginner. All of these devices impair the perfection and permanency of the joint. We do not list compasses and dividers with the straightening device, and do not furnish it with our Paragon Instruments, but to meet individual preferences we can furnish instruments No. 836 to 838 with straightening device.

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WEIGHT AND BULK
of Compasses and Dividers

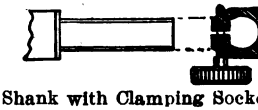
They should always be heavy enough to be absolutely rigid during all manipulations to which they are properly subjected, and the metal should be so distributed that it will nowhere add to the weight without increasing the rigidity or stiffness. The quantity of metal, irrespective of its distribution, is determined by the hardness (toughness) of the German silver; the harder and tougher that is, the less of it is required.

The length of compasses, dividers and bows, as given in our catalogue is "over all," including the handle. Of course such lengths are liable to vary slightly.

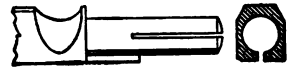
Another important feature about compasses is the manner of inserting the several points (parts) belonging to them. Here, as is often the case, most makers recommend what costs least and is easiest to make. In the following illustrations are shown the principal patterns for shanks of insertion pieces: the long and strong pentagonal shank, the shank with clamping socket and the round shank with steel feather and spring socket.



Pentagonal Shank with Set Screw.



Shank with Clamping Socket



Round Shank with Steel Feather.

The pentagonal shank should engage in a socket of the same shape and size and be held there by a screw which presses the beveled part into the corresponding V groove in the socket, thus keeping it in perfect alignment even after many years of wear.

The round shank is held by the spring of the socket and kept in align ment by a steel feather. This construction, if properly made, offers many advantages. It is inserted or removed quicker than parts held by thumbscrew, there are no screws to wear out or be lost, no screwheads to obstruct the sight, and the instrument can be made lighter and of more graceful shape.



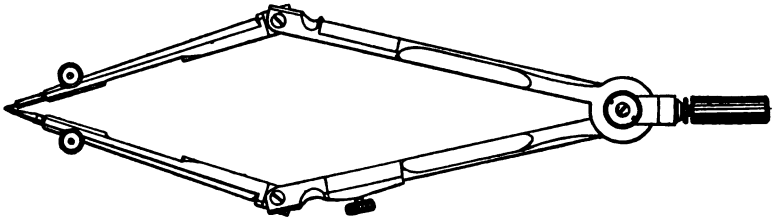
Compasses, with round-shank pencil point inserted, (no thumbscrew).



Compasses, with pencil point with pentagonal shank inserted.

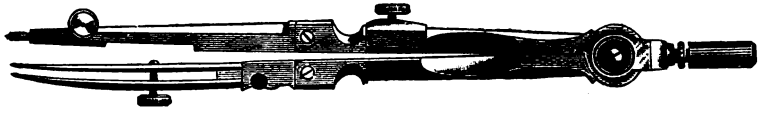
The round shank for insertion pieces requires the most precise workmanship and the very best material to give permanent satisfaction. Both of these conditions obtain in our Paragon Instruments. Compasses with round shank and steel feather are listed under Nos. 603 R and following (page 83).

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Compasses in position for testing alignment.

All joints in compasses and their parts should move in the same plane. This is readily tested by inserting the several parts and then folding them as shown in the cut above, when their points should meet. This is also a test for the alignment of the shank in the socket, and every good instrument should stand this test.



Compasses with fixed needle point with hairspring. (No 604½ H.)

Some draughtsmen prefer making minute adjustments with the Hairpring rather than by careful setting of the main joint. We therefore list and carry many patterns of *compasses* with hairspring.

PROPORTIONAL DIVIDERS.



Adjustable steel points in steel legs of Paragon Proportional Dividers.

We draw attention to the improvement in the Paragon Proportional Dividers No. 435 to No. 440, (page 63). All of them have **steel legs** and movable (adjustable) round steel points held by a set screw, permitting of ready setting to the original length in case of wear or accidental breaking.

In No. 442, page 65, No. 734, page 111, and No. 1091, page 135, the steel points are fixed and bent rectangular, so that they can be re-pointed without affecting the correctness of the instrument.

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DRAWING OR RULING PENS.

The drawing pen is that instrument of a Draftsman's outfit which is in most constant use, and in which defects in quality or construction would therefore most readily become apparent.

A good drawing pen should be made of steel properly tempered, neither too soft, nor hardened to brittleness. The nibs should be accurately set, both of the same length, and both equally firm when in contact with the drawing paper. The point should be shaped to be fine enough to admit of absolute control of the contact of the pen in starting and ending lines, but otherwise as broad and rounded as possible, in order to hold a convenient quantity of ink without dropping it. The lower (under) blade should be sufficiently firm to prevent approach of the blades of the pen when using it against a straightedge. The spring of the pen, which separates the blades, should be sufficient to hold the upper blade in its position, but not so strong that it would interfere with easy adjustment by the thumbscrew. The thread of the thumbscrew must be deeply and accurately cut, so as not to strip.

Highly tempered steel is necessarily more brittle than a softer steel and it would not be an indication of inferior steel if a pen should be injured by a fall.

Drawing pens are generally of one of two types: with a joint to allow the blades to be thrown apart for cleaning and setting, or without a joint.



Pen with joint. (No. 527).



Pen without joint. (No. 521).

The joint should, of course, be very carefully made, otherwise the upper blade becomes shaky and the pen consequently useless. Many fine pens with joint have also a pin set in the ferrule, which is exposed by unscrewing the blades off the handle and is used for marking points for which a pencil would be too coarse.



Pen with spring blade. (No. 523½).

Pens without a joint, but in which the upper blade is made to spring open (spring blade), possess many of the advantages of a pen with a good joint. A good pen without a joint is far preferable to an inferior one with a joint, and it costs less.

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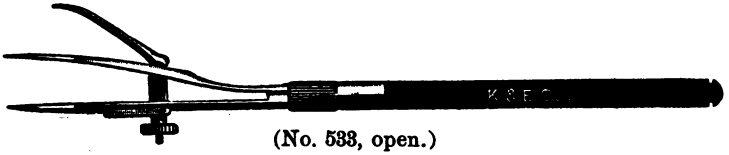


Detail Drawing Pen. (No. 558-2.)

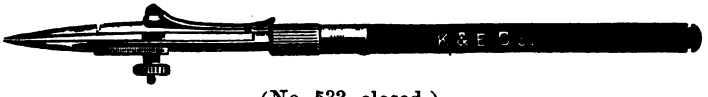
The **Detail Drawing Pen** is a modification of this style of pen. The wide blades hold much ink, so that long and heavy lines can be drawn without refilling the pen.

PATENT PARAGON DRAWING PENS.

A much appreciated improvement in drawing pens is a device which allows the pen to be opened (for cleaning) without disturbing the original setting for width of line.



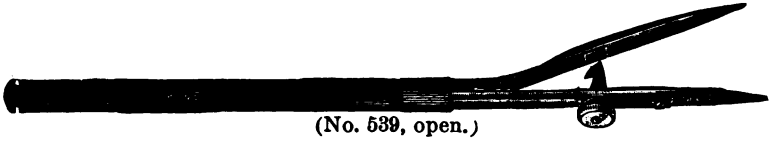
(No. 533, open.)



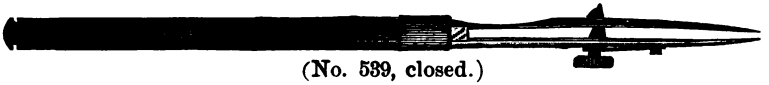
(No. 533, closed.)

EXPRESS Drawing Pens, Paragon. Patented.

The upper blade of the Express pens is made to spring open when it is released. The setting for width of line is regulated by the thumbnut attached to a steel lug which passes through the spring blade and engages an eccentric lever by which the spring blade is released or restored to its prior setting. (Nos. 532 to 534, page 76.)



(No. 539, open.)



(No. 539, closed.)

CLICK Drawing Pens, Paragon. Patented.

The upper blade of the Click Pen is made to spring open when released. It is held by a steel hook which passes through a slot and is kept in place by a spring. From this hook a thread extends, passing through the other blade; a thumb nut regulates the setting of the blades for width of line. The pen is opened by pushing the hook off its bearing, and is restored to its prior setting by pressing the blades together, when the hook catches automatically. (No. 537 to 539, page 76.)

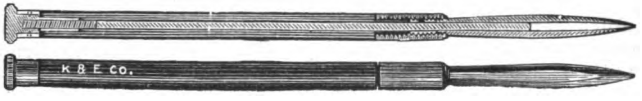
We furnish the Click Pen (patented) also in the 8-key brand grade. (No. 802 to 804, page. 119.)

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Drawing Pen with push screw. (No. 690.)

Pens for close ruling (hatching pens) are made also with push srcew, *i. e.*, the spring of the blades holds their points together and the thumb screw, which applies against the lower (under) blade, forces them apart. Hatching pens have firm blades, and generally 2 or 3 pairs of blades with points of different taper are furnished with one handle.

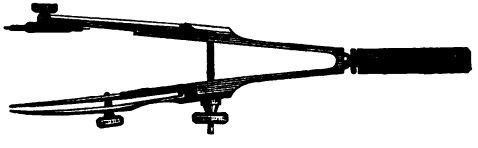


Drawing Pen without thumbscrew. (No. 695.)

Another manner of adjustment is by a wedge between the blades, which separates or releases them as it is moved down or up by a threaded rod with a thumbnut placed at the end of the handle (No. 695, page 80). The absence of the thumbscrew prevents obstruction to sight in crowded drawings.

SPRING BOWS.

These were originally developed from the shape of compasses, but later the demand for small sizes led to changes in the patterns, and now bows are made entirely of steel, and symmetrical, as shown here:

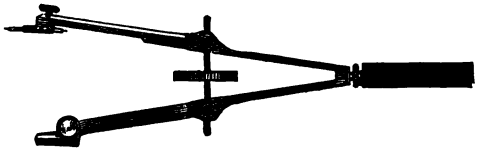


(No. 481.)

What is said in the description of ruling pens about the necessity of a sufficiently stiff spring and about the relation between spring-pressure and thumbscrew, applies to bows of spring steel just as well as to blades of ruling pens.

(In the coarse adjustment of bows, the spring should be compressed by the fingers while setting the thumbnut, to avoid wear of the thread).

For draftsmen who use a bow instrument much, those with center thumbnut will be a great convenience:



(No. 486.)

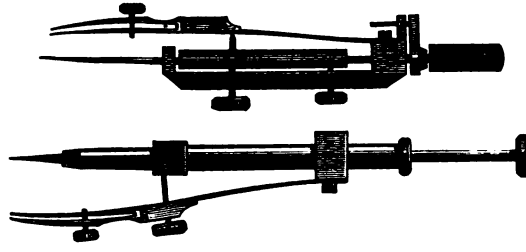
It will be seen from the cut that two threads, a right and a left, engaging in swiveling sockets are moved by one central thumbnut.

The main difference between a single thread and a right and left thread bow is that in the latter the stiffness of the spring bow does not depend on the

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strength of the spring, but both legs of the bow are held rigidly by the screw, without depending on counter-pressure from the spring. As two threads engage simultaneously, the motion is double that of a single thread, and it therefore requires only one-half the number of turns to set it. Such bows are listed under numbers 485, 740 and 9045 C. (pages 70, 112, 146).

The two bows below represent another useful pattern, which is adapted especially for drawing very small circles or arcs.



(No. 452)

(No. 453.)

In both of them the pen draws by its weight, but in number 452 the central pin revolves with the instrument, while in number 453 the central pin is stationary and the pen revolves about it. The latter has the advantage, that the paper will not be pierced, even if many circles are drawn from one centre. It is the best spring bow for drawing very small circles or arcs. (See pages 66, 114, 145).

The instruments which we have described, compasses, ruling pens and bows, practically cover the field. What has been said of compasses and dividers applies equally to proportional, whole-and-half, pocket and three-legged dividers and to beam compasses, while the remarks about pens practically include border, curve, and railroad pens, and of course the pen points of compasses. The various approved and recognized styles of all these drawing instruments are so well illustrated and so fully described in our Catalogue that it would be needless to say more about them here.

In conclusion we would emphasize that our **Paragon Instruments** are indeed all that their name implies, which is proven also by the fact that even the instruments of Swiss manufacture, which in former years held the American market, had to give way to them and have been entirely remodeled, so that they are now largely imitations of our **Paragon Instruments**, as far as our several patents and copyrights will permit.

Our **Paragon Instruments** are essentially the **American Pattern**, produced and introduced by us.

REPAIRING OF DRAWING INSTRUMENTS.

The proper repairing of Drawing Instruments requires skill and experience. We carry reserve parts for our instruments and are prepared to repair them in the best possible manner at a reasonable charge.

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SYNOPSIS.

MATHEMATICAL INSTRUMENTS.

This synopsis of the various grades and kinds of instruments which we list, will facilitate satisfactory selection. See also Index.

COMPASSES AND DIVIDERS WITH TONGUE JOINT.

Paragon, page 57. &c.
Key brand, page 106. &c.
Excelsior, page 144.

COMPASSES AND DIVIDERS WITH ESSER'S PATENT PIVOT JOINT.

Paragon, page 83. &c.
Paragon, with Esser's Patent Lock Joint page 87.

COMPASSES AND DIVIDERS WITH PIVOT JOINT.

Key brand, page 108. &c.

POCKET DIVIDERS AND COMPASSES.

Paragon; page 63.
Key brand, page 110.

THREE-LEGGED DIVIDERS. WHOLE-AND-HALF DIVIDERS.

Paragon, page 63.
Key brand, page 110.

PROPORTIONAL DIVIDERS.

Paragon, page 63. &c.
Key brand, page 110. &c.
Plain, page 135.

BOW INSTRUMENTS.

Paragon, page 66 &c.
Key brand, page 112. &c.
Excelsior, page 145. &c.

DOTTING INSTRUMENTS.

Paragon, page 71.
Key brand, page 116.

BEAM COMPASSES.

Paragon, page 71. &c.
Key brand. page 115. &c.

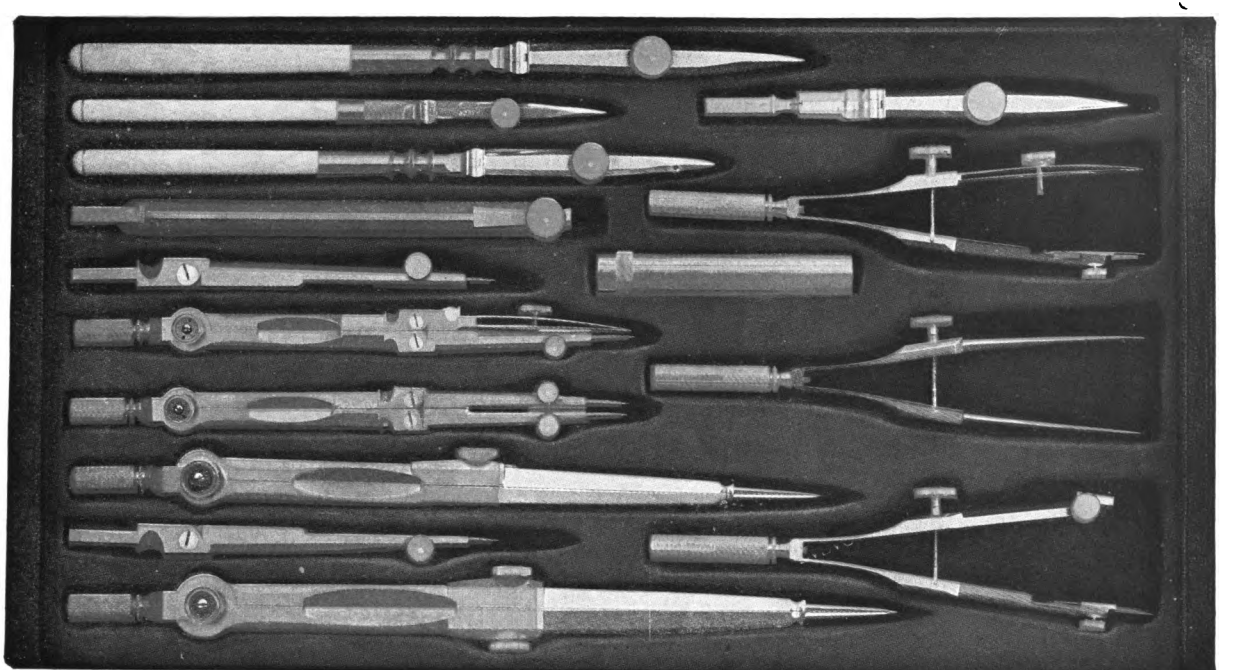
DRAWING PENS.

Paragon, page 75. &c.
Key brand, page 117 &c.
Arrow brand, page 134.
Excelsior, page 144

SETS OF INSTRUMENTS IN CASES.

Paragon with tongue joint, page 81. &c.
Paragon with Esser's pivot joint, page 89. &c.
Key brand with tongue joint, page 122. &c.
Key brand with pivot joint, page 125. &c.
Excelsior, page 139. &c.
Beginner's, page 147. &c.

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PARAGON INSTRUMENTS
Assortment of No. 625, page 98.

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PARAGON INSTRUMENTS

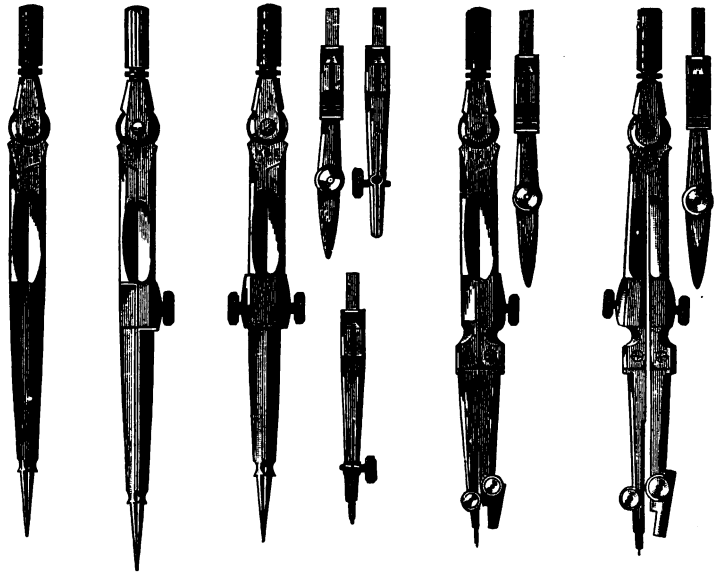
of best Rolled German Silver and Finest Steel.

THE VERY BEST INSTRUMENTS MADE.

(For description see page 46.)

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y Paragon.

"Copyright, 1887, by Keuffel & Esser."



No. 401. 402. 403. 404. 404 H.

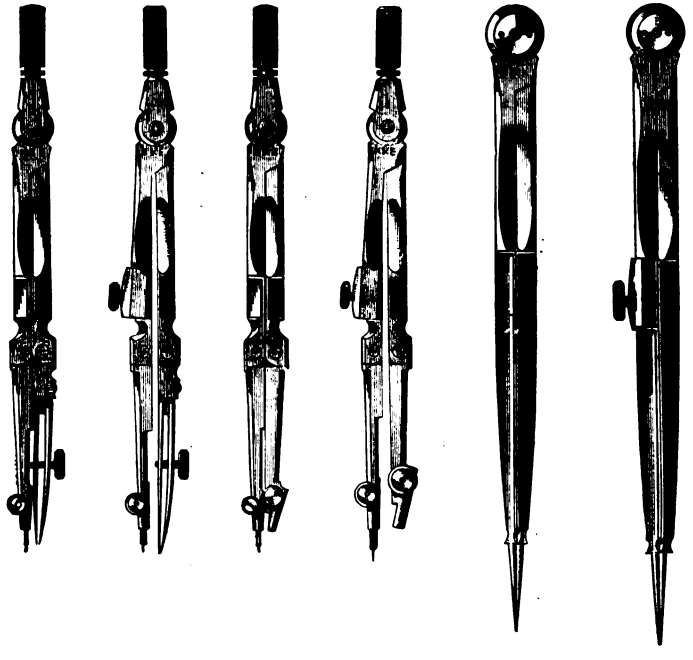
401.	Plain Dividers 4 in. with Handle	each	$ 2 00
402.	Hairspring Dividers, 4 in., with Handle	"	2 60
403.	Compasses, 4 in., with 2 Steel Points, Pen, Pencil and Needle Point.	"	6 00
404.	do. 4¼ " " fixed Needle Point, Pen and Pencil Point	"	5 25
404 H.	do. 4¼ " like No. 404, but with Hairspring . .	"	6 25

For Paragon Instruments with Patent Pivot-joint see page 83.

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Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.

"Copyright, 1887, by Keuffel & Esser."



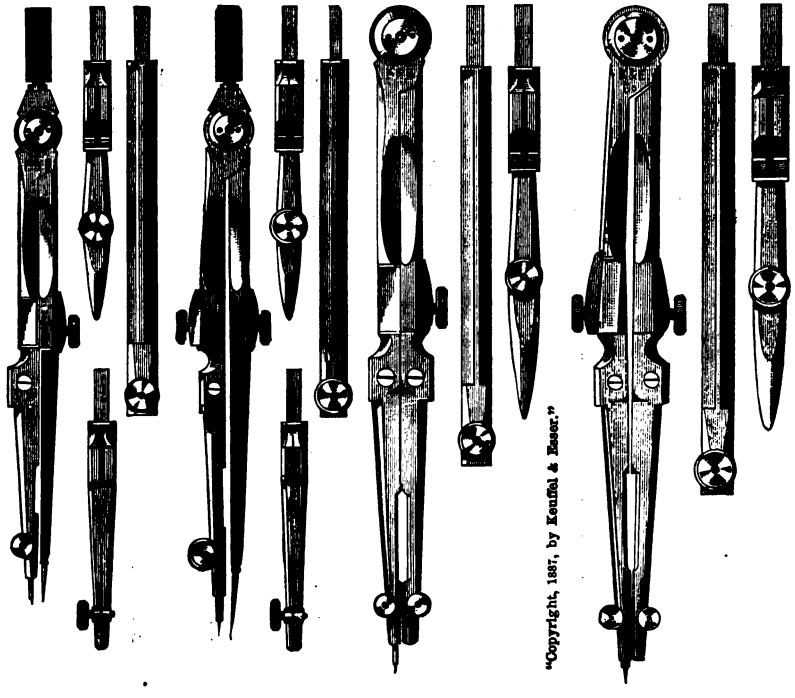
No. 406. 406 H. 407. 407 H. 410. 412.

406.	Compasses, 4½ in., with fixed Needle and Pen Point . .	each	$3 50
406 H.	do. 4½ " like No. 406, but with Hairspring . .	"	4 50
407.	do. 4½ " with fixed Needle and Pencil Point .	"	3 50
407 H.	do. 4½ " like No. 407, but with Hairspring . .	"	4 50
410.	Plain Dividers, 5 in.	"	2 20
411.	do. do. 6 "	"	2 50
412.	Hairspring Dividers, 5 in.	"	3 00
413.	do. do. 6 "	"	3 30

For Paragon Instruments with Patent Pivot Joint see page 83.

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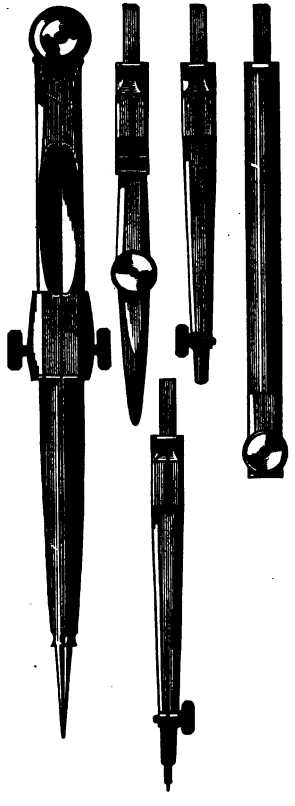
No. 414. 414 H. 415. 415 H.

414.	Compasses	4¾ in.,	with fixed Needle Point, Steel, Pen, Pencil Point and Lengthening Bar .	each	$	7 25
414 H.	do.	4¾ "	like No. 414, but with Hairspring .	"		8 25
415.	do.	5½ "	with fixed Needle Point, Pen, Pencil Point and Lengthening Bar	"		7 00
415 H.	do.	5½ "	like No. 415, but with Hairspring .	"		8 00

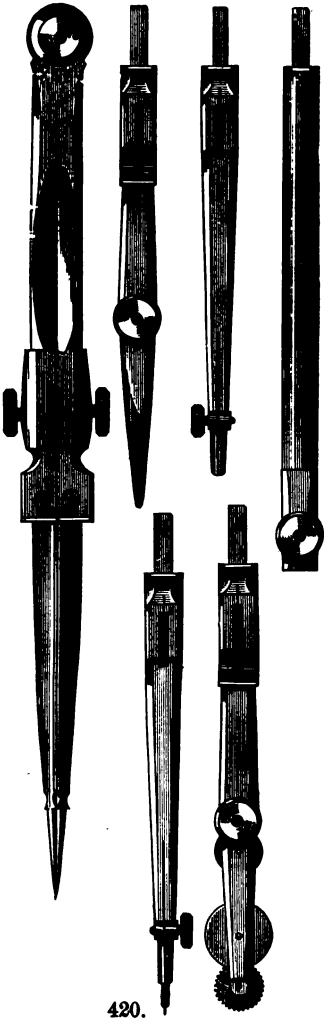
For Paragon Instruments with Patent Pivot Joint see page 83.

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No. 417. 420.

417.	Compasses,	6	in., with 2 Steel Points, Pen, Pencil, Needle Point and Lengthening Bar	each	$ 8 00
418.	do.	6½	" with 2 Steel Points with Joint, (see cut of No. 420) Pen, Pencil, Needle Point and Lengthening Bar	"	9 25
419.	do.	7	" with 2 Steel Points with Joint, Pen, Pencil, Needle Point, Lengthening Bar and Dotting Pen	"	10 75
420.	do.	7	" like No. 419, but Dotting Pen with 6 Wheels	"	12 00

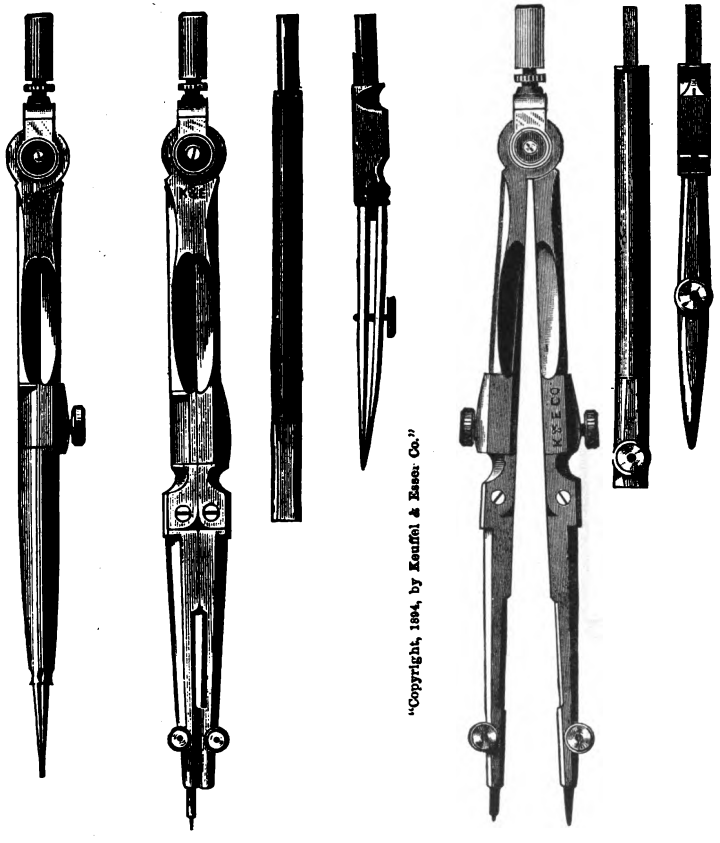
For Paragon Instruments with Patent Pivot Joint see page 83

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PARAGON INSTRUMENTS

WITH ESSER'S PATENT PIVOT JOINT.



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No. 608. 610 R. 610 H.

PARAGON COMPASSES AND DIVIDERS

WITH

ESSER'S PATENT PIVOT JOINT.

ARE LISTED ON

Page 83, &c.

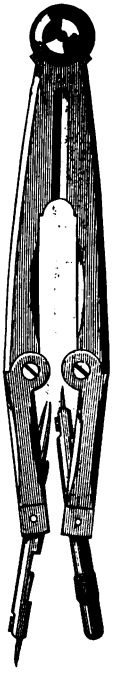
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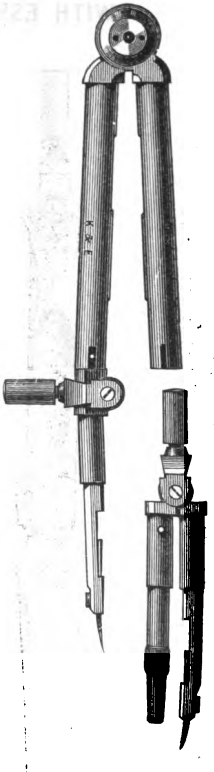
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No. 425.



426.



427.

425.	Pocket Dividers with Sheath, 5 in.	each	$ 3 00
426.	Pocket Compasses with Folding Points, 5 in.	"	10 00
	Morocco Case, silk velvet lined	"	1 00
427.	Pillar Compasses, 5½ in., 2 Needle Points, Pen and Pencil Point with Handle which can be withdrawn from the Compasses and used as small Bow-Pen and Bow-Pencil respectively	"	11 00
	Morocco Case, silk velvet lined	"	1 00

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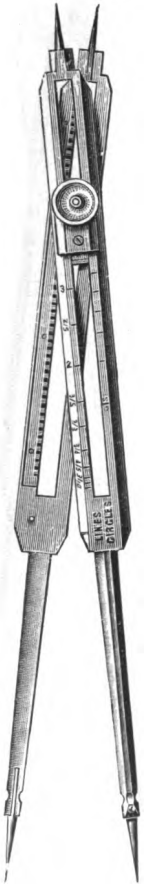
No.			
430	Three-legged Dividers for taking off three points, 6 in. . .	each	$ 5 00
	Morocco Case, silk velvet lined	"	1 00
431.	Three-legged Dividers, one leg adjustable for length, 6 in.	"	6 00
	Morocco Case, silk velvet lined	"	1 00
432.	Whole-and-Half Dividers, 7 in.	"	4 25
	Morocco Case, silk velvet lined	"	1 00
435.	Proportional Dividers, finely divided for lines and circles, $7\frac{3}{4}$ in., ...	"	10 00
	Morocco Case, silk velvet lined	"	1 00
437.	Proportional Dividers, finely divided for lines and circles, $9\frac{1}{4}$ in., with Rack-Movement	"	12 50
	Morocco Case, silk velvet lined	"	1 00

Paragon Proportional Dividers have **Steel Legs** with **Adjustable Steel Points.**

(See page 51).

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No. 439.



441.

439. Proportional Dividers, finely divided for lines and circles, $9\frac{1}{4}$ in., with Rack-Movement . . . . . each $ 15 00
Morocco Case, silk velvet lined . . . . . " 1 10

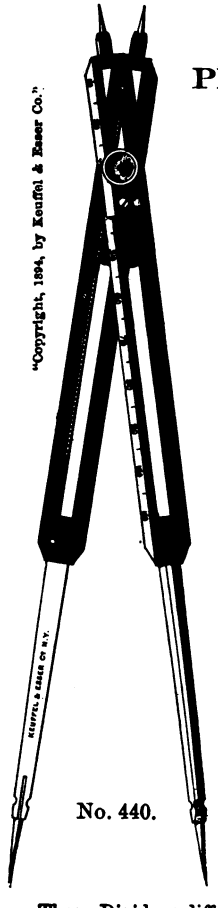
440 Proportional Dividers, see page 65.

441. Proportional Dividers, finely divided for lines, circles, planes and solids, $9\frac{1}{4}$ in., with Micrometer Adjustment, " 18 00
Morocco Case, silk velvet lined . . . . . " 1 20

Paragon Proportional Dividers have **Steel Legs** with **Adjustable Steel Points.**
(See page 51).

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UNIVERSAL PROPORTIONAL DIVIDERS.

Registered, 1898, by KEUFFEL & ESSER CO.

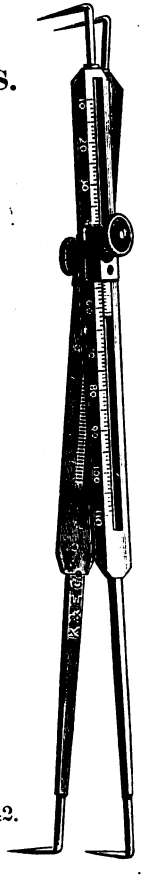
440. Universal Proportional Dividers (Registered) 10 in., with Rack-Movement, in polished Mahogany Case, with Table of Settings . . . . each $17 50

441. Porportional Dividers, see page 64.

442. Universal Proportional Dividers (Registered) 10 in., with Rack-Movement, points bent rectangular, in polished Mahogany Case, with Table of Settings . . . . each $17 50

Paragon Proportional Dividers No. 440 have steel legs with adjustable steel points (see page 51). No. 442 have points bent rectangular, so that they can be re-pointed without affecting their correctness.

No. 440.



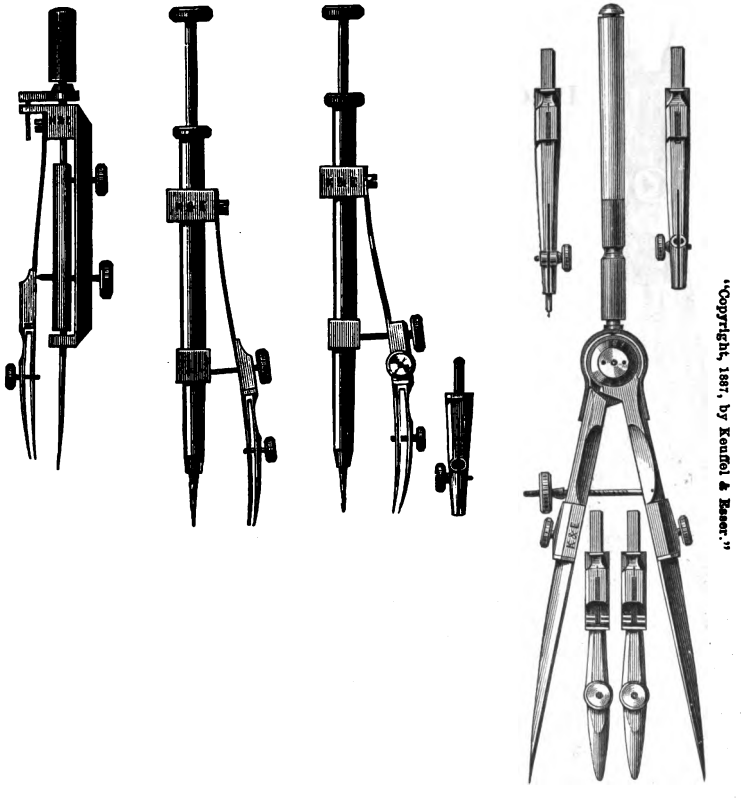
No. 442.

These Dividers differ from the ordinary ones in that their whole length is divided into 200 equal parts, which are further subdivided into tenths by means of a vernier. These graduations are not carried over the entire length of the instrument, because those seen in the figure from 10 to 110 reading with the vernier to 2000ths, are practically all that are necessary for the almost endless variety of purposes to which these Dividers may be applied. By this method of graduation any desired ratio may be set off. Thus setting 488 (taken from many others in a table of settings which accompanies each instrument) gives the ratio between the diameter and the circumference of a circle, that is, when the slide is set to this number by means of the vernier, the opening at one end will take in the diameter of a circle, and the opening between the points of the other end gives at once its circumference reduced to lineal measure. In like manner we have settings for such ratios as the diameter of a circle and the side of an equal square, feet and metres, yards and metres etc. The list of settings for Lines, Planes and Solids, inclosed with each instrument, is much more complete than the series of fixed graduations on the best Dividers of the old style. The setting of the slide from such a table is effected more easily and more accurately than it can be done by the ordinary method. By means of the fully graduated scale very small departures from a given ratio can be both detected and ascertained.

Any other desired setting not found in the list, may be obtained by means of a very simple formula given with the table of settings.

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No. 452. 453. 454. 458.

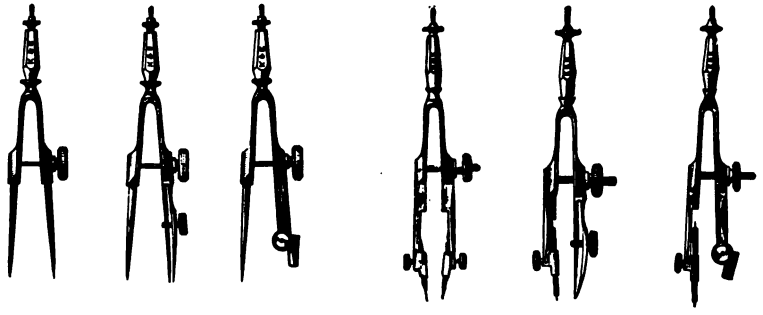
452.	Drop Spring Bow Pen, 3½ in., spring blade, with self-adjusting point, for very small circles	each	$ 3 75
	Morocco Case, silk velvet lined	"	75
453.	Drop Spring Bow Pen, 4 in., spring blade, for very small circles	"	3 75
	Morocco Case, silk velvet lined	"	75
454.	Drop Spring Bow Pen, spring blade, and Pencil, 4 in., for very small circles	"	5 00
	Morocco Case, silk velvet lined	"	75
458.	Spring Bow Compasses, 6½ in., with long Ivory Handle, 2 Steel Points, 2 Pen Points (for use as railroad pen), Pencil and Needle Point	"	8 25
	Morocco Case, silk velvet lined	"	1 00

Nos. 452, 453 and 454 are the most suitable instruments for drawing small circles. A rod passes through the instrument serving as handle and needle point. In Nos. 453 and 454 this center rod remains stationary while the instrument is turned and pen or pencil draw by their own weight, avoiding the slipping of the needle or scratching of the pen.

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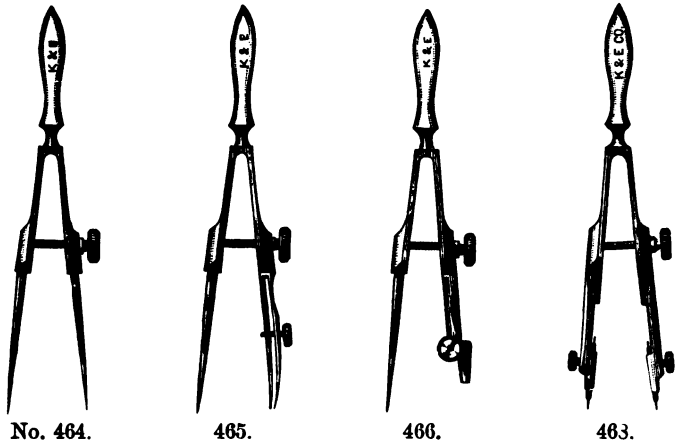
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No. 460. 461. 462. 460½. 461½. 462½.

460.	Minute Steelspring Bow Dividers, with Metal Handle 2½ in.,	each	$ 2 00
461.	" " " Pen, spring blade " " 2½ in.,	"	2 50
462.	" " " Pencil, " " 2½ in.,	"	2 50
463.	" " Bows, set of 3, Nos. 460, 461, 462, in morocco Case, silk velvet lined	set	8 20
460½.	" " Bow Dividers, with 2 Needle Points, Metal Handle, 2½ in.	each	2 75
461½.	" " " Pen, spring blade, with Needle Point, Metal Handle, 2½ in.	"	2 75
462½.	" " " Pencil, with Needle Point, Metal Handle, 2½ in	"	2 75
463½.	" " Bows, set of 3, Nos. 460½, 461½, 462½, in Morocco Case, silk velvet lined	set	9 45

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No. 464. 465. 466. 463.

464.	Steelspring Bow Dividers, with Ivory Handle, 3¼ in. . .	each	$ 2 00
465.	" " Pen, spring blade " " 3¼ " . . "		2 50
466.	" " Pencil. " " 3¼ " . . "		2 50
467.	" Bows, set of 3, Nos. 464, 465, 466, in morocco Case, silk velvet lined	set	8 20
468.	Steelspring Bow Dividers, 2 Needle Points, Ivory Handle, 3¼ in.,	each	2 75

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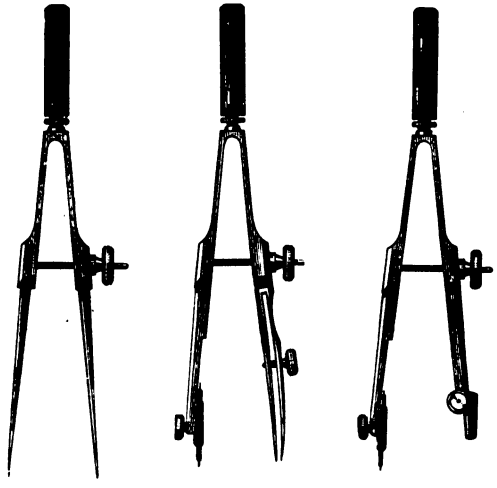
No. 476. 477. 478.

476.	Steelspring Bow Dividers, with German silver Handle, ...	5 in.,	each	$ 2	40
477.	" " Pen, spring blade, with Needle Point, German silver Handle,	5 "	"	3	00
478.	" " Pencil, with Needle Point, German silver Handle . . .	5 "	"	3	00
479.	" Bows, set of 3, Nos. 476, 477, 478, in morocco Case, silk velvet lined	set		9	90

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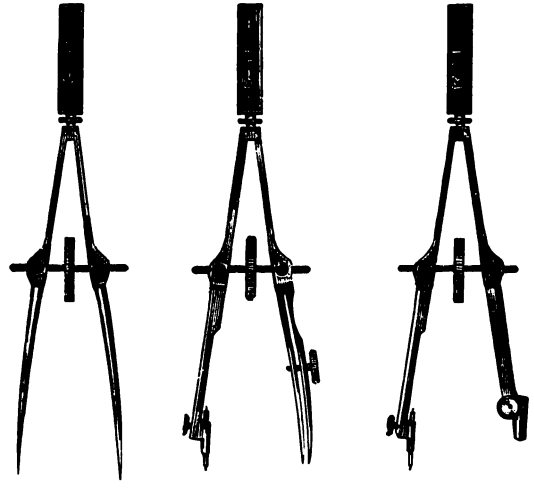
No. 480. 481. 482.

480.	Steelspring Bow Dividers, German silver Handle, $3\frac{3}{4}$ in., each		$ 2 00
481.	" " Pen, spring blade, Needle Point, German silver Handle . . . . $3\frac{3}{4}$ " "		2 50
482.	" " Pencil, Needle Point, German silver Handle . . . . . $3\frac{3}{4}$ " "		2 50
483.	" Bows, set of 3, Nos. 480, 481, 482, in morocco Case, silk velvet lined	set	8 20
480½.	Steelspring Bow Dividers, German silver Handle, $3\frac{1}{4}$ in., each		2 00
481½.	" " Pen, spring blade, Needle Point, German silver Handle . . . . . $3\frac{1}{4}$ in., "		2 50
482½.	" " Pencil, Needle Point, German silver Handle . . . . . $3\frac{1}{4}$ in., "		2 50
483½.	" Bows, set of 3, Nos. 480½, 481½, 482½, in morocco Case, silk velvet lined . .	set	8 20

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No. 485. 486. 487.

485.	Steelspring Bow Dividers, with central thumbnut, German silver Handle, $3\frac{3}{4}$ in. . .	each	$	2	60
486.	" " Pen, spring blade, central thumbnut, with Needle Point, German silver Handle, $3\frac{3}{4}$ in	"		3	25
487.	" " Pencil, central thumbnut, with Needle Point, German silver Handle, $3\frac{3}{4}$ in.	"		3	25
488.	" Bows, set of 3, Nos. 485, 486, 487, in morocco Case, silk velvet lined .	set		10	35

Steelspring Bows Nos. 485, 486, 487 are opened and closed by a right and left thread, which is operated by one thumbnut situated between the shanks of the instrument; this thread also holds the points rigidly and doubles the speed of the screw.

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PARAGON DOTTING INSTRUMENT AND BEAM COMPASS

For Circles and Straight Lines.

Illustration ¼ size.

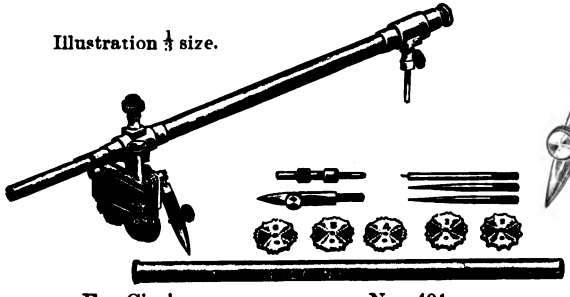
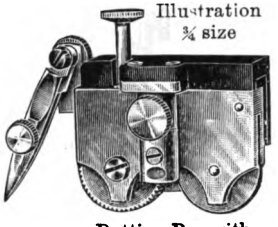


Illustration ¾ size



Dotting Pen with attached finger piece.

For Circles — No. 491. — For Straight Lines

491. Paragon Dotting Instrument, German silver, 12 in., 2 Round Bars, Dotting Pen, Pen and Pencil Points, (the Pen Points have Spring Blade) 2 Steel Needle Points, 1 Shouldered Needle for use with Dotting Pen, 1 Shouldered Needle for use with Pen or Pencil Point, Micrometer Adjustment. In velvet lined morocco Case, with bar lock . . . . . each $ 10 00

This instrument for drawing dotted circles and straight lines, is of practical construction and does good work. The propelling and supporting wheels of the dotting pen travel on the drawing and are therefore not so liable to slip as those which travel on a straightedge. For dotting circles the dotting pen is clamped to the bar; for dotting straight lines along a straightedge there is a finger piece, to attach to the dotting pen and serving as handle

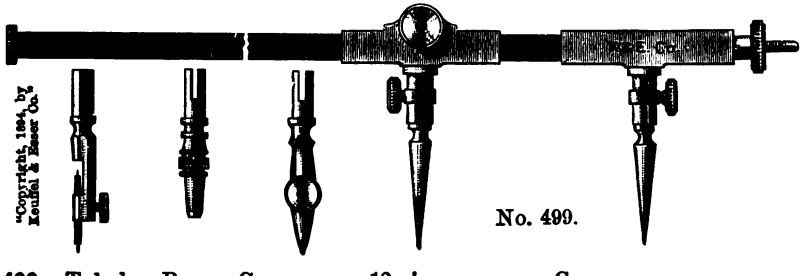
There are 6 ratchet wheels which are readily interchangeable by lifting the flat spring which holds them on their pivots. They produce the following patterns:

No. 1. ---------- No. 4. ..—..—..—..—..—..—

2. — — — — — — — — — — No. 5. — - — - — - — - — - — -

3. — - — - — - — - — - — - No. 6. — — — — — — — — — — —

PARAGON BEAM COMPASSES.



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No. 499.

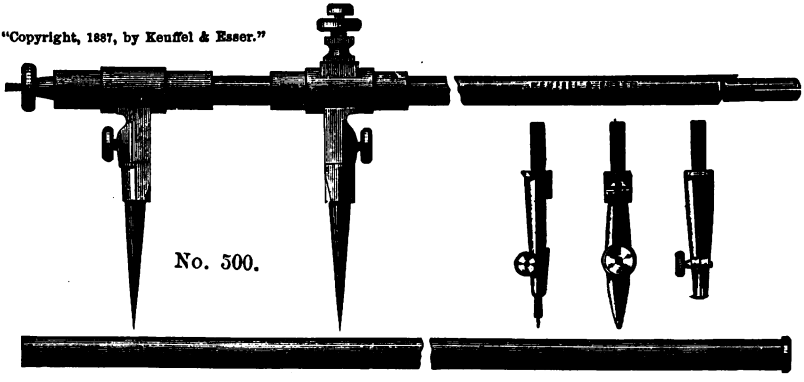
499. Tubular Beam Compasses, 12 in., square German silver Bar, with 2 Steel Points, Pen, Pencil and Needle Point, Micrometer Adjustment . . . . . each $ 7 50

Morocco Case, silk velvet lined . . . . . " 2 00

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No. 500.

500. Tubular Beam Compasses, 18 in., 2 round German silver Bars, 2 Steel Points, Pen, Pencil and Needle Point, Micrometer Adjustment . . . . . each $ 10 50

501. do. do. do. do. 27 in., 3 Bars " 11 75

502. do. do. do. do. 38 " 3 " " 15 25

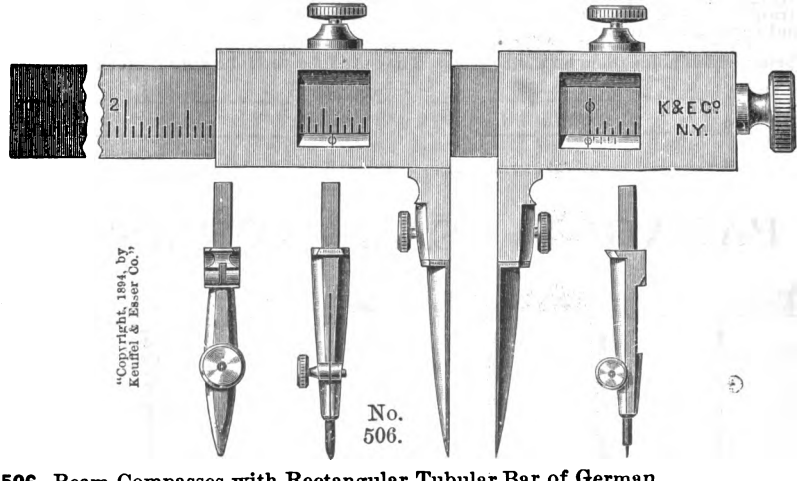
The bar of No. 502 is heavier than those of the smaller sizes.

503. Wheel Attachment for No. 500 or 501 . . . . . " 2 50

504. " " " " 502 . . . . . " 2 75

Morocco Case, silk velvet lined, for No. 500 501 502
each $ 2 25 2 50 3 50

do. do. do. if with No. 503 or No. 504 add 50



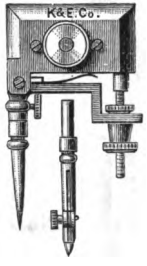
"Copyright, 1894, by Keuffel & Esser Co."

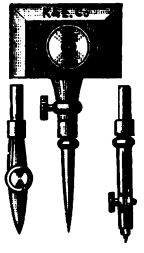
No. 506.

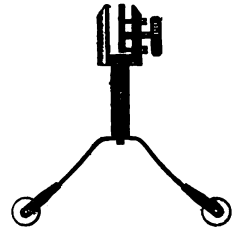
506. Beam Compasses with Rectangular Tubular Bar of German silver, Pen, Pencil and Needle Point, 2 Steel Points, **Wheel Attachment,** Micrometer Adjustment. Bar 44 in. long, divided to $\frac{1}{20}$ inch and by vernier to $\frac{1}{200}$ inch; and 1 meter to millimeters and by vernier to $\frac{1}{10}$ millimeter. Instrument in polished mahogany Case . . . . . each $ 35 00

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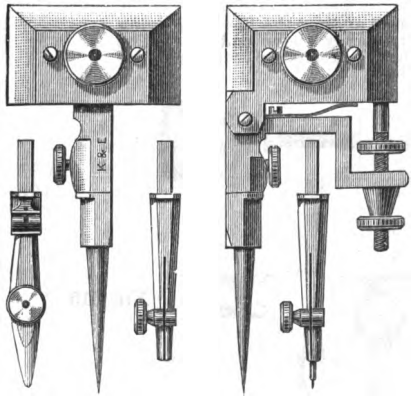


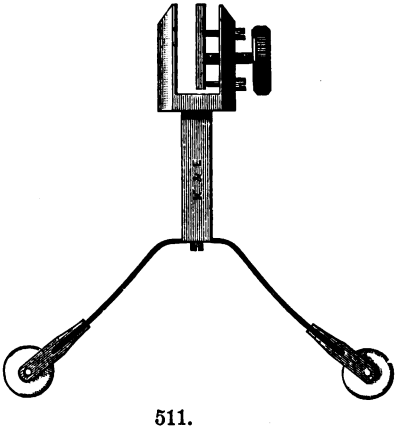




No. 509. 509½

509.	Minute Beam Compasses with 2 Steel Points, Pen, Pencil and Needle Point, Micrometer Adjustment	each	$ 7 50
509½.	Wheel Attachment for No. 509	"	2 25
	Morocco Case, silk velvet lined, for No. 509	"	2 00
	do do " " " " " 509 and No. 509½	"	2 25





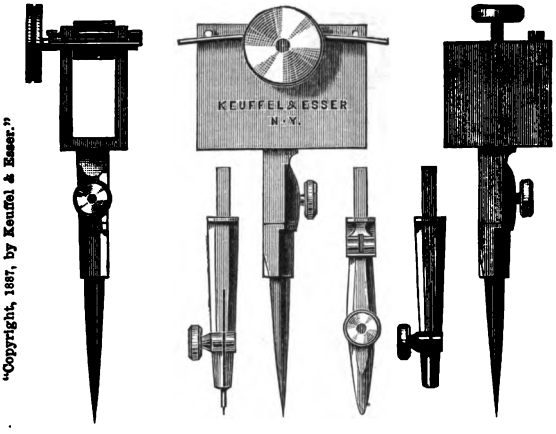
No. 510. 511.

510.	Beam Compasses with 2 Steel Points, Pen, Pencil and Needle Point, Micrometer Adjustment	each	$ 9 00
511.	Wheel Attachment for No. 510	"	2 25
	Morocco Case, silk velvet lined, for No. 510	"	2 25
	do do " " " " " 510 and No. 511	"	2 50

For Wooden Bars for Beam Compasses see page 214.

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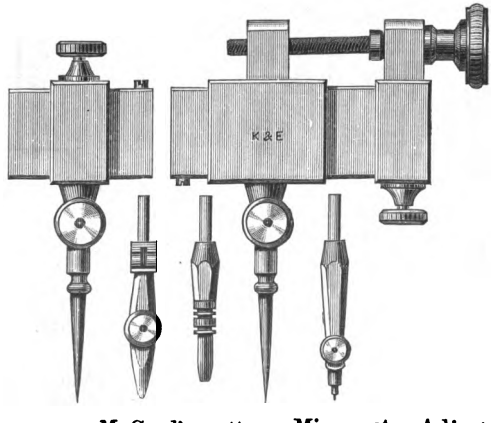


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No. 512.

512.	Beam Compasses with 2 Steel Points, Pen, Pencil and Needle Point	each	$ 9 75
513.	Wheel Attachment for No. 512	"	2 75
	Morocco Case, silk velvet lined, for No. 512	"	1 25
	do do " " " " " 512 and No. 513	"	1 75

No. 512 has a pinion which is pressed against the bar by a spring and turned by a thumbscrew, as illustrated by above end-view. The pinion serves for fine adjusting without interfering with the free sliding of the compass-head along the bar.



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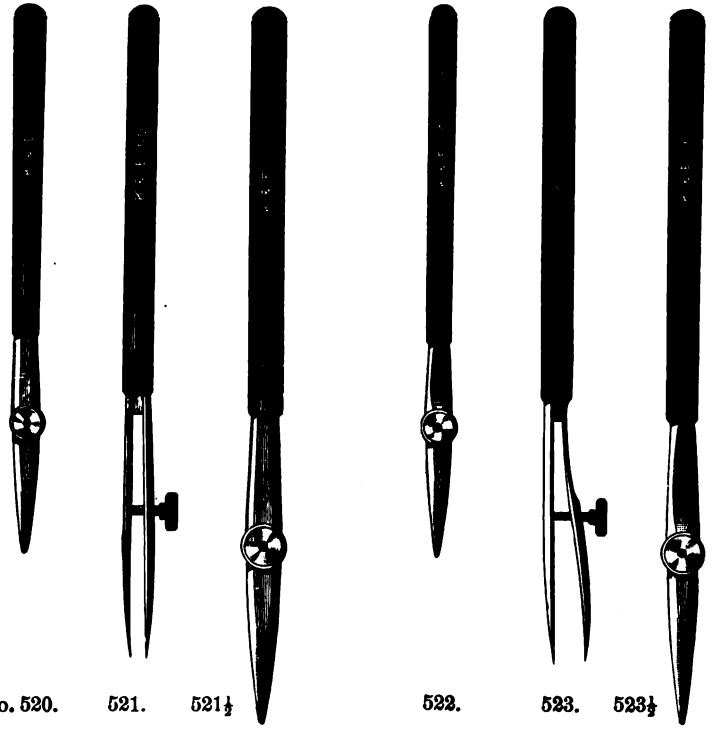
No. 515

515.	Beam Compasses, McCord's pattern, Micrometer Adjustment, 2 Steel Points, Pen, Pencil and Needle Point . .	each	$14 00
516.	Wheel Attachment for No. 515	"	2 75
	Morocco Case, silk velvet lined, for No. 515	"	1 25
	do do " " " " " 515 and No. 516	"	1 75

For Wooden Bars for Beam Compasses see page 214.

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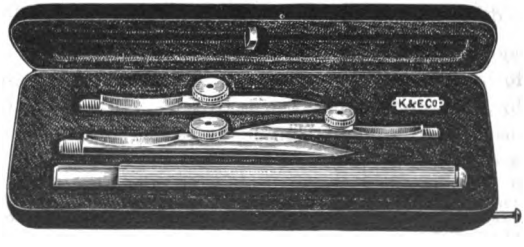
Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



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No. 520. 521. 521½ 522. 523. 523½

520.	Drawing Pen, Ebony Handle, 4½ in.	each	$ 1 00
521.	" " " " 5 "	"	1 10
521½.	" " " " 5½ "	"	1 25
522.	" " " " upper blade with spring, 4½ in.	"	1 10
523.	" " " " " " " " 5 "	"	1 20
523½.	" " " " " " " " 5½ "	"	1 35
	Above pens with Aluminum Handle	extra "	10



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No. 525.

525. Paragon Drawing Pen, Aluminum Handle, with 3 interchangeable pens of different size, spring blade, in morocco Case, silk velvet lined . . . . . set $ 3 75

526, &c. Drawing Pens, see page 77.

For Patent Paragon Pens, see next page.

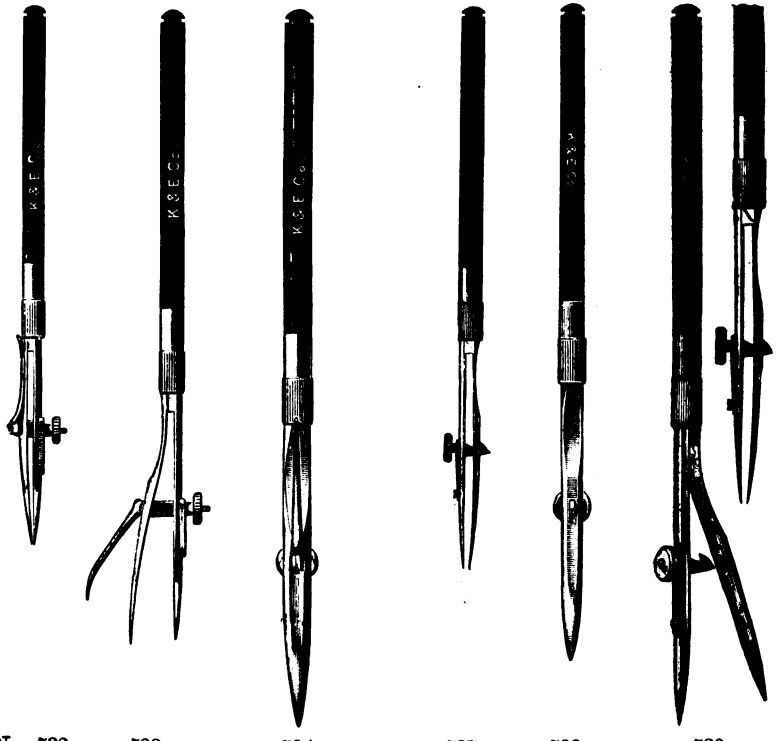
Drawing Pens carefully set and sharpened . . . . . each $ 15 to 20

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Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.

PATENT PARAGON DRAWING PENS.

(Patented.)



No. 532. 533. 534. 537. 538. 539.

532.	**Express**	Paragon	Drawing	Pen,	Patented,	Ebony	Handle,	4½	in.	each	$	2 00
533.	do	do	do	do	"	"	"	5	"	"		2 20
534.	do	do	do	do	"	"	"	5½	"	"		2 40
537.	**Click**	Paragon	Drawing	Pen,	Patented,	Ebony	Handle,	4½	"	"		1 50
538.	do	do	do	do	"	"	"	5	"	"		1 60
539.	do	do	do	do	"	"	"	5½	"	"		1 75
	Above pens with Aluminum Handle, extra, ...									"		10

541. Spline Pen, see page 77.

The Patent Paragon Drawing Pens, the Express and the Click, possess all the excellent qualities which have made our Paragon Pens famous. In addition they can be returned to exactly their original setting after having been opened (for cleaning) while at work on a drawing.

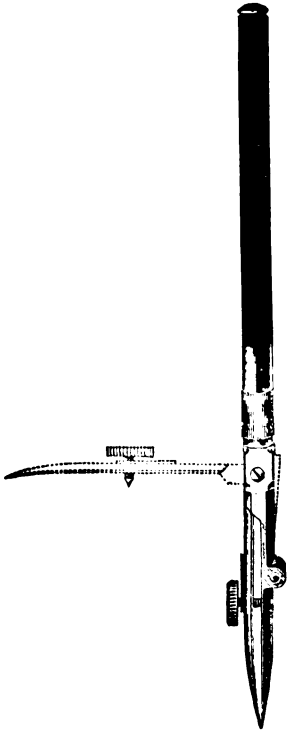
In the **Express Pens Nos. 532 to 534** the steel lug bearing the thread for the thumb nut, passes through the spring blade and engages an eccentric, moved by a lever, by which the spring blade is released, or restored to its original setting.

In the **Click Pens Nos. 537 to 539** the lug bearing the thread for the thumb nut ends in a steel hook which passes through a slot in the other blade, and is kept in place by a spring. The pen is opened by pushing the hook off its bearing, and is restored to its original setting by pressing the blade down, when the hook catches automatically.

Drawing Pens carefully set and sharpened . . . . . each $ 15 to 20

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KNIFE SPRING PARAGON PENS.



No. 523 K.

KNIFE SPRING PARAGON DRAWING PENS.

522 K	Knife Spring Paragon Drawing Pen, Ebony Handle, 4½ in.,									each	$	2 35
523 K	do.	do.	do.	do.	do.	"	"	5	"	"		2 45
524 K	do.	do.	do.	do.	do.	"	"	5½	"	"		2 60

PARAGON COMPASSES WITH KNIFE SPRING PEN.

610 K Compasses, 6¼ in., with fixed Needle point, **Knife Spring Pen Point,** Pencil Point and Lengthening Bar . . . . . each $ 8 75

(See No. 610, page 85.)

PARAGON STEELSPRING BOWS WITH KNIFE SPRING PEN.

481 K Steelspring Bow Pen, **Knife Spring Pen,** Needle Point, German silver Handle, 3¾ in. . . . . each $ 3 75

(See No. 481, page 69.)

486 K Steelspring Bow Pen, **central thumbnut, Knife Spring Pen,** Needle Point, German silver Handle, 3¾ in. . . . . " 4 50

(See No. 486, page 70.)

The Spring Joint Paragon Pens have a hinged upper blade actuated by a spring, similar to a pocket knife, which either holds it open at 90 degrees or presses it firmly against the fixed blade.

The adjustment for width of line is by a push screw threaded into the upper blade and a split nut. An indentation in the fixed blade to receive the conical point of the push-screw, forms an additional protection against lateral displacement of the blades.

Opening the pen for cleaning does not change the adjustment for width of line.

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KEUFFEL & ESSER CO. NEW YORK.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.

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No. 526. 527. 528. 529. 535. 536. 541. 543.

526.	Drawing Pen with Joint, Ivory Handle, 4 in.	each	$ 1 40
527.	" " " " and Pin, Ivory Handle, 5 in. . .	"	1 60
528.	" " " " " " " " 5½ " . .	"	1 80
529.	" " " " " " " " 6 " . .	"	2 00
530.	" " " " " " " " "		
	German silver blades, for red ink, 5½ " . .	"	1 80
532-534.	Express Drawing Pens, see page 76.		
535.	Border Pen, for broad lines, Ivory Handle . . . 6½ " . .	"	3 00
536.	" " " " " " " improved 6½ " . .	"	3 50
	Border Pen No. 536 may be used also as Railroad Pen by filling only the two pairs of blades with ink.		
537-539.	Click Drawing Pens, see page 76.		
Old No. 699. **541.**	Spline Pen, Ivory Handle, 5 in.	"	3 00
	Spline Pen No. 541 is a steelspring bow pen, the other shank of which ends in a flat lug. Applying this lug against splines, etc., prevents blotting from contact of the pen point with the spline. The bow facilitates locating the line in the correct place without shifting the spline.		
543.	Railroad Pencil, Ivory Handle, 5 in.	"	3 00
	Above instruments with Aluminum Handle . . . . extra	"	1(

Drawing Pens carefully set and sharpened . . . . . each $ 15 to 2(

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No. 544. 545. 550. 551. 555. 556. 557.

544.	Railroad Pen with Joints to blades and in shanks, Ivory Handle, 5 in.	each	$ 3	50
545.	Railroad Pen with Joints to blades and in shanks, K & E improved, Ivory Handle, 5 in.	"	3	75
	The improvement consists in having both pens bent in the same direction, so that lines can be drawn against a straightedge or rule as readily as with a ruling pen.			
550.	Dotting Pen with 6 Wheels, Ivory Handle, 6 in.	each	$ 3	75
551.	do. do. 6 " " " improved, 6 in.	"	4	25
	The improved Dotting Pen No. 551, is doubtless the best pen for the purpose, as it entirely prevents blotting, provided the ink be not too thin. The reservoir, after being filled, is closed and supplies no more ink to the dotting wheel than is actually required.			
555.	Opisometer, Ivory Handle, for measuring curved lines 4½ in.	each	$ 1	80
556.	Tracer, Ivory Handle 5 in.	"		90
557.	Pricker, Ivory Handle 5 in.	"	1	75
	Above instruments with Aluminum Handle, . . . extra	"		10

Drawing Pens carefully set and sharpened . . . . . each $ 15 to 20

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No. 558–1. 558–2. 558–3.

558–1.	Detail Drawing Pen, 5 in., upper blade with spring, flat Ebony Handle					each	$ 1 60
558–2.	do.	do.	do.	6 in.		"	1 70
558–3	do.	do.	do.	7 "		"	1 80
	Above pens with Aluminum Handle, extra					"	10



No. 559.

559. Fine German silver Lead Box, screw cap, containing 6 leads . . . . . each $ 25

560&c. Sets Paragon Instruments, see page 81. &c.
600&c. Dividers, Compasses with Esser's Patent Joint, see page 83, &c.

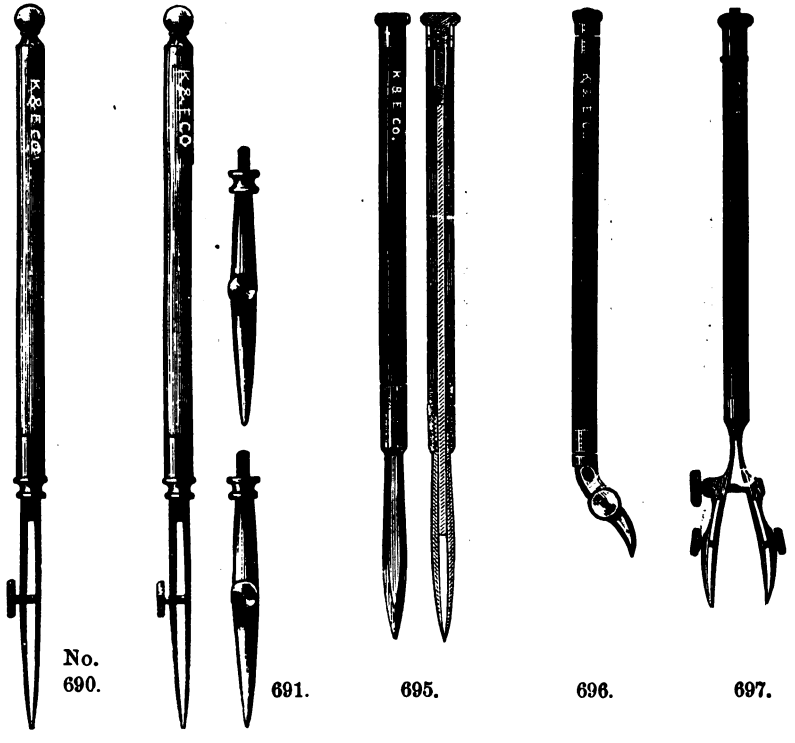
Drawing Pens carefully set and sharpened . . . . . each $ 15 to 20

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Each instrument stamped KEUFFEL & ESSER CO, or K. & E. CO., N. Y. Paragon.

IMPROVED DRAWING PENS.

PARAGON



No. 690. 691. 695. 696. 697.

690. Hatching Pen, extra fine, with Pushing Screw, 6 in. . . each $ 1 00

691. do. like 690, but 3 Pens to one Handle. . . . " 2 60

695. Improved Drawing Pen, 5¼ in., without thumb-screw . . " 1 45

This pen opens and closes by turning the set-screw at the upper end of the handle, avoiding the screw through the blades and preventing displacement of the nibs sideways. As there is no obstruction to the sight in working, this pen is preferable for fine work.

696. Improved Curve Pen, 4¾ in., spring blade . . . . . each $ 1 50

This pen has a hollow handle in which a thin rod rotates. The blades being fastened to the end of the rod and being eccentric to it, turn easily and follow the smallest curve with precision. By means of a nut at the upper end of the rod, the pen can be clamped and may then be used as a regular drawing pen.

697. Improved Railroad Pen, 5¼ in., spring blades . . . . . each $ 4 25

The construction of this pen is like that of No. 696 with the exception of its having two pair of blades.

These improved pens, have been extensively imitated in inferior qualities. Insist on obtaining the Paragon brand.

700. Dividers see page 106.

Drawing Pens carefully set and sharpened . . . . . each $ 15 to 20

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PARAGON INSTRUMENTS

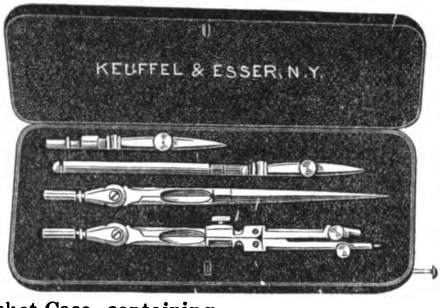
WITH TONGUE JOINT

IN MOROCCO POCKET CASES, SILK VELVET LINED.

THE VERY BEST INSTRUMENTS MADE.

(For description see page 46.)

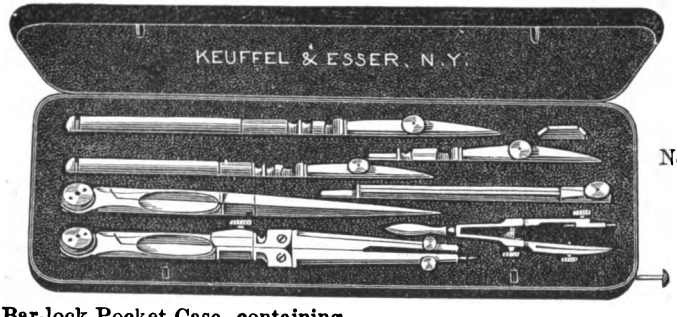
SETS OF ANY OTHER COMBINATION FURNISHED TO SUIT THE PURCHASER.



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No. 560.

560. Bar-lock Pocket Case, containing
1 Compasses, 4¼ in., with Handle, fixed Needle Point, Pen and Pencil Point, No. 404,
1 Plain Divider, 4 in., with Handle, No. 401,
1 Drawing Pen, 4 in., with Joint, Ivory Handle, No. 526
1 German silver Box with Leads, No. 559 . . . . . each $ 10 50



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No. 565.

565. Bar-lock Pocket Case, containing
1 Compasses, 5½ in., fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 415,
1 Plain Divider, 5 in., No. 410,
1 Steelspring Bow Pen No. 481½,
1 Drawing Pen, 5 in., with Joint and Pin, Ivory Handle, No. 527,
1 Drawing Pen, 5½ in., with Joint and Pin, Ivory Handle, No. 528,
1 German silver Box with Leads, No. 559 . . . . . each $ 17 75

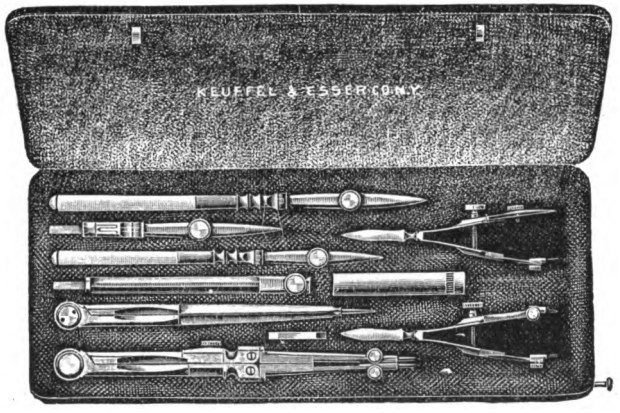
565 P. Pocket Case with **folding flaps**, containing same assortment as No. 565 . . . . . " 18 15

For sets of Paragon instruments with Esser's Patent Pivot Joint, see page 89, &c.

For empty cases for instruments see page 137.

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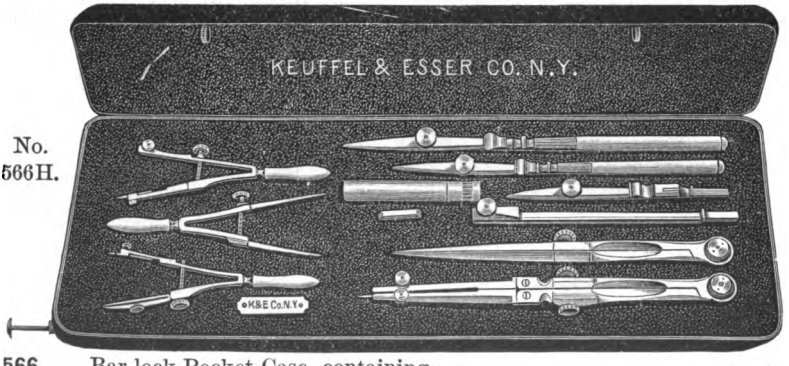
Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



No. 565½.

565½. Bar-lock Pocket Case, containing
1 Compasses, 5½ in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 415,
1 Plain Divider, 5 in., No. 410,
1 each Steelspring Bow Pen and Pencil, No. 481½, 482½,
1 each Drawing Pen, 5 in., 5½ in., with Joint and Pin, Ivory Handle, No. 527, 528,
1 German silver Box with Leads, No. 559 . . . . . each $ 20 45

565½ P. Pocket Case with **folding flaps,** containing same assortment as No. 565½ . . . . " 20 65



No. 566H.

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566. Bar-lock Pocket Case, containing
1 Compasses, 5½ in., fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 415,
1 Hairspring Divider, 5 in., No. 412,
1 Set Steelspring Divider and Bows No. 480½, 481½, 482½,
1 each Drawing Pen, 5 in., 5½ in., with Joint and Pin, Ivory Handle, No. 527. 528,
1 German silver Box with Leads, No. 559 . . . . . each $ 23 25

566 P. Pocket Case with **folding flaps,** containing same assortment as No. 566 . . . . . " 23 45

566 H. Bar-lock Pocket Case, containing same assortment as No. 566, but Compasses with Hair Spring No. 415 H. " 24 25

566 H.P. Pocket Case with **folding flaps,** containing same assortment as No. 566 H. . . . . " 24 45

For empty cases for instruments see page 137.

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PARAGON INSTRUMENTS

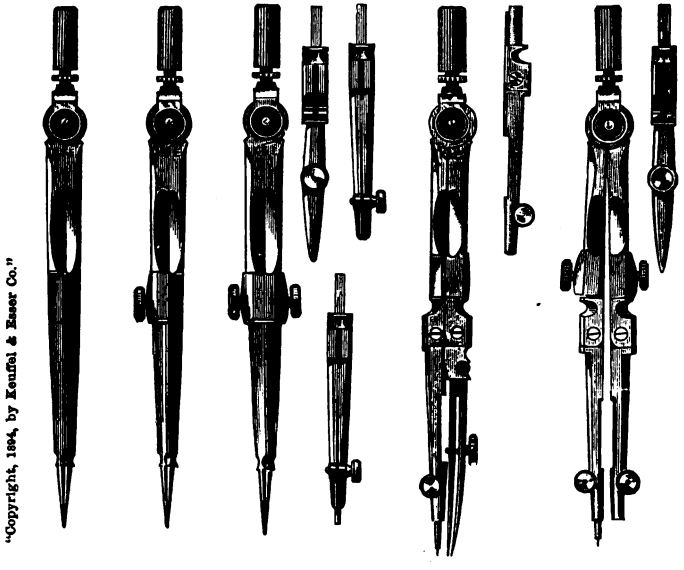
WITH ESSER'S PATENT PIVOT JOINT.

THE VERY BEST INSTRUMENTS MADE,

Of the same quality, workmanship and finish as the other Paragon Instruments Nos. 401 to 566 H. P.

(For description see page 46)

We list the Paragon Compasses with Esser's Patent Pivot joint also with the insertion pieces with round shank aligned by a steel feather and held in a spring socket. This construction dispenses with the thumbscrew, as explained on page 50. (See cuts 603R, 610R &c.)



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No. 600. 601. 602. 603R. 603 H.

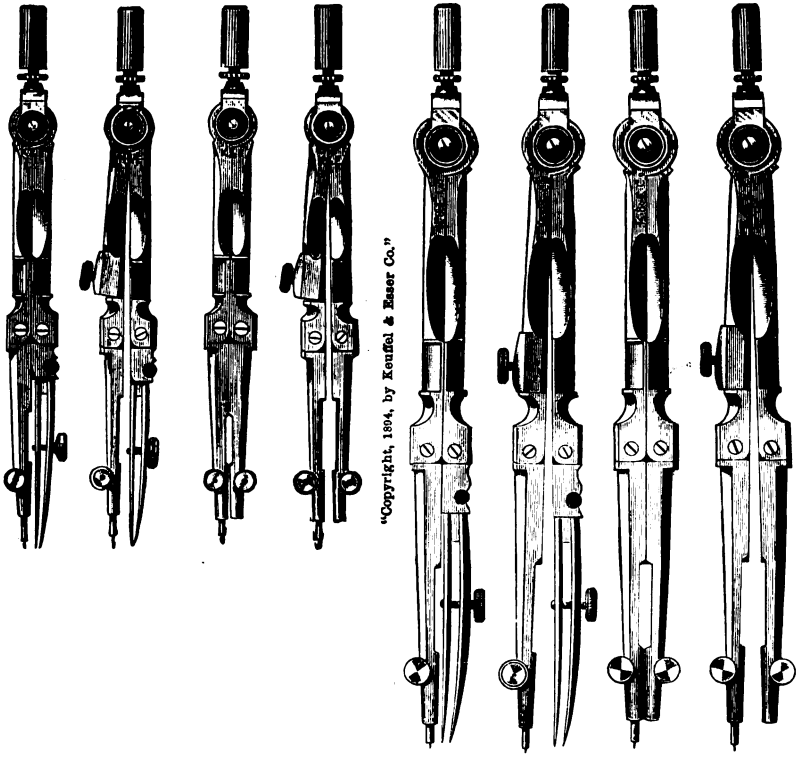
600.	Plain Divider, 4 in.	each	$	2 25
601.	Hairspring Divider, 4 in.	"		3 00
602.	Compasses, 4 in., with 2 Steel Points, Pen, Pencil and Needle Point	"		7 00
603.	do. 4¼ " " fixed Needle Point, Pen and Pencil Point	"		6 00
603 R.	do. 4¼ " like No. 603, but the insertion pieces with round shank (no thumbscrew)	"		6 00
603 L.	do. 4¼ " " " 603, but with **Lengthening Bar**	"		6 75
603 LR.	do. 4¼ " " " 603 L, but the insertion pieces with round shank (no thumbscrew)	"		6 75
603 H.	do. 4¼ " " " 603, but with Hairspring . .	"		7 00
603 HR.	do. 4¼ " " " 603 H, but the insertion pieces with round shank (no thumbscrew)	"		7 00

For Paragon Instruments as above, but with Tongue-joint see page 57.

For empty cases for instruments see page 137.

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No. 604. 604 H. 605. 605 H. 604½. 604½ H. 605½. 605½ H.

604.	Compasses,	4¼	in.,	with fixed Needle and Pen Point	each $ 4 00
604 H.	do.	4¼	"	like No. 604, but with Hairspring	" 5 00
605.	do.	4¼	"	with fixed Needle and Pencil Point	" 4 00
605 H.	do.	4¼	"	like No. 605, but with Hairspring	" 5 00
604½.	do.	5¾	"	with fixed Needle and Pen Point	" 4 75
604½ H.	do.	5¾	"	like No. 604½, but with Hairspring	" 5 75
605½.	do.	5¾	"	with fixed Needle and Pencil Point	" 4 75
605½ H.	do.	5¾	"	like No. 605½, but with Hairspring	" 5 75

For empty cases for instruments see page 137.

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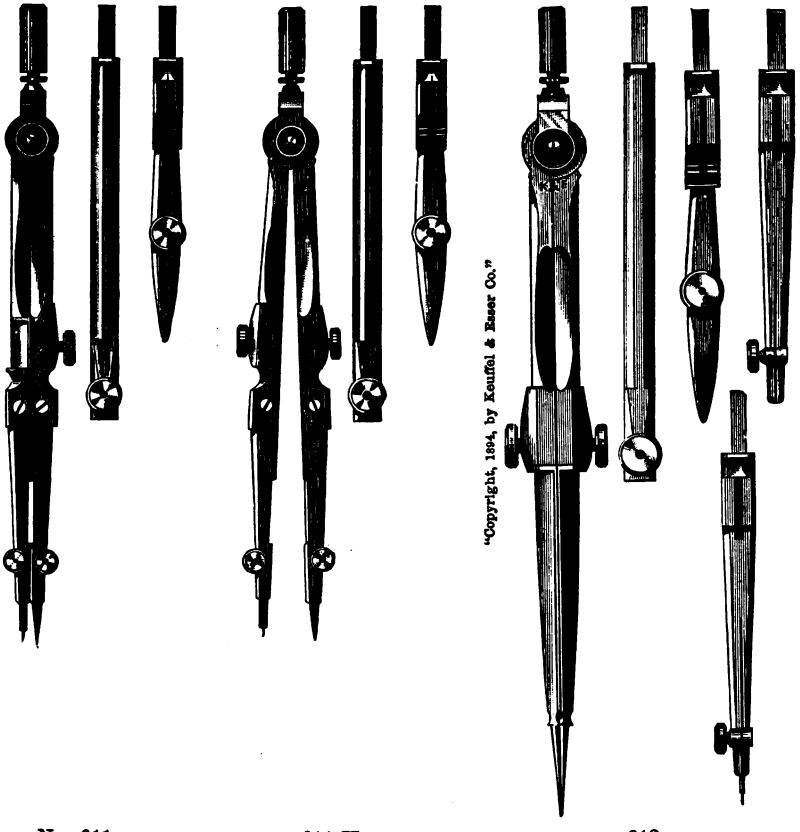
No. 606. 608. 608½. 610 R. 610 HD.

606.	Plain Divider,	5¾ in.	. . . . .	each	$ 2	50
607.	do.	6¼ "	. . . . .	"	3	00
608.	Hairspring Divider,	5¾ in.	. . . . .	"	3	50
608½.	do.	do.	5¾ " with Joint in each leg	"	4	50
609.	do.	do.	6¼ "	"	4	00
610.	Compasses,	6¼ in.,	with fixed Needle Point, Pen, Pencil Point and Lengthening Bar	"	7	50
610 R.	do.	6¼ "	like No. 610, but the insertion pieces with round shank (no thumbscrew) .	"	7	50
610 H.	do.	6¼ "	like No. 610, but with Hairspring . .	"	8	50
610 HR.	do.	6¼ "	" " 610H, but the insertion pieces with round shank (no thumbscrew) .	"	8	50
610 HD.	do.	6¼ "	like No. 610H, but with improved Dotting Pen with 6 wheels	"	12	00
610 HDR.	do.	6¼ "	like No. 610HD., but the insertion pieces with round shank (no thumbscrew) .	"	12	00

For description of insertion pieces with round shank see page 50.
For empty cases for instruments see page 137.

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No. 611. 611 H. 612.

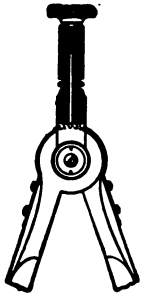
611.	Compasses,	5	in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar . . .	each	$ 7 25
611 R.	do.	5	" like No. 611, but the insertion pieces with round shank (no thumbscrew) .	"	7 25
611 H.	do.	5	" like No. 611, but with Hairspring . .	"	8 25
611 HR.	do.	5	" like No. 611 H, but the insertion pieces with round shank (no thumbscrew) .	"	8 25
612.	do.	6¼	" with 2 Steel Points, Pen, Pencil, Needle Point and Lengthening Bar . .	"	8 50
612 R.	do.	6¼	" like No. 612, but the insertion pieces with round shank (no thumbscrews) .	"	8 50

For description of insertion pieces with round shank see page 83.
For empty cases for instruments see page 137.

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PARAGON INSTRUMENTS



WITH

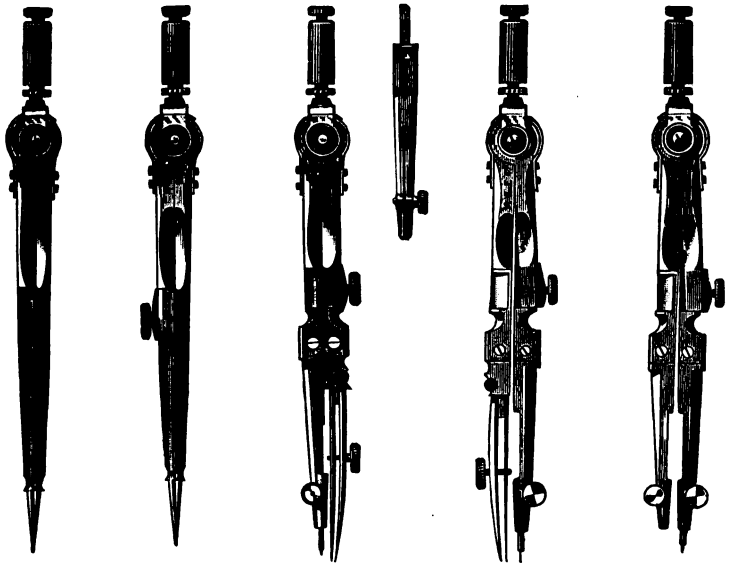
ESSER'S PATENT PIVOT JOINT

AND

PATENT LOCKING DEVICE



The instruments Nos. 613 to 618HDR, have Esser's Patent Pivot Joint, as described on page 48, and in addition they have a device for locking or clamping the joint in any position as described on page 49: Esser's Patent Lock Joint. This useful attachment adds practically nothing to the bulk of the instrument nor does it in any way interfere with any of its uses, nor detract from its appearance.



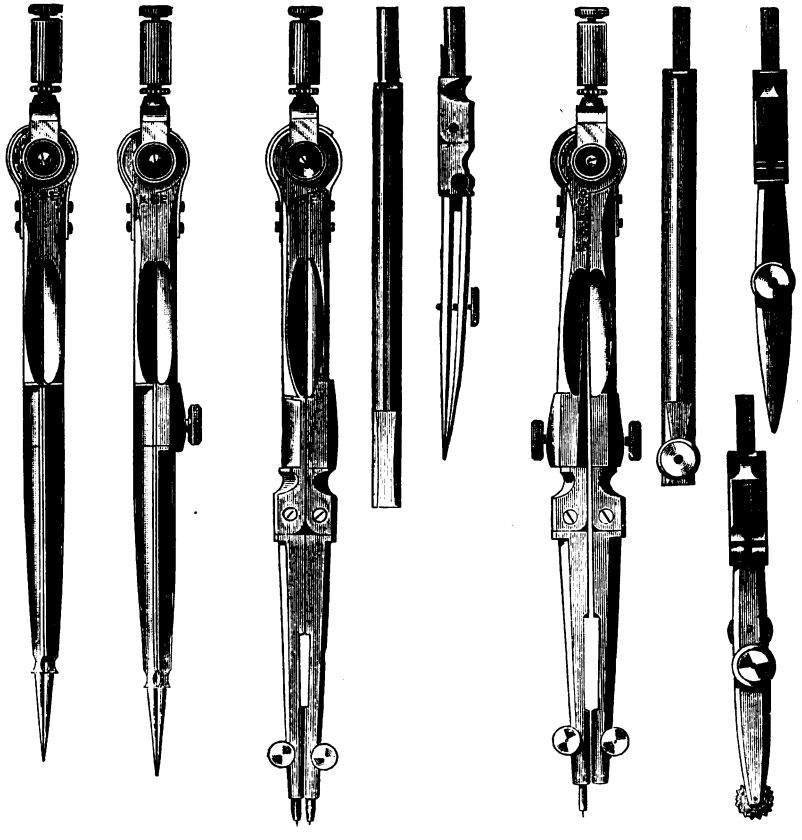
No. 613. 614 615 615-1 615-2

613.	Plain Divider, 4 in.	each	$	2 85
614.	Hairspring Divider, 4 in.	"		3 60
615.	Compasses, 4½ in., with fixed Needle Point, Pen and Pencil Point	"		6 60
615 H.	do. like No. 615, but with Hairspring	"		7 60
615 R.	do. 4½ in., like No. 615, but the insertion pieces with round shank (no thumbscrew)	"		6 60
615-1.	do. 4½ in., with fixed Needle Point with Hairspring and Pen Point	"		5 60
615-2.	do. 4½ in., with fixed Needle Point with Hairspring and Pencil Point	"		5 60

For description of insertion pieces with round shank see page 50.
For empty cases for instruments see page 137.

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Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



No. 616. 617. 618 R. 618 HD.

616.	Plain Divider, 5¾ in.	each	$ 3 10
617.	Hairspring Divider, 5¾ in.	"	4 10
618.	Compasses, 6¼ in., with fixed needle Point, Pen, Pencil Point and Lengthening Bar	"	8 10
618 R.	do. 6¼ in., like No. 618, but the insertion pieces with round shank (no thumbscrew) .	"	8 10
618 H.	do. 6¼ " like No. 618, but with Hairspring . .	"	9 10
618 HR.	do. 6¼ " like No. 618 H., but the insertion pieces with round shank (no thumbscrew) .	"	9 10
618 HD.	do. 6¼ " like No. 618 H, but with improved Dotting Pen Point	"	12 60
618 HDR.	do. 6¼ " like No. 618HD, but the insertion pieces with round shank (no thumbscrew) . .	"	12 60

For description of insertion pieces with round shank see page 50.
For empty cases for instruments see page 137.

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Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.

PARAGON INSTRUMENTS

WITH

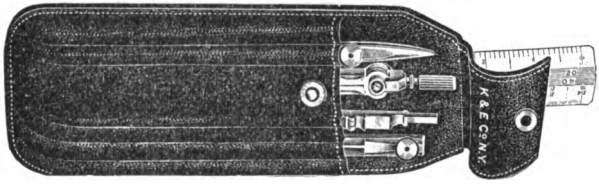
ESSER'S PATENT PIVOT JOINT

IN MOROCCO POCKET CASES, SILK VELVET LINED.

For description see pages 46, 48.

SETS OF ANY OTHER COMBINATION FURNISHED TO SUIT THE PURCHASER.

The Compasses in these sets are listed with **insertion pieces with pentagonal shank** (with thumbscrew). We furnish them also with the **insertion pieces with round shank and spring socket** (without thumbscrew) at the same price, if the compass is listed separately in that form. For description see page 50.



No. 619.

619. Vest Pocket Set, **sewed leather Pouch,** about 2½ × 7 in., with flap and button catch, containing
1 Compasses 6¼ in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 610,
1 Drawing Pen, Ebony Handle, 5 in., upper blade with spring, No. 523,
1 Paragon Scale 6 in, 10, 40, 30 and 50 parts to the inch, No. 1419 P. . . . . each $ 12 00

For Esser's Patent Lock Joint to the Compasses in above set, add per set $ 60

The pouch contains also compartments for a pencil and a fountain pen. These are not covered by the flap, to have them conveniently accessible without opening the flap



No. 620

620. Pocket Case **with folding flaps** containing
1 Compasses, 4½ in., with Pen, Pencil, Needle Point and Lengthening Bar, insertion pieces with round shank, No. 603 LR,
1 Plain Divider, 4 in., No. 600,
1 Drawing Pen, Ebony Handle, 4½ in., upper blade with spring, No. 522,
1 German silver Box with Leads, No. 559 . . . . each $ 12 50

Above Set in Pocket Case with Bar-lock furnished at same price.

For empty cases for instruments see page 137.

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Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



"Copyright, 1894, by Keuffel & Esser Co."

No. 621.

621. Pocket Case with **folding flaps** containing
1 Compasses, 4½ in., with fixed Needle and Pen Point, No. 604,
1 Compass, 4½ in., with fixed Needle and Pencil Point, No. 605,
1 Hairspring Divider, 4 in., No. 601,
1 Drawing Pen, Ebony Handle, 4½ in., upper blade with spring, No. 522,
1 German Silver Box with Leads, No. 559. . . each $ 14 50



"Copyright, 1894, by Keuffel & Esser Co."

No. 621 H.

621 H. Pocket Case with **folding flaps** containing
1 Compass, 4½ in., with fixed Needle Point with Hairspring and Pen Point, No. 604 H,
1 Compass, 4½ in., with fixed Needle Point with Hairspring and Pencil Point, No. 605 H,
1 Hairspring Divider, 4 in., No. 601,
1 Drawing Pen, Ebony Handle, 4½ in., upper blade with spring, No. 522,
1 German silver Box with Leads, No. 559 . . . each $ 16 50

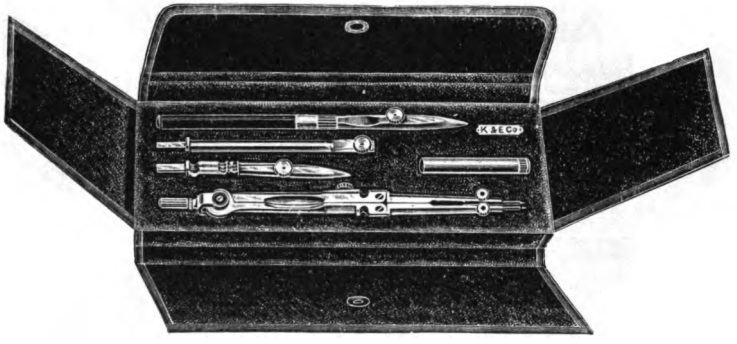
For Esser's Patent Lock Joint to the Compasses and Divider in above set, ... add per set 1 80

Above Sets in Pocket Case with Bar-lock furnished at same price.

For empty cases for instruments see page 137.

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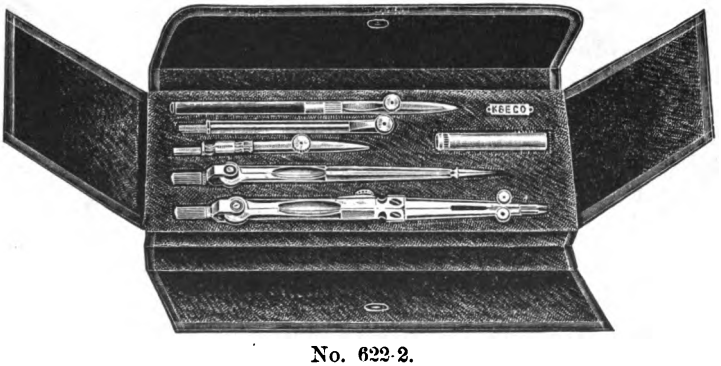
Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



No. 622-1.

622-1. Pocket Case with **folding flaps,** containing
1 Compasses, 6½ in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar No. 610,
1 Drawing Pen, Ebony Handle, 5 in., upper blade blade with spring, No. 523,
1 German silver Box with Leads, No. 559 . . . . each $ 11 35

For Esser's Patent Lock Joint to the Compasses in above set, ... add per set 60



No. 622-2.

622-2. Pocket Case with **folding flaps,** containing same assortment as No. 622-1, but with addition of 1 Plain Divider, 5¾ in., No. 606 . . . . . each $ 14 00

For Esser's Patent Lock Joint to the Compasses and Divider in above set, ... add per set 1 20

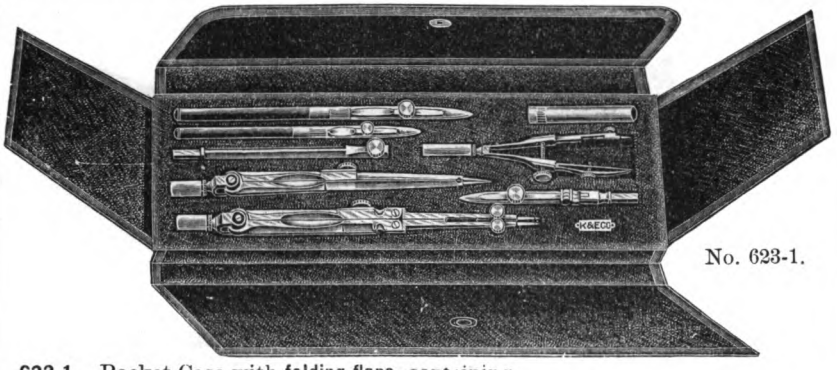
Above Sets in Pocket Case with Bar-lock furnished at the same price.

See note at top of page 89, Insertion pieces with round shank (no thumbscrew).

For empty cases for instruments see page 137.

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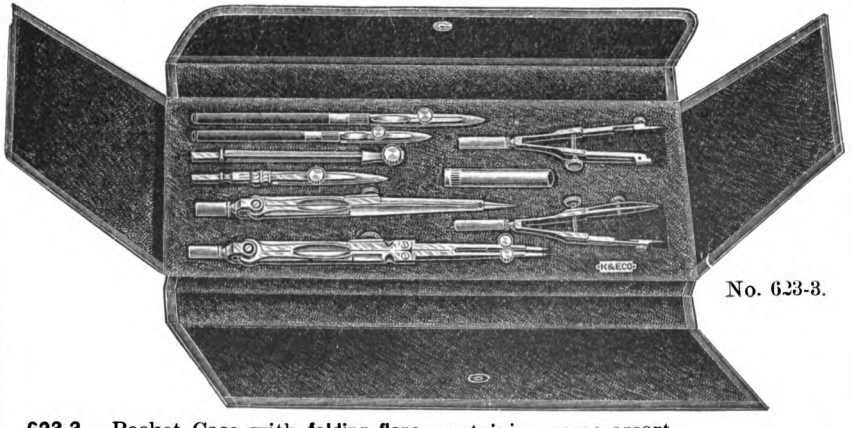
Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



No. 623-1.

623-1. Pocket Case with **folding flaps,** containing
1 Compasses, $6\frac{1}{4}$ in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 610,
1 Hairspring Divider, $5\frac{3}{4}$ in., No. 608,
1 Steelspring Bow Pen, No. 481,
1 each Drawing Pen, Ebony Handle $4\frac{1}{2}$ in., $5\frac{1}{2}$ in. upper blade with spring, No. 522, $523\frac{1}{2}$,
1 German silver Box with Leads, No. 559 . . . . each $ 19 00

623-1 C. Pocket Case with **folding flaps,** containing same assortment as No. 623-1, but with Bow Pen 486 (with central thumbnut) in place of No. 481 " 19 75



No. 623-3.

623-3. Pocket Case with **folding flaps,** containing same assortment as No. 623-1, but with addition of 1 Steelspring Bow Pencil, No. 482 . . . . . " 21 50

623-3 C. Pocket Case with **folding flaps,** containing same assortment as No. 623-3, but bows No. 486, 487 (with central thumbnut) in place of No. 481, 482 . . . " 23 00

For Esser's Patent Lock Joint to the Compasses and Divider in above sets, ... add per set 1 20

Above Sets in Pocket Case with Bar-lock furnished at same price.

See note at top of page 89, Insertion pieces with round shank (no thumbscrew)

For empty cases for instruments see page 137.

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Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



No. 624.

624. Pocket Case with **folding flaps,** containing

1 Compasses, $6\frac{1}{4}$ in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 610.

1 Hairspring Divider, $5\frac{3}{4}$ in., No. 608,

1 Steelspring Bow Divider, $3\frac{3}{4}$ in. No. 480,

1 do. Bow Pen, $3\frac{3}{4}$ " 481,

1 do. Bow Pencil, $3\frac{3}{4}$ " 482,

1 Drawing Pen, Ebony Handle, $4\frac{1}{2}$ in., upper blade with spring, No. 522,

1 Drawing Pen, Ebony Handle, $5\frac{1}{2}$ in., upper blade with spring, No. $523\frac{1}{2}$,

1 German silver Box with Leads, No. 559. . . . each $ 23 50

624C. Pocket Case with **folding flaps,** containing same assortment as No. 624, but with Spring Bows Nos. 485, 486, 487, (central thumbnut) in place of 480, 481, 482 . . . . . " 25 60

For Esser's Patent Lock Joint to the Compasses and Divider in above sets, ... add per set 1 20

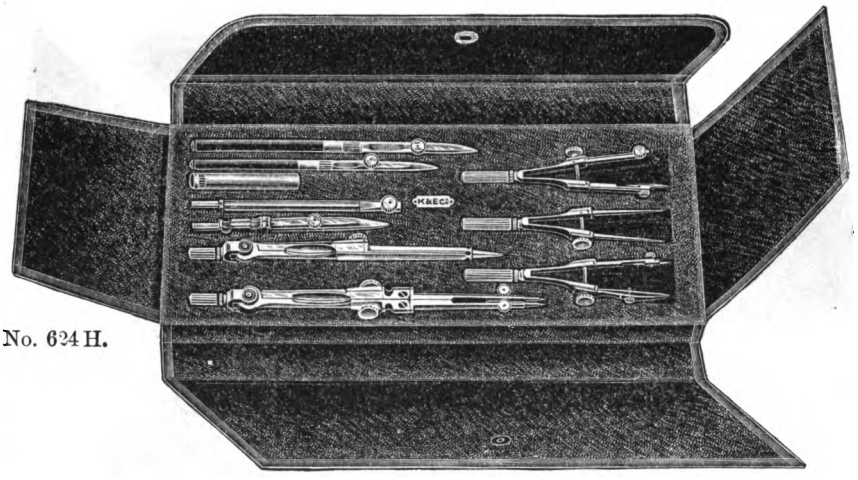
Above Sets in Pocket Case with Bar-lock furnished at same price.

See note at top of page 89, Insertion pieces with round shank (no thumbscrew).

For empty cases for instruments see page 137.

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Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



No. 624 H.

624 H. Pocket Case with **folding flaps**, containing,

1 Compasses, 6¼ in., fixed Needle Point with Hairspring, Pen, Pencil Point and Lengthening Bar, No. 610 H,

1 Hairspring Divider, 5¾ in., No. 608,

1 Steelspring Bow Divider, 3¾ in., No. 480.

1 do. Bow Pen, 3¾ " 481.

1 do. Bow Pencil, 3¾ " 482.

1 Drawing Pen, Ebony Handle, 4½ in., upper blade with spring, No. 522.

1 Drawing Pen, Ebony Handle, 5½ in., upper blade with spring, No. 523½.

1 German silver Box with Leads, No. 559 . . . . . each $ 24 50

624 HC. Pocket Case with **folding flaps**, containing same assortment as No. 624 H, but with Spring Bows Nos. 485, 486, 487 (central thumbnut) in place of 480, 481, 482 . . . . . " 26 60

For Esser's Patent Lock Joint to the Compasses and Divider in above sets, ... add per set 1 20

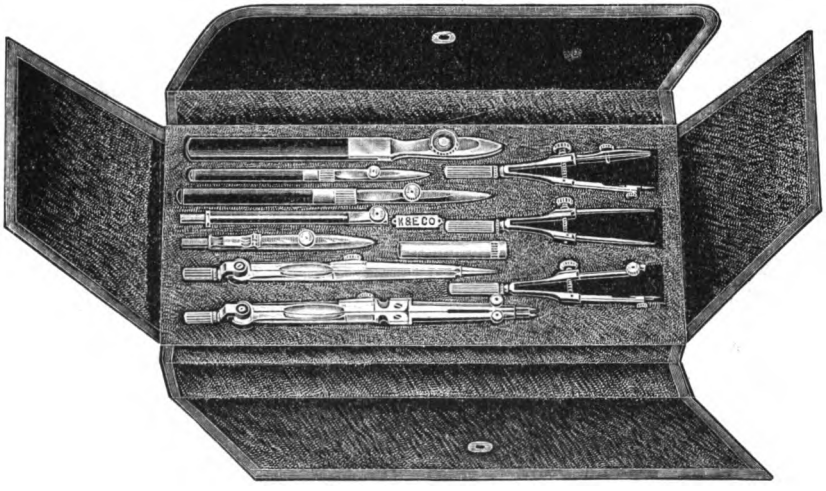
Above Sets in Pocket Cases with Bar-lock furnished at same price.

See note at top of page 89, Insertion pieces with round shank (no thumbscrew).

For empty cases for instruments see page 137.

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Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



No. 624 B.

624B. Pocket Case with **folding flaps,** containing

1 Compasses, 6¼ in., with fixed Needle Point Pen, Pencil Point and Lengthening Bar, No. 610,
1 Hairspring Divider, 5¾ in., No. 608.
1 Steelspring Bow Divider, 3¾ in. No. 480.
1 do Bow Pen, 3¾ " 481.
1 do Bow Pencil, 3¾ " 482.
1 Drawing Pen, Ebony Handle, 4½ in., upper blade with spring, No. 522.
1 Drawing Pen, Ebony Handle, 5½ in., upper blade with spring, No. 523½.
1 Detail Drawing Pen, flat Ebony Handle 6 in., upper blade with spring, No. 558-2.
1 German silver Box with Leads, No. 559 . . . each $ 25 50

624BC. Pocket Case with **folding flaps,** containing same assortment as No. 624 B, but with Spring Bows Nos. 485, 486, 487. (central thumbnut) in place of 480, 481, 482 . . . . . " 27 60

For Esser's Patent Lock Joint to the Compasses and Divider in above set, ... add per set 1 20

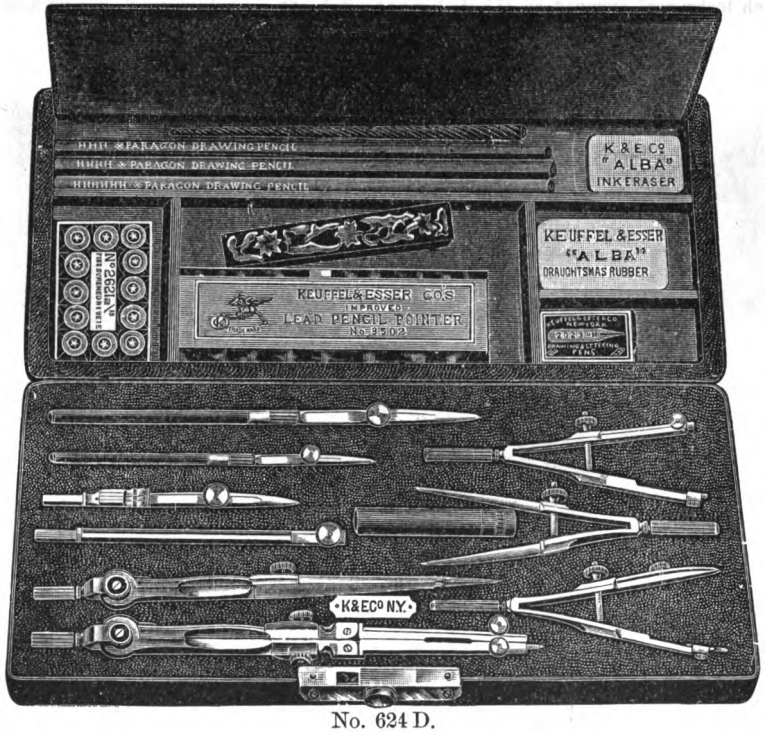
Above Sets in Pocket Case with Bar-lock furnished at same price.

See note at top of page 89, Insertion pieces with round shank (no thumbscrew)

For empty cases for instruments see page 137.

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Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



No. 624 D.

624 D. Morocco Case with recessed and partitioned lid with hinged cushion. The lid is arranged for holding pencils, penholders, pens, tacks, rubber, pencil pointer, India Ink, etc.; (which are shown in cut No. 624 D, but are not included in price), containing

1 Compasses, 6¼ in., fixed Needle Point with Hairspring, Pen, Pencil Point and Lengthening Bar, No. 610 H,
1 Hairspring Divider, 5¾ in., No. 608,
1 Set Steelspring Divider and Bows, 3¾ in., Nos. 480, 481, 482.,
1 each Drawing Pen, Ebony Handle, 4½ in., 5½ in., Nos. 522, 523½,
1 German silver Box with Leads, No. 559 . . . . each $25 50

624 DB. Morocco Case with recessed lid containing same assortment as No. 624 D, but with addition of 1 Detail Drawing Pen, 6 in., upper blade with spring, flat Ebony Handle No. 558-2 . . . . " 27 40

Above Sets with Spring Bows Nos. 485, 486, 487, (central thumbnut) in place of 480, 481, 482, add . . . . . per set $ 2 10

For Esser's Patent Lock Joint to the Compasses and Divider in above set, ... add per set 1 20

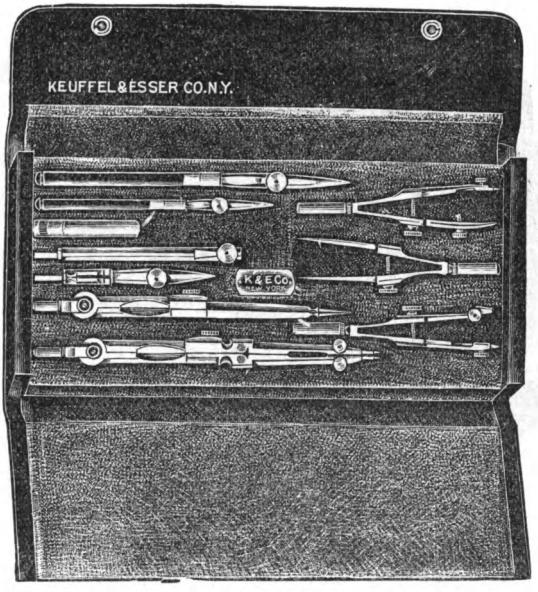
625. Set of Instruments, see page 98.
626. Set of Instruments, see page 99

See note at top of page 89, Insertion pieces with round shank (no thumbscrew).

For empty cases for instruments see page 137.

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Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



No. 627.

627. Improved Pocket Case, with **folding covers and pocket,** containing

1 Compasses, $6\frac{1}{4}$ in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 610.

1 Hairspring Divider, $5\frac{3}{4}$ in., No. 608,

1 Steelspring Bow Divider, $3\frac{3}{4}$ in., No. 480,

1 do. Bow Pen, $3\frac{3}{4}$ " 481,

1 do. Bow Pencil, $3\frac{3}{4}$ " 482,

1 Drawing Pen, Ebony Handle $4\frac{1}{2}$ in., upper blade with spring, No. 522,

1 Drawing Pen, Ebony Handle, $5\frac{1}{2}$ in., upper blade with spring, No. $523\frac{1}{2}$,

1 German silver Box with Leads, No. 559 . . . . each $ 23 50

627 C. Improved Pocket Case, with **folding covers and pocket,** containing same assortment as No. 627, but with Spring Bows Nos. 485, 486, 487 (with central thumbnut) in place of No. 480, 481, 482 " 25 60

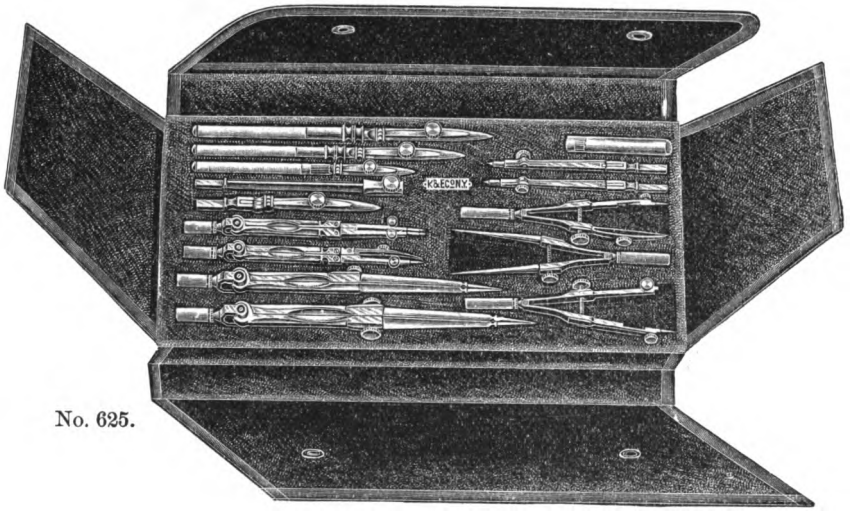
For Patent Lock Joint to the Compasses and Divider in above set, ... add per set 1 20

See note at top of page 89, Insertion pieces with round shank (no thumbscrew).

For empty cases for instruments see page 137.

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Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



No. 625.

625. Pocket Case, with **folding flaps,** containing

1 Compasses, 6¼ in., with 2 Steel Points, Pen, Pencil, Needle Point and Lengthening Bar, No. 612,
1 Compass, 4½ in., fixed Needle and Pen Point, No. 604,
1 do. 4½ " " " " Pencil " " 605,
1 Hairspring Divider, 5¾ in., No. 608,
1 Steelspring Bow Divider, 3¾ in., No. 480,
1 do. Bow Pen, 3¾ " 481,
1 do. Bow Pencil, 3¾ " 482,
1 Drawing Pen with Joint, Ivory Handle, 4 in., No. 526,
1 Drawing Pen with Joint and Pin, Ivory Handle, 5 in., No. 527,
1 Drawing Pen with Joint and Pin, Ivory Handle, 5½ in., No. 528,
1 German silver Box with Leads, No. 559 . . . . each $ 37 50

625 C. Pocket Case with **folding flaps,** containing same assortment as No. 625 but with Spring Bows, No. 485, 486, 487, (central thumbnut) in place of 480, 481, 482 . . . . . " 39 60

For Esser's Patent Lock Joint to the 6¼ in. Compasses and 5¾ in. Divider in above set, ... add per set 1 20

Above sets in Pocket Case, with Bar-lock, furnished at same price.

See note at top of page 89, Insertion pieces with round shank (no thumbscrew).

For empty cases for Instruments see page 137.

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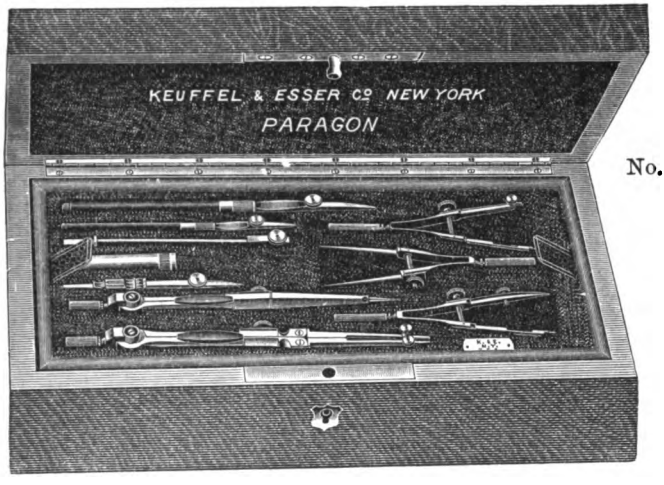
Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.

PARAGON INSTRUMENTS

WITH

ESSER'S PATENT PIVOT JOINT

In polished Mahogany Cases, Tray lined with Silk Velvet, with Lock.



No. 626.

626. Polished Mahogany Case, Tray lined with Silk Velvet, with Lock, containing:

1 Compasses, 6½ in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 610,

1 Hairspring Divider, 5¾ in., No. 608,

1 Steelspring Bow Divider, 3¾ in., No. 480,

1 do. Bow Pen, 3¾ " 481,

1 do. Bow Pencil, 3¾ " 482,

1 Drawing Pen, Ebony Handle, 4½ in., upper blade with spring, No. 522,

1 Drawing Pen, Ebony Handle, 5½ in., upper blade with spring, No. 523½,

1 German silver Box with Leads, No. 559, ... each $ 26 70

For Esser's Patent Lock Joint to the Compasses and Divider, add per set 1 20

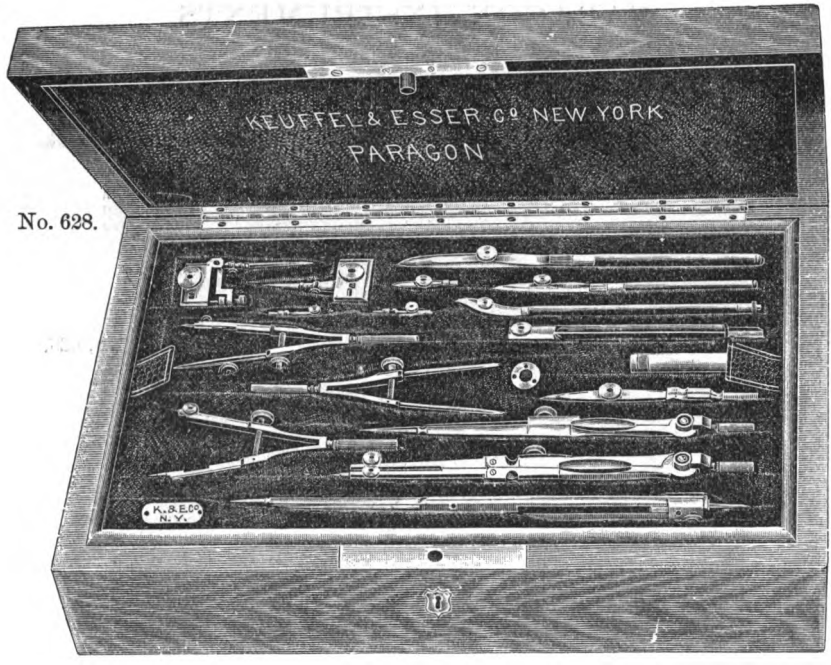
Above set with spring bows, No. 485, 486, 487, (central thumbnut) in place of 480, 481, 482, add . . . " 2 10

See note at top of page 89, Insertion pieces with round shank (no thumbscrew).

For empty cases for instruments see page 137.

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Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



No. 628.

628. Polished Mahogany Case, Tray lined with Silk Velvet, with Lock, containing:

1 Compasses, 6½ in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 610,
1 Hairspring Divider, 5¾ in., No. 608,
1 Proportional Divider, No. 435,
1 Minute Beam Compass, with 2 Steel Points, Pen, Pencil and Needle Point, No. 509,
1 Steelspring Divider, 3¾ in., No. 480,
1 do. Bow Pen, 3¾ " 481,
1 do. Bow Pencil, 3¾ " 482,
1 Drawing Pen, Ebony Handle, 4½ in., upper blade with spring, No. 522,
1 Drawing Pen, Ebony Handle, 5½ in., upper blade with spring, No. 523½,
1 Improved Curve Pen, 4¾ in., No. 696,
1 Horn Centre with German silver Rim, No. 2691,
1 German silver Box with Leads, No. 559 . . . . . each $ 48 80

For Patent Lock Joint to the Compasses and Divider, . . . add per set 1 20

Above set with spring bows, No. 485, 486, 487, (central thumbnut) in place of 480, 481, 482, ... add " 2 10

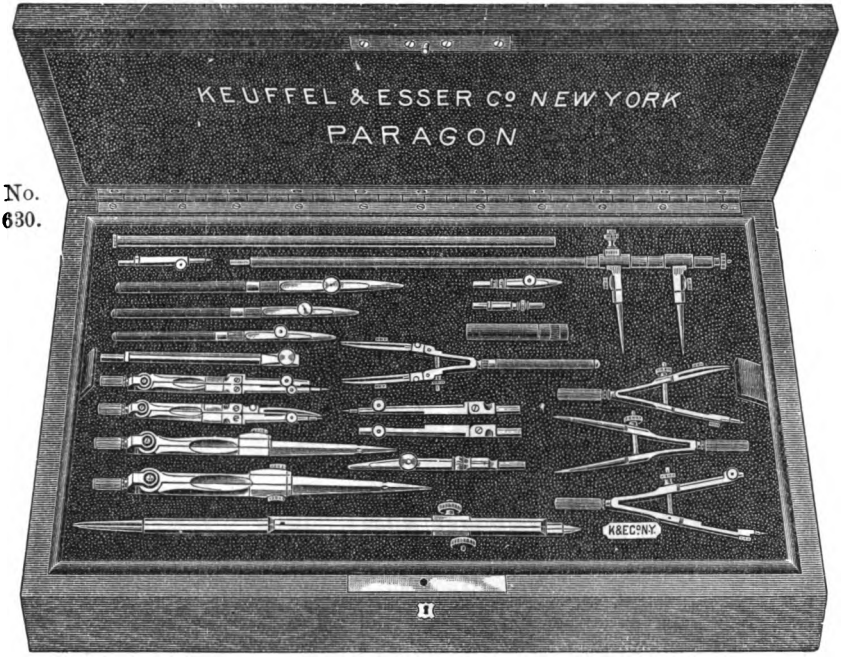
See note at top of page 89, Insertion pieces with round shank (no thumbscrew).

For empty cases for instruments see page 137.

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Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.

No. 630.



630. Polished Mahogany Case, Tray lined with Silk Velvet, with Lock, cont'g:

1 Compasses, 6¼ in., with 2 Steel Points, Pen, Pencil, Needle Point and Lengthening Bar, No. 612,
1 Compasses, 4½ in., fixed Needle and Pen Point, No. 604,
1 Compasses, 4½ in., fixed Needle and Pencil Point, No. 605,
1 Hairspring Divider, 5¾ in., No. 608,
1 Proportional Divider, No. 437,
1 Tubular Beam Compass, 18 in., 2 round German silver Bars, 2 Steel Points, Pen, Pencil and Needle Point, No. 500.
1 Steelspring Divider, 3¾ in., No. 480,
1 " Bow Pen, 3¾ " 481,
1 " Bow Pencil, 3¾ " 482,
1 Drawing Pen, Ebony Handle, 4½ in., upper blade with spring, No, 522,
1 Drawing Pen, Ebony Handle, 5 in., upper blade with spring, No. 523,
1 Drawing Pen, Ebony Handle, 5½ in., upper blade with spring, No. 523½,
1 Railroad Pen, improved, Ivory Handle, 5 in., No. 545,
1 German silver Box with Leads, No. 559 . . . . . each $ 69 00

For Esser's Patent Lock Joint to the 6¼ in. Compasses and 5¾ in. Divider, ... add per set 1 20

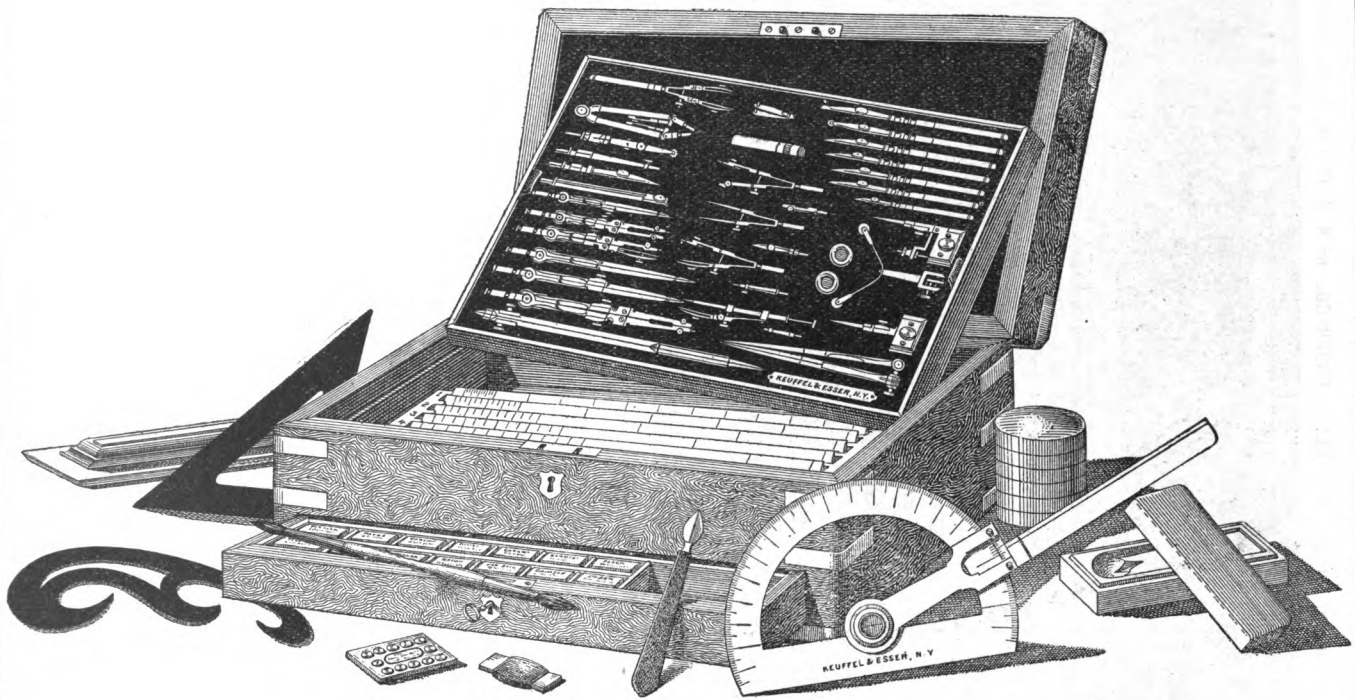
Above set with spring bows, No. 485, 486, 487 (centrel thumbnut) in place of 480, 481, 482, ... add " 2 10

See note at top of page 89, Insertion pieces with round shank (no thumbscrew).

For empty Cases for instruments see page 137.

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No. 633,

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Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.

632. Polished Mahogany Case, with Tray lined with Silk Velvet, with Lock, containing

1 Compasses 6¼ in., with patent Lock Joint, fixed Needle Point, with Hairspring, Pen, Pencil Point, Lengthening Bar, Dotting Pen, No. 618 HD,
1 Compasses, 4¼ in., with Patent Lock Joint, fixed Needle Point with Hairspring and Pen Point, 615-1,
1 Compasses, 4¼ in., with Patent Lock Joint, fixed Needle Point with Hairspring and Pencil Point, 615-2,
1 Hairspring Divider, 4 in., with Patent Lock Joint, No. 614,
1 Plain Divider, 5¾ in., with patent Lock Joint No. 616,
1 Hairspring Divider, 5¾ in., with Patent Lock Joint, No. 617,
1 Pocket or Pillar Compasses, No. 427,
1 Three legged Divider, No. 430,
1 Proportional Divider with movable Points, No. 439
1 Spring Bow Pen and Pencil, No. 454,
1 Set Steelspring Divider and Bows, No. 480, 481, 482,
1 Beam Compass 510, with Wheel Attachment 511,
1 Drawing Pen, 4 in., Joint, Ivory Handle, No. 526,
2 do. 5 " " Pin, Ivory Handle, 527,
2 do. 5½ " " " " " 528,
1 do. 6 " " " " " 529.
1 Railroad Pen, 5 " Ivory Handle, No. 544,
1 Dotting Pen, 6 " " " " 551,
1 Adjusting Key and Screw Driver No. 825,
2 Horn Centres with German silver rim, No. 2691,
1 German silver Box with Leads, No. 559 . . . . each $ 125 00

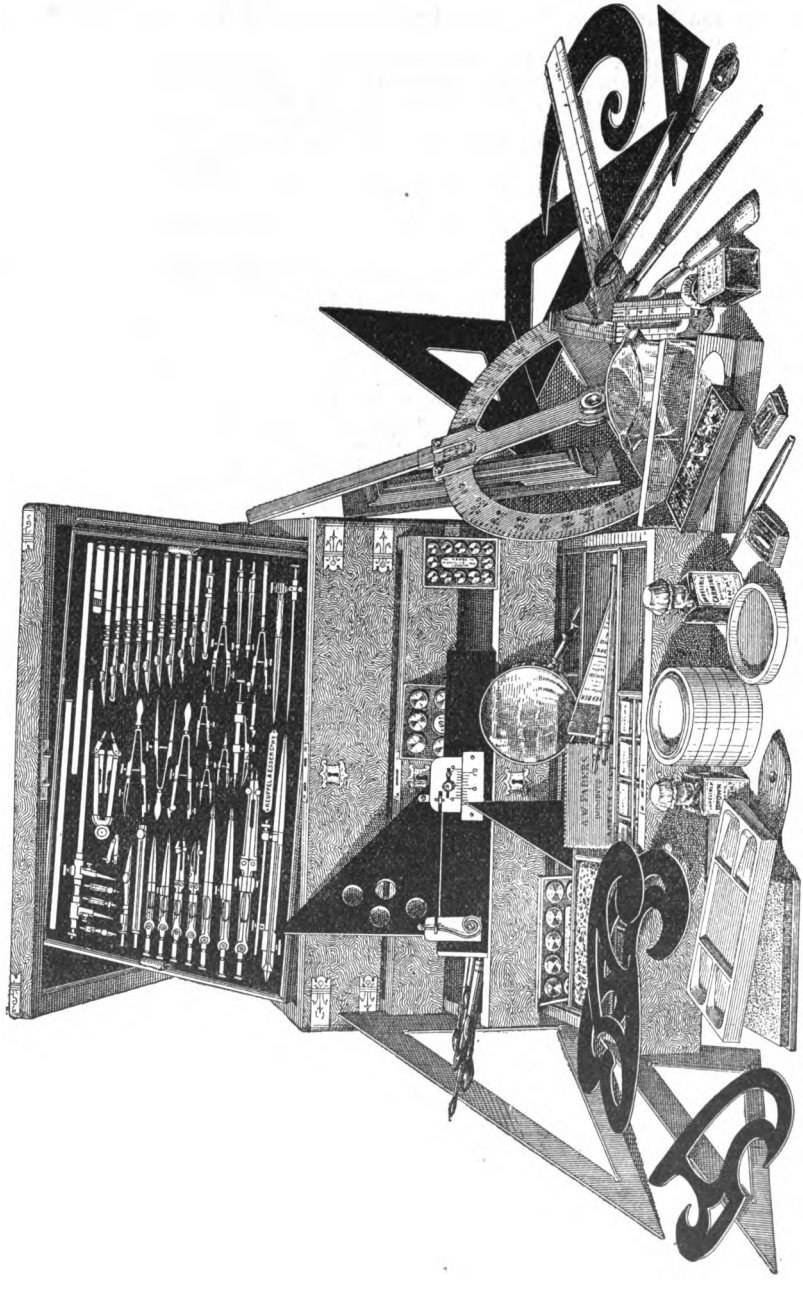
633. Fine polished Mahogany Case, with Tray lined with Silk Velvet, **Drawer**, German silver Bands and Corners, with Lock, (see illustration), containing same instruments as No. 632, and in addition

1 Set (8) Paragon Scales like No. 1576 P,
1 Paper Cutter, No. 2701,
1 Protractor, No. 1226,
1 German silver Parallel Rule, No. 1750,
2 doz. each German Silver Thumb Tacks, No. 2622, 2624,
1 Tacklifter, No. 2680,
1 each Xylonite Triangle, No. 1855, 5, 8, 12 in.,
1 " " " " 1856, 4, 7, 10 "
1 " " Curve, " 1860, 4, 13, 19
1 Set of 18 Full Pans Technical Water Colors, No. 2900 and 2901
1 Cake Chinese Ink, No. 3031, VIII,
1 doz. assorted Camel Hair Brushes, No. 3102,
1 each black Sable Brush, No. 3120, 1, 2, 6, 10, 14, 18,
1 " double Camel Hair Brush, No. 3135, 1, 3,
1 Camel Hair Brush, No. 3136, 3,
1 Patent Ink Slab, No. 3150,
1 Nest of Saucers, No. 3161,
1 doz. Lettering Pens, No. 3202, with Holder,
3 Artist Pencils, No. 3361,
3 Boxes Leads, No. 3370,
1 Cake Sponge Rubber, No. 3408,
2 Cakes Alba Rubber, No. 3415,
2 " Ink Eraser, No. 3418, 3419,
1 Steel Eraser, No. 3481,
1 Pencil Pointer, No. 3507, ... each $ 210 00

Above sets with spring bows, Nos. 485, 486, 487, (central thumb-nut) in place of 480, 481, 482, ... add per set 2 10

See note at top of page 89, Insertion pieces with round shank (no thumbscrew).
For empty cases for instruments see page 137.

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No. 634

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Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.

634. Magazine Case, Polished Hardwood, Tray lined with Silk Velvet, three Drawers with Locks, ornamental Metal Corners, Bands, Hinges, Escutcheons and Name-Plate, containing

1 Compasses 6½ in., with Patent Lock Joint, fixed Needle Point, with Hairspring, Pen, Pencil Point, Lengthening Bar, Dotting Pen, No. 618 H D,
1 Hairspring Divider 5¾ in., with Patent Lock Joint, No. 617,
1 Plain Divider, 5¾ in., with Patent Lock Joint, No. 616,
1 Compasses 4½ in., with Patent Lock Joint, with fixed Needle and Pen Point, No. 615-1,
1 Compasses 4½ in., with Patent Lock Joint, with fixed Needle and Pencil Point, No. 615-2,
1 Hairspring Divider 4 in., with Patent Lock Joint, No. 614,
1 Plain Divider 4 in., with Patent Lock Joint, No. 613,
1 Pocket Compasses, No. 427,
1 Three-legged Divider, one leg adjustable, No. 431,
1 Proportional Divider with Micrometer Adjustment, No. 441,
1 Drop Spring Bow Pen and Pencil, No. 454,
1 Set Steelspring Divider and Bows, No. 460, 461½, 462½,
1 " " do. " do. No. 476, 477, 478,
1 Tubular Beam Compass, 36 in., No. 502,
1 Express Paragon Pen 5 in., Ebony Handle, No. 533,
1 Drawing Pen, 4 in. with Joint, Ivory Handle, No. 526,
2 do. 5 " " " and Pin, Ivory Handle, No. 527,
2 do. 5½ " " " " " " " " " 528,
1 do. 6 " " " " " " " " " 529,
1 Railroad Pencil, 5 in., Ivory Handle, No. 543,
1 " Pen, 5 in., Ivory Handle, No. 544,
1 Improved Dotting Pen, 6 in., Ivory Handle, No. 551,
1 Pricker, Ivory Handle, No. 557,
1 Adjusting Key and Screwdriver, No. 825,
1 German silver Box with Leads, No. 559,
1 Casey's Section Liner, No. 1157,
1 Protractor with Arm and Vernier, No. 1226,
1 Set (8) Paragon Scales like No. 1576 P, 1 Ivory Scale Rule, No. 1720,
1 German silver Parallel Rule, No. 1751,
1 Set Xylonite Lettering Triangles, No. 1858,
1 each do. Triangle, No. 1855, 5, 8, 12 in.,
1 " do. do. " 1856, 4, 7, 10 "
1 " do. Curve, No. 1860—4, 13, 19, 1 Curve No. 1861 (Spiral),
1 " Steel Triangle No. 2002, 10½ in., No. 2003, 8 in.,
2 doz. each G. S. Tacks, No. 2622, 2626; 1 doz. Steel Tacks, No. 2600,
1 Tacklifter, No. 2680, 2 Horn Centres, No. 2691,
1 Set (18) Full Pans Technical Colors, No. 2900 and 2901,
1 Set of 6 Columbia Drawing Inks, 1 Cake India Ink, No. 3031, IX.
1 doz. Brushes, No. 3102, 1 each Brush, No. 3123, 1, 2,
1 each Brush, No. 3120, 1, 2, 4, 6, 8, 10, 14, 18, 22,
1 " do. " 3133, 0, 3, No. 3135, 1, 3,
1 Patent Ink Slab, No. 3150, 1 Nest of Saucers, No. 3161,
1 Centre Slab, No. 3183, 1 Water Glass, No. 3186,
1 doz. each Pens, No. 3200, 3202, 1 each Penholder, No. 3220, 3221,
6 Artist Pencils, No. 3361, 6 Boxes Leads, No. 3370,
1 Cake Sponge Rubber, No. 3408,
2 Cakes Alba Rubber, No. 3415, 1 each Ink Erasers, No. 3418, 3419
1 Pencil Pointer, No. 3507, 1 Steel Eraser, No. 3480,
1 Reading Glass, No. 6970, 3 in., ... each $ 300 00

See note at top of page 89, Insertion pieces with round shank (no thumbscrew).

For empty cases for Instruments see page 137.

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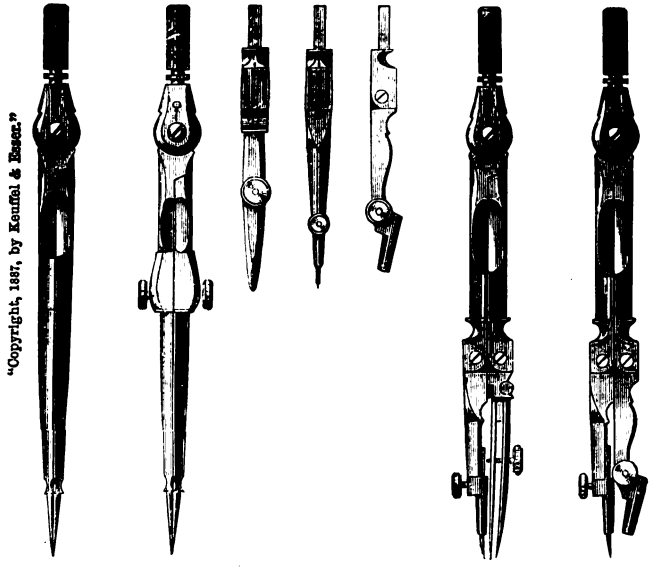
Each instrument stamped with trade-mark

EXTRA FINE
GERMAN INSTRUMENTS

OF ROLLED GERMAN SILVER, FINE STEEL POINTS, HIGHLY FINISHED

"TRADE MARK."

The above trade-mark is our full guaranty that these instruments are the very best of their kind.



No. 700. 702. 704. 705.

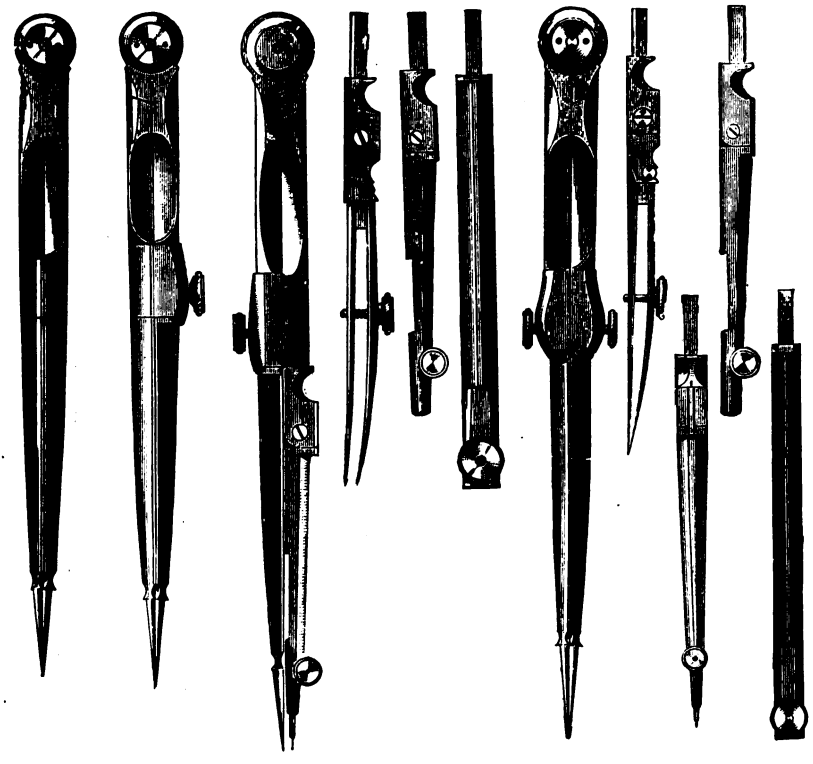
700.	Plain Divider, 4½ in., with Handle	each	$ 1 00
702.	Compasses, 4½ in., with 2 Steel Points, Pen, Pencil and Needle Point	"	2 80
704.	do. 4½ " with fixed Needle and Pen Point . .	"	2 15
705.	do. 4½ " " " " " " Pencil Point .	"	2 15

For Brand Instruments with Pivot Joint see page 108.

For sets containing above instruments see page 122.

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Each instrument stamped with trade-mark



No. 707. 710. 715. 717.

706.	Plain Divider, 4½ in.	each	$ 80
707.	do. 5 "	"	85
708.	do. 6 "	"	1 00
710.	Hairspring Divider, 5 in.	"	1 50
711.	do. 6 "	"	2 00
715.	Compasses, 5½ in., with fixed Needle Point, Steel, Pen, Pencil Point and Lengthening Bar .	"	3 05
717.	do. 5½ " with 2 Steel Points, Pen, Pencil, Needle Point and Lengthening Bar	"	3 55

For sets containing above instruments see page 122.

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EXTRA FINE

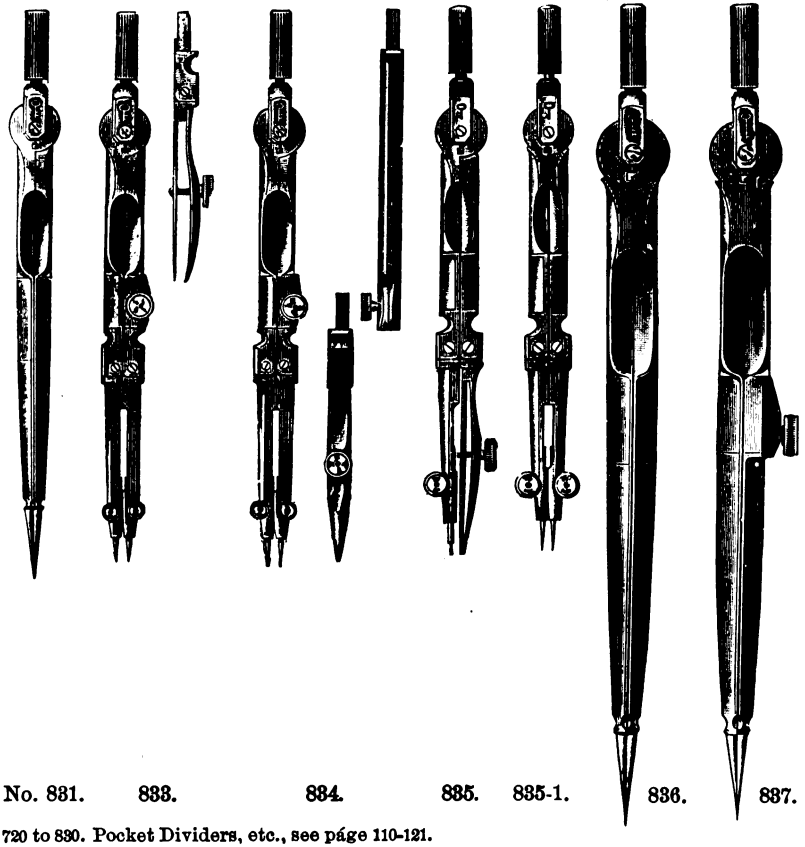
GERMAN INSTRUMENTS

WITH PIVOT JOINT

"TRADE MARK."

OF ROLLED GERMAN SILVER, FINE STEEL POINTS, HIGHLY FINISHED

Each instrument stamped with trade-mark



No. 831. 833. 834. 835. 835-1. 836. 837.

720 to 830. Pocket Dividers, etc., see page 110-121.

831.	Plain Divider, in. 4½	each	$	1 35
833.	Compasses, 4½ in., fixed Needle Point, Pen Point with spring blade, Pencil Point, 2 Shouldered Needles	"		3 60
834.	Compasses, 4½ in., fixed Needle Point, Pen Point with spring blade, Pencil Point, Lengthening Bar, 2 Shouldered Needles	"		4 00
835.	Compasses, 4½ in., fixed Needle Point, and Pen Point with spring blade	"		2 75
835-1.	Compasses, 4½ in., fixed Needle Point and Pencil Point	"		2 75
836½.	Plain Divider, 5 in.	"		1 50
836.	do. 6 "	"		1 50
837½.	Hairspring Divider, 5 in.	"		2 20
837.	do. do, 6 in.	"		2 20

For sets containing above instruments, see page 125.

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Each instrument stamped with trade-mark



No. 838½. 838. 838H. 839.

838½. Compasses, 5½ in., fixed Needle Point, Pen Point with spring blade, Pencil Point, Lengthening Bar, 2 Shouldered Needles . . . . . each $ 4 25

838. Compasses, 6½ in., fixed Needle Point, Pen Point with spring blade, Pencil Point, Lengthening Bar, 2 Shouldered Needles . . . . . " 4 50

838 H. Compasses, 6½ in., Hairspring to fixed Needle Point, Pen Point with spring blade, Pencil Point and Lengthening Bar, 2 Shouldered Needles . . . . . " 5 10

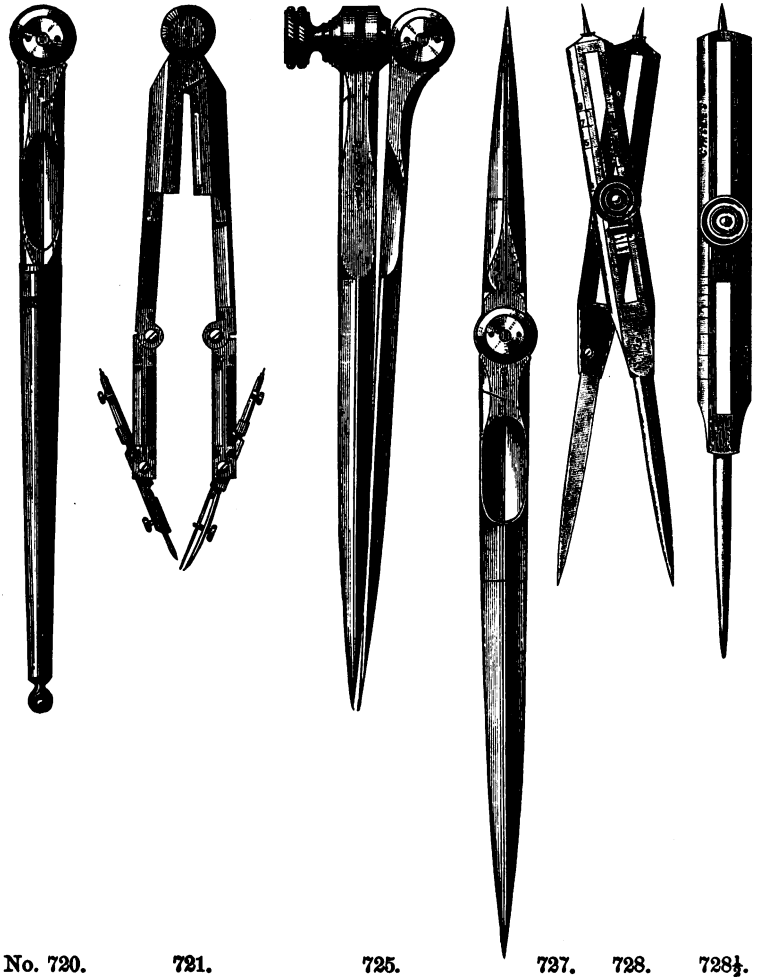
839. Compasses, 6½ in., 2 Steel Points, Pen Point with spring blade, Pencil Point, Needle Point, Lengthening Bar, 2 Shouldered Needles . . . . . " 5 10

850, &c. Sets Key Brand Instruments, Tongue Joint, see page 122, &c.

For sets containing above instruments see page 125.

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Each instrument stamped with trade-mark



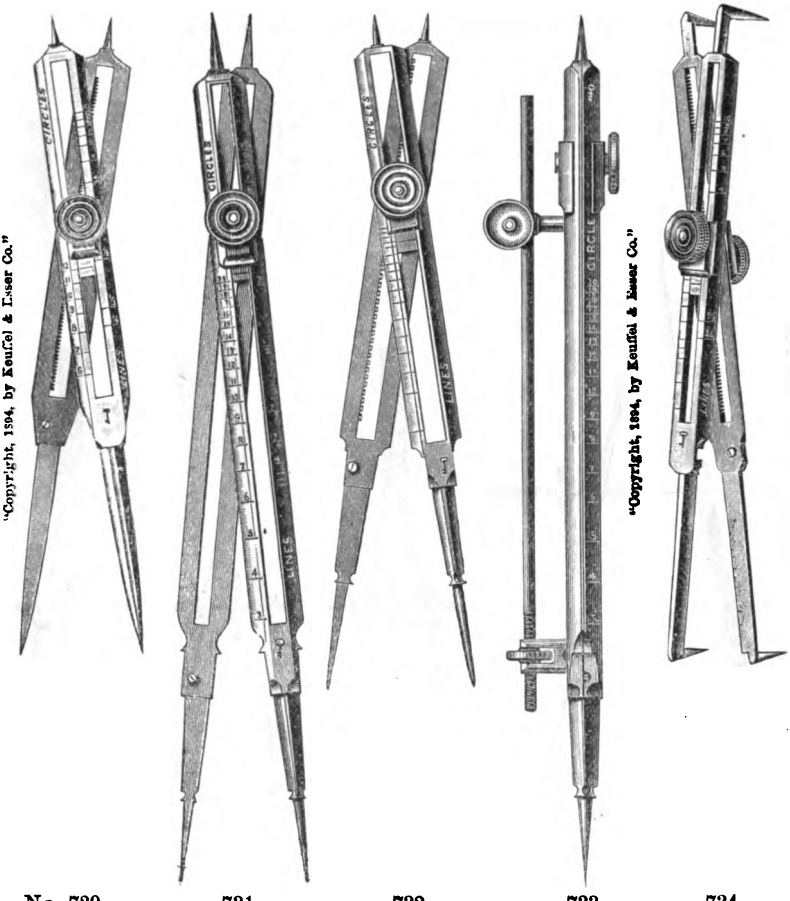
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"Copyright, 1894, by Keuffel & Esser Co."

No.	720.	721.	725.	727.	728.	728½.		
720.	Pocket Divider, 5 in., with metal Sheath						each	$ 1 60
721.	Pocket Compasses with folding points, 4½ in.						"	5 60
725.	Three-legged Dividers, 5 in.						"	3 00
727.	Whole and Half Dividers, 6½ in.						"	2 50
728.	Proportional Dividers, 6½ in., for lines						"	2 50
	Morocco Case for No. 728						"	70
728½.	Proportional Dividers, 7 in., for lines and circles						"	3 25
	Morocco Case for No. 728½						"	80

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No. 729. 731, 732 733. 734.

729.	Proportional Dividers, 7 in., with Rack-Movement, for lines and circles	each	$ 5 20
730.	Proportional Dividers, 7½ in., for lines and circles.	"	6 45
731.	Proportional Dividers, 9½ in., for lines and circles	"	9 40
732.	Proportional Dividers, 7½ in., with Rack-Movement, for lines, circles, planes and solids	"	9 60
733.	Proportional Dividers, 9½ in., with Micrometer Adjustment, for lines and circles	"	12 80
734.	Proportional Dividers, 7½ in., with Rack-Movement, for lines and circles, Points bent rectangular . . .	"	10 00

The rectangular bent points permit of re-pointing without affecting the correctness.

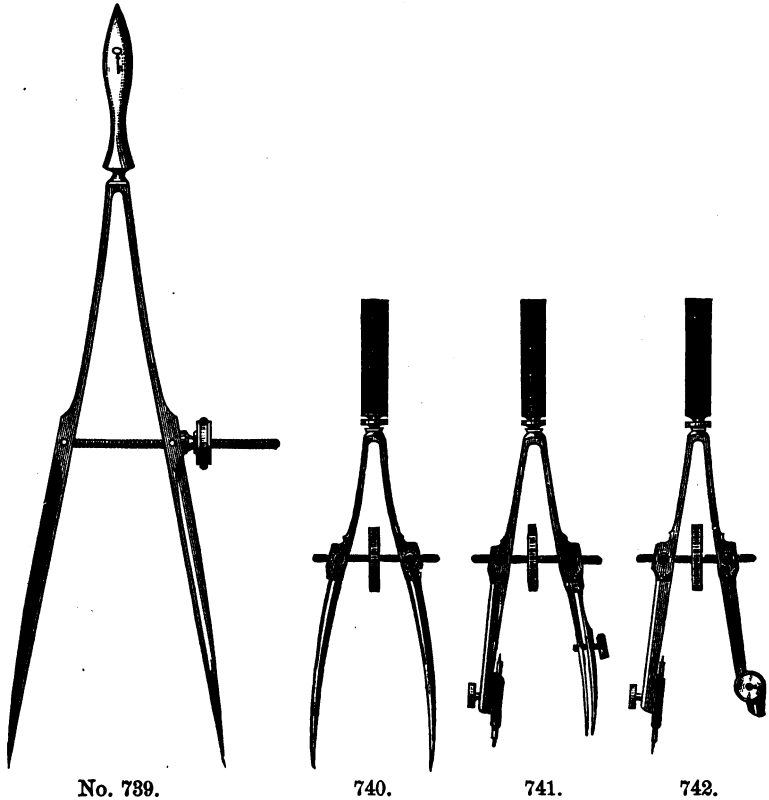
Morocco Case for No.	729	730	731	732	733	734
each, $	.90	.90	1.00	.90	1.10	.90

For Paragon Proportional Dividers, see page 63.
For lower-priced Proportional Dividers, see page 135.

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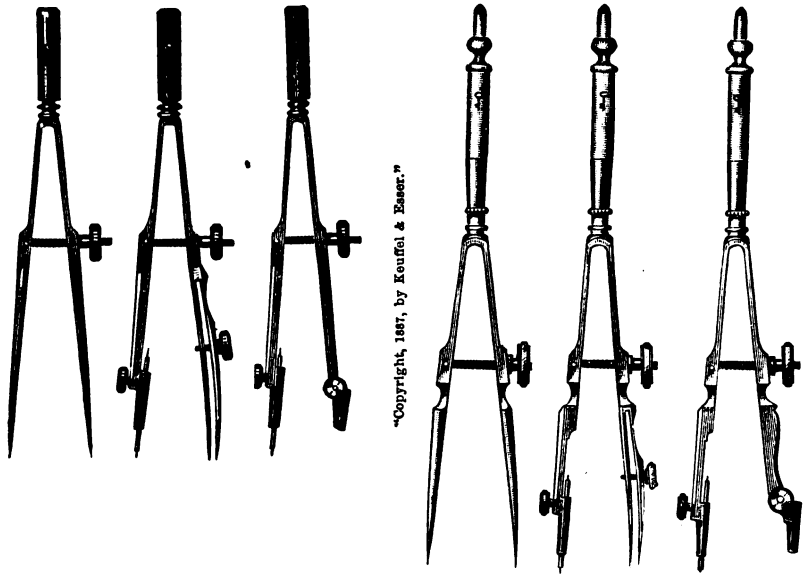
No. 739. 740. 741. 742.

739.	Large Steelspring Divider, $5\frac{3}{4}$ in., white Handle	each	$	2 35
740.	Steelspring Divider, $3\frac{3}{4}$ in., German silver Handle	"		1 75
741.	do. Bow Pen with Spring Blade, $3\frac{3}{4}$ in., with Needle Point, German silver Handle . .	"		2 00
742.	do. Bow Pencil, $3\frac{3}{4}$ in., with Needle Point, German silver Handle	"		2 00
743.	do. Bows, set of 3, Nos. 740, 741, 742, in morocco Case	set		6 75

Steelspring Bows No. 740, 741, 742 are opened and closed by a right and left thread, which is operated by one thumbnut situated between the shanks of the instrument; this thread also holds the points rigidly and doubles the speed of the screw.

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Each instrument stamped with trade-mark



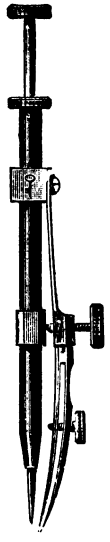
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No. 750. 751. 752. 755. 756. 757.

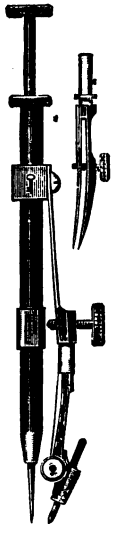
750.	Steelspring	Divider, 3¾ in., with German silver Handle . .	each	$	1 10
751.	do.	Bow Pen with Spring Blade, 3¾ in., with Needle Point, German silver Handle	"		1 45
752.	do.	Bow Pencil 3¾ in., with Needle Point, German silver Handle	"		1 45
753.	do.	Bows, Set of 3, Nos. 750, 751, 752, in morocco Case	set		4 90
755.	Steelspring	Divider, 4½ in., white Handle	each	$	1 00
756.	do.	Bow Pen, with Spring Blade, 4½ in., with Needle Point, white Handle	"		1 85
757.	do.	Bow Pencil, 4½ in. with Needle Point, white Handle	"		1 85
758.	do.	Bows, Set of 3, Nos. 755, 756, 757, in morocco Case	set		4 60

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No. 763.



764.

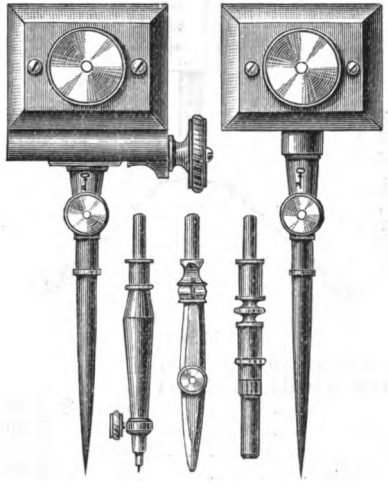
763.	Drop Spring Bow Pen with spring blade, 4 in., ...	each	$ 2 00
764.	Drop Spring Bow Pen and Pencil, pen with spring blade, 4 in.	"	3 00
	Morocco Case, for No. 763	"	75
	Morocco Case, for No. 764	"	80

In Nos. 763, 764, a rod passes through the instrument serving as handle and needle point. This center rod remains stationary while the instrument is turned, and pen or pencil draw by their own weight avoiding the slipping of the needle or scratching of the pen.

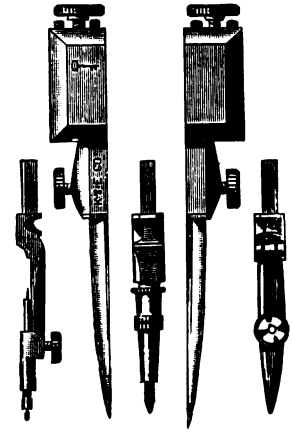
For other Drop Spring Bow Pens, see pages 66, 145.

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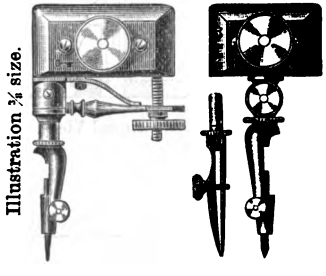
No. 770. 773.

770. Beam Compasses, to fit on a bar or straightedge, with 2 Steel Points, Pen, Pencil and Needle Point, with Micrometer Adjustment . . . . . each $ 7 00
Morocco Case for No. 770 . . . . . " 1 75

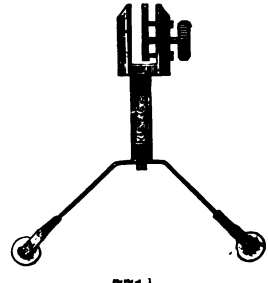
772. Beam Compasses see page 116.

773. Beam Compasses with 2 Steel Points, Pen, Pencil, and Needle Point, with 30 in. **Hardwood Bar** . . . . " 3 85
Morocco Case for No. 773 . . . . . " 1 50

Illustration ¾ size.



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No. 771. 771½.

771. Minute Beam Compasses, to fit on a bar or straightedge, with Pen, spring blade, Pencil, fixed Needle Point and Micrometer Adjustment . . . . . each $ 5 85

771½. Wheel Attachment for No. 771 . . . . . " 2 50
Morocco Case for No. 771 . . . . . " 1 75
" " " " 771 with No. 771½ . . . . . " 2 00

For Wooden Bars for Beam Compasses see page 214.

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Each instrument stamped with trade-mark 🔑

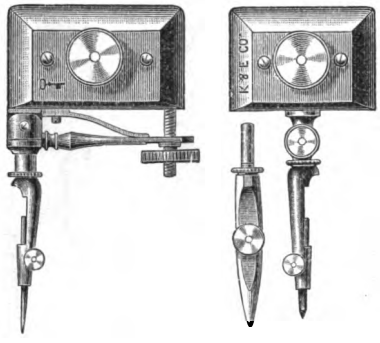
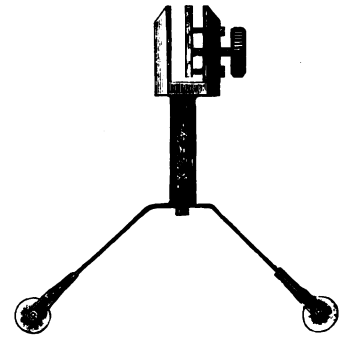


Illustration ½ size.



No. 772. 772½

772. Beam Compasses, to fit on a bar or straightedge, with Pen, Spring Blade, Pencil, fixed Needle Point and Micrometer Adjustment . . . . . each $ 5 80

772½. Wheel Attachment for No. 772, ... " 2 50

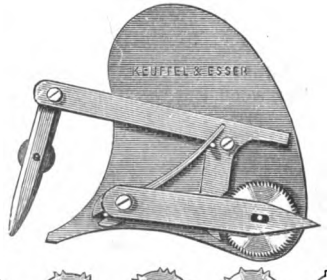
Morocco Case for No. 772, ... " 1 75

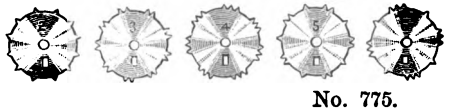
" " for No. 772 with No. 772½, ... " 2 00

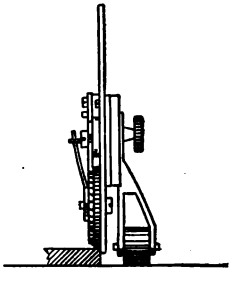
For wooden bars for beam compasses see page 214.

DOTTING INSTRUMENT.

Illustration ⅓ size.







Sectional View.

No. 775.

№ 1 ---------- № 4 — · — · — · — · —

" 2 — — — — — — — — " 5 — · — · — · — · —

" 3 — · — · — · — · — · — " 6 — · · — — · · — — · ·

Fac-simile of dottings.

775. Dotting Instrument, Improved, German silver, with 6 Wheels, in Case . . . . . each $ 6 00

The outer wheel is rolled on the edge of a T square or straightedge and turns the ratchet wheel which interrupts the contact of the pen to produce the dotting. The flat point, close to the pen slides on the paper. To change the pattern of the dotted line, throw back the spring which holds the wheel on its axle and insert the proper ratchet wheel. On the reverse side of the instrument is an adjustable support with wide roller, which prevents the slipping of the propelling wheel and facilitates maintaining proper vertical position of the instrument during use.

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Each instrument stamped with trade-mark

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No. 779. 780. 781. 782. 782½. 783. 784. 784½. 785.

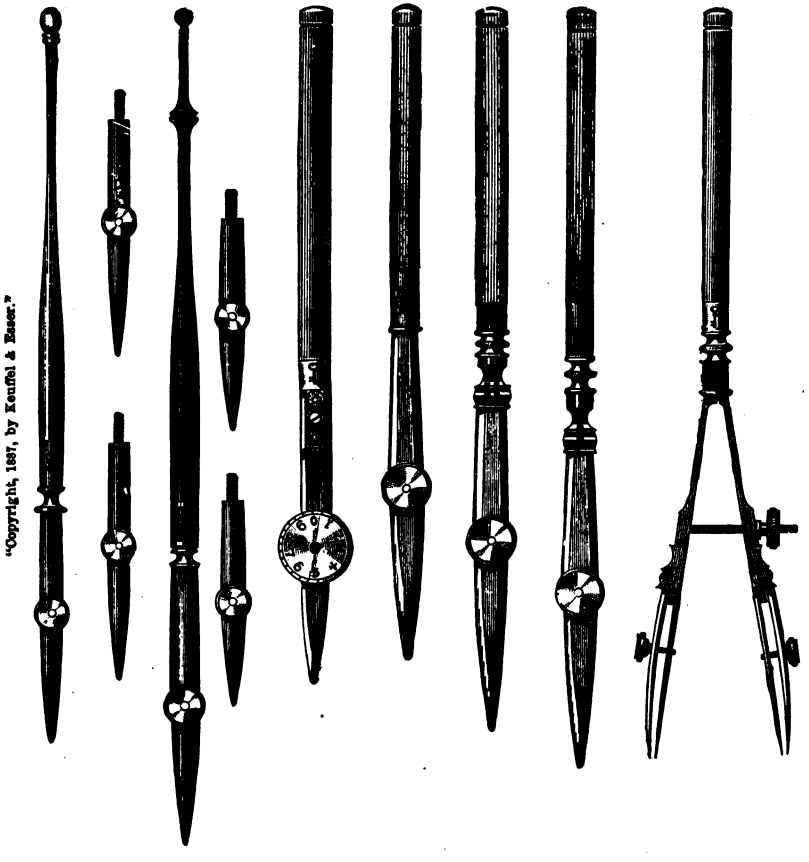
779.	Drawing Pen, Aluminum Handle,	4½	in.	each	$	40
780.	do.	"	" 5½ "	"		45
781.	Drawing Pen,	"	" 5½ " plain Joint .	"		50
782.	Drawing Pen,	"	" 4½ " fine Joint . .	"		75
782½.	do.	"	" 5 " " . .	"		80
783.	do.	"	" 5½ " " . .	"		85
784.	Drawing Pen,	"	" 4½ " fine Joint and Pin	"		85
784½.	do.	"	" 5½ " " "	"		90
785.	do.	"	" 6 " " "	"		95

For Brand Drawing Pens see page 134.
For Paragon Drawing Pens see page 75, &c.

Drawing Pens carefully set and sharpened, each $ 15 to 20

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No. 786. 792. 795. 797. 798. 799. 805.

786.	Hatching Pen,	5¾ in.,	with 3 Pens to one Handle, White Handle,	each	$ 1 50
790.	do.	6½ "	with Pushing Screw, Ebony Handle . . .	"	85
791.	do.	6½ "	do. 2 Pens to one Handle	"	1 30
792.	do.	6½ "	do. 3 " " " "	"	1 70
795.	Drawing Pen,	5½ "	graduated Thumbscrew, Aluminum	"	1 80
797.	do.	5½ "	with German silver Blades, for red ink, Aluminum Handle.	"	60
798.	do.	5½ "	do. do. with Joint	"	90
799.	do.	5¾ "	do. do. " " and Pin	"	1 10
805.	Railroad Pen,	6 "	Pens with Joint, Aluminum Handle . . .	"	2 50

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Each instrument stamped with trade-mark



No. 802. 803. 804. 806. 807. 808.

802. **Click** Drawing Pen, Key brand, Ebony Handle, upper blade with Spring, 4½ in., (Patented) each . . . . . $ 1 00

803. **Click** Drawing Pen, Key brand, Ebony Handle, upper blade with Spring, 5 in., (Patented) each 1 05

804. **Click** Drawing Pen, Key brand, Ebony Handle, upper blade with Spring, 5½ in., (Patented) each 1 10

The Click Pens can be returned to exactly their original setting after having been opened (for cleaning) while at work on a drawing etc. The lug bearing the thread for the thumb screw ends in a steel hook which passes through a slot in the other blade, and is kept in place by a spring. The pen is opened by pushing the hook off its bearing, and is restored to its original setting by pressing the blade down, when the hook catches automatically.

(For Paragon Click Pens see page 76).

805. Railroad Pen, see page 118.

806. Drawing Pen, Ebony Handle, upper blade with Spring, 4½ in., each $ 75

807. do. " " " " " " 5 " " 80

808. do. " " " " " " 5½ " " 85

Aluminum Handle for Nos. 802 to 808, extra . . . . . " 10

Drawing Pens carefully set and sharpened . . . . each $ 15 to 20

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Each instrument stamped with trade-mark

"Copyright, 1894, by Keuffel & Esser Co."



No. 809. 810. 812. 813. 814. 815.

809.	Pricker, 3 in., Aluminum Handle, brass Screw Tip, steel Needle	each	$ 50
810.	Dotting Pen with one Wheel, 5 in., Aluminum Handle . .	"	1 00
812.	Detail Pen, 5½ in., flat Ebony Handle	"	75
813.	do. 6½ " " " "	"	85
814.	do. 6½ " round " "	"	1 00
815.	do. 6½ " for double lines, round Ebony Handle	"	2 00
	Aluminum Handle for Nos. 812, 813, extra	"	10

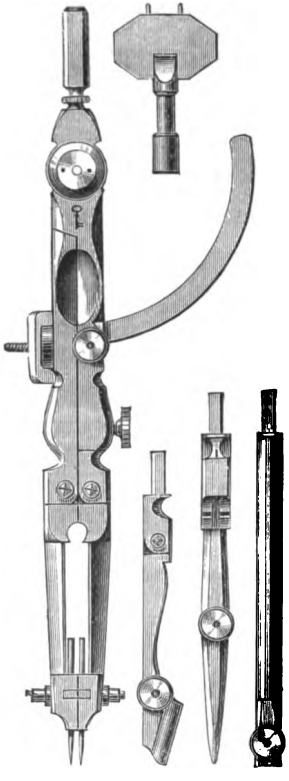
The Detail Pens are especially adapted for drawing long and heavy lines, such as occur in detail drawings, etc. They are made to hold much ink, to obviate the necessity of frequent filling.

Drawing Pens carefully set and sharpened . . . . . each $ 15 to 20

Digitized by Google

Each instrument stamped with trade-mark

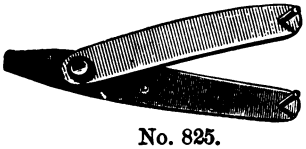
LITHOGRAPHIC COMPASSES.



No. 820.

820. Lithographic Compasses, German silver, 7½ in., very strong, with Arc, Set Screw and Micrometer Adjustment; with Handle, one fixed and one movable Needle Point, Pen, Pencil Point, Lengthening Bar and Wrench-key, in morocco Case . . . . . each $ 14 00

Illustrations full size.



No. 825.



830.

825. Adjusting-key and Screwdriver . . . . . each $ 35

830. Leads for Instruments, nickelplated case containing 4 Leads . . . . . " 10

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Each instrument stamped with trade-mark

EXTRA FINE GERMAN INSTRUMENTS

WITH TONGUE JOINT,

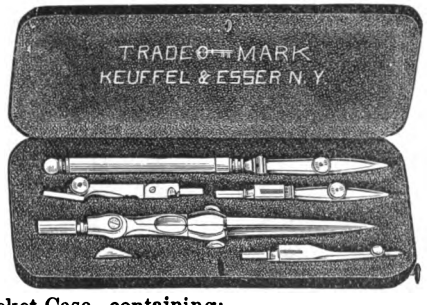
ROLLED GERMAN SILVER, FINE STEEL POINTS, HIGHLY FINISHED.

"TRADE MARK"

IN FINE MOROCCO POCKET CASES, BAR-LOCK, VELVET LINED.

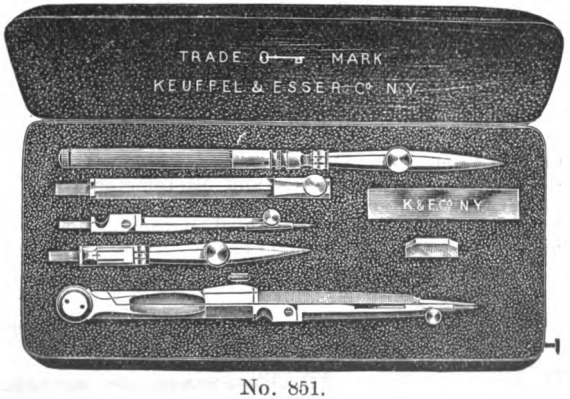
SETS OF ANY OTHER COMBINATION FURNISHED TO SUIT THE PURCHASER.

"Copyright, 1887, by Keuffel & Esser."



No. 850.

850. Bar-lock Pocket Case, containing:
1 Compasses, 4½ in., with 2 Steel Points, Pen, Pencil and Needle Point, No. 702,
1 Drawing Pen with Joint, 4½ in., No. 782,
1 Box with Leads, No. 830 . . . . . each $ 4 80



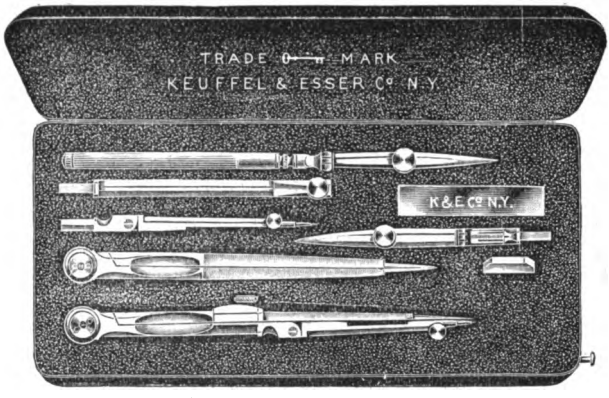
No. 851.

851. Bar-lock Pocket Case, containing:
1 Compasses, 5½ in. with fixed Needle Point, Steel, Pen, Pencil Point, and Lengthening Bar, No. 715,
1 Drawing Pen with Joint and Pin, 6 in., No. 785,
1 Box with Leads, No. 830 . . . . . each $ 5 50

For Sets of -Brand Instruments with Pivot Joint see page 125.

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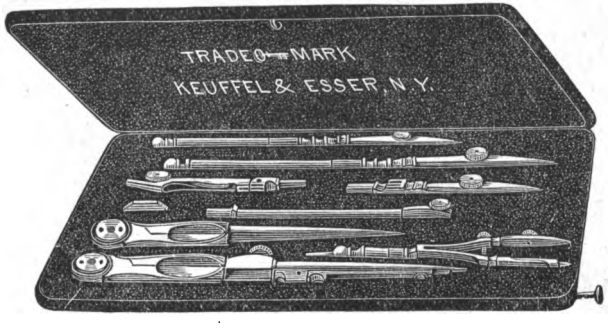
Each instrument stamped with trade-mark



No. 851½

851½. Bar-lock Pocket Case, containing:

1 Compasses, 5½ in with fixed Needle Point, Steel, Pen, Pencil Point and Lengthening Bar, No. 715,
1 Divider, 5 in., No. 707,
1 Drawing Pen with Joint and Pin, 6 in., No. 785,
1 Box with Leads, No. 830, ... each $ 6 55



No. 852.

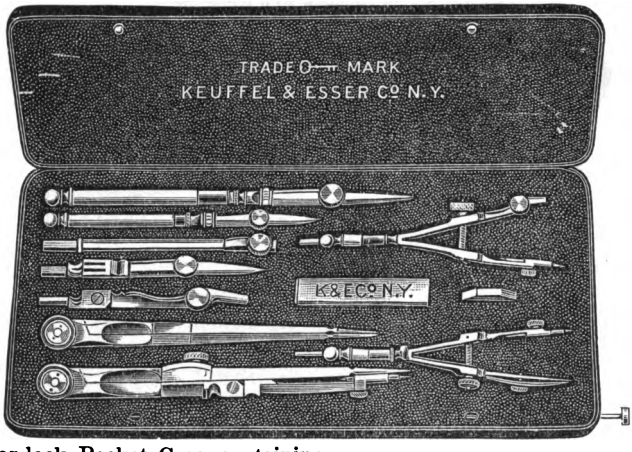
852. Bar-lock Pocket Case, containing:

1 Compasses, 5½ in., with fixed Needle Point, Steel, Pen, Pencil Point and Lengthening Bar, No. 715,
1 Divider, 5 in., No. 707,
1 Steelspring Bow Pen, with Needle Point, No. 756,
1 Drawing Pen with Joint, 4½ in. No. 782,
1 do. " " and Pin, 6 in. No. 785,
1 Box with Leads, No. 830 . . . . . each $ 8 75

For Sets of Brand Instruments with Pivot Joint, see page 125.

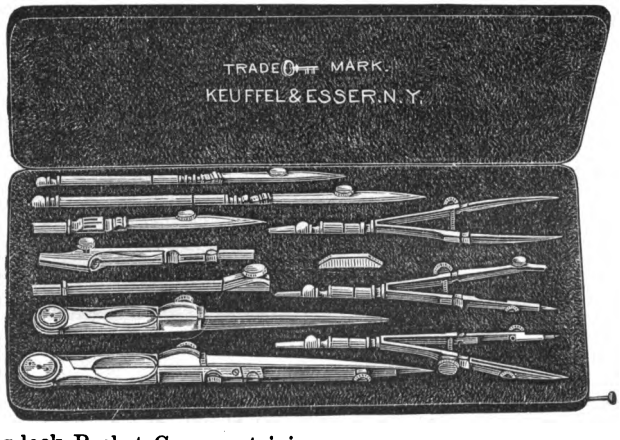
Digitized by Google

Each instrument stamped with trade-mark



No. 853.

853. Bar-lock Pocket Case, containing:
1 Compasses, 5½ in., with fixed Needle Point, Steel, Pen, Pencil Point and Lengthening Bar, No. 715,
1 Divider, 5 in., No. 707,
1 Steelspring Bow Pen, with Needle Point, No 756,
1 Steelspring Bow Pencil, with Needle Point, No. 757,
1 Drawing Pen with Joint, 4½ in., No. 782,
1 do. " " and Pin, 6 in., No. 785,
1 Box with Leads, No. 830. . . . . each $10 85



"Copyright, 1887, by Keuffel & Esser."

No. 854.

854. Bar-lock Pocket Case, containing:
1 Compasses, 5½ in., with fixed Needle Point, Steel, Pen, Pencil Point and Lengthening Bar, No. 715,
1 Hairspring Divider, 5 in., No. 710,
1 Steelspring Divider. No. 755,
1 " Bow Pen, with Needle Point, No. 756,
1 " Bow Pencil, with Needle Point, No. 757,
1 Drawing Pen with Joint, 4½ in., No. 782,
1 do. " " and Pin, 6 in., No. 785,
1 Box with Leads, No. 830 . . . . . each $ 12 00

For Sets of Brand Instruments with Pivot Joint, see page 125.

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Each instrument stamped with trade-mark 🔑

EXTRA FINE GERMAN INSTRUMENTS

WITH PIVOT-JOINT.

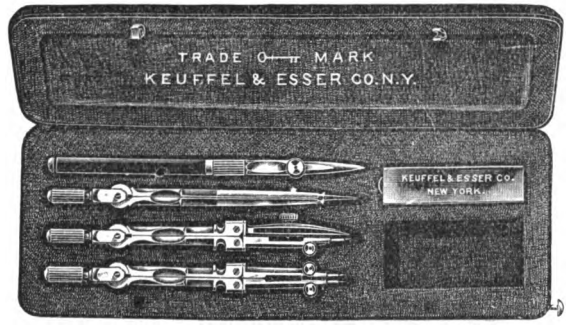
ROLLED GERMAN SILVER, FINE STEEL POINTS, HIGHLY FINISHED.

"TRADE 🔑 MARK."

IN FINE MOROCCO POCKET CASES, VELVET LINED,

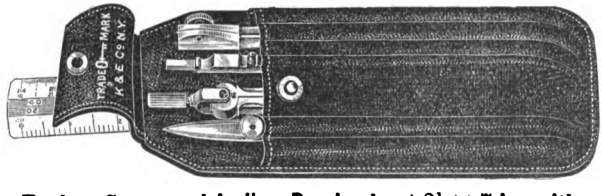
WITH BAR LOCK OR WITH FOLDING FLAPS.

SETS OF ANY OTHER COMBINATION FURNISHED TO SUIT THE PURCHASER.



No. 888.

888 Bar-lock Pocket Case, containing:
1 Compasses, 4½ in., with fixed Needle Point and Pen Point, No. 835,
1 Compasses, 4½ in., with fixed Needle Point and Pencil Point, No. 835-1,
1 Divider, 4½ in., No. 831,
1 Drawing Pen, Ebony Handle, upper blade with spring, 4½ in., No. 806,
1 Box with Leads, No. 830 . . . . . each $ 8 90



No. 889.

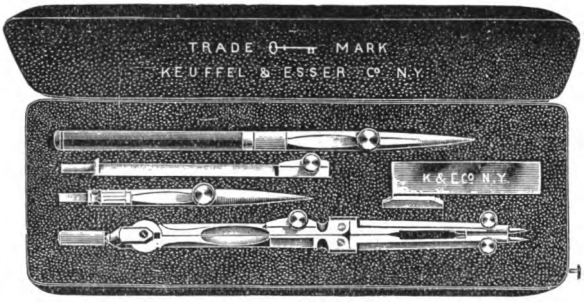
889. Vest Pocket Set, **sewed leather Pouch,** about 2½ × 7 in., with flap and button catch, containing:
1 Compasses, 6½ in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 838,
1 Drawing Pen, 5 in., Ebony Handle, upper blade with Spring, No. 807,
1 Paragon Scale, 6 in., div. 10, 40, 30 and 50 parts to the inch, 4 bevels, No. 1419 P. . . . . each $ 8 60

The pouch also contains compartments for a pencil and a fountain pen. These are not covered by the cover flap, to have the pencil and pen conveniently accessible without opening the flap.

For empty cases for Instruments, see page 137.

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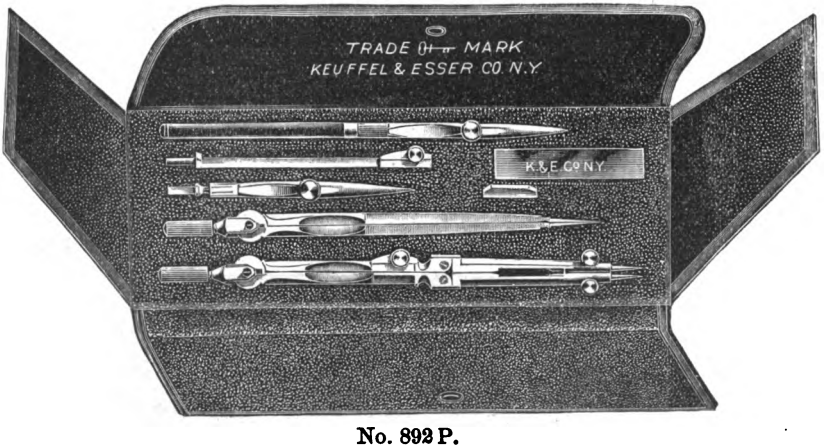
Each instrument stamped with trade-mark



No. 890

890. Bar-lock Pocket Case, containing:
1 Compasses 6½ in., with fixed Needle Point, Pen, Pencil Point, and Lengthening Bar, No. 838,
1 Drawing Pen, 5½ in., Ebony Handle, upper blade with Spring, No. 808,
1 Box with Leads, No. 830, ... each $ 6 65

890 P. Pocket Case with **folding flaps,** containing same assortment as No. 890. . . . . " 6 80



No. 892 P.

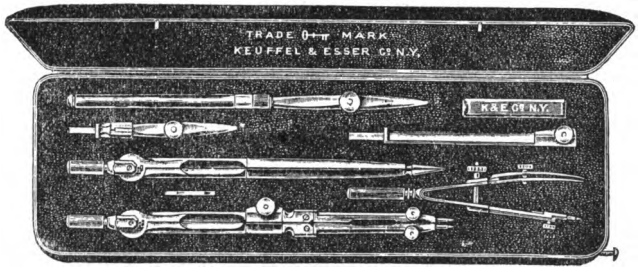
892. Bar-lock Pocket Case, containing:
1 Compasses 6½ in., with fixed Needle Point, Pen, Pencil Point, and Lengthening Bar, No. 838,
1 Divider, 5½ in., No. 836,
1 Drawing Pen, 5½ in., Ebony Handle, upper blade with Spring, No. 808,
1 Box with Leads, No. 830, ... each $ 8 25

892 P. Pocket Case with **folding flaps,** containing same assortment as No. 892 . . . . . " 8 40

For empty cases for instruments, see page 137.

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Each instrument stamped with trade-mark



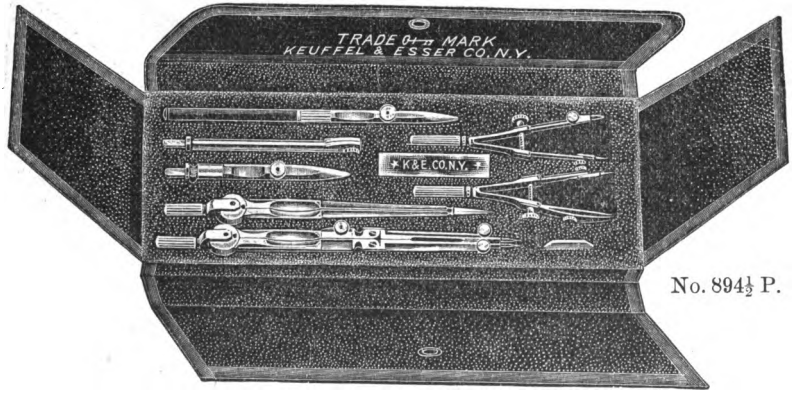
No. 894.

894. Bar-lock Pocket Case, containing:
1 Compasses, 6½ in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 838
1 Divider, 5½ in., No. 836,
1 Steelspring Bow Pen, No. 751,
1 Drawing Pen, 5½ in., Ebony Handle, upper blade with Spring, No. 808,
1 Box with Leads, No. 830 . . . . . each $10 00

894 P. Pocket Case with **folding flaps**, containing same assortment as No. 894 . . . . . " 10 15

894 C. Bar-lock Pocket Case, containing same assortment as No. 894, but Bow Pen No. 741 with central thumbnut, in place of No. 751 . . . . . " 10 55

894 CP. Pocket Case with **folding flaps**, containing same assortment as No. 894 C. . . . . " 10 70



No. 894½ P.

894½. Bar-lock Pocket Case, containing same assortment as No. 894, but with addition of 1 Steelspring Bow Pencil No. 752 . . . . . each $11 75

894½ P. Pocket Case with **folding flaps**, containing same assortment as No. 894½ . . . . . " 11 95

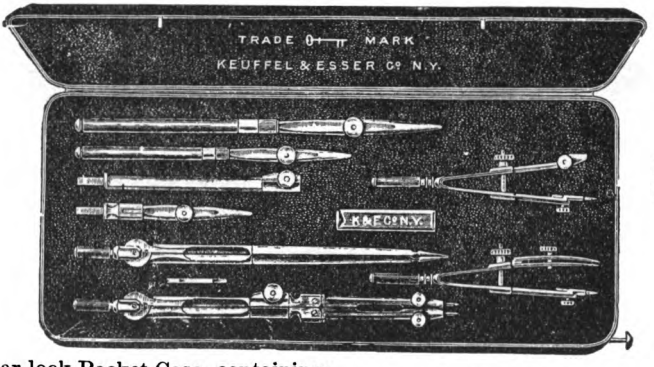
894½ C. Bar-lock Pocket Case, containing same assortment as No. 894½, but Bow Pen and Pencil No. 741, 742 with central thumbnut, in place of No. 751, 752 " 12 85

894½ CP. Pocket Case with **folding flaps**, containing same assortment as No. 894½ C. . . . . " 13 05

For empty cases for instruments see page 137.

Digitized by Google

Each instrument stamped with trade-mark



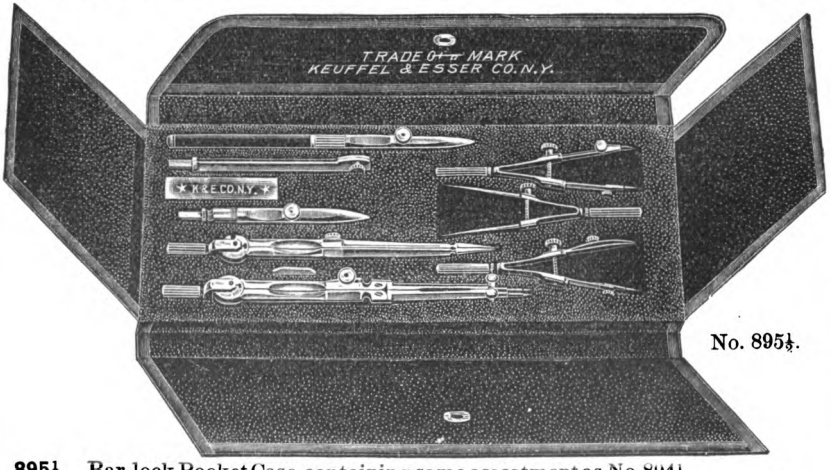
No. 895.

895. Bar-lock Pocket Case, containing:
1 Compass, 6½ in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 838,
1 Divider, 5½ in., No. 836,
1 each Steelspring Bow Pen and Pencil, No. 751, 752,
1 each Drawing Pen, Ebony Handle, upper blade with Spring, No. 806, 4½ in., and 808, 5½ in.,
1 Box with Leads, No. 830 . . . . . each $ 12 50

895 P. Pocket Case, **folding flaps,** cont'g same assortment as No. 895, " 12 70

895 C. Bar-lock Pocket Case, containing same assortment as No. 895, but Bow Pen and Pencil No. 741, 742, with central thumbnut, in place of No. 751, 752 . . . . . " 13 60

895CP. Pocket Case, **folding flaps,** cont'g same assortment as 895 C, " 13 80



No. 895½.

895½. Bar-lock Pocket Case, containing same assortment as No. 894½ (page 127) but with hairspring divider No. 837 in place of 836 and with addition of 1 Steelspring Bow Divider No. 750 . . . . . each $ 13 65

895½P. Pocket Case, **folding flaps,** cont'g same assortm't as No. 895½ " 13 90

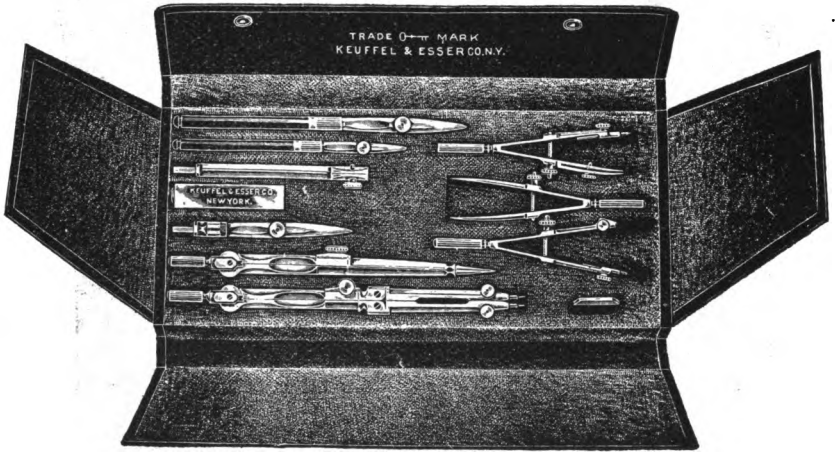
895½C. Bar-lock Pocket Case, containing same assortment as No. 895½, but Bows No. 740, 741, 742 with central thumbnut, in place of No. 750, 751, 752. . . . . " 15 40

895½CP Pocket Case with **folding flaps,** containing same assortment as No. 895½ C . . . . . " 15 65

For empty cases for instruments, see page 137.

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Each instrument stamped with trade-mark



No. 896 P.

896. Bar-lock Pocket Case, containing:
1 Compass, 6½ in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 838,
1 Hairspring Divider, 5½ in., No. 837,
1 each Steelspring Divider and Bows, 3¾ in., No. 750, 751, 752,
1 each Drawing Pen, Ebony Handle, upper blade with Spring, No. 806, 4½ in., and 808, 5½ in.,
1 Box with Leads, No. 830 . . . . . each $14 50

896 P. Pocket Case with **folding flaps**, containing same assortment as No. 896 . . . . . " 14 75

896 C. Bar-lock Pocket Case, containing same assortment as No. 896, but Bows No. 740, 741 742, with central thumbnut, in place of No. 750, 751, 752 . . . " 16 25

896 CP. Pocket Case, with **folding flaps**, containing same assortment as No. 896 C. . . . . " 16 50

For empty cases for instruments see page 137.

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Each instrument stamped with trade-mark



No. 897.

897. Bar-lock Pocket Case, containing:
1 Compasses, 6½ in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 838,
1 Hairspring Divider, 5½ in., No. 837,
1 Compass, 4½ in., with fixed Needle Point and Pen Point, No. 835,
1 Compass, 4½ in., with fixed Needle Point and Pencil Point, No. 835-1,
1 Steelspring Divider, 3¾ in., No. 750,
1 " " Bow Pen with Needle Point, 3¾ in., No. 751,
1 Steelspring Bow Pencil, with Needle Point, 3¾ in., No. 752,
1 Drawing Pen with Joint, Aluminum Handle, 4½ in., No. 782,
1 Drawing Pen with Joint and Pin, Aluminum Handle, 6 in., No. 785,
1 Hatching Pen 5¾ in., White Handle, with 3 Pens to one handle, No. 786,
1 Box with Leads, No. 830. . . . . each $28 50

897 P. Pocket Case with **folding flaps,** containing same assortment as No. 897. . . . . " 24 00

897 C. Bar-lock Pocket Case, containing same assortment as No. 897, but Bows No. 740, 741, 742 with central thumbnut, in place of Nos. 750, 751, 752 . . . " 25 25

897 CP. Pocket Case with **folding flaps,** containing same assortment as No. 897 C . . . . . " 25 75

For empty cases for instruments see page 137.

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Each instrument stamped with trade-mark

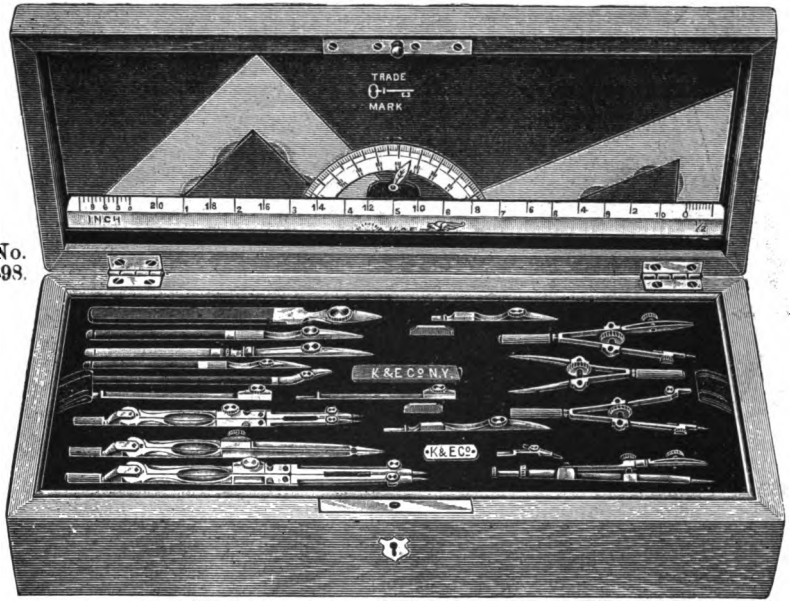
EXTRA FINE GERMAN INSTRUMENTS

WITH PIVOT JOINT.

ROLLED GERMAN SILVER, FINE STEEL POINTS, HIGHLY FINISHED.

"TRADE MARK"

IN POLISHED MAHOGANY CASES, VELVET LINED, WITH CUSHION BETWEEN INSTRUMENTS AND LID; LOCK AND TRAY.



No. 898.

898. Polished Mahogany Case, Tray lined with Velvet, with Lock, containing:

1 Compasses, 6½ in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 838,
1 Hairspring Divider, 5½ in., No. 837,
1 Compasses, 5½ in., with fixed Needle Point, Pen, Pencil Point, and Lengthening Bar, No. 838½,
1 each Steelspring Divider and Bows, 3¾ in., with central thumbnut, No. 740, 741, 742,
1 Drop Spring Bow Pen and Pencil, 4 in., upper blade of Pen with Spring, No. 764,
1 each Drawing Pen, Ebony Handle, upper blade with Spring, No. 806, 4½ in., 808, 5½ in.,
1 Drawing Pen, 5½ in., with German silver Blades, with Joint, Aluminum Handle, No. 798,
1 Improved Curve Pen, 4½ in , No. 696,
1 Detail Pen, 6½ in., flat Ebony Handle, No. 813,
1 Box with Leads, No. 830,
1 German silver Protractor, 4½ in., No. 1260,
1 Boxwood Scale, 12 in., No. 1391,
1 each Xylonite Triangle, No. 1855, 8 in., 1856, 6 in. each $ 35 75

For empty cases for instruments, see page 137.

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Each instrument stamped with trade-mark

No. 899.



899. Polished Mahogany Case, Tray lined with Velvet, with Lock, containing:

1 Compasses, 6½ in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 838.
1 Hairspring Divider, 5½ in., No. 837,
1 each Steelspring Divider and Bows, No. 750,751,752.
1 Proportional Dividers, 7 in., No. 729,
1 Beam Compasses with Pen, Pencil, fixed Needle Point, Micrometer Adjustment, No. 772,
1 each Drawing Pens, Ebony Handle, upper blade with Spring, No. 806, 4½ in., 808, 5½ in.,
1 Detail Pen, 6½ in., round Ebony Handle, No. 814.
1 Railroad Pen, both pens with joint, No. 805.
1 Improved Curve Pen, No. 696,
1 Horn Centre with German silver Rim, No. 2691,
1 Box with Leads, No. 830,
1 each Xylonite Triangle, No. 1855,7 in., 1856,6 in.
1 German silver Protractor, 4¼ in., No. 1260,
1 Boxwood Scale, 12 in., No. 1391 . . . . . each $39 75

899 C. Polished Mahogany Case, Tray lined with Velvet, with Lock, containing same assorment as No. 899, but Bows No. 740, 741, 742 with central thumbnut, in place of No. 750, 751, 752 . . . . . " 41 30

For empty cases for instruments see page 137.

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Each instrument stamped with trade-mark

No. 900.



900. Polished Mahogany Case, Tray lined with Velvet, with Lock, containing:

1 Compasses, 6½ in., with Hairspring to fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 838 H,
1 Hairspring Divider, No. 837,
1 Compasses, 4½ in., with fixed Needle Point and Pen Point, No. 835.
1 Compasses, 4½ in., with fixed Needle Point and Pencil Point, No. 835-1,
1 each Steelspring Divider and Bows, 3¾ in., with central thumbnut Nos. 740, 741, 742,
1 Drop Spring Bow Pen and Pencil, 4 in., No. 764,
1 Beam Compasses with Pen, Pencil, fixed Needle Point, Micrometer Adjustment, No. 772, with Wheel Attachment, No. 772½,
1 Proportional Dividers, 7½ in., Rack Movement, No. 732,
1 each Drawing Pen, Ebony Handle, upper blade with Spring, No. 806, 4½ in., No. 808, 5½ in.,
1 Drawing Pen, German silver Blades, with Joint, Aluminum Handle, No. 798, 5½ in.,
1 Detail Pen, flat Ebony Handle, 6½ in., No. 813,
1 Detail Pen for double lines, Ebony Handle, 6½ in. No. 815,
1 Railroad Pen, both pens with joint, No. 805,
1 Improved Curve Pen, No. 696,
1 Box with Leads, No. 830,
1 each Xylonite Triangle, No. 1855, 8 in., No. 1856, 6 in.,
1 German silver Protractor, 6⅜ in., No. 1262,
1 Paragon Scale, 12 in , No. 1391 P. . . . . each $ 61 00

For empty cases for instruments see page 137.

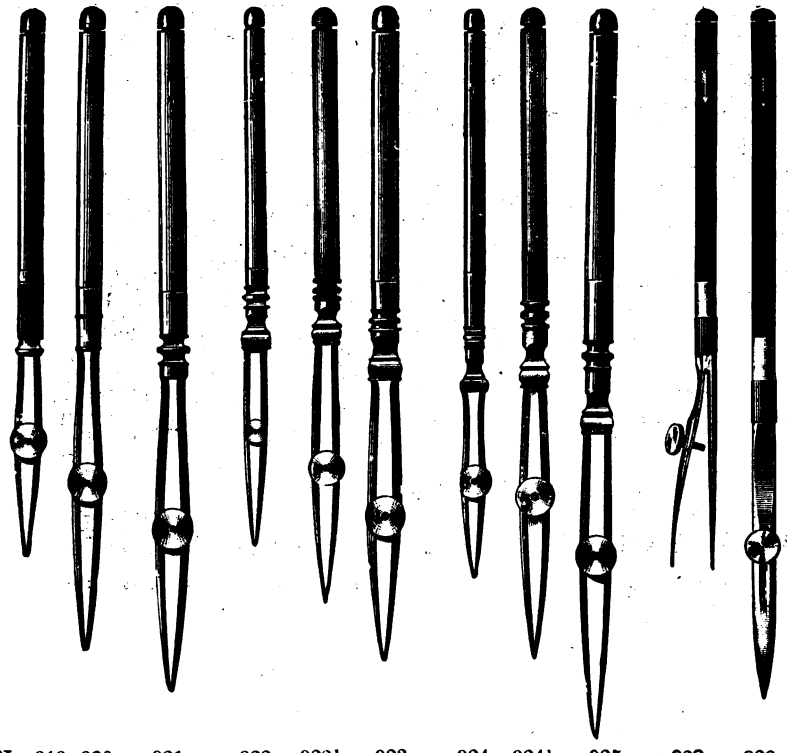
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Each instrument stamped with trade-mark

FINE GERMAN DRAWING PENS.

"TRADE MARK"

"Copyright, 1887, by Keuffel & Esser."



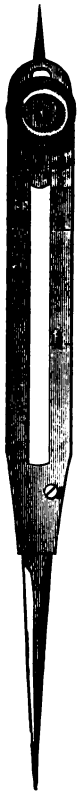
No.	919.	920.	921.	922.	922½.	923.	924.	924½.	925.	928.	929.

919.	Drawing Pen, White Handle,	4½ in.	each	$ 30
920.	do.	" 5½ "	"	35
921.	Drawing Pen,	" 5½ " plain Joint	"	40
922.	Drawing Pen,	" 4½ " fine Joint	"	45
922½.	do.	" 5 " " "	"	50
923.	do.	" 5½ " " "	"	55
924.	Drawing Pen,	" 4½ " fine Joint and Pin . .	"	65
924½.	do.	" 5½ " " " " " . .	"	70
925.	do.	" 6 " " " " " . .	"	75
928.	Drawing Pen, Ebony Handle,	4½ " upper blade with Spring	"	60
929.	do.	" 5½ " " " " "	"	65

990. Carrying Case for Instruments, see page 136.

For Brand Drawing Pens see page 117, &c.

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No. 1085.



1087.



1091

990. Instrument Carrying Case, see page 138.
1006. Beginner's Sets, see page 147.

1085. Brass Proportional Dividers, 6¼ in., divided for Lines, in Case . . . . . each $ 2 00

1087. German silver Proportional Dividers, 6¼ in., divided for Lines, in Case . . . . . " 2 50

1091. German silver Proportional Dividers, 7 in., divided for Lines, with Rack-Movement, Points bent rectangular, in Case . . . . . " 7 50

The rectangular bent points permit of re-pointing without affecting the correctness.

For other Proportional Dividers see pages 63, 110.

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SEPARATE PARTS

FOR

PARAGON AND "KEY" BRAND INSTRUMENTS.

To accommodate our customers we keep in stock separate parts for our Mathematical Instruments, as listed below. While we can replace parts for compasses, **we can replace neither the compasses (to be fitted to parts), nor the three-cornered steel legs of compasses.** To repair points which are not detachable from the compasses (fixed points) is generally not advisable.

As all inserts to compasses are carefully fitted by hand, they are not interchangeable, but must be fitted to the instrument. The charge for such fitting is included in the following prices.

PARTS FOR PARAGON INSTRUMENTS.

Pen Points, Pencil Points, Needle Points, for Compasses . . .	each	$	1 25
do. do. do. " Beam Compasses	"		1 00
Lengthening Bars for Compasses	"		1 00
Ebony Handles for Drawing Pens	"		15
Ivory do. " do.	"		30
Aluminum do. " do.	"		25
Ivory do. " Bow Instruments	"		25
Ger. silver do. " do.	"		15
Nut and Thread " do. Nos. 460 to 482½	"		25
Thumbscrew with right and left Thread for Nos. 485 to 487 . .	"		60
Screws and Nuts	"		15
Shouldered Needles	"		12

PARTS FOR "KEY" BRAND INSTRUMENTS.

Pen Points, Pencil Points, Needle Points, for Compasses . . .	each	$	80
do. do. do. " Beam Compasses	"		70
Lengthening Bars for Compasses	"		70
Ebony Handles for Drawing Pens	"		10
Aluminum do. " do.	"		15
White do. " Bow Instruments	"		15
Ger. silver do. " do.	"		15
Nut and Thread " do. Nos. 750 to 757	"		20
Thumbscrew with right and left Thread for Bows, Nos. 740-742	"		50
Screws and Nuts	"		10
Shouldered Needles	"		06

We have the best facilities for Repairing and Cleaning Drawing Instruments and Sharpening Ruling Pens.

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CASES FOR DRAWING INSTRUMENTS

We make and furnish well made velvet lined cases for drawing instruments and here list some of the usual sizes.

When ordering a case separate from the instruments, it is necessary to send on the instruments to insure their proper fitting in the tray.

The price of the case includes the fitting of the instruments.

WOODEN CASES WITH LOCK AND TRAY

These Cases are made of thoroughly seasoned wood, have a tray to hold the instruments, and under the tray room for colors, brushes, etc.

Partitions under the tray for tools, colors, etc., can be added at slight additional cost.

The dimensions refer to the size of the tray in the box.

	Size of Tray.	Mahogany, Brass Hinges and Shield, Tray lined with Velvet. No. 992.	Mahogany polished, German Silver Shield, Hinges and Lock plated. Tray lined with Silk Velvet. No. 994.
A.	4 × 9 in.	each $ 3 75	each $ 5 00
B.	5 × 9 "	" 4 50	" 5 75
C.	5 × 12½ "	" 5 75	" 7 50
D.	6 × 10 "	" 5 50	" 7 50
E.	7 × 11 "	" 6 50	" 8 75
F.	7 × 13 "	" 7 00	" 10 00
G.	10 × 14 "	" 9 00	" 14 00

Cases of mahogany, oak or other wood, with drawers, German silver or plated corners, bands, name-plate, escutcheon etc., made to order. Such cases are illustrated under Nos. 633 and 634, pages 102 and 104.

POCKET CASES

WITH FOLDING FLAPS.

These Cases are covered with morocco, velvet lined with four flaps, with button lock, as illustrated on pages 90, etc.

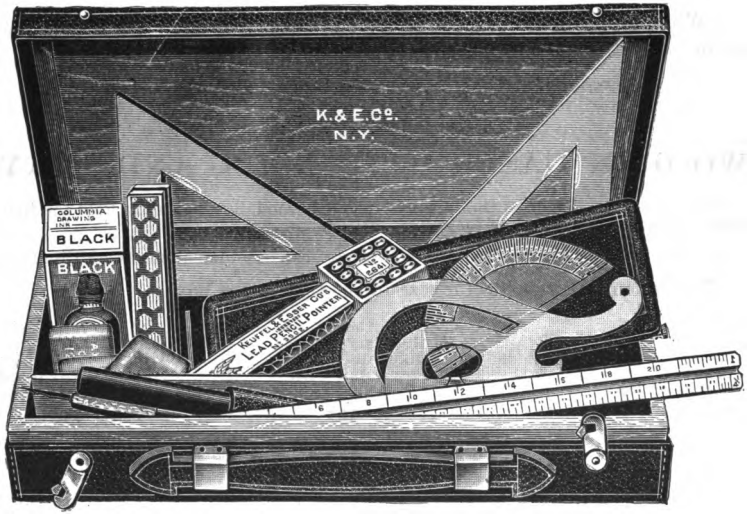
	Size of Case about	Lined with Velvet. No. 996.	Lined with Silk Velvet. No. 998.
A.	3 × 6 in.	each $ 1 70	each $ 2 00
B.	3½ × 7½ "	" 2 10	" 2 50
C.	3½ × 8½ "	" 2 30	" 2 75
D.	3½ × 9½ "	" 2 50	" 3 00
E.	4 × 9½ "	" 2 75	" 3 25
F.	4½ × 9¾ "	" 3 00	" 3 50
G.	4¾ × 10 "	" 3 40	" 4 00
H.	5½ × 10 "	" 3 80	" 4 50

For other cases see next page.

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CARRYING CASE FOR DRAWING TOOLS.

(Dress Suit Case Style.)



No. 990

990. Sewed Leather Carrying Case for Drawing Tools . . . . . each **$ 5 00**

Fine Sewed Sole Leather Case, natural color, 13⅛ × 7½ × 2½ in., with grip handle and nickelplated safety hooks, lined with wood and partitioned for set of instruments, triangles, curves, scales, pencils, thumbtacks, rubbers, liquid ink, pencil pointer, etc. A neat, convenient and durable case for students and others who carry their drawing tools about.

1006 S. Sets Instruments for Beginners, see page 147, &c.

EXTRA-FINE POCKET CASES, FANCY LEATHER, WITH FOLDING FLAPS.

We furnish to order Pocket Cases with Folding Flaps (see illustration of No. 624, page 93 or No. 627, page 97,) of finest workmanship, lined with silk velvet and covered with fancy leather, such as **Walrus, Genuine morocco, Pigskin, Alligator, Russia leather, Seal, Lizard** etc. Such cases are very appropriate for gifts. Prices on application.

For other empty cases for instruments, see preceding page.

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EXCELSIOR INSTRUMENTS

GERMAN SILVER.

FOR TECHNICAL SCHOOLS.

Compasses and Dividers with Handle.

TRADE- MARK.

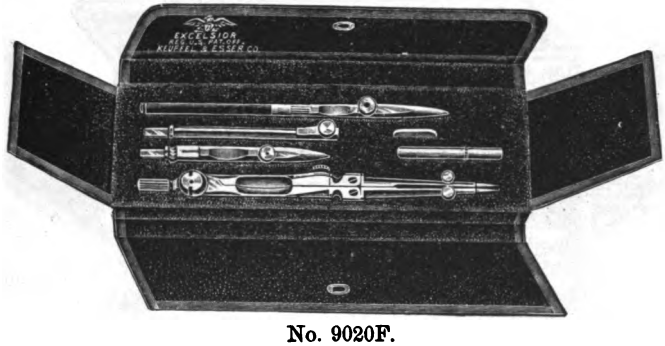
EXCELSIOR

The Excelsior Instruments meet the demand for a good durable instrument with handle, at a moderate price, for use in those schools where drawing is of minor importance.

The combination of tongue joint with handle solves the problem of making satisfactory instruments of this grade. The compasses, their pen, pencil and needle points, and the dividers, have steel joints.

To avoid confusion, we retain the numbers under which we list these Excelsior Instruments in our Trade Supplement.

They are put up in neat velvet lined pocket cases. Each assortment is listed in case with bar-lock and also in case with folding flaps and button lock.



No. 9020F.

1006 etc. sets of instruments, see page 147.

9020. Bar-lock Pocket Case, containing:

1 Compasses 6 in. with fixed Needle Point, Pen Point with spring blade, Pencil Point and Lengthening Bar, 2 Shouldered Needles. No. 9042.

1 Drawing Pen 5½ in. with spring blade, No. 9049,

1 Box with Leads. . . . . each $ 3 50

9020 F. Pocket Case with **folding flaps**, containing same assortment as No. 9020 . . . . . " 3 80

For separate Excelsior Instruments see page 144, &c.

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TRADE- EXCELSIOR MARK.



No. 9022.

9022. Bar-lock Pocket Case, containing:
1 Compasses 6 in., with fixed Needle Point, Pen Point with spring blade, Pencil Point and Lengthening Bar, No. 9042,
1 Divider, 6 in., No. 9040,
1 Drawing Pen, 5½ in., with spring blade, No. 9049,
1 Box with Leads . . . . . each $ 4 50

9022 F. Pocket Case with **folding flaps,** containing same assortment as No. 9022 . . . . . " 4 80



No. 9024 F.

9024. Bar-lock Pocket Case, containing:
1 Compasses 6 in., with fixed Needle Point, Pen Point with spring blade, Pencil Point and Lengthening Bar, No. 9042,
1 Divider, 6 in., No. 9040,
1 Steelspring Bow Pen, 3½ in., with Needle Point, No. 9046,
1 Drawing Pen, 5½ in., with spring blade, No. 9049,
1 Box with Leads . . . . . each $ 5 80

9024 F. Pocket Case with **folding flaps,** containing same assortment as No. 9024 . . . . . " 6 20

For separate Excelsior Instruments see page 144, &c.

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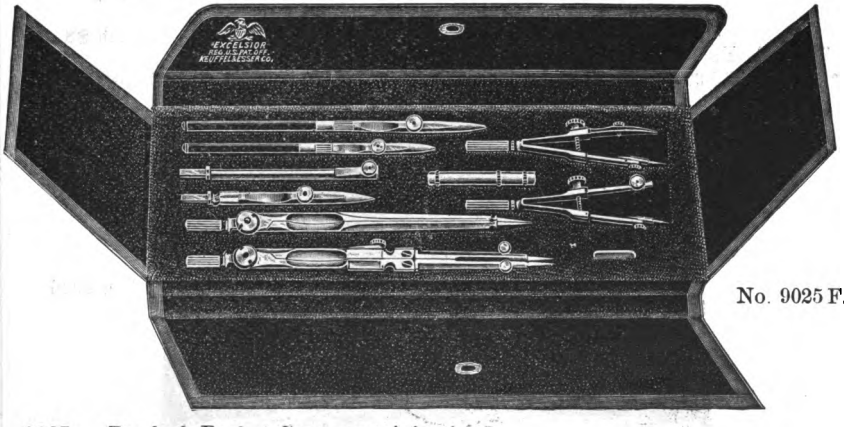
TRADE- EXCELSIOR MARK.



No. 9024½.

9024½. Bar-lock Pocket Case, containing:
1 Compasses 6 in., with fixed Needle Point, Pen Point with spring blade, Pencil Point and Lengthening Bar, No. 9042,
1 Divider, 6 in., No. 9040,
1 each Steelspring Bow Pen and Pencil, 3½ in., with Needle Point, No. 9046, 9047,
1 Drawing Pen, 5½ in., upper blade with spring, No. 9049,
1 Box with Leads . . . . . each $ 7 00

9024½ F. Pocket Case with **folding flaps**, containing same assortment as No. 9024½ . . . . . each $ 7 50



No. 9025 F.

9025. Bar-lock Pocket Case, containing:
1 Compasses 6 in., with fixed Needle Point, Pen Point with spring blade, Pencil Point and Lengthening Bar, No. 9042,
1 Divider, 6 in., No. 9040,
1 each Steelspring Bow Pen and Pencil, 3½ in., with Needle Point, No. 9046, 9047,
1 each Drawing Pen, 4½ in., 5½ in., with spring blade, No. 9048, 9049,
1 Box with Leads . . . . . each $ 7 70

9025 F. Pocket Case with **folding flaps**, containing same assortment as No. 9025 . . . . . each $ 8 20

For separate Excelsior Instruments see page 144, &c.

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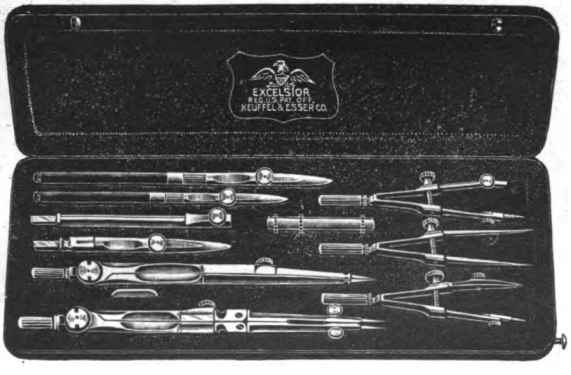
TRADE- MARK.
EXCELSIOR



No. 9025½ F.

9025½. Bar-lock Pocket Case, containing:
1 Compasses 6 in. with fixed Needle Point, Pen Point with spring blade, Pencil Point and Lengthening Bar, No. 9042.
1 Divider 6 in. No. 9040.
1 Set Steelspring Divider and Bows 3½ in., No 9045, 9046, 9047,
1 Drawing Pen 5½ in. with spring blade, No. 9049.
1 Box with Leads . . . . . each $8 10

9025½ F. Pocket Case with **folding flaps**, containing same assortment as No. 9025½ . . . . . " 8 60



No. 9026.

9026. Bar-lock Pocket Case, containing:
1 Compasses 6 in. with fixed Needle Point, Pen Point with spring blade, Pencil Point and Lengthening Bar, No. 9042.
1 Hairspring Divider 6 in. No. 9041.
1 Set Steelspring Divider and Bows, 3½ in., No. 9045, 9046, 9047
1 Drawing Pen 4½ in. with spring blade No. 9048.
1 Drawing Pen 5½ in. " " " No. 9049.
1 Box with Leads . . . . . each $9 40

For Separate Excelsior Instruments see page 144, &c.

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TRADE- MARK.
EXCELSIOR.



No. 9026 F.

9026 F Pocket Case with **folding flaps**, containing:

1 Compasses 6 in. with fixed Needle Point, Pen Point with spring blade, Pencil Point and Lengthening Bar, No. 9042.
1 Hairspring Divider 6 in. No. 9041.
1 Steelspring Bow Divider 3½ in. No. 9045.
1 Steelspring Bow Pen 3⅛ in. with Needle Point No. 9046.
1 Steelspring Bow Pencil 3⅛ in. with Needle Point No. 9047.
1 Drawing Pen 4½ in. with spring blade, No. 9048.
1 Drawing Pen 5½ in. " " " No. 9049.
1 Box with Leads . . . . . each $10 00

For separate Excelsior Instruments see page 144, &c.

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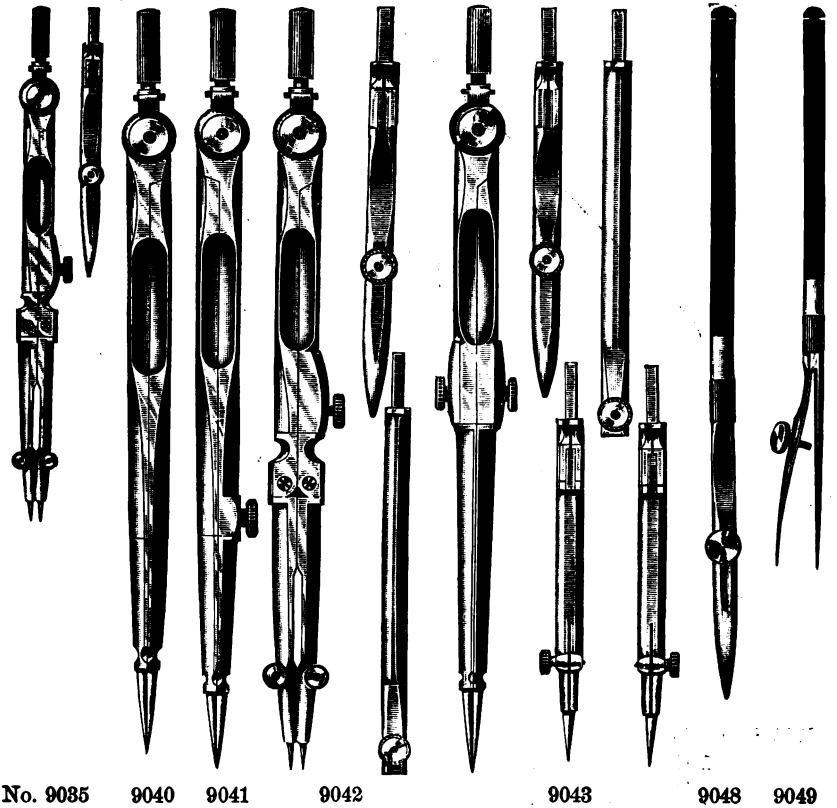
EXCELSIOR INSTRUMENTS

GERMAN SILVER.

(For description see page 138.)

TRADE- MARK.

EXCELSIOR

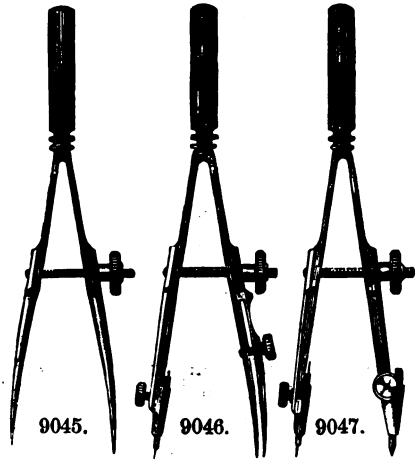


No.		
9035.	Compasses 4½ in., with fixed Needle Point, Pen Point with spring blade, Pencil Point, 2 Shouldered Needles . .	each $ 2 10
9040.	Divider 6 in . . .	" 90
9041.	Hairspring Divider 6 in. . .	" 1 50
9042.	Compasses 6 in., with fixed Needle Point, Pen Point with spring blade, Pencil Point and Lengthening Bar, 2 Shouldered Needles . .	" 2 80
9043.	Compasses 6 in., 2 Steel Points, Needle Point, Pen Point with spring blade, Pencil Point, Lengthening Bar, 2 Shouldered Needles . .	" 3 50
9048.	Drawing Pen, 4⅛ in. with spring blade . .	" 50
9049.	" " 5½ in. " " " . .	" 55

These Instruments are listed in Sets under Nos. 9020 to 9026 F, pages 139 to 143.

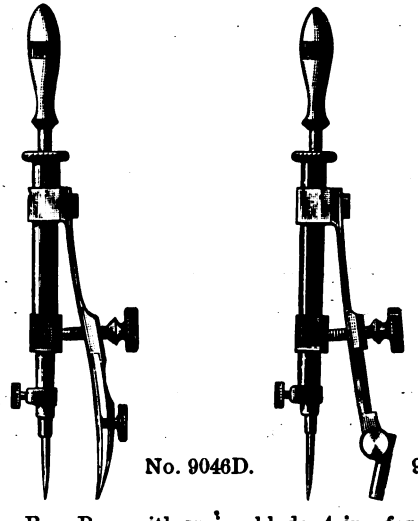
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TRADE- EXCELSIOR MARK.



9045. 9046. 9047.

9045. Steelspring Dividers, 3½ in., German silver Handle . . . . each, $ 80
9046. " Bow Pen, with spring blade, 3½ in., Needle Point, German silver Handle . . . . . " 1 10
9047. " Bow Pencil, 3½ in., Needle Point, German silver Handle . . . . . " 1 10



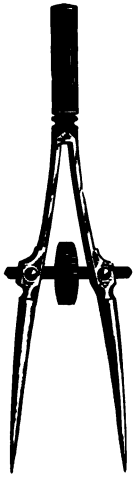
No. 9046D. 9047D.

9046D. Drop Spring Bow Pen, with spring blade, 4 in., for small circles, German silver Handle, ... each, $ 1 85
9047D do. do. Pencil, 4 in., for small circles, German silver Handle . . . . . " 1 85

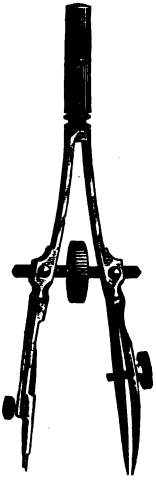
In Spring Bows Nos. 9046D. and 9047D. a steel rod passes through the instrument, serving as needle point and carrying the handle. This center-rod remains stationary while the pen or pencil revolve around it and draw by their own weight.

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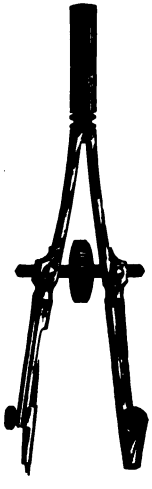
TRADE- EXCELSIOR MARK.



No. 9045 C.



9046 C.



9047 C.

9045 C. Steelspring Dividers, 3½ in., German silver Handle . . . each $ 1 25

9046 C. do. Bow Pen, with spring blade, 3½ in., with Needle Point, German silver Handle. . . . . " 1 50

9047 C. do. Bow Pencil, 3½ in., with Needle Point, German silver Handle . . . . . " 1 50

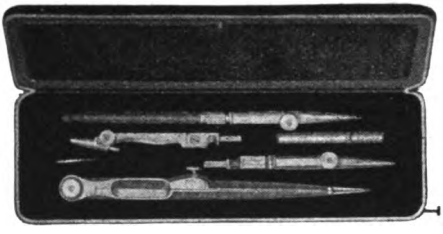
The bows No. 9045 C to 9047 C are opened and closed by a right and left thread operated by one thumbscrew situated between the shanks of the instrument. The threads hold the shanks rigid and double the speed of the screw.

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NICKELPLATED INSTRUMENTS

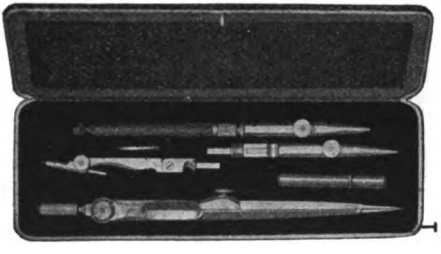
OF LOW PRICE, IN POCKET CASE WITH BAR LOCK.

FOR BEGINNERS.



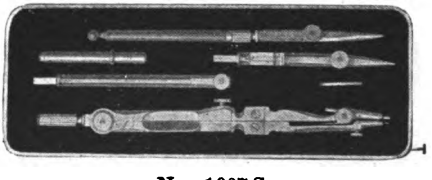
No. 1006 S.

1006 S. Bar-lock Pocket Case, containing:
Compasses 5 in., with Pen and Pencil Point,
Ruling Pen 5 in. with black handle, Box with Leads, each $ 1 15



No. 1006 H.

1006 H. Bar-lock Pocket Case, containing:
Compasses **with Handle,** 6¼ in., with Pen and Pencil Point
Ruling Pen 5 in., with black handle, Box with Leads, » 1 25

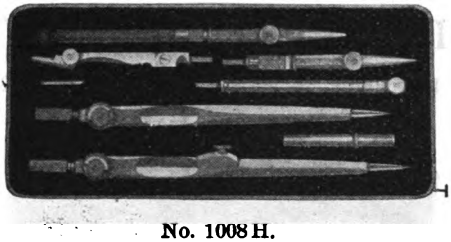


No. 1007 S.

1007 S. Bar-lock Pocket Case, containing:
Compasses 5 in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar,
Ruling Pen 5 in. with black handle, Box with Leads, « 1 45

1007 H. Bar-lock Pocket Case, containing:
Compasses **with Handle,** 6¼ in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar,
Ruling Pen 5 in. with black handle, Box with Leads, » 1 55

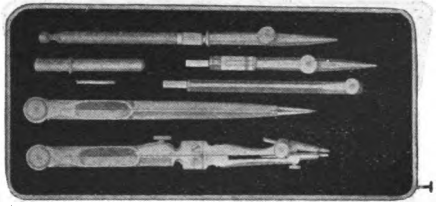
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No. 1008 H.

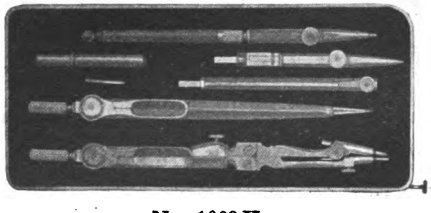
1008 S. Bar-lock Pocket Case, containing:
Compasses 5 in., with Pen, Pencil Point, and Lengthening Bar,
Divider 5 in ,
Ruling Pen 5 in. with black handle, Box with Leads, each $ 1 65

1008 H. Bar-lock Pocket Case, containing:
Compasses **with Handle** 6¼ in., with Pen, Pencil Point and Lengthening Bar,
Divider **with Handle** 5¾ in.,
Ruling Pen 5 in. with black handle, Box with Leads, " 1 85



No. 1009 S.

1009 S Bar-lock Pocket Case, containing:
Compasses 5 in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar,
Divider 5 in.,
Ruling Pen 5 in. with black handle, Box with Leads, " 1 75

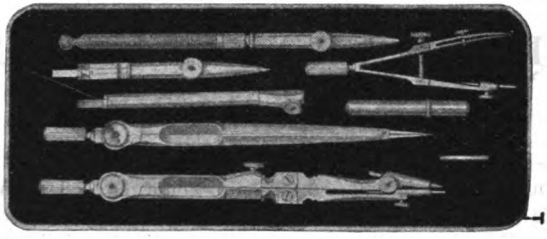


No. 1009 H.

1009 H. Bar-lock Pocket Case, containing:
Compasses **with Handle** 6¼ in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar,
Divider **with Handle** 5¾ in.,
Ruling Pen 5 in. with black handle, Box with Leads, " 1 95

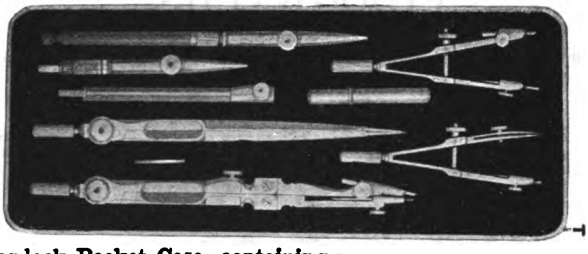
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No. 1010H



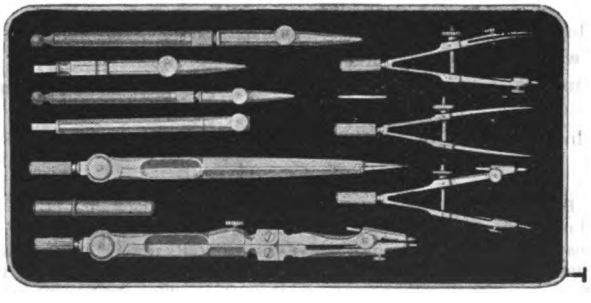
1010 H. Bar-lock Pocket Case, containing:
Compasses **with Handle,** 6¼ in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar,
Divider **with Handle** 5¾ in.,
Spring Bow Pen 3½ in., with Needle point,
Ruling Pen 5 in. with black handle, Box with Leads, each $ 3 00

No. 1011H.



1011 H. Bar-lock Pocket Case, containing:
Compasses **with Handle,** 6¼ in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar
Divider **with Handle,** 5¾ in.,
Spring Bow Pen 3½ in., with Needle point,
Spring Bow Pencil 3½ in., with Needle point,
Ruling Pen 5 in. with black handle, Box with Leads, " 3 60

No. 1012H.



1012 H. Bar-lock Pocket Case, containing:
Compasses **with Handle,** 6¼ in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar,
Divider **with Handle,** 5¾ in.,
Steel Spring Bow Divider 3½ in.,
Spring Bow Pen 3½ in., with Needle point,
Spring Bow Pencil 3½ in., with Needle point,
Ruling Pen 4 in., with ebony handle,
Ruling Pen 5 in. with black handle, Box with Leads, " 4 25

1085. Proportional Dividers, see page 135.

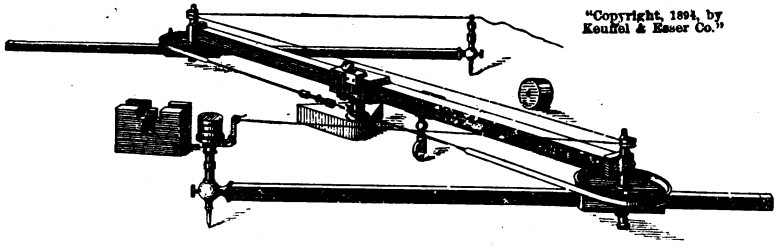
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EIDOGRAPHS AND PANTOGRAPHS.

are instruments designed to reproduce drawings on a reduced, equal or enlarged scale. It is obvious, that in order to obtain a correct reproduction, instruments of extreme accuracy must be employed, especially in enlarging, as in this case any error arising from imperfect mechanical construction is magnified.

EIDOGRAPHS.

For reproducing to even scale, enlarging up to 1:8 and reducing up to 8:1.



No. 1120.

1120. Eidograph, brass, of improved construction, Arms 30 in., with 2 Balance-weights and movable Support, complete, in hardwood Case, with Table of Settings . . . . . each $125 00

1121. Eidograph, like No. 1120, but Arms 36 in. . . . . " 135 00

These **Eidographs** are very carefully constructed instruments; their motions are delicate and regular and they cover a larger surface than a pantograph of similar size. The main beam, as shown in the cut, revolves horizontally upon a heavy socket. At each end of this beam is a disc and the two are connected by an encircling steel band, so that either disc transmits simultaneous motion to the other. The steel band is adjustable to secure equal motion of both discs. To the under surface of each disc a sleeve is attached, through which passes an adjustable arm. Each arm carries either tracing or pencil point. The main beam and the arms are graduated and provided with verniers. Very fine settings can be obtained, and ratios can be established with great accuracy according to the formula furnished with each instrument. Allowance can be made for the shrinkage of originals, and drawings can be so reproduced that the area of the original and of the copy bear any desired ratio to each other.

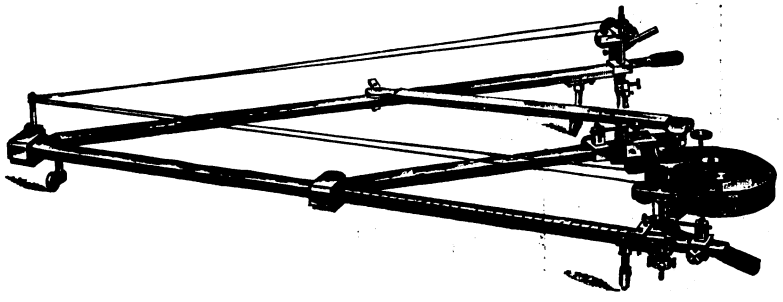
1122—1125 Precision Pantographs, see page 152, &c.

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PANTOGRAPHS

with Wheel Supports.

For Reducing from 6 : 1 to 1 : 1 or Enlarging from 1 : 1 to 1 : 6 in all ratios.



No. 1127.

1127. Pantograph of hollow, square brass bars, 28 in., connected by pivot joints. The left-hand bar is graduated and has a vernier and micrometer adjustment. Convenient contrivance for operating the pencil from the tracing point. Iron weight with two adjustable needle points to fix its position on the drawing board. With Pencil Point, two Steel Points, one box of 5-inch Leads, in wooden Case with Lock and key . . . . . each $ 87 50

Pantograph No. 1127 is of high quality and workmanship. It moves on casters and is not suspended from a standard. Although this causes a little more friction, it makes the instrument better adapted for use in a limited space. It can also be stored in its case more readily than the suspended pantographs, as it does not require setting up like the latter. This pantograph is adapted especially for reducing, but can be used for enlarging.

SUSPENDED PANTOGRAPHS.

Suspended Pantographs, (Nos. 1122 to 1131,) are very delicate instruments. There is no friction of the supports of the bars on the drawing, as the entire mechanism is suspended.

Of the **Suspended Pantographs** only **Nos. 1122 to 1124** will reproduce in all ratios from the size of the original to 1 : 20 or 20 : 1, as only these pantographs have the arrangement for placing the pole within the parallelogram (interchanging the pole for one of the tracing points). Other suspended pantographs do not have this arrangement and reproduce only within the limits stated with the description of each.

Precision Pantographs Nos. 1122 to 1125, are, on account of their fine mechanical construction, especially adapted for very accurate reproductions, and are highly recommended to Civil and Mechanical Engineers, Topographers, Hydrographers, Engravers and Lithographers.

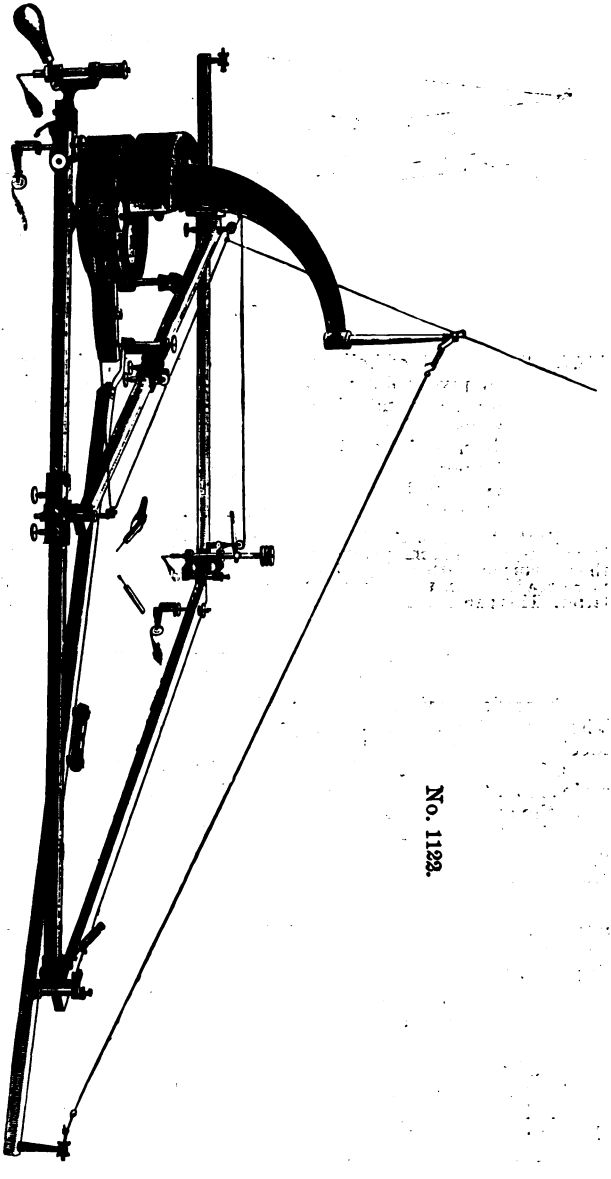
Suspended Pantographs Nos. 1129 to 1131, resemble No. 1125 but are of simpler construction, although of the same class of workmanship and material. These instruments are recommended to Designers, Pattern Makers, etc., for drawings where the highest degree of accuracy is not required.

Suspended Pantographs Nos. 1132 to 1134 have pearwood bars which are not graduated throughout and they are therefore limited to the ratios for which they are marked, as stated in their description. Within their range they are good reliable instruments.

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PRECISION PANTOGRAPHS.

For Reproducing to even scale, enlarging up to 1 : 20 and reducing up to 20 : 1 in all ratios.



No. 1122.

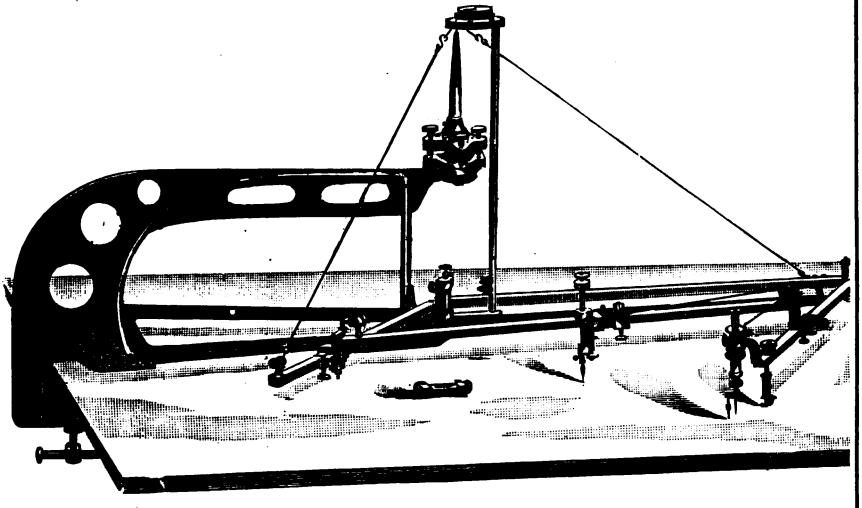
Suspended Precision Pantograph of hollow, square metal bars, connected by pivot-joints; the bars are graduated throughout and the sliding sockets are provided with verniers and micrometer adjustments. Extra Supporting Bar and appliances for setting up the instrument with the pole within the parallelogram, in which position it will reproduce the size of the original, (see illustration). Pole and pencil point interchangeable. Convenient contrivance for operating the pencil from the tracing point. Solid Iron Standard, with 2 Spirit Levels, 2 Leveling Screws, and 1 extra Weight. Instrument with adjustable Tracing Point, Pencil Point with 3 Brass Weights, 2 Steel Points, 1 Spirit Level, 1 Box of 5-inch Leads. Directions and Formula for computing the setting for any ratio, in polished hardwood Case with Lock and key.

1122.	Length of Bars, 33 inches . . .	each	$160 00
1123.	" " " 38 "	"	170 00

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PRECISION PANTOGRAPHS.

For Reproducing to even scale, enlarging up to 1 : 20 and reducing up to 20 : 1 in all ratios.



No. 1124.

1124. Suspended **Precision Pantograph,** extra large adjustable clamping Standard, the base of which is raised off the board, so that the drawing can be slipped under it. Hollow square metal bars, **24 in.**, connected by pivot joints, graduated throughout, the sliding sockets with vernier and micrometer adjustments. Extra supporting bar and appliances for setting up the instrument with the pole within the parallelogram, to reproduce in the size of the original. Pole and pencil point interchangeable. Convenient contrivance for operating the pencil from the tracing point.

Instrument with adjustable Tracing Point, Pencil Point with 3 Brass Weights, 2 Steel Points, 1 Spirit Level, 1 box of 5-inch Leads, Directions and Formula for computing the setting for any ratio, in polished hardwood Case with Lock and key, separate Box for Standard . . . . . each $ 180 00

1124C. do. do. do. but bars 38 in. . . . . " 210 00

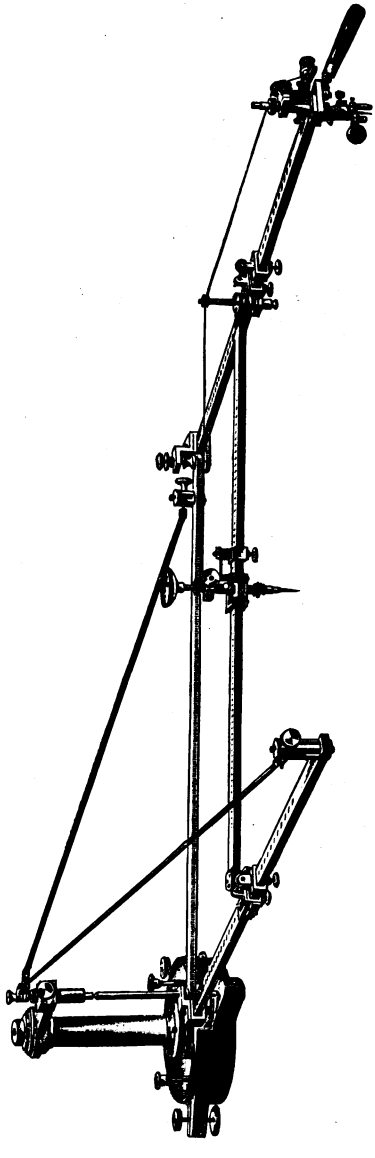
This suspended Pantograph has a large brace-shaped standard of great stabiltiy and rigidity, held in position by a clamp screw. The base of the standard is raised off the board to admit of slipping the drawing under it, a great convenience when reducing drawings. The vertical support of the standard is adjusted by a 4-screw leveling head and its adjustment controlled by means of a sensitive cross level with fork-shaped support, resting on the ball pole of the base of the standard. This level is removed after the vertical support has been adjusted.

The advantages of the extra-large brace-shaped standard are that the instrument is clamped to the table or board, doing away with the weights and avoiding damage to the board from the fastening screw. There are no leveling screws in the base to injure the board or the drawing and the standard is easily adjusted by means of its four leveling screws (like on surveying instruments).

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PRECISION PANTOGRAPHS.

No. 1125. For Reducing from 15 : 1 to 5 : 4 or Enlarging from 1 : 15 to 4 : 5 in all ratios.



No. 1125.

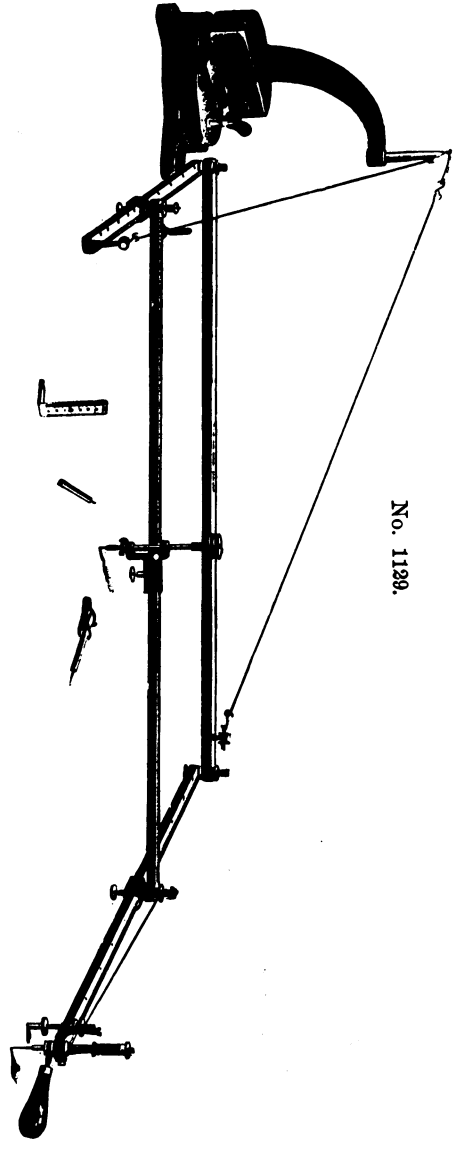
This Suspended Precision Pantograph is of finest quality and very similar in construction to No. 1122 and 1123. The brass Standard, on heavy iron base with adjusting screws, carries a sensitive circular level. The square, hollow brass bars are connected by pivot joints and sliding sockets, which carry verniers and have micrometer adjustment. They are graduated to half-millimeters and read by vernier to ½ millimeter. Instrument complete with 1 box of 6-inch Leads, with Directions, in hardwood Box with Lock and key.

1125. Length of Bars, 24 inches . . . . each $ 155 00

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SUSPENDED PANTOGRAPHS.

For Reducing from 20 : 1 to 5 : 4 or Enlarging from 1 : 20 to 4 : 5 in all ratios.



No. 1129.

Suspended Pantograph of hollow, square metal bars, connected by cone joints; the bars are fully graduated and the edges of the sliding sockets are beveled to facilitate the reading of ratios. Tracing and Pencil Point are interchangeable. Plain solid iron Standard with 1 extra Weight. Instrument with adjustable Tracing Point, Pencil Point with 3 Brass Weights, 2 Steel Points, 1 graduated metal Gauge, for setting bars parallel to table, 1 box of 5-inch Leads, Directions and Formula for computing the setting for any ratio. In hardwood Case with Lock and key.

1129.	Length of Bars, 28 inches	each	$ 75 00
1130.	" " " 33 "	"	85 00
1131.	" " " 38 "	"	92 50

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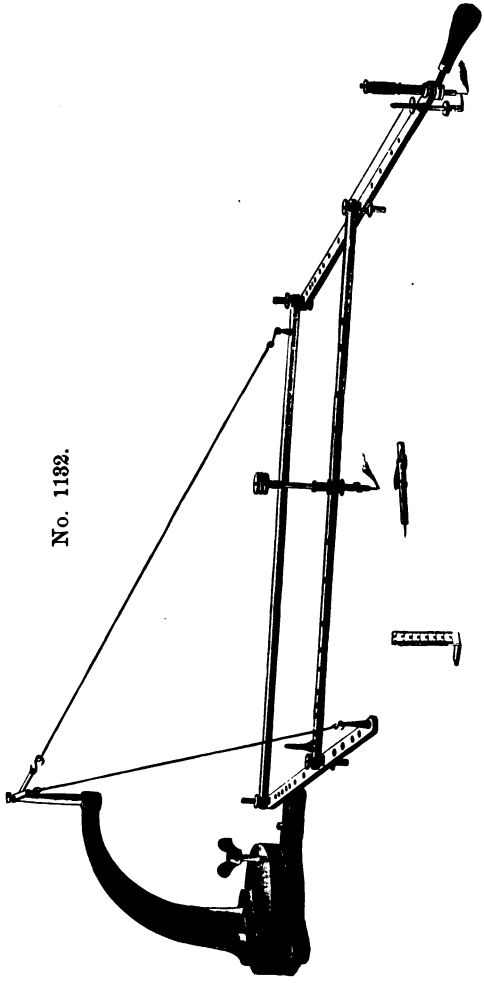
SUSPENDED PANTOGRAPHS.

(PEARWOOD BARS)

For Reducing and Enlarging in the following ratios:

5:4, 4:3, 3:2, 5:3, 2:1, 5:2, 3:1, 4:1, 5:1, 6:1, 8:1, 10:1, 12:1, 20:1, or vice-versa.

No. 1132.



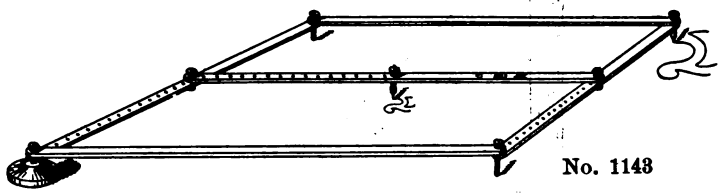
Suspended Pantograph of strong well-seasoned Pearwood Bars, connected by cone joints in brass bearings and provided with holes accurately spaced for the above ratios. Tracing and Pencil Point are interchangeable. Plain solid iron Standard. Instrument with adjustable Tracing Point, Pencil Point with 3 Brass Weights, 1 Steel Point, 1 graduated metal Gauge for setting bars parallel to table, 1 box of 5-inch Leads, and Directions. In hardwood Case with Lock and key.

1132.	Length of Bars, 28 inches . . . . each	$	35 00
1133.	" " 33 " . . . . "		36 00
1134.	" " 38 " . . . . "		37 50

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PANTOGRAPHS OF HARDWOOD.

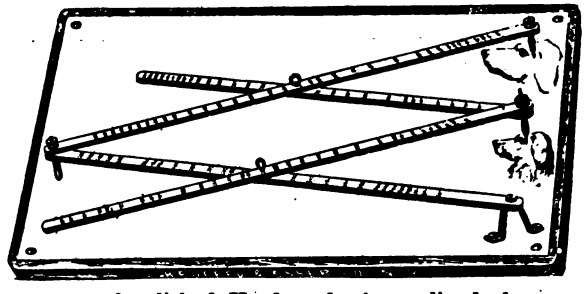
Pantographs 1143-1145 have our improved tracer and lead holders and take the usual Artist Lead, which is interchangeable with the steel tracer These points are held by a screw sleeve. All metal parts are nickel plated.



No. 1143

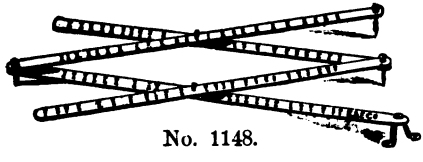
1143. Pantograph of polished Hardwood, bars 22½ in., for reducing and enlarging drawings in 15 ratios, from 2:1 to 16:1 or vice-versa, in plain box, with Directions . . . . . each $ 3 50

No. 1144.

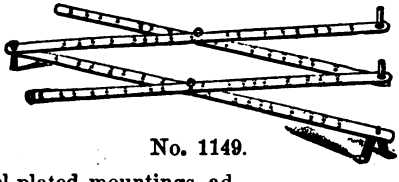


1144. Pantograph of polished Hardwood, fancy lined, bars 21 in., metal foot; tracer and lead point interchangeable, for reducing and enlarging drawings in 34 ratios, from 8:1 to 1⅛:1 or vice versa, in plain box, with Directions . . . . . each $ 1 75

1145. Pantograph do. do. do. but bars 41 in, and joints formed by bolts and thumb nuts . " 5 00



No. 1148.



No. 1149.

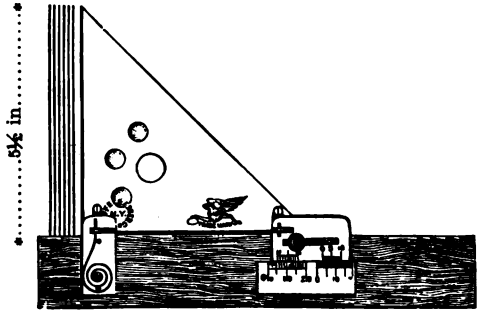
1148. Pantograph of Hardwood, nickel-plated mountings, adjustable lead, bars 21 in.; for reducing and enlarging drawings in 25 ratios, 8: 1 to 1⅛: 1, in plain box, with Directions, ... each $ 1 20

1149. Pantograph of hardwood, nickel-plated mountings, lead pencil and tracer interchangeable in tubular holders, bars 21 in., for reducing and enlarging drawings in 181 ratios, from 8: 1, to 1⅛: 1, in plain box, with Directions. . . . . " 50

1155. Odontograph page 203.
1156. Duplex Angle, page 203.

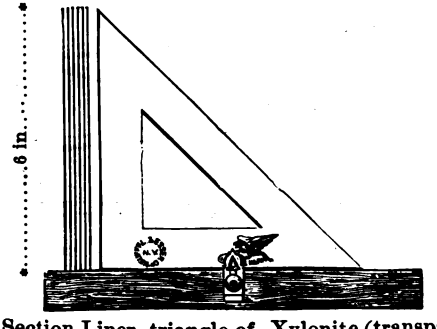
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SECTION LINERS.



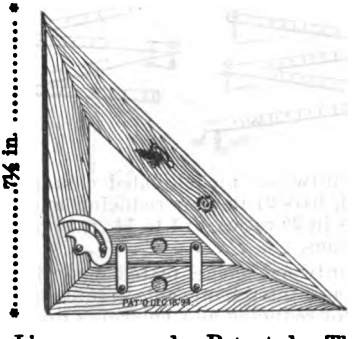
No. 1157.

1157. Casey's Section Liner, triangle of Xylonite (transparent), straightedge of boxwood, German silver Mountings, a very reliable and simple instrument. There is hardly any practice required to operate it to perfection. By the 2 scales with verniers, on the metal plates, the distances are regulated to $\frac{1}{100}$th inch or $\frac{1}{10}$th millimeter, ... each $ 3 50



No. 1158.

1158. William's Section Liner, triangle of Xylonite (transparent), straightedge of Boxwood, a simple and practical instrument which after a little practice will be found to work very satisfactorily . . . . . each $ 2 00

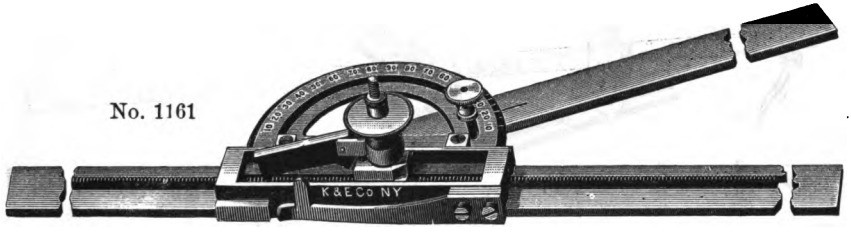


No. 1158½.

1158½. Hill's Section Liner, pearwood. Patented. The width of the spacing can be instantly adjusted by rotating the cam-shaped piece shown in the cut. A simple and reliable instrument . . . . . each $ 1 00

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BOTH'S PATENT SECTION LINER AND SCALE DIVIDER



1160. Both's Patent Section Liner and Scale Divider, **German Silver**, base 14¾ in. Protractor graduated to degrees, with Vernier reading to five minutes. Instrument in wooden Case, with full Directions for setting and using . each $12 00

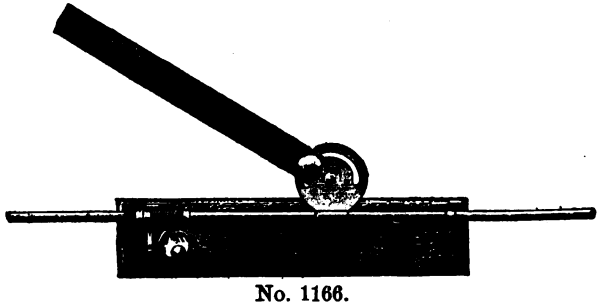
1161. Both's Patent Section Liner and Scale Divider, like No. 1160, but of brass and without Vernier to the protractor . . . . . " 9 00

Both's Patent Section Liner and Scale Divider is the easiest to manipulate, the most rapid and exact in execution, the finest in workmanship and the most durable of any hitherto known.

The essential parts of Both's Patent Section Liner are: a flat rack bar 14¾ in. long, bearing an accurately cut rack 9 in. long with 24 teeth to the inch, and a nicely fitted carriage made to slide on the rack bar; to this are attached the semi-circular protractor graduated to degrees, the pivoted ruler arm extending 10 in. beyond the protractor, and the mechanism for uniformly advancing the ruler arm. This mechanism consists of a steel pawl which engages in the teeth of the rack bar, taking from one to six teeth at a time, according to the take-up to which the adjusting nut has been set. The slide and with it the ruler arm, are made to advance on the rack bar by pressing on a knob which causes the pawl to engage in a tooth of the rack.

The comfort and satisfaction attending the use of this instrument, the assurance of being able to do absolutely accurate work in less time than with any other, its easy adjustment for section-lining or for scales, its great scope, together with durability and neatness, make it without exception a superior instrument and a valuable and most useful addition to the outfit of every draughtsman who knows and appreciates the value of good tools.

SIMPLEX SECTION LINER



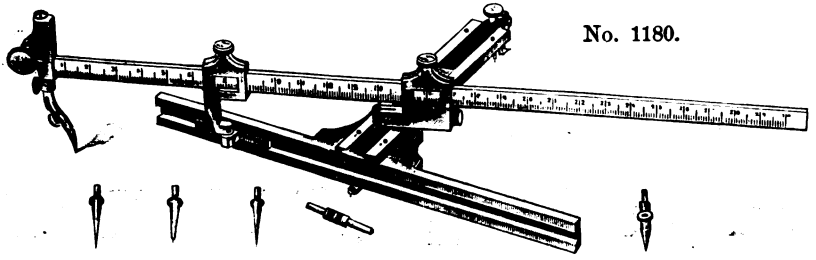
No. 1166.

1166. Simplex Section Liner, hardwood base, rod 15 in., rule 7 in., held on the drawing by pins at bottom of base . . . . each $ 1 50

The Simplex is a simple section liner with which fairly good work can be done. It will space up to about ½ in. and is very easy to handle.

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ELLIPSOGRAPH AND BEAM COMPASS



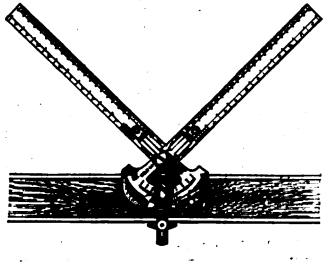
No. 1180.

1180. German silver Ellipsograph, fine quality 12-inch bar graduated 32nds inches on one side and millimeters on the other, with 2 Pen Points, 1 Pencil Point, 3 Steel Points, in morocco Case . . . . . each $ 25 00

This instrument draws ellipses of any shape, from ½ inch up to 22 inches major axis, with the greatest accuracy. Its construction is shown by the illustration. The graduated bar with the runners can be removed from the frame and a needlepoint inserted into one of the runners, when it forms a light, but strong Beam Compass. The Ellipsograph, also the T-shaped frame, can be taken apart and stored compactly in its morocco Case.

PARAGON DRAFTING INSTRUMENT.

PATENTED.



No. 1190,
with Scales 1191.

1190. Paragon Drafting Instrument, Patented, German silver, protractor graduated to single degrees, with any one pair of scales 1191 A. to E. as selected, in wooden Box (with spaces for six 12-inch scales), with Directions . . . each $22 50

White-edge Scales, 12 in., with German silver Socket, for Paragon Drafting Instrument.

1191-A.	⅛, ¼ × ½, 1 inch to the foot	per pair	$2 50
1191-B.	⅜, ¾ × 1½, 3 " " " "	" "	2 50
1191-C.	3 × 6 " " " "	" "	2 50
1191-D.	⅛, ¼ × ½, full size	" "	2 50
1191-E.	20, 40 × 30, 60 parts to the inch	" "	2 50
	Scales with other graduations made to order	" "	3 50

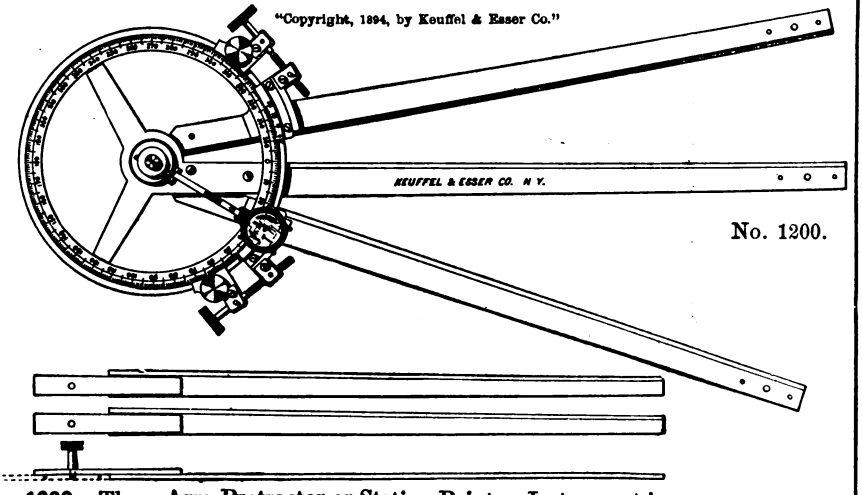
The Paragon Drafting Instrument replaces nearly all the tools usually employed in drafting. It can be used on any T square or straightedge from 1⅞ to 2⅞ in. wide, can be easily shifted to any part of the drawing board and lines are located, measured and drawn with it in one operation. It is a labor and time saving device with which accurate work can be done quickly and conveniently.

The instrument is used to best advantage in connection with the parallel motion straightedge listed on page 225.

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METAL PROTRACTORS

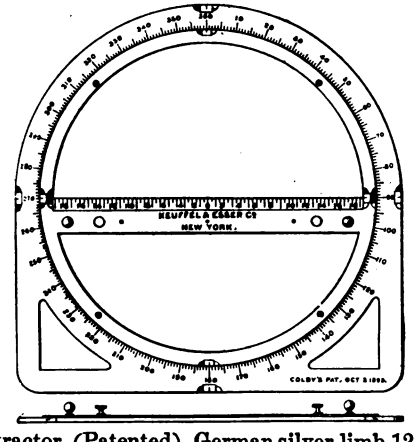
"Copyright, 1894, by Keuffel & Esser Co."



No. 1200.

1200. Three-Arm Protractor or Station Pointer, Instrument in substantial wooden Case, with Screwdriver . . . . each $ 90 00

Protractor as made by us for the U. S. Navy, Bronze Circle 6½ in., divided on solid silver to half degrees, numbered in opposite directions from 0 to 350 and from 360 to 10, with 2 verniers reading to 1 minute. Both verniers with tangent screw. Magnifying lens on central arm. Two interchangeable Tubular Centres $\frac{3}{8}$ in. diameter, with glass bottom, removable cylinder for centre with spring-point for marking centre exactly. Three German silver arms, 17 in. long, each with extension piece with setscrew to lengthen to 27½ in. beyond edge of circle.



No. 1209.

1209. Colby's Protractor, (Patented), German silver limb 12 in., divided to 15 minutes, Scale graduated as required, in Mahogany Case . . . . . each $ 60 00

Extra Scales, with any of the usual graduations . . . . . " 3 50

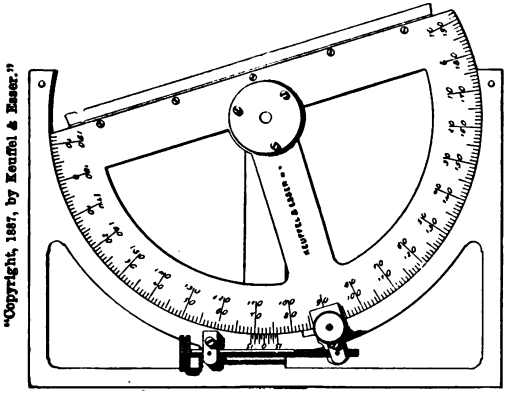
This instrument can be used for all kinds of protracting, but it is especially designed for plotting notes of surveys made with the stadia.

The limb is graduated from 0° to 360°, 15 minutes divisions. Scale on cross-arm has zero mark in centre, and is graduated in both directions in any unit desired. The revolving inner circle with the cross-arm is raised to prevent friction on the paper.

To hold instrument in position, paper weights are placed on the corners of the outer plate.

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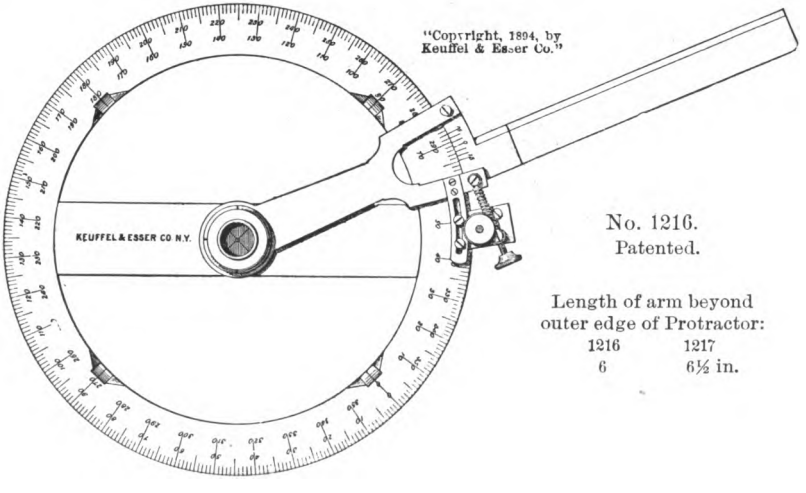
PARAGON PROTRACTORS.



No. 1210

1210. Crozet Protractor, 8 in., German silver, divided to ¼ degrees, Vernier reading to 1 minute, with tangent screw, in polished Mahogany Case . . . . . each $ 40 00

This is a very practical protractor. It is used along a straightedge or T square and angles are set off without bringing the centre over the starting point.



No. 1216.
Patented.

Length of arm beyond outer edge of Protractor:

1216	1217
6	6½ in.

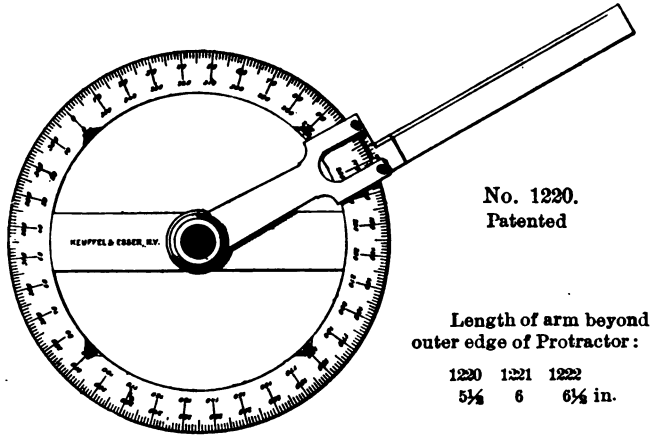
1216. Circular German silver Protractor, 8 in., Horncentre and Movable Arm, with **Tangent Screw,** div. to ¼ degrees, Vernier reading to 1 minute, each $ 20 00

1217. do. do. 10 in. " " ¼ " " " " 1 " " 24 00

Polished Mahogany Case for No. 1216 1217
each $ 2 50 2 75

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PARAGON PROTRACTORS.

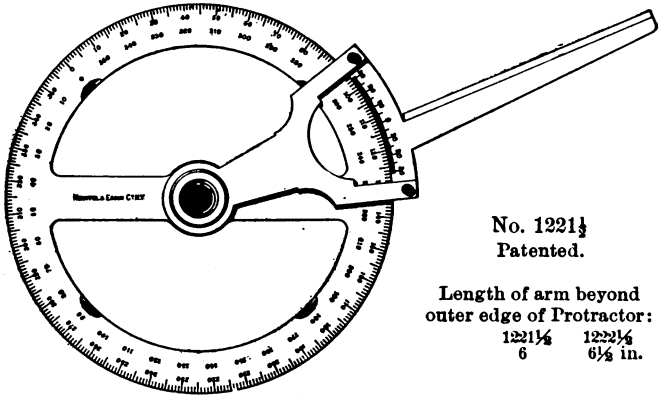


No. 1220.
Patented

Length of arm beyond outer edge of Protractor:

1220	1221	1222
5½	6	6½ in.

1220. Circular German silver Protractor, 6 in., with Horncentre and Movable Arm, div. to ½ degrees, Vernier read'g to 3 min., each $ 14 00
1221. do. do. 8 in., " " ¼ " " " " 1 " " 16 00
1222. do. do. 10 " " " ¼ " " " " 1 " " 20 00



No. 1221½
Patented.

Length of arm beyond outer edge of Protractor:

1221½	1222½
6	6½ in.

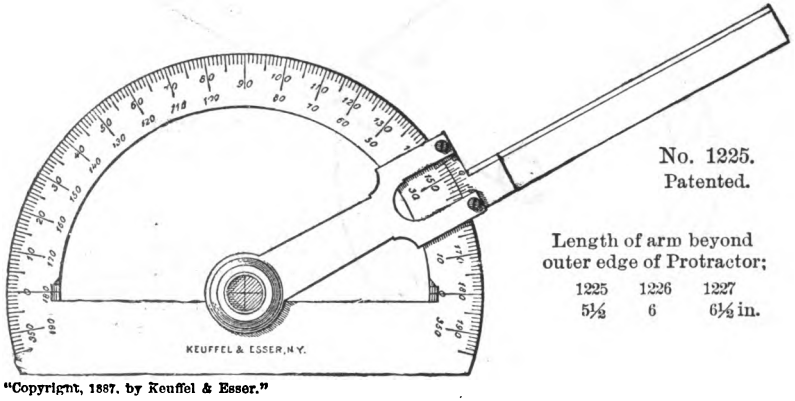
1221½. Circular German silver Protractor, 8 in., with Horncentre and Movable Arm, div. to ½ degrees, Vernier read'g to 1 minute, each $ 17 25
1222½. do. do. 10 in. " ½ " " " " 1 " " 21 25

The divisions of protractors 1221½ and 1222½ are again as open as of those divided to ¼ degrees reading to 1 minute. Their verniers are therefore twice as long as those of the latter.

Polished Mahogany Case for	No. 1220,	1221,	1222,	1221½,	1222½,
	each $ 2 25	2 50	2 75	2 50	2 75

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PARAGON PROTRACTORS.



No. 1225.
Patented.

Length of arm beyond outer edge of Protractor;

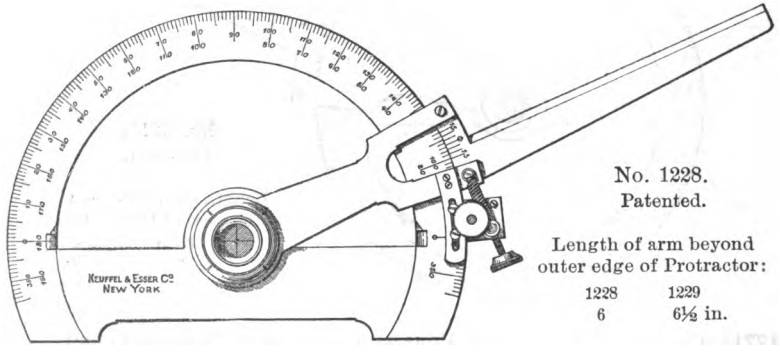
1225	1226	1227
5½	6	6½ in.

"Copyright, 1887, by Keuffel & Esser."

1225. Semicircular German silver Protractor, 6 in., with Horn-centre and Movable Arm, div. to ½ degrees, Vernier read'g to 3 minutes, each $ 10 00

1226. do. do. 8 in. " ¼ " " " " 1 minute, " 14 00

1227. do. do. 10 " " ¼ " " " " 1 " " 17 00



No. 1228.
Patented.

Length of arm beyond outer edge of Protractor:

1228	1229
6	6½ in.

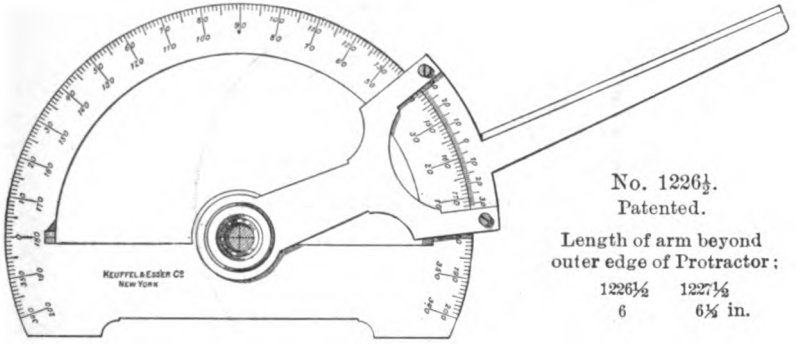
1228. Semicircular German silver Protractor with **Tangent Screw** 8 in. div. to ¼ degrees, Vernier read'g to 1 minute, each 18 00

1229. do. do. 10 " " ¼ " " " " 1 " " 21 00

Polished Mahogany Case for No.	1225	1226	1227	1228	1229
each	$ 2 00	2 25	2 50	2 25	2 50

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PARAGON PROTRACTORS.



No. 1226½.
Patented.

Length of arm beyond outer edge of Protractor:

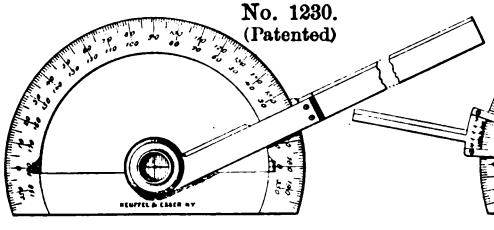
1226½	1227½
6	6½ in.

1226½. Semicircular German silver Protractor, 8 in., with Horn-centre and Movable Arm, div. to ½ degrees, Vernier read'g to 1 minute each $ 15 25

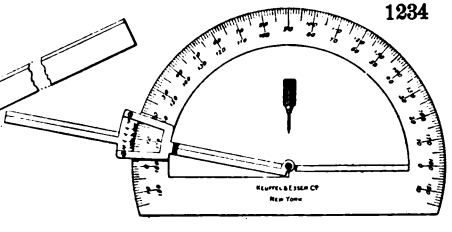
1227½. do. do. 10 in., " " ½ " " " " 1 " " 18 25

The divisions of protractors 1226½, 1227½ are again as open as of those divided to ¼ degrees reading to one minute. Their verniers are therefore twice as long as those of the latter.

No. 1230.
(Patented)



1234



1230. Semicircular German silver Protractor, 6 in., divided to ½ degrees with Horn-centre, and Movable Arm extending 6 in. beyond edge . . . . . each $ 8 75

1231. do. do. do. 7 in. Movable Arm extending 6½ in. beyond edge . . . . . " 10 00

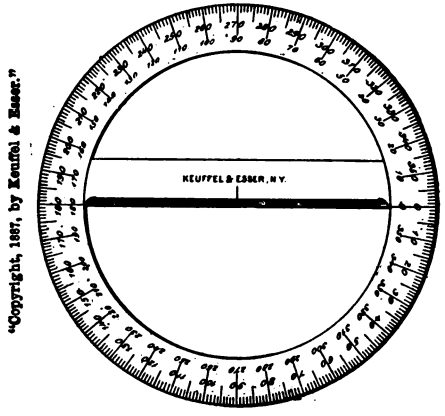
1234. Semicircular German silver Protractor, 5 in., divided to half-degrees, with vernier reading to 3 minutes, perforated centre, Movable Arm extending from ⅛ inch beyond centre to 2 inches beyond outer edge, in cloth covered velvet lined Box, with Pricker. . . . . " 9 00

Protractor No. 1234 is very light, and handy for field work, for orienting, plotting, &c. as it has the advantage that radii can be drawn very nearly to the centre. The centre is perforated and with the pricker furnished with the instrument the centre can be set exactly on a given point and the point marked.

Polished Mahogany Case for No.	1226½	1227½	1230	1231
each $	2 25	2 50	2 00	2 25

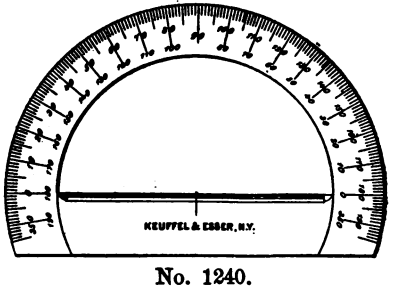
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PARAGON PROTRACTORS.

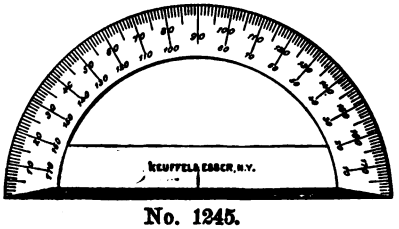


No. 1235.

1235. Circular German silver Protractor, 5 in., beveled edge, divided to ½ degrees . . . . . each $ 5 50



No. 1240.



No. 1245.

Centre on inner edge

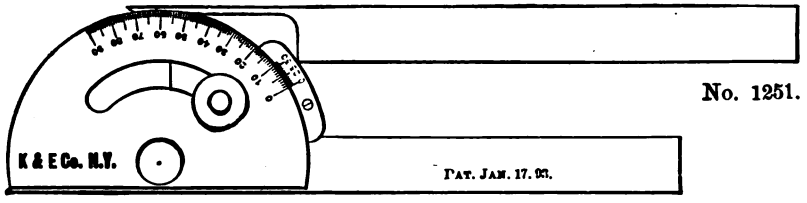
1240.	Semicircular	German silver	Protractor,	4 in.,	beveled edge, divided to	1 degree, ...	each	$ 1 80
1241.	do.	5 in.,	"	"	½	"	"	2 25
1242.	do.	6 "	"	"	½	"	"	2 90
1243.	do.	6 "	"	"	¼	"	"	3 50

Centre on outer edge

1245.	Semicircular	German silver	Protractor,	4 in.,	beveled edge, divided to	1 degree, ...	each	$ 1 45
1246.	do.	5 in ,	"	"	½	"	"	1 80
1247.	do.	6 "	"	"	½	"	"	2 40
1248.	do.	6 "	"	"	¼	"	"	2 90
1249.	do.	7 "	"	"	½	"	"	3 50
1250.	do.	8 "	"	"	½	"	"	4 20

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LIMB PROTRACTORS.



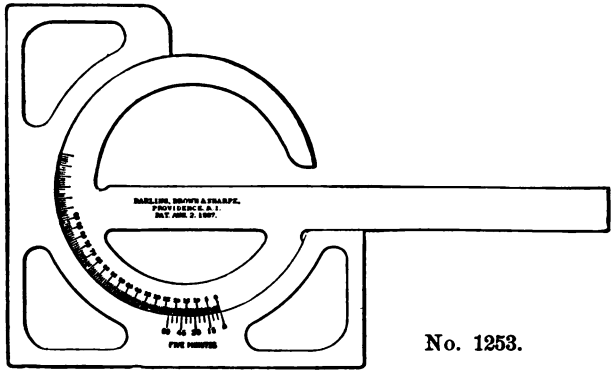
No. 1251.

1251.	Draftsman's Limb Protractor, **German silver**, ... each	$ 10 00
1251 C.	Mahogany Case for No. 1251 . . . . . "	1 00
1252.	Machinist's Limb Protractor, like No. 1251, but of **steel** . "	4 00
1252 C.	Mahogany Case for No. 1252 . . . . . "	1 00

These Protractors have blades about 9 inches long. The arc is of 4 in. diameter, graduated to degrees, with vernier reading to 5 minutes. A clamping screw securely holds the blades at any angle and serves as knob handle.

Either blade can be used against a T square, giving any angle and its complement from 0° to 90°, so that it is practically an adjustable triangle.

No. 1251 is a finely finished, engine divided tool designed for draughtsman's use and of greater precision and finer workmanship than the steel protractor of like design, No. 1252.



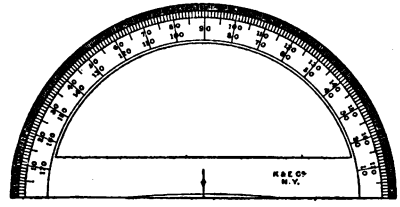
No. 1253.

1253.	Draftsman's Steel Protractor, with Directions . . . . . each	$ 6 50
1253 C.	Morocco Case for No. 1253 . . . . . "	1 25

This Protractor is of sheet steel, graduated on one side to degrees, with vernier reading to 5 minutes. The blade is 8 ½ inches long. It is used chiefly in connection with a T square or Straight Edge. Being perfectly flush on both sides, it can be used either side up and on either edge of the blade. This makes it particularly convenient in dividing circles, transferring angles, drawing oblique lines at right angles to each other or laying off given angles on each side of a line without changing the setting.

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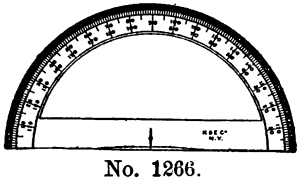
PLAIN METAL PROTRACTORS.



No. 1262

German Silver.

1260.	Semicircular	Protractor,	4¼	in.,	divided to	1	degree,	. .	each	$ 40
1261.	do.	do.	5⅛	"	"	½	"	. .	"	60
1262.	do.	do.	6⅜	"	"	½	"	. .	"	80
1263.	do.	do.	7½	"	"	½	"	. .	"	1 15
1264.	do.	do.	8½	"	"	½	"	. .	"	1 50

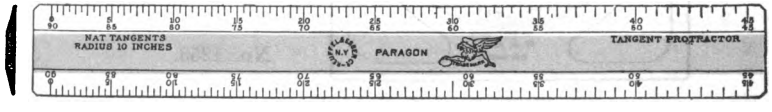


No. 1266.

Brass.

1265.	Semicircular	Protractor,	3¾	in.,	divided to	1	degree,	. .	each	$ 09
1266.	do.	do.	4¼	"	"	1	"	. .	"	25
1267.	do.	do.	5⅛	"	"	½	"	. .	"	50
1268.	do.	do.	6⅜	"	"	½	"	. .	"	70

TANGENT PROTRACTOR



No. 1257

1257. Rogers' Tangent Protractor, 10 in. radius, boxwood, with bevels coated with a material resembling ivory, divided on both edges to 10 minutes and numbered 0 to 45 and 45 to 90° . . . . . each $ 3 00

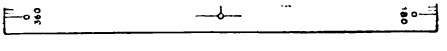
A very convenient and accurate instrument for plotting angles and an efficient substitute for a vernier protractor.

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KEUFFEL & ESSER CO. NEW YORK.

XYLONITE PROTRACTORS.

(Transparent)



No. 1868 A.

(Transparent)

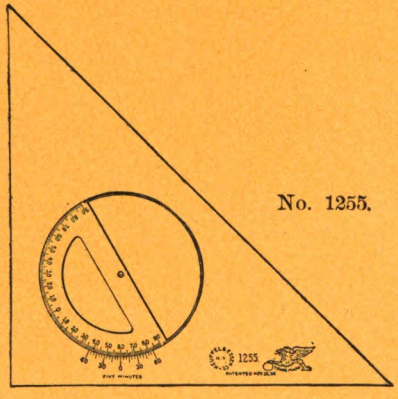
Engine Divided. Fine Quality.

1868 A.	Xylonite	Semicircular	Protractor,	no bevel,	5	in. div. to	½°	each	$ 1 20
"	"	"	"		6	" "	½°	"	1 40
"	"	"	"		8	" "	½°	"	2 00

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ADJUSTABLE PROTRACTOR TRIANGLE.

Belcher's Patent.



No. 1255.

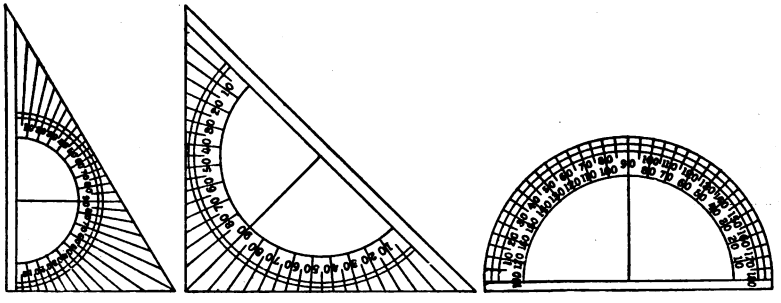
1255. Adjustable Protractor Triangle, 8 in., xylonite, (transparent), 45°×45°×90° . . . . . each $ 2 50

The semicircular protractor, 3½ diam., is graduated to single degrees, numbered 0-90 at every 10 degrees in both directions, double vernier reading to 5 minutes. It revolves in a circular groove, where it is held by a spring. The triangle and protractor are flush on both sides, so that either side can be used for drawing slopes in opposite directions, etc. The base line of the protractor has a drawing edge.

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XYLONITE PROTRACTORS.

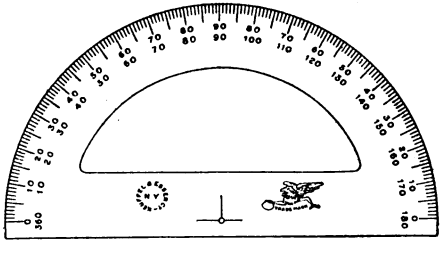
(Transparent)



No. 1866. 1867. 1868.

1866.	Xylonite Protractor Triangle, 30 × 60°,	5 in.,	div. to	1°	each	$		45
	" " " "	6 "	"	1°	"			50
	" " " "	7 "	"	1°	"			70
1867.	Xylonite Protractor Triangle, 45°,	5 in.	div. to	1°	"			50
	" " " "	6 "	"	1°	"			70
	" " " "	7 "	"	1°	"			90
1868.	Xylonite Semicircular Protractor, flat,	5 in.	div. to	½°	"			45
	" " " "	6 "	"	½°	"			60
	" " " "	7 "	"	½°	"			75
	" " " "	8 "	"	½°	"		1	20
	" " " "	10 "	"	½°	"		2	00

These Protractors are intended to replace the unsatisfactory horn protractors.



No. 1868 A.

(Transparent)

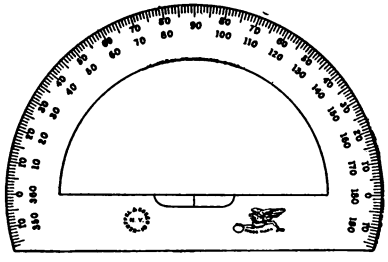
Engine Divided. Fine Quality.

1868 A.	Xylonite Semicircular Protractor, no bevel,	5 in.	div. to	½°	each	$	1	20
	" " " "	6 "	"	½°	"		1	40
	" " " "	8 "	"	½°	"		2	00

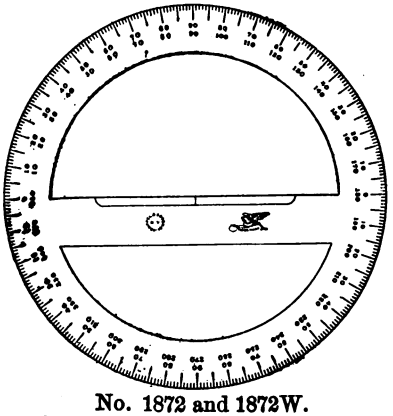
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FINE XYLONITE PROTRACTORS.

ENGINE DIVIDED, BEVELED EDGE.



No. 1869 and 1869W.



No. 1872 and 1872W.

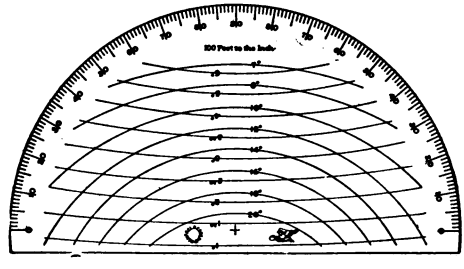
Transparent

1869.	Semicircular	Xylonite	Protractor,	beveled	edge,	6 in.,	½°	each	$ 2 75
1870.	do.	do.	do.	"	"	8 "	½°	"	3 50
1871.	Circular	do.	do.	"	"	6 "	½°	"	3 50
1872.	do.	do.	do.	"	"	8 "	½°	"	4 50
1873.	do.	do.	do.	"	"	10 "	½°	"	5 50

Opaque, White

1869 W.	Semicircular	Xylonite	Protractor,	beveled	edge,	6 in.,	½°	each	$ 2 75
1870 W.	do.	do.	do.	"	"	8 "	½°	"	3 50
1871 W.	Circular	do.	do.	"	"	6 "	½°	"	3 50
1872 W.	do.	do.	do.	"	"	8 "	½°	"	4 50
1873 W.	do.	do.	do.	"	"	10 "	½°	"	5 50

RAILROAD CURVE PROTRACTORS.



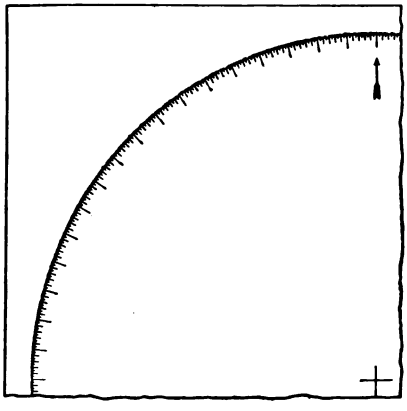
No. 1878. **(Transparent)**

1877. Xylonite Railroad Curve Protractor, 8 in., divided to half degrees, with circular Curves ½°, 1°, 1½°, 2°, 2½°, 3°, 3½°, 4°, 5°, 6°, 7°, 8°, scale 400 feet = 1 inch . . . . . each $ 2 75

1878. Xylonite Railroad Curve Protractor, 10 in., divided to half degrees, with circular Curves, 1°, 1½°, 2°, 2½°, 3°, 3½°, 4°, 5°, 6°, 7°, 8°, 10°, 12°, 14°, 16°, 18°, 20° scale 100 feet = 1 inch. . . . . " 3 25

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PAPER PROTRACTORS



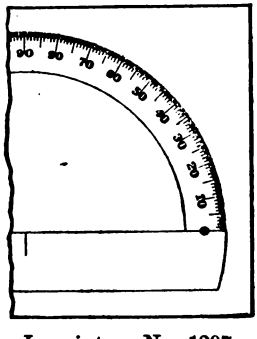
Imprint on No. 1293 to 1295,

Circular, 14 in.

1293	Vegetable Tracing Paper,	14 in.	diam.	div.	¼°	Sheet	15½x21	in.,	each $ 30
1294.	Drawing Paper,	14 "	"	"	¼°	"	15½x20	"	" 30
1295.	Bristol Board,	14 "	"	"	¼°	"	16½x20	"	" 40

Circular, 8 in.

1296.	" "	8 "	"	"	½°	"	10 x12	"	" 20
1296T.	Vegetable Tracing Paper,	8 "	"	"	½°	"	9½x12	"	" 20



Imprint on No. 1297.

Semicircular, 5 in.

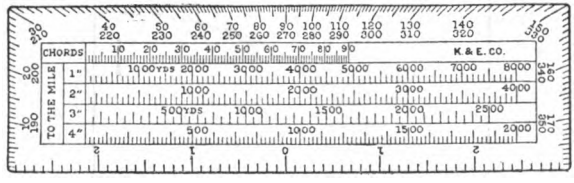
1297. Bristol Board, 5 in. diam. div. ½°, Sheet 5¼ x 7 in., ... each $ 10

1298. " " 5 " " " ½° " 6¼ x 8 " with Diagonal Scales, inches to $\frac{1}{100}$ths, and millimeters . . . . " 15

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MILITARY PROTRACTOR.

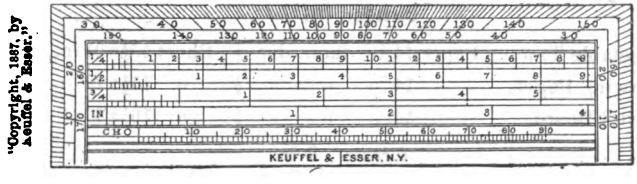
(TRANSPARENT)



No. 1305.

1305. Square Xylonite (transparent) Protractor, $6 \times 1\frac{3}{4}$ in., beveled edges, whole degrees. Scales, 1, 2, 3 and 4 in. to the mile, reading to yards. Scale of Chords. Scale of inches in tenths on lower edge . . . . . each $ 3 00

BOXWOOD AND IVORY PROTRACTORS.



No. 1320.

1310. Square Boxwood Protractor, $6 \times 1\frac{3}{4}$ in. Whole degrees, Scales: $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, 1 inch to the foot, Scale of Chords, Diagonal Scales . . . . . each $ 35

1320. Square Ivory Protractor, $6 \times 1\frac{3}{4}$ in. Whole degrees. Scales: $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, 1 inch to the foot, Scale of Chords, Scales of 25, 30, 35, 40, 45 parts per inch, Diagonal Scales . . " 1 75

1321. Square Ivory Protractor, $6 \times 1\frac{3}{4}$ in. Whole degrees. Scales: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$, 1 inch to the foot, Scale of Chords, Diagonal Scales, Scales of 30, 35, 40, 45, 50, 60 parts per inch, Scale of 40 on lower edge . . . . . " 2 50

1322. Square Ivory Protractor. 6×2 in. Whole degrees. Scales: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$ $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$, 1, $1\frac{1}{8}$, $1\frac{1}{4}$, $1\frac{1}{2}$ inch to the foot, Scale of Chords, Diagonal Scales, Scale of 30, 35, 40, 45, 50, 60 parts per inch, Scale of 40 on lower edge . . . . . " 4 35

1323. Square Ivory Protractor, $6 \times 2\frac{1}{2}$ in. Half degrees. Scales: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$, 1, $1\frac{1}{8}$, $1\frac{1}{4}$, $1\frac{3}{8}$, $1\frac{1}{2}$ inch to the foot, Scale of Chords, Diagonal Scales, Scale of 10, 15, 20, 25, 30, 35, 40, 45, 50, 60 parts per inch, Scale of 40 on lower edge . . . . . " 5 00

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PARAGON AND BOXWOOD SCALES

Machine-divided. U. S. St'd.

The U. S. St'd. machine-divided Paragon and Boxwood Scales manufactured by us, are of the best selected material, of proper width and thickness, and of finest finish. They are superior in quality and accuracy to any others on the market.

Although we list and carry in stock a very large assortment of scales, we are often called upon to make

SPECIAL SCALES TO ORDER.

To avoid error and tedious and delaying correspondence, we give directions for ordering such Scales.

There are two distinctly different ways of dividing a scale:

the **"open divided"** and the **"full divided or Chain Scale."**

OPEN DIVIDED SCALES

are illustrated under *A*, *B*, *C*. They are generally used in **architectural** or **mechanical** drawing, and are divided in inches or parts of inches, which represent feet or full inches. The units are marked along the whole length of the edge and only the end units are subdivided to inches and fractions.

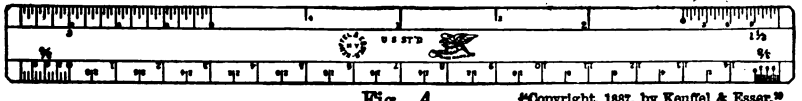


Fig. *A*. "Copyright, 1887, by Keuffel & Esser."

Fig. *A* represents an open divided Scale with **four different divisions,** two on each edge. Two of these divisions are numbered to read from the right, the other two from the left. (When two divisions are to be placed on one edge, one must be the double of the other like $\frac{1}{8} \times \frac{1}{4}$, $\frac{3}{8} \times \frac{3}{4}$, 2×4, etc.)

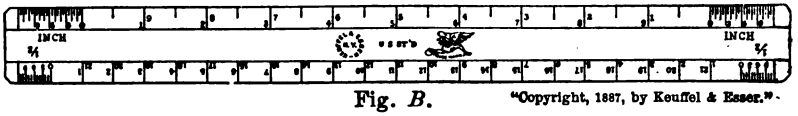


Fig. *B*. "Copyright, 1887, by Keuffel & Esser."

Fig. *B* represents an open divided Scale with **two different divisions,** one on each edge; each edge reading from right to left and from left to right.

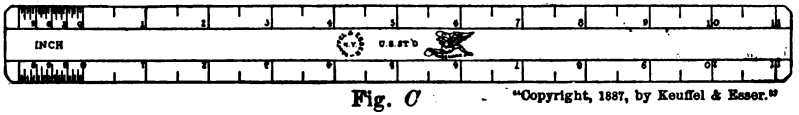


Fig. *C* "Copyright, 1887, by Keuffel & Esser."

Fig. *C* represents an open divided Scale with only **one division,** the same on both edges; one edge reads from right to left, the other from left to right.

In ordering open divided Scales it is therefore necessary to state that they are to be open divided, also length, shape and material, how many different

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divisions are wanted, which on each edge and whether the numbers should read from right to left, or from left to right or both ways. Of course they can read both ways only when there is but one division on each edge. If other than the usual numbering is wanted, this must also be explained in the order.

FULL DIVIDED OR CHAIN SCALES

are those on which equal divisions and sub-divisions are carried along the whole length of the divided part. Therefore only one kind of division can be made on one edge. They are generally divided to decimals of inches or feet, numbered continuous per 10 divisions, and are used by **Surveyors** and **Civil Engineers,** but they can be divided inches to the foot, as shown in figure *E*.



Fig. *D*. "Copyright, 1887, by Keuffel & Esser."

Fig. *D* represents a Chain Scale with **two different divisions,** one on each edge, each of which **reads from right to left and from left to right** (both ways).



Fig. *E*. "Copyright, 1887, by Keuffel & Esser."

Fig. *E* represents a Chain Scale with **two different divisions,** one on each edge, each of which reads from **left to right.**

In ordering Chain Scales it is therefore necessary to state that they are to be Chain Scales, also length, shape and material, which divisions are wanted and whether they should read from right to left, or from left to right, or both ways, and how they are to be numbered.

The price of special scales to order depends on so many factors, that it is not feasible to give any directions for estimating their cost. We shall be pleased to quote a price on receipt of an accurate description of the scale wanted.

The safest way to order a Special Scale is to use our printed forms for ordering scales, which are furnished on request. In the absence of a printed form, state material, shape and length of scale wanted, and send a sketch showing divisions and numbering. It is not necessary that the sketch should show correct or actual divisions, if the value of the divisions (in inches, etc.) is stated.

Bevels on opposite side.

We furnish any of our flat scales with the two bevels, on opposite sides (▬) and carry some of the more frequently used scales of this style in stock. (See No. 1391PR. &c.)

Scales with any divisions, also in foreign measures, made to order.

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KEUFFEL & ESSER CO.

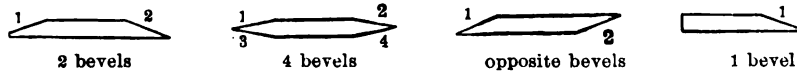
ORDER FOR SPECIAL SCALES.

Please read all questions and answer all that apply to the scale wanted

Flat Scales.

Of what material is the scale to be? **Boxwood?** **Paragon** (white lined)**?**

Of which cross-section?.....



2 bevels | 4 bevels | opposite bevels | 1 bevel

What is length of scale to be? (State length of graduated part, not of the blank, unless special length blank is wanted.).....

How is each edge to be graduated and numbered? :

Edge 1.....

" 2.....

" 3.....

" 4.....

If inch to the foot, is it to be open divided or continuous .....

In which direction is each edge to be numbered? from **right to left?** from **left to right?** **both ways?**.....

Are there any special directions about relative length of graduation marks?

.....

Remarks .....

.....

.....

.....

It is always safest to send a sketch. This need not be accurate if the *value* of the divisions (units) is stated and the divisions and numberings are indicated.

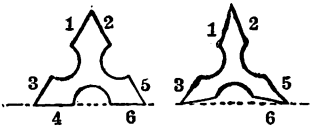
OVER

Blank for ordering special scales.
ADDITIONAL BLANKS WILL BE FURNISHED ON REQUEST.

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Triangular Scales.

Of what material is the scale to be? **Boxwood? Paragon** (white lined)**?**

Of which cross-section? 

What is the length of the scale to be? (State length of graduated part, not of the blank, unless special length blank is wanted.).....

How is each edge to be graduated and numbered?:

Edge 1.....

" 2.....

" 3.....

" 4.....

" 5.....

" 6.....

If inch to the foot, is it to be open divided or continuous?.....

In which direction is each edge to be numbered? from **right to left? left to right? both ways?**.....

Are there any special directions about relative length of graduation marks?

.....

Remarks .....

.....

.....

.....

It is always safest to send a sketch. This need not be accurate if the *value* of the divisions (units) is stated and the divisions and numberings are indicated.

OVER.

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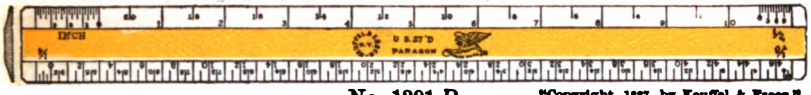
Each Scale Stamped Paragon.

OPEN DIVIDED PARAGON SCALES.

Machine Divided, U. S. St'd.

Paragon Scales are made of the best seasoned Boxwood. The bevels are coated with a material resembling ivory, which will permanently remain white and is not liable to shrink. They combine durability and distinctness, and will not tire nor injure the eyes.

DIVIDED: INCH TO THE FOOT.



No. 1391 P. "Copyright, 1887, by Keuffel & Esser."

1390 P.	Flat Paragon Scale, 6 in. div. $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1 in. to the foot each	$	75
1391 P.	do. 12 " " " " " " " " " " " "		1 25
1391 PA.	do. 12 " " $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{3}{4}$, " " " " " "		1 25
1391 PB.	do. 12 " " $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{4}$, $1\frac{1}{2}$, " " " " " "		1 25
1392 P.	do. $12\frac{1}{2}$ " " $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1, " " " " " "		1 35

Scale No. 1392P has the advantage of covering 100 feet on ⅛ inch, 50 feet on ¼ inch, and 25 feet on ½ inch scale.

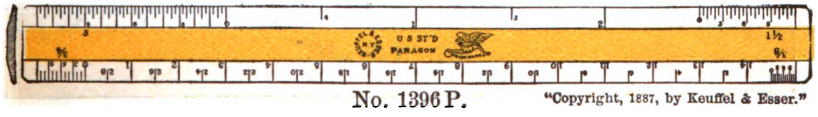
1393 P.	Flat Paragon Scale, 18 in., div. $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1 in. to the foot each	$	2 25
1394 P.	do. 24 " " " " " " " " " " " "		3 00
1395 P.	do. 24 " div. $\frac{1}{8}$, $\frac{1}{4}$ in. to the foot and $\frac{1}{16}$th inch full size . . . . . "		3 00



No. 1391PR.

Bevels on Opposite Sides

1391 PR.	Flat Paragon Scale, 12 in., div. $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1 in. to the foot each	$	1 25
1392 PR.	do. $12\frac{1}{2}$ in., " " " " " " " " " "		1 35



No. 1396 P. "Copyright, 1887, by Keuffel & Esser."

1396 P.	Flat Paragon Scale, 12 in. div. $\frac{3}{8}$, $\frac{3}{4}$, $1\frac{1}{2}$, 3 in. to the foot each	$	1 25
1397 P.	do. 18 " " " " " " " " " " " "		2 25
1398 P.	do. 24 " " " " " " " " " " " "		3 00

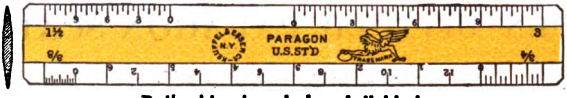
Bevels on Opposite Sides

1396 PR.	do. 12 " div. $\frac{3}{8}$, $\frac{3}{4}$, $1\frac{1}{2}$, 3 in. to the foot each		1 25

Flat Paragon Scales with other divisions, **one or both sides divided**, made to order, see page 173.

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Each Scale Stamped Paragon.

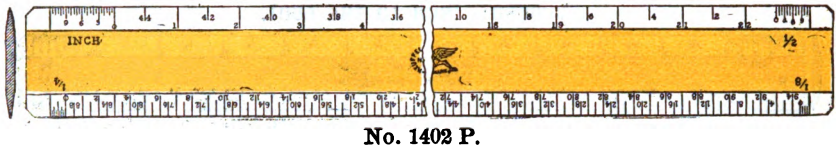


No. 1399 P.

Both sides beveled and divided.

1399 P. Flat Paragon Pocket Scale, 6 in., $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, $1 \times \frac{3}{8}$, $\frac{3}{4}$, $1\frac{1}{2}$, 3 in. to the foot, in leather Sheath . . . . . each $ 1 35

Scales 1399 P, are less than one inch wide and very convenient for the pocket. They have all the usual scales employed by the building professions.



No. 1402 P.

Both sides beveled and divided.

1400 P.	Flat Paragon Scale, 12 in., div. $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, $1 \times \frac{3}{8}$, $\frac{3}{4}$, $1\frac{1}{2}$, 3 in. to foot														each	$	2 00
1401 P.	"	18	"	"	"	"	"	"	"	"	"	"	"	"	"		3 50
1402 P.	"	24	"	"	"	"	"	"	"	"	"	"	"	"	"		4 75

PARAGON CHAIN SCALES.

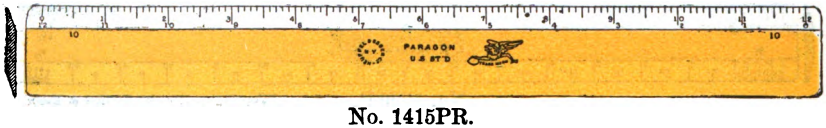
Machine Divided, U. S. St'd.

DIVIDED: INCHES AND TENTHS.



No. 1415P. "Copyright, 1887, by Keuffel & Esser."

1410 P.	Flat Paragon Chain Scale, 6 in., div. 10×50 parts to the inch,														each	$	75
1411 P.	do.	6	"	"	20×40	"	"	"	"	"							75
1412 P.	do.	6	"	"	30×60	"	"	"	"	"							75
1413 P.	do.	6	"	"	80×100	"	"	"	"	"						1	00
1415 P.	do.	12	"	"	10×50	"	"	"	"	"						1	25
1416 P.	do.	12	"	"	20×40	"	"	"	"	"						1	25
1417 P.	do.	12	"	"	30×60	"	"	"	"	"						1	25
1418 P.	do.	12	"	"	80×100	"	"	"	"	"						1	50



No. 1415PR.

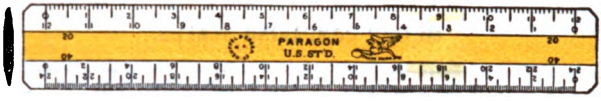
Bevels on opposite sides.

1415 PR.	Flat Paragon Chain Scale, 12 in. div. 10×50 parts to the in.														each	$	1 25
1416 PR.	do.	12	"	"	20×40	"	"	"	"	"							1 25
1417 PR.	do.	12	"	"	30×60	"	"	"	"	"							1 25
1418 PR.	do.	12	"	"	80×100	"	"	"	"	"							1 50

Flat Paragon Scales with other divisions, **one or both sides divided,** made to order, see page 173.

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Each Scale Stamped Paragon.



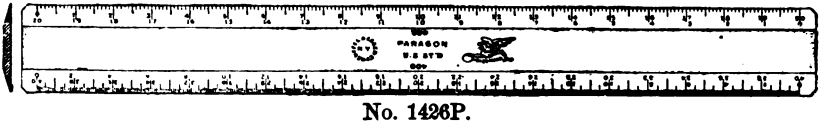
No. 1419 P.

Both sides beveled and divided.

1419 P. Flat Paragon Pocket Scale, 6 in., div. 10, 40, 30 and 50 parts to the inch, in leather Sheath . . . . . each $ 1 35

Scales 1419 P, are less than one inch wide and very convenient for the pocket.

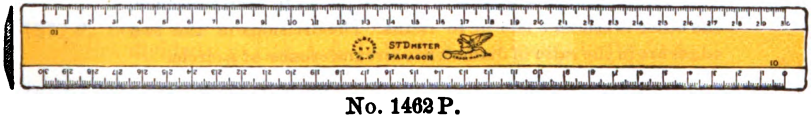
DIVIDED: FOOT IN HUNDREDTHS.



No. 1426P.

1425 P.	Flat Paragon Chain Scale,	12	in.,	div.	100×500	parts to the foot	each	$	1	25
1426 P	do.	12	"	"	200×400	" " " " "			1	25
1427 P.	do.	12	"	"	300×600	" " " " "			1	25
1428 P.	do.	12	"	"	800×1000	" " " " "			1	50

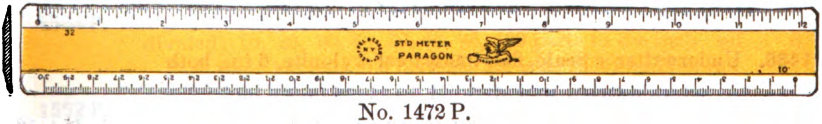
DIVIDED: METRIC MEASURE.



No. 1462 P.

1460 P.	Flat Paragon Scale,	10	cm.,	div.	mm. and half-mm	. . . .	each	$		75
1461 P.	do.	20	"	"	"	" " "	. . . . "		1	00
1462 P.	do.	30	"	"	"	" " "	. . . . "		1	25
1463 P.	do.	50	"	"	"	" " "	. . . . "		2	25

DIVIDED: INCHES AND METRIC MEASURE.



No. 1472 P.

1472 P.	Flat Paragon Scale,	30	cm.,	div.	32nds. in. and half-mm		each	$	1	50
1473 P.	do.	50	"	"	"	" " "	. . . "		2	50

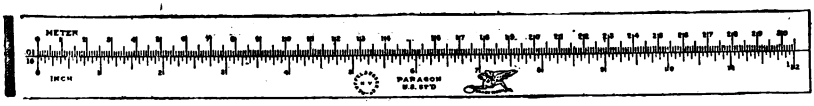
These scales are divided in inches on one edge and in metric measure on the other, which makes them very convenient for converting plans from one system into the other.

Flat Paragon Scales with other divisions, **one or both sides divided,** made to order, see page 173.

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Each Scale Stamped Paragon.

METRIC COMPARING SCALES.

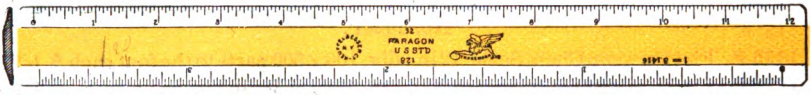


No. 1482 P.

1482 P. Flat Paragon Scale, (white facing) 30 cm., inch and metric comparing scale, div. mm. and 16ths in. on median line, (no bevels) . . . . . each $ 1 50

1483 P. do. do. do. like No. 1482 P, but 50 cm. . . . " 2 50

DIVIDED: DIAMETER AND CIRCUMFERENCE.

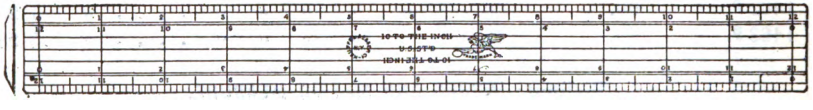


No. 1480 P.

1480 P. Flat Paragon Scale, 12 in., divided for diameter and circumference . . . . . each $ 1 75

One edge of this scale is divided in inches to thirty-seconds, the other to spaces 3.1416 in. to 128ths. The divisions of the two edges are in the ratio of diameter to circumference of a circle.

UNDERWRITER'S SCALES.



No. 1487

1486. Underwriter's Scale, flat, **transparent** xylonite, 6 in., both edges beveled, and divided 10 parts to the inch; the inch graduations are carried across the scale . . . . each $ 1 50

1487. Underwriter's Scale, flat, like No. 1486, but 12 in. . . . " 2 00

Flat Paragon Scales with other divisions, **one or both sides divided** made to order, see page 173.

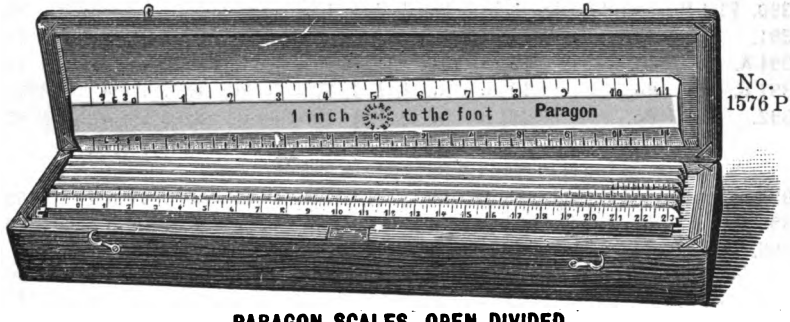
For Scales For Indicator Diagrams, see under Planimeters.

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PARAGON SCALES IN SETS.

Flat Scales in Sets represent the most perfected form of Draftsman's Scales. They are put up and arranged in a manner to make their use the most practical, time saving and economical. The Scales are arranged as the illustration shows in a neat and strong mahogany box with a separate space for each scale plainly numbered so that the scale of the desired division can be found at a glance. In this manner the scales, which are as valuable and more delicate than compasses and dividers, are protected as well as the latter. It is unreasonable that scales should be allowed to take care of themselves while compasses are preserved in velvet-lined cases.

Each Scale Stamped Paragon.



No. 1576 P.

PARAGON SCALES, OPEN DIVIDED.

Each Scale has the same division on both edges, one edge reading from left to right, the other edge from right to left. See figure C, page 178:

1575 P.	Set of 4 Paragon Scales, 12 in. divided: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1 inch to the foot	set	$ 6 25
1576 P.	Set of 8 Paragon Scales, 12 in. divided: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 3 inches to the foot . . .	"	11 50
1577 P.	Set of 12 Paragon Scales, 12 in. divided: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 2, 3, 4, 6 inches to the foot and $\frac{1}{16}$ inch full size	"	17 00
1578 P.	Set of 4 Paragon Scales, 18 in. divided: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1 inch to the foot	"	10 75
1579 P.	Set of 8 Paragon Scales, 18 in. divided: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 3 inches to the foot . . .	"	20 25
1580 P.	Set of 12 Paragon Scales, 18 in. divided: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 2, 3, 4, 6 inches to the foot and $\frac{1}{16}$ inch full size	"	30 00

PARAGON CHAIN SCALES.

Each Scale has two different divisions, one on each edge, each of which is numbered to read both ways. See figure D, page 174:

1584 P.	Set of 4 Paragon Scales, 12 in. divided: 10, 20, 30, 40, 50, 60, 80, 100 parts to the inch	set	6 75

Each Scale has only one division, the same on both edges, and is numbered to read both ways on each edge:

1592 P.	Set of 6 Paragon Scales, 12 in. divided: 10, 20, 30, 40, 50, 60 parts to the inch	set	9 00
1593 P.	Set of 8 Paragon Scales, 12 in. divided: 10, 20, 30, 40, 50, 60, 80, 100 parts to the inch	"	13 00

PARAGON METRIC SCALES.

1598 P.	Set of 6 Paragon Scales, 30 cm. divided metric measure: .01 .02 .03 .05 .025 .0125 . .	"	9 00
1599 P.	Set of 6 Paragon Scales, 50 cm. divided metric measure: .01 .02 .03 .05 .025 .0125 . .	"	17 00

Sets of Scales with other divisions made to order. See page 173.

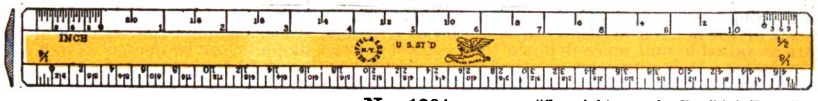
For Boxwood Scales in Sets see page 183.

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FINE QUALITY BOXWOOD SCALES.

Machine Divided, U. S. St'd.

DIVIDED: INCH TO THE FOOT.



No. 1391. "Copyright, 1887, by Keuffel & Esser."

1390. Flat Boxwood Scale, 6 in., div. $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1 in. to the foot . . each $ 50

1391. do. 12 " " " " " " " " " " . . " 75

1391 A. do. 12 in., div. $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{3}{4}$ in. to the foot . . " 75

1391 B. do. 12 " " $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{4}$, $1\frac{1}{2}$ " " " " . . " 75

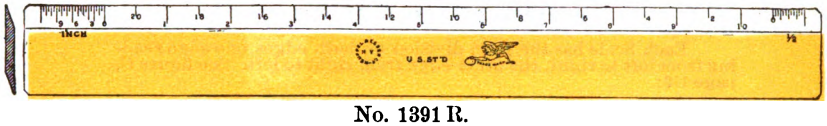
1392. do. $12\frac{1}{2}$ " " $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1 " " " " . . " 85

Scales No. 1392 and 1392R have the advantage of covering 100 feet on $\frac{1}{8}$ inch, 50 feet on $\frac{1}{4}$ inch and 25 feet on $\frac{1}{2}$ inch scale.

1393. Flat Boxwood Scale, 18 in., div. $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1 in. to the foot . . each 1 50

1394. do. 24 " " " " " " " " " " . . " 2 00

1395. do. 24 " div. $\frac{1}{8}$, $\frac{1}{4}$ inch to the foot and $\frac{1}{16}$ inch full size " 2 00

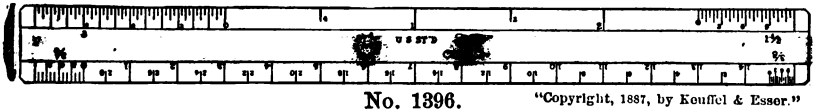


No. 1391 R.

Bevels on opposite sides.

1391 R. Flat Boxwood Scale, 12 in., div. $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1 in. to the foot each $ 75

1392 R. do. $12\frac{1}{2}$ " " " " " " " " " " 85



No. 1396. "Copyright, 1887, by Keuffel & Esser."

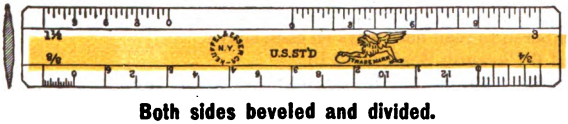
1396. Flat Boxwood Scale, 12 in., div. $\frac{3}{8}$, $\frac{3}{4}$, $1\frac{1}{2}$, 3 in. to the foot . each $ 75

1397. do. 18 " " " " " " " " " " . " 1 50

1398. do. 24 " " " " " " " " " " . " 2 00

Bevels on opposite sides.

1396 R. Flat Paragon Scale, 12 in., div. $\frac{3}{8}$, $\frac{3}{4}$, $1\frac{1}{2}$, 3 in. to the foot . " 75



No. 1399.

Both sides beveled and divided.

1399. Flat Boxwood Pocket Scale, 6 in., $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, $1 \times \frac{3}{8}$, $\frac{3}{4}$, $1\frac{1}{2}$, 3 in. to the foot, in leather Sheath . . . . . each $ 75

Scale 1399 is less than one inch wide, and very convenient for the pocket. It has all the scales usually employed by the building professions.

Flat Boxwood Scales with other divisions, **one or both sides divided**, made to order, see page 173.

For Flat Paragon Scales, see page 175 &c.

The illustrations show the scales on this page with white edges, while in fact they are of plain boxwood throughout as stated in the description.

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FINE QUALITY BOXWOOD SCALES IN SETS.



No. 1576

OPEN DIVIDED SCALES.

Each Scale has the same division on both edges, one edge reading from left to right, other edge from right to left. See figure C, page 173.

1575. Set of 4 Boxwood Scales, 12 in.
divided: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1 inch to the foot . . . . . set $4 25

1576. Set of 8 Boxwood Scales, 12 in.
divided: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 3 inches to the foot . " 7 50

1577. Set of 12 Boxwood Scales, 12 in.
divided: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 2, 3, 4, 6 inches to the foot, and $\frac{1}{16}$ inch full size . . . . . " 11 00

1578. Set of 4 Boxwood Scales, 18 in.
divided: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1 inch to the foot . . . . . " 7 75

1579. Set of 8 Boxwood Scales, 18 in.
divided: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 3 inches to the foot . " 14 25

1580. Set of 12 Boxwood Scales, 18 in.
divided: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 2, 3, 4, 6 inches to the foot, and $\frac{1}{16}$ inch full size . . . . . " 21 00

CHAIN SCALES.

Each Scale has two different divisions one on each edge, each of which is numbered to read both ways. See figure D, page 174.

1584. Set of 4 Boxwood Scales, 12 in.
divided: 10, 20, 30, 40, 50, 60, 80, 100 parts to the inch set 4 70

Each Scale has only one division, the same on both edges, and is numbered to read both ways on each edge.

1592. Set of 6 Boxwood Scales, 12 in.
divided: 10, 20, 30, 40, 50, 60 parts to the inch . . . set 6 00

1593. Set of 8 Boxwood Scales, 12 in.
divided: 10, 20, 30, 40, 50, 60, 80, 100 parts to the inch " 9 00

METRIC SCALES.

1598. Set of 6 Boxwood Scales, 30 cm.
divided: metric measure .01, .02, .03, .05, .025, .0125 " 6 00

1599. Set of 6 Boxwood Scales, 50 cm.
divided: metric measure .01, .02, .03, .05, .025, .0125 " 11 00

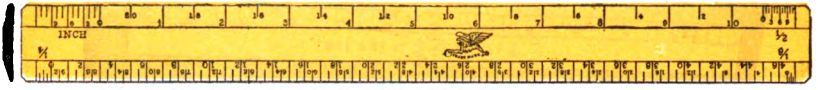
Sets of Scales with other divisions made to order, see page 173.

For Paragon Scales in Sets see page 179.

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PLAIN FLAT BOXWOOD SCALES.

MACHINE DIVIDED.



No. 1606. "Copyright, 1887, by Keuffel & Esser."

1605. Flat Boxwood Scale, 6 in., div. $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1 in. to the foot . each $ 30
1606. do. 12 " " " " " " " " " " " " 50
1606½. do. 18 " " " " " " " " " " " " 90
1607. do. 24 " " " " " " " " " " " " 1 20
1608. do. 12 " div. $\frac{1}{16}$ in. on both edges . . . . " 50



No. 1610. "Copyright, 1887, by Keuffel & Esser."

Both sides beveled and divided.

1609. Flat Boxwood Scale, 12 in., $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1×$\frac{3}{8}$, $\frac{3}{4}$, 1$\frac{1}{2}$, 3 in. to the foot each $ 90
1609½. do. 18 " " " " ×" " " " " " " " 1 50
1610. do. 24 " " " " ×" " " " " " " " 2 00

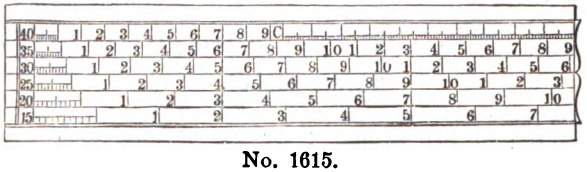
DIVIDED: INCHES AND TENTHS.



No. 1611. "Copyright, 1887, by Keuffel & Esser."

1611. Flat Boxwood Chain Scale, 12 in., div. 10×50 parts to the in. . each $ 50
1612. do do do 12 " " 20×40 " " " " " " 50
1613. do do do 12 " " 30×60 " " " " " " 50

PLOTTING SCALES.



No. 1615.

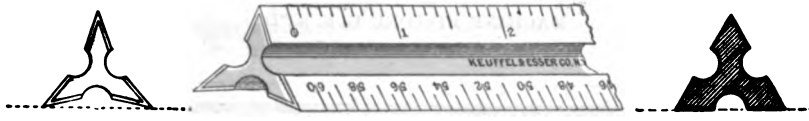
1615. Ivory Plotting Scale, 6 in. . . . . each $1 00
1616. Hardwood Plotting Scale, 6 in. . . . . " 15

For Fine Quality Boxwood Scales, see page 180 &c.

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TRIANGULAR PARAGON SCALES.

MACHINE DIVIDED. U. S. ST'D.

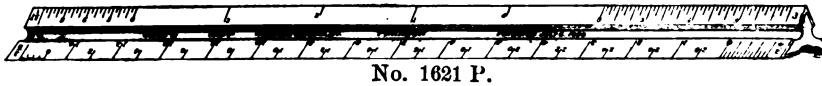


Improved shape

Usual shape.

The Paragon Scales have the improved shape, shown in above cut, which prevents the divisions wearing off by friction and insures better contact with the drawing and a better angle of vision. The bevels bearing the divisions are lined with a material resembling ivory, like the Flat Paragon Scales.

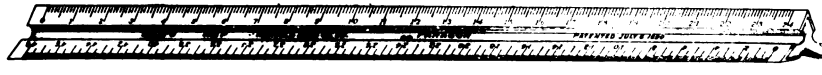
Each Scale Stamped Paragon.



No. 1621 P.

Triangular **Paragon** Scales, **Architect's,**

1620 P.	6 in., div. $\frac{3}{32}$, $\frac{3}{16}$, $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 3 in. to the foot, $\frac{1}{16}$ in., each	$1 50
1621 P.	12 "	2 25
1622 P.	12 " " $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 2, 3, 4 " " " " " " "	2 25
1623 P.	18 "	4 50
1624 P.	24 "	6 50



No. 1631 P.

Triangular **Paragon** Chain Scales, **Engineer's,**

1630 P.	6 in., div. 10, 20, 30, 40, 50, 60 parts to the inch . . . each	$ 1 50
1631 P.	12 " " " " " " " " " " " " . . . "	2 25
1632 P.	18 " " " " " " " " " " " " . . . "	4 50
1633 P.	24 " " " " " " " " " " " " . . . "	6 50
1634 P.	12 " " 20, 30, 40, 50, 60, 80 " " " " . . . "	2 50
1635 P.	Triangular **Paragon** Chain Scale, 12 in. div. 100, 200, 300, 400, 500, 600 parts to the foot "	2 50

SHEATHS FOR TRIANGULAR SCALES.

In ordering, please state whether for Paragon, White Edge, Plain Boxwood, or Improved (B) Scale.

1619 A.	Sheaths for 6 in. scale . . . . . each	$ 20
1619 B.	do. 12 " " . . . . . "	25
1619 C.	do. 18 " " . . . . . "	40
1619 D.	do. 24 " " . . . . . "	50

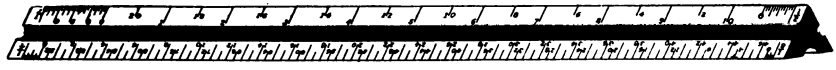
These sheaths are of stout cardboard, lined with velvet.

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TRIANGULAR BOXWOOD SCALES

WITH WHITE EDGES.

MACHINE DIVIDED U. S. ST'D.



No. 1621W.

Triangular Boxwood Scales, white edges, **Architect's,**

1620 W.	6 in., div. $\frac{3}{32}$, $\frac{3}{16}$, $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 3 in. to the foot, $\frac{1}{16}$ in.,	each	$1 25
1621 W.	12 "		2 00
1622 W.	12 " " $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 2, 3, 4 " " " " " " " "		2 00
1623 W.	18 "		4 00
1624 W.	24 "		6 00



No. 1631 W.

Triangular Boxwood Chain Scales, white edges, **Engineer's,**

1630 W.	6 in., div. 10, 20, 30, 40, 50, 60 parts to the inch . . .	each	$ 1 25
1631 W.	12 " " " " " " " " " " " " " " . . . "		2 00
1632 W.	18 " " " " " " " " " " " " " " . . . "		4 00
1633 W.	24 " " " " " " " " " " " " " " . . . "		6 00
1634 W.	12 " " 20, 30, 40, 50, 60, 80 " " " " . . . "		2 25

Triangular scales of any style, with any divisions, also in foreign measures, made to order. See page 173.

For Sheaths for Scales see page 185.

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KEUFFEL & ESSER CO. NEW YORK.

TRIANGULAR BOXWOOD SCALES.

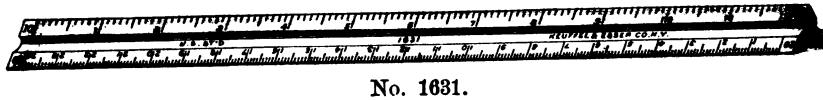
MACHINE DIVIDED U. S. ST'D.



No. 1621.

Triangular Boxwood Scales, **Architect's,**

1620.	6 in. div. $\frac{3}{32}$, $\frac{3}{16}$, $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 3 in. to the foot, $\frac{1}{16}$ in., each	$ 55
1621.	12 "	75
1621 M.	12 " " $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 3 in. to the foot, 50 parts to the inch, $\frac{1}{16}$ in. "	75
1622.	13 " " $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 2, 3, 4 " " " " " " "	75
1623.	18 "	2 50
1624.	24 "	4 25



No. 1631.

Triangular Boxwood Chain Scales, **Engineer's,**

1630.	6 in., div. 10, 20, 30, 40, 50, 60 parts to the inch . . . . each	$ 55
1631.	12 " " " " " " " " " " " " . . . . "	75
1632.	18 " " " " " " " " " " " " . . . . "	2 50
1633.	24 " " " " " " " " " " " " . . . . "	4 25
1634.	12 " " 20, 30, 40, 50, 60, 80 " " " " . . . . "	1 00
1635.	Triangular Boxwood Chain Scale, 12 in., div. 100, 200, 300, 400, 500, 600 parts to the foot "	1 50
1638.	Triangular Boxwood Combination Scale, 12 in. (copyrighted by Prof. L. F. Rondinella), 1 face (flat) div.: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$ and full size (proportional inches), 1 face (grooved) $\frac{1}{8}$, $\frac{3}{16}$ $\frac{1}{4}$, $\frac{3}{8}$ inches to the foot, 1 face (grooved) 10x50 parts to the inch . . . . . "	1 00

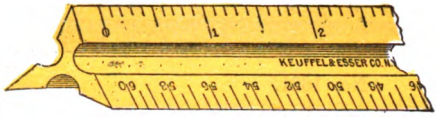
Triangular Scales of any style with any divisions, also in foreign measures, made to order. See page 173.

For Sheaths for Scales see page 185.

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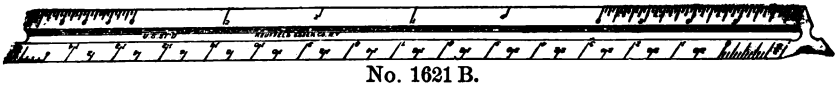
IMPROVED
TRIANGULAR BOXWOOD SCALES.

MACHINE DIVIDED U. S. ST'D.





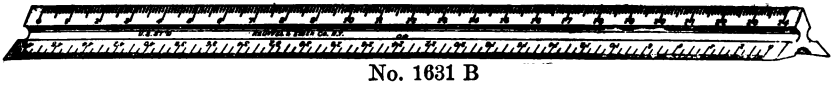
The shape of these Triangular Scales prevents the wearing of the surface from contact with the drawing while using the scale, and it affords a better angle of vision than the usual shape.



No. 1621 B.

Improved Triangular Boxwood Scales, **Architect's,**

1620 B. 6 in., div. $\frac{6}{32}$, $\frac{3}{16}$, $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 3 inches to the foot, $\frac{1}{16}$ in. each $ 75
1621 B. 12 " 1 00
1622 B. 12 " " $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 2, 3, 4 " " " " " " " " 1 00

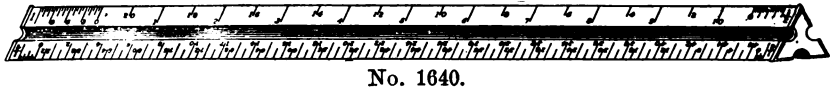


No. 1631 B

Improved Triangular Boxwood Chain Scales, **Engineer's,**

1630 B. 6 in., div. 10, 20, 30, 40, 50, 60 parts to the inch . . . each $ 75
1631 B. 12 " 1 00
1634 B. 12 " " 20, 30, 40, 50, 60, 80 " " " " . . . " 1 25
1635 B. Improved Triangular Boxwood Chain Scale,
12 in. div. 100, 200, 300, 400, 500, 600 parts to the foot " 1 50

TRIANGULAR SCALES OF METAL.



No. 1640.

1640. Triangular Metal Scale, 12 in. nickelplated, **Architect's,**
divided like No. 1621, ... each $ 2 50
1641. do. do. do. 12 in. **Engineer's,** divided like No. 1631, " 2 50
1642. do. do. do. 12 in. " " " " 1634, " 2 50

METRIC TRIANGULAR SCALES. (Boxwood.)



No. 1655.

each
1645. Triangular Boxwood Scale, 20 cm., div. .01 .02 .03 .05 .025 .0125 $ 75
1655. do. 30 " " " " " " " " " 1 00
1665. do. 50 " " " " " " " " " 2 75

For Sheaths for Triangular Scales see page 185.

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PAPER SCALES.

PRINTED ON BRISTOL BOARD FROM ENGINE DIVIDED PLATES.

19 × 1¾ inches.

(Each scale has only one division, except Nos. 1678, 1689.)



1675. Set A, 6 in Set, div. $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 3 in. to the foot, set $ 1 00

1676. do. B, 6 " " " $\frac{3}{32}$, $\frac{1}{8}$, $\frac{5}{16}$, $\frac{5}{16}$, $\frac{3}{8}$, $\frac{7}{8}$ " " " " " 1 00

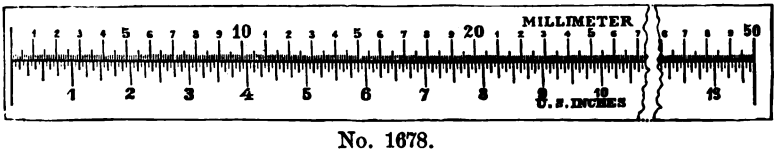
Separate Scales, any of the above . . . . . each 20



1677. Set C, 6 in Set, div. 10, 20, 30, 40, 50, 60 parts to the in. set $ 1 00

Separate Scales, any of the above . . . . . each 20

1677 T. Separate Scales, div. 2 in., 4 in. to the foot, 66 parts per inch, inches in 16ths. . . . " 20



No. 1678.

1678. Metric and Inch Comparing Scale, $\frac{1}{2}$ meter long, divided 16ths inches and millimeters . . . . . each $ 30

1679. Metric Scale, $\frac{1}{2}$ meter long, div. millimeters . . . . . " 20

1689. Scale of Proportional Inches, 12 in., div. $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1 inches . " 10

PATENT SCALE GUARDS.



No. 1690.

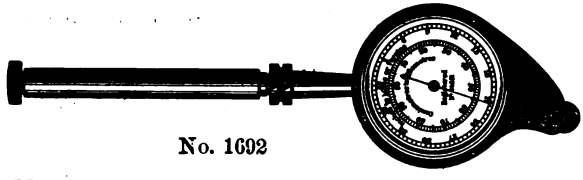
1690. Patent Guards for Triangular Scales, German silver . . . each $ 20

1691. do. do. Nickelplated . . . . " 15

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MAP MEASURES.

(CHARTOMETERS.)

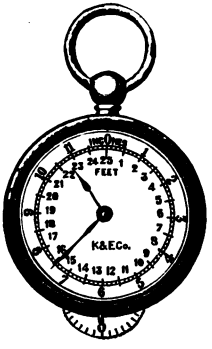


No. 1692

1692. Map Measure, 5 in., swiveling metal handle with lock-nut, dial about 1⅛ in , with 2 graduations, Inches : Miles, and Centimeters : Kilometers . . . . . each $ 3 00



No. 1694 A.



No. 1694

1694 A. Map Measure, watch pattern, nickelplated, $1\frac{3}{16}$ in. diam., registers 25 feet in feet, inches and eighths inches . . . . . each 1 75

1694. Map Measure, like No. 1694 A, but 1½ in. diam. . . . . " 2 00



No. 1695

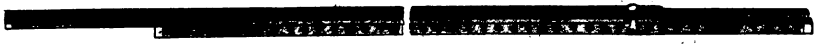
1695. Map Measure, Watch pattern, nickelplated, 1¾ in. diam., three numbered dials, registers 100 feet in feet, inches and eighths inches, with device for setting back to zero . . . . . " 4 50

To measure a line, the instrument is set to 0, and the line is carefully followed in one direction by the small projecting tracer wheel, holding the instrument vertical. The index hands on the dial will then indicate the length of the line in feet, inches and eighths inches.

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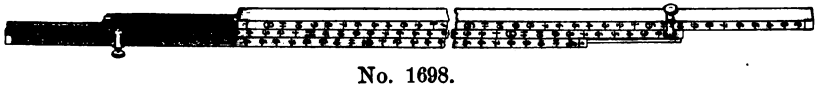
EXTENSION MEASURES.

Door and window frames, heights of ceilings, etc., can be measured quickly and accurately with these useful rules. They can be quickly extended within a window or other opening to the exact distance between any two points, and can be CLAMPED so that they will maintain the length to which they have been extended. The extension rule can be used between points not accessible for measuring with a tape.



No. 1696.

1696 A.	Extension Measure,	4	feet,	2	fold,	extending to	8	feet,	each	$	3 50
1696 B.	do	5	"	2	"	"	" 10	"	"		4 00
1696 C.	do	6	"	2	"	"	" 12	"	"		5 00



No. 1698.

1698 D.	Extension Measure,	3	feet,	3	fold,	extending to	9	feet,	each	$	5 00
1698 E.	do	4	"	3	"	"	" 12	"	"		6 00
1698 F.	do	5	"	3	"	"	" 15	"	"		7 50

Extension Measures No. 1696 and 1698 are of hardwood with brass clamps, and the sections are tongued and grooved. Those in two sections (No. 1696) read opposite the end of the first section for all measurements beyond the first section; in those in three sections the reading is carried from the first to the third section and readings beyond the first and third sections are taken on the second (middle) section. They are graduated in feet, inches and eighths of inches.



No. 1699.

1699 A.	Extension Measure,	2	feet,	2	fold	extending to	4	feet,	each	$	65
1699 B.	do	3	"	2	"	"	" 6	"	"		80
1699 C.	do	4	"	2	"	"	" 8	"	"		90
1699 D.	do	5	"	2	"	"	" 10	"	"		1 05

Extension Measures No. 1699 A to D are of hardwood with brass trimmings. Readings are taken opposite the end of the first section for all measurements beyond the first section. They are graduated in feet, inches and eighths of inches, and are provided with a clamping device.

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KEUFFEL & ESSER CO. NEW YORK.

SHRINKAGE RULES
ENGINE DIVIDED



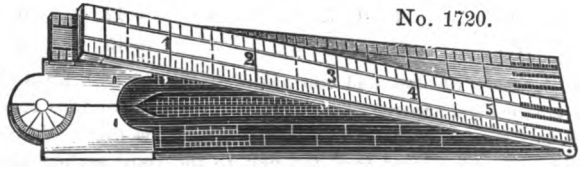
"Copyright, 1894, by Keuffel & Esser Co." No. 1701.

These Shrinkage Rules are of hardwood, brass tipped, both sides divided, about 1½ in. wide by ⅛ in. thick and divided to eights, tenths, twelfths and sixteenths inches. They are superior to all others in quality, accuracy and finish.

1700.	Shrinkage Rule,	$24\frac{2}{10}$ = 24 in.	(1 foot = 12.1 in.)	each	$ 1 20
1701.	do.	$24\frac{1}{4}$ = 24 "	(1 " = $12\frac{1}{8}$ in.)	"	1 20
1701½.	do.	$24\frac{3}{8}$ = 24 "	(1 " = $12\frac{3}{16}$ in.)	"	1 20
1702.	do.	$24\frac{1}{2}$ = 24 "	(1 " = $12\frac{1}{4}$ in.)	"	1 20
1702½.	do.	$24\frac{5}{8}$ = 24 "	(1 " = $12\frac{5}{16}$ in.)	"	1 20
1703.	do.	25 = 24 "	(1 " = $12\frac{1}{2}$ in.)	"	1 20
1704.	do.	$25\frac{1}{2}$ = 24 "	(1 " = $12\frac{3}{4}$ in.)	"	1 20
1705.	do.	26 = 24 "	(1 " = 13 in.)	"	1 20
1706.	do.	$26\frac{3}{4}$ = 24 "	(1 " = $13\frac{3}{8}$ in.)	"	1 20

Rules for any other shrinkage made to order. Prices on application.

SCALE RULES.



1720. Ivory Joint Rule, 2 feet, 4 fold, German silver mounted, 24 in. to $\frac{1}{8}$, first 6 in. to $\frac{1}{16}$, 12 in. to $\frac{1}{10}$, 12 in. to $\frac{1}{12}$, edge divided: foot to $\frac{1}{100}$. The inside edges are beveled and have Scales of $\frac{1}{16}$, $\frac{3}{16}$, $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, inches to the foot; inside faces have scales (not brought to edge) of $\frac{5}{8}$, $\frac{7}{8}$, $1\frac{1}{4}$, $1\frac{1}{2}$ in. to the foot. The main joint is graduated to 5 degrees, for setting off angles . . . . . each $ 8 00

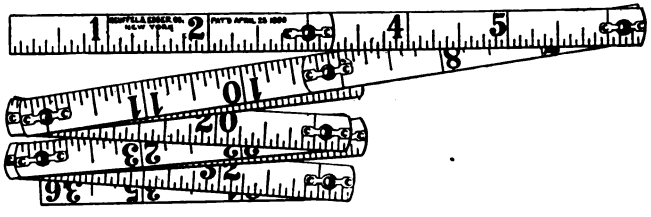
1721. Boxwood Joint Rule, 2 feet, 4 fold, German silver mounted, 24 in. to $\frac{1}{8}$, first 5 in. to $\frac{1}{16}$, 12 in. to $\frac{1}{10}$, 12 in. to $\frac{1}{12}$, edge divided: foot to $\frac{1}{100}$. The inside edges are beveled and have scales of $\frac{1}{16}$, $\frac{3}{16}$, $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1 in. to the foot: inside faces have scales (not brought to the edge) of $\frac{1}{8}$, $\frac{1}{8}$, $\frac{5}{8}$, $\frac{7}{8}$, $1\frac{1}{4}$, $1\frac{1}{2}$, 2, 3 inches to the foot. Main joint graduated to 5 degrees, for setting off angles . . . . . " 2 00

1722. Boxwood Joint Rule, 2 feet, 4 fold, Brass mounted, 24 in., divided to $\frac{1}{8}$, 12 in. to $\frac{1}{12}$, 12 in. to $\frac{1}{10}$, 24 in. to $\frac{1}{16}$, scales on beveled edges of $\frac{1}{16}$, $\frac{1}{8}$, $\frac{3}{16}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1 inch to the foot. The main joint is graduated at 45, 60 and 90 degrees. . . . . " 1 25

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K & E
PATENT FOLDING
STEEL POCKET RULES.

SPRING JOINTS.



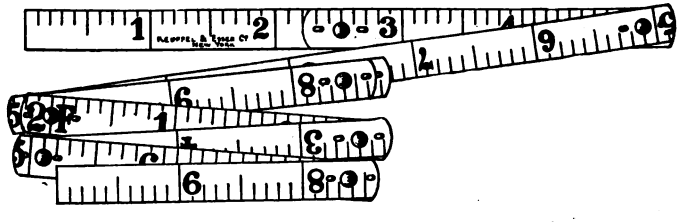
No. 1727.

These Rules are made of carefully tempered spring steel, 3/8 in. wide and graduated on both sides. They fold up smaller than any other rule; the 12-fold three-foot rule is only 3/8 in. thick X 3 3/4 in. long when folded.

The divisions are sharp and accurate and the numbering is very distinct. It runs in opposite directions on the two sides. The aligning springs at the joints hold the rule in a rigid straight line when it is opened, without in any way interfering with folding it.

Divided: 1/16 × 1/16 in.

1725.	K & E Steel Pocket Rule,	1 foot,	4 fold	each	$ 25
1726.	do.	do.	2 " 8 "	"	50
1727.	do.	do.	3 " 12 "	"	75



No. 1727 D. (100ths-foot side.)

Divided: 1/16 in. × 1/100 ft.

1725 D.	K & E Steel Pocket Rule	1 foot,	4 fold	each	$ 40
1726 D.	do.	do.	2 " 8 "	"	70
1727 D.	do.	do.	3 " 12 "	"	1 00

As the rules 1725 D to 1727 D have one side divided to 10ths and 100ths of a foot, they are useful to the Civil Engineer in connection with measuring with tapes or band chains. The numbering on these rules begins at the same end on both sides.

Divided: 1/16 in. × mm.

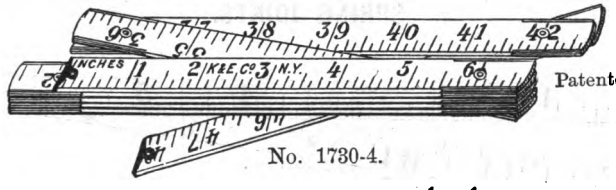
1728.	K & E Steel Pocket Rule, **metric**, 3 foot 12 fold	each	$ 1 00
	Leather Sheaths for any of the above rules	"	05

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K & E

PATENT FOLDING RULES.

SPRING JOINTS, HARDWOOD, YELLOW FINISH; 5/8 IN. WIDE.



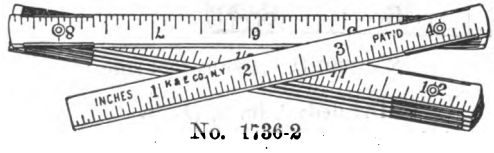
No. 1730-4.

1730-2.	K & E Pocket Rule,		2	feet,	4	fold,	div.	$\frac{1}{16}\times\frac{1}{16}$	in.,	**metal tips**	each	$	20
1730-3.	do.	do.	3	"	6	"	"	do	"	"	"	"	25
1730-4.	do.	do.	4	"	8	"	"	do.	"	"	"	"	38
1730-5.	do.	do.	5	"	10	"	"	do.	"	"	"	"	45
1730-6.	do.	do.	6	"	12	"	"	do.	"	"	"	"	55
1730-8.	do.	do.	8	"	16	"	"	do.	"	"	"	"	75
1730-4 F.	K & E Pocket Rule, **numbered feet and inches,**												
			4	feet,	8	fold,	div.	$\frac{1}{16}\times\frac{1}{16}$	in.,	"	"	"	38
1730-5 F.	do.	do.	5	"	10	"	"	do.	"	"	"	"	45
1730-6 F.	do.	do.	6	"	12	"	"	do.	"	"	"	"	55
1730-8 F.	do.	do.	8	"	16	"	"	do.	"	"	"	"	75
1730-4D.	K & E Pocket Rule,		4	feet,	8	fold,	div.	$\frac{1}{16}$	in. $\times\frac{1}{100}$	ft.,	"	"	38
1730-6D.	do.	do.	6	"	12	"	"	do.	"	"	"	"	55
1732-4.	do. **metric**	do.	4	"	8	"	"	$\frac{1}{16}$	in. $\times$ **mm.**	"	"	"	38

Nos. 1730-2 to 1732-4 are provided with ingenious spring joints, which hold the rule in a straight line when open, so that vertical or horizontal distances may be easily measured. The ends are provided with **metal tips** (see note on opposite page).

SPRING JOINTS, HARDWOOD, YELLOW FINISH; 3/8 in. WIDE.

NARROW.



No. 1736-2

1736-2.	K & E Pocket Rule,		2	feet,	6	fold,	$\frac{1}{16}\times\frac{1}{16}$	in.,	**metal tips,**		each	$	30
1736-3.	do.	do.	3	"	9	"	do.	do.		"	"	"	40
1737-2.	do.	do.	2	"	6	"							
			$\frac{1}{10}\times\frac{1}{100}$		feet on both sides,					"	"	"	30

No. 1736-2 to 1737-2 are made like numbers 1730-2, etc., but are in 4-inch joints and only ¾ in. wide. The 3 foot rule, when closed, measures only ¾ x ⅝ x 5 inches. These miniature rules are therefore very convenient for the pocket. They are just as accurate as the larger rules.

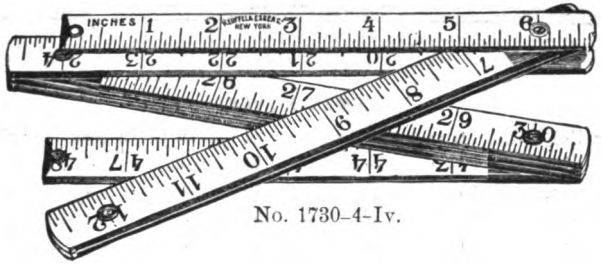
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K & E
IVORINE PATENT FOLDING RULES.

Ivorine Pocket Rules are similar to the celebrated K & E Folding Pocket Rules, but have a white coating on which the black graduations and figures are much more distinct and legible than on the yellow rules. This coating is very durable and permanent, resists heat and moisture and can be cleaned with water, alcohol or oil, so that the nice appearance and distinctness of the rule can be preserved.

The ends of the rule are protected against wear by metal tips of a very practical patented device. They do not obscure the graduations and are securely fastened in place without rivets and flush with the rule. They preserve the correctness of the rule.

SPRING JOINTS, HARDWOOD, IVORINE FINISH; 5/8 IN. WIDE.

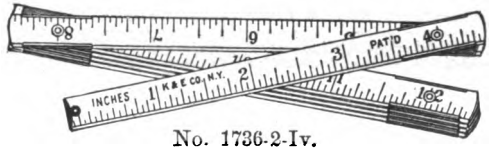


No. 1730-4-Iv.

1730-2-Iv.	Ivorine	Pocket	Rule,	2	ft.,	4	fold,	div. $\frac{1}{16}\times\frac{1}{16}$ in.,	**metal tips,**	each	$		30
1730-3-Iv.	do.	do.	do.	3	"	6	"	"	do.	"	"	"	"	40
1730-4-Iv.	do.	do.	do.	4	"	8	"	"	do.	"	"	"	"	50
1730-5-Iv.	do.	do.	do.	5	"	10	"	"	do.	"	"	"	"	65
1730-6-Iv.	do.	do.	do.	6	"	12	"	"	do.	"	"	"	"	85
1730-8-Iv.	do.	do.	do.	8	"	16	"	"	do.	"	"	"	"	1 10
1730-4-D-Iv.	do.	do.	do.	4	"	8	"	"	$\frac{1}{16}$ in. $\times\frac{1}{100}$ ft	"	"	"		50
1730-6-D-Iv.	do.	do.	do	6	"	12	"	"	do.	do.	"	"	"	85
1730-4-M-Iv.	do.	do.	metric	4	"	8	"	"	$\frac{1}{16}$ in. $\times$ mm.		"	"	"	50

SPRING JOINTS, HARDWOOD, IVORINE FINISH; 3/8 IN. WIDE.

NARROW.



No. 1736-2-Iv.

1736-2-Iv.	Ivorine	Pocket	Rule,	2	ft.,	6	fold,	div. $\frac{1}{16}\times\frac{1}{16}$ in.,	**metal tips,**	each	$		50
1736-3-Iv.	do.	do.	do.	3	"	9	"	"	do.	do.	"	"	"	60
1737-2-Iv.	do.	do.	do.	2	"	6	"	"	$\frac{1}{100}$ ft. $\times\frac{1}{100}$ ft.		"	"		50
1737-M-Iv.	do.	do.	do.	1	meter,	10	fold,	div. $\frac{1}{16}$ in. $\times$ mm.			"	"		60

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ROLLING PARALLEL RULES.

FINEST QUALITY.

Our Metal Rolling Parallel Rules are constructed to insure the greatest possible accuracy of motion and are also much heavier than those generally offered. The metal guard over the axle is so shaped that it forms a convenient handle.



No. 1751.

GERMAN SILVER.

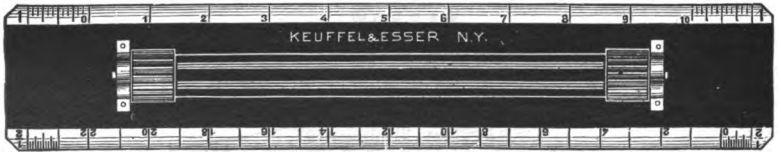
1750.	Parallel Rule,	9	in.,	weight	about	24	oz.,	in plain	Box	.	each	$	8 50
1751.	do.	12	"	"	"	32	"	"	"	.	"		10 00
1752.	do.	15	"	"	"	40	"	"	"	.	"		12 00
1753.	do.	18	"	"	"	54	"	"	"	.	"		15 00
1754.	do.	24	"	"	"	72	"	"	"	.	"		20 00
1754 H.	do.	24	"	"	"	10	lb.	"	"	.	"		35 00

Parallel Rule No. 1754H is extra heavy (about ⅜ in. thick) and is recommended as the most reliable parallel rule for the most accurate work.

BRASS.

1755.	Parallel Rule,	9	in.,	weight	about	24	oz.	in plain	Box	.	each	$	7 25
1756.	do.	12	"	"	"	32	"	"	"	.	"		8 50
1757.	do.	15	"	"	"	40	"	"	"	.	"		10 00
1758.	do.	18	"	"	"	54	"	"	"	.	"		12 00
1759.	do.	24	"	"	"	72	"	"	"	.	"		18 00

Mahogany Boxes for Nos. 1750 to 1759 — 9 in. each $ 1 00; 12 in. 1 10; 15 in. 1 25; 18 in. 1 35; 24 in. 1 50



No. 1760.

1760.	Ebony Rolling Parallel Rule, Brass mountings, white edges, div. ⅛, ¼, ½, 1 in. to the foot,					12	in.,				each	$	5 00
1761.	do.		do.		do.	15	"				"		6 50
1762.	do.		do.		do.	18	"				"		7 50

See Note about Ebony page 201.

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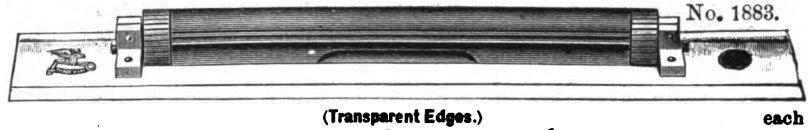
ROLLING PARALLEL RULES (CONTINUED)



No. 1767.

1765. Ebony Rolling Parallel Rule, Brass mountings, 9 in. . . each $2 75
1766. do. do. " " 12 " . . " 3 25
1767. do. do. " " 15 " . . " 4 00
1768. do. do. " " 18 " . . " 5 00

1780-1785. Folding Parallel Rules, see below.



No. 1883.

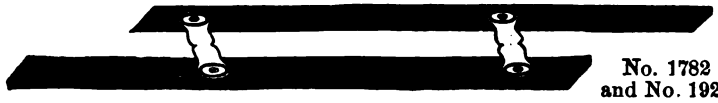
(Transparent Edges.) each

1881. Xylonite Lined Rolling Parallel Rule, Nickelplated Mountings, 9 in. $3 50
1882. do. do. do. do. " " 12 " 4 25
1883. do. do. do. do. " " 15 " 5 00
1884. do. do. do. do. " " 18 " 6 00
1885. do. do. do. do. " " 24 " 8 00

These Parallel Rules are substantially made and very accurate. The metal guard over the axle materially adds to their weight. The blade is of maple with beveled transparent Xylonite edges.

1886. Xylonite Lined Straight Edges, see page 214.

FOLDING PARALLEL RULES.



No. 1782 and No. 1922.

KEUFFEL & ESSER Co's. **EBONY** Parallel Rules, Nickelplated Brass Bars,

	1780	1781	1782	1783	1784	1785
	6	9	12	15	18	24 in.
each	$ 50	70	90	1 10	1 50	2 25

1796-1798. Sigsbee's Parallel Rules, see below.

1920. **HARD RUBBER** Folding Parallel Rule, Nickelplated Bars, 6 in., each $ 75
1921. " " " do. " " 9 " " 1 00
1922. " " " do. " " 12 " " 1 25
1923. " " " do. " " 15 " " 1 50
1924. " " " do. " " 18 " " 1 75
1925. " " " do. " " 24 " " 2 50

2000-2065. Metal Drawing Tools, see page 219.

SIGSBEE'S PATENT PARALLEL RULES.



No. 1796.

1796. Sigsbee's Patent Parallel Rules, Ebony, 15 in., ... each $ 3 00
1797. " " " " " 18 " . . . . . " 4 00
1798. " " " " " 24 " . . . . . " 5 00

These Parallel Rules have nickelplated brass mountings and the bars are pivoted, so that the rule can be laid over, (stepping) to cover any distance.

1802, 1804, Black Xylonite Triangles, see page 200.

See Note about Ebony, page 201.

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DRAWING TOOLS.

HARD RUBBER, XYLONITE, WOOD.
(TRANSPARENT)





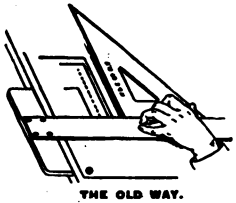


To insure buyers that they are obtaining K & E drawing tools, triangles, curves, etc., we stamp each piece with our firm name and trade mark.

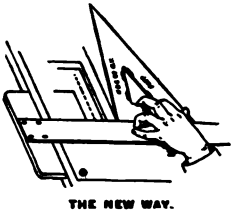




IMPROVED TRIANGLES.



THE OLD WAY.



THE NEW WAY.

The K & E Co. Improved Hard Rubber and Xylonite Triangles have bevels on their inner edges from opposite faces (surfaces) so that they can be readily picked up by catching the finger nail under the bevel when taking hold of them, thus avoiding blurring of fresh ink lines.

LIST OF NUMBERS.

To facilitate selecting, we list all tools of the same kind but of different material in one group, instead of grouping them according to material, as heretofore. We retain the familiar catalogue numbers, which we repeat in their natural sequence, to facilitate locating any desired article in the new groupings by its catalogue number.

1155.	Templet Odontograph	page 203
1156.	Duplex Angle	" 202
1802. 1804.	Hard Rubber Triangles	" 200
1820.	Irregular Curves, Hard Rubber	" 205
1836. 1836S.	Ship Curves, Hard Rubber	" 207
1837.	Mechanical Engineer's Curves, Hard Rubber	" 205

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1840–1847T. Railroad Curves, Hard Rubber . . . . . page 209
1848. Curve Radiator, Hard Rubber . . . . . " 212
1855–1856. Triangles, Xylonite . . . . . " 200
1857 A. B. Roof Pitch, Embankment, Triangles . . . . . " 202
1858, 1859. Lettering Triangles and Templets . . . . . " 202
1859 B. Splines, Black Xylonite . . . . . " 208
1860. Irregular Curves, Xylonite . . . . . " 205
1861. Logarithmic Spiral Curve . . . . . " 203
1862-1862D. Ellipses, Hyperbolas, Parabolas, Xylonite . . . . . " 203
1863. Mechanical Engineer's Curves, Xylonite . . . . . " 205
1864–1865S. Ship Curves, Xylonite . . . . . " 207
1881–1885. Parallel Rules, Xylonite . . . . . " 197
1886. Straightedges, Xylonite lined . . . . . " 214
1887, 1888. T Squares, Xylonite lined . . . . . " 217
1891–1891G. Railroad Curves, Xylonite . . . . . " 211
1891 R. Curve Radiator, Xylonite . . . . . " 212
1920–1925. Parallel Rules, Hard Rubber . . . . . " 197
2000–2008. Metal Triangles . . . . . " 219
2018–2030. Metal Straightedges . . . . . " 220
2040–2065. Steel T Squares . . . . . " 221
2100–2165. Wooden Triangles . . . . . " 201
2170. Irregular Curves, Pearwood . . . . . " 205
2175–2179. Adjustable Curve Rules . . . . . " 208
2180–2184. Ellipses, Hyperbolas, Parabolas, Pearwood . . . . . " 203
2185. Splines, Pearwood . . . . . " 208
2186–2187. Spline Weights . . . . . " 208
2190. Set of Splines . . . . . " 208
2195–2195S. Ship Curves, Pearwood . . . . . " 207
2200–2209. Railroad Curves, Pearwood . . . . . " 213
2210–2212. Railroad Curves, Cardboard . . . . . " 213
2250–2270. Straightedges, Wooden . . . . . " 214
2280, 2281. Bars for Beam Compasses . . . . . " 214
2300–2420. T Squares, Wooden . . . . . " 215
2450–2453. Centrolineads . . . . . " 218

For Metal Triangles, Straightedges, T-squares, see page 219, &c.

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BLACK XYLONITE TRIANGLES.

"Copyright. 1887, by Keuffel & Esser."



No. 1802.



1804.

1802. **Improved** Hard Rubber Triangles, 30 × 60 degrees,

	4	6	8	10	12	14	16 in.
each $	20	30	45	55	75	1 10	1 50

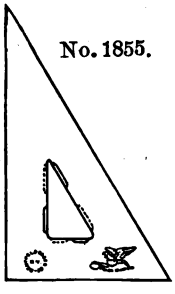
1804. **Improved** Hard Rubber Triangles, 45 degrees,

	4	6	8	10	12	14	16 in.
each $	30	45	55	75	1 15	1 60	2 30

1820. Irregular Curves, see page 205.

XYLONITE (Transparent) TRIANGLES.

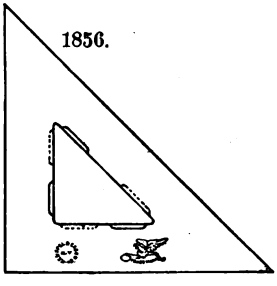
The Xylonite which we use in manufacturing our goods, is made specially for such tools, and stands up better than the material generally used.



No. 1855.



1855-1



1856.

1855. **Improved** Xylonite Triangles (transparent), 30 × 60 degrees,

	4	5	6	7	8	9	10	11	12	13	14	16 in.
each $	25	35	40	45	55	65	75	85	1 00	1 25	1 65	2 50

1855-1. **Improved** Xylonite Triangles (transparent), 22½ × 67½ degrees,

	4	6	8	10	12	14	16 in.
each $	25	40	55	75	1 00	1 65	2 50

1856. **Improved** Xylonite Triangles (transparent), 45 degrees,

	4	5	6	7	8	9	10	11	12	13	14	16 in.
each $	35	45	55	65	75	95	1 10	1 35	1 65	1 90	2 20	3 15

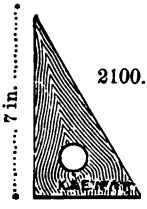
See page 198: "Improved Triangles."

1857 A. Roof pitch Triangles, see page 200.

For sequence of numbers, see list page 198.

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WOODEN TRIANGLES.



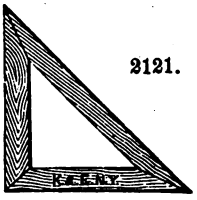
2100.



2106.



2110.



2121.

Pearwood Triangles; **solid**, 30 × 60 degrees,

No.	2100	2101
	7	9 in.
each $	10	12

Pearwood Triangles, **solid**, 45 degrees,

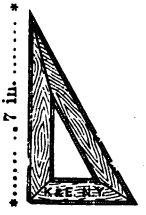
No.	2105	2106
	6	8 in.
each $	10	12

Pearwood Triangles, **framed** 30 × 60 degrees,

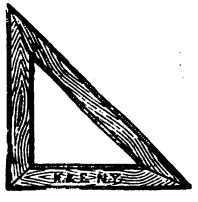
No.	2110	2111	2112	2113
	7	9	11	14 in.
each $	18	24	30	35

Pearwood Triangles, **framed**, 45 degrees,

No.	2120	2121	2122	2123
	6	8	10	12 in.
each $	18	24	30	35



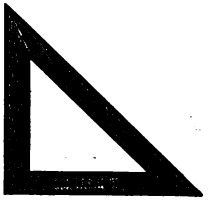
No. 2130



2141.



2150.



2161.

Pearwood lined Triangles, 30 × 60 degrees,

No.	2130	2131	2132	2133	2134
	7	9	11	14	17 in.
each $	25	30	40	50	75

Pearwood lined Triangles, 45 degrees,

No.	2140	2141	2142	2143	2144
	6	8	10	12	14 in.
each $	25	30	40	50	75

Mahogany Triangles, **Ebony lined**, 30 × 60 degrees,

No.	2150	2151	2152	2153	2154	2155
	7	9	11	14	17	20 in.
each $	30	40	55	75	1 20	1 50

Mahogany Triangles, **Ebony lined** 45 degrees,

No.	2160	2161	2162	2163	2164	2165
	6	8	10	12	14	16 in.
each $	30	40	55	75	1 20	1 50

2170 Irregular Curves, see page 205.

EBONY.

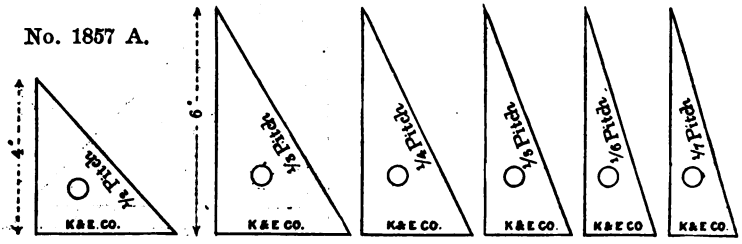
On account of the extreme scarcity of real Ebony, the trades using this material have been forced to substitute stained wood of various kinds, while they have retained the designation Ebony.

We have followed this custom in describing our goods, although we furnish BLACK BOXWOOD where we designate Ebony. We have adopted black BOXWOOD because it is even superior to Ebony in hardness, smoothness and color.

For sequence of numbers, see list page 198.

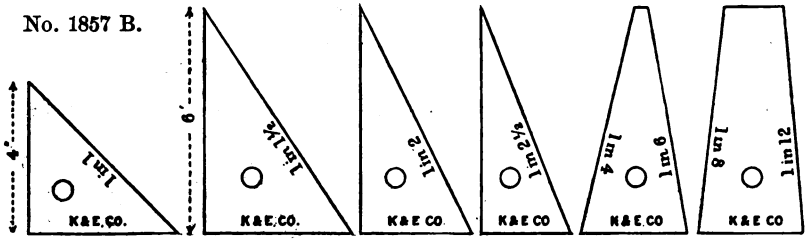
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No. 1857 A.

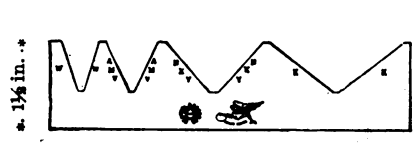


1857A. Xylonite Triangles for roof pitches, 6 in set . . . . . set $ 3 00

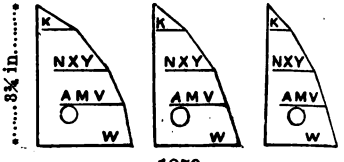
No. 1857 B.



1857B. Xylonite Triangles for embankments, 8 slopes on 6 templets, set $ 4 50



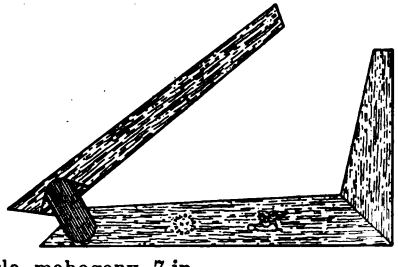
No. 1858.



1859.

1858. Xylonite Lettering Templets, 3 in set . . . . . set $ 2 00
1859. Xylonite Lettering Triangles, 3 in set . . . . . " 1 50
1859B. Black Xylonite Splines, see page 208.

DUPLEX ANGLE.



No. 1156

1156. Duplex Angle, mahogany, 7 in . . . . . each $ 1 00

The Duplex Angle is practically a right-angle triangle with a movable hypotenuse, the joint of which will retain, by friction, any angle to which it is set. It is therefore specially adapted for transferring or copying angles.

As the Duplex Angle lies flush on either side it can be used for drawing equal angles in opposite directions, a great advantage in drawing roof pitches, teeth of gear wheels, sides of taper arms of wheels, polygons, etc.

For sequence of numbers, see list page 198.

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COPENHAGEN SHIP CURVES

Pattern No.	Hard Rubber No. 1836. each	Xylonite transparent No. 1864. each	Pearwood No. 2195. each	Pattern No.	Hard Rubber No. 1836. each	Xylonite transparent No. 1864. each	Pearwood No. 2195. each	Pattern No.	Hard Rubber No. 1836. each	Xylonite transparent No. 1864. each	Pearwood No. 2195. each
31	$1 00	$1 25	$	72	$ 40	$ 50	$	113	$ 40	$ 50	$ 30
32	1 00	1 25	70	73	40	50		114	35	45	30
33	1 00	1 25		74	40	50	30	115	40	50	30
34	1 00	1 25	70	75	40	50		116	40	50	
35	1 00	1 25		76	40	50		117	35	45	
36	1 00	1 25	70	77	40	50		118	25	30	
37	1 00	1 25		78	40	50	30	119	35	45	30
38	1 00	1 25	70	79	40	50		120	35	45	
39	1 00	1 25		80	40	50		121	30	40	25
40	1 00	1 25	70	81	40	50	30	122	30	40	
41	1 00	1 25		82	40	50	30	123	25	30	
42	1 00	1 25		83	40	50	30	124	25	30	
43	1 00	1 25	70	84	40	50		125	25	30	
44	1 00	1 25		85	40	50		126	25	30	
45	1 00	1 25	70	86	40	50		127	25	30	
46	1 00	1 25		87	50	65	40	128	30	40	
47	1 00	1 25	70	88	60	75		129	40	50	30
48	80	1 00	60	89	60	75	50	130	40	50	30
49	60	75		90	50	65	40	131	40	50	30
50	60	75	50	91	50	65		132	40	50	
51	60	75		92	40	50		133	40	50	
52	50	65		93	40	50		134	40	50	
53	50	65	40	94	35	45	30	135	40	50	
54	80	1 00		95	40	50		136	35	45	
55	50	65	40	96	40	50		137	30	40	25
56	1 00	1 25		97	40	50		138	40	50	
57	60	75		98	50	65	40	139	40	50	
58	60	75		99	40	50		140	40	50	30
59	60	75	50	100	40	50		141	40	50	
60	50	65	40	101	40	50		142	40	50	
61	60	75		102	30	40	25	143	35	45	
62	60	75	50	103	35	45		144	40	50	30
63	60	75	50	104	30	40		145	40	50	
64	60	75		105	35	45		146	40	50	
65	60	75	50	106	40	50		147	40	50	
66	40	50	30	107	40	50	30	148	40	50	30
67	40	50		108	40	50		149	40	50	30
68	40	50		109	50	65		150	40	50	
69	40	50	30	110	60	75		151	40	50	30
70	40	50		111	40	50					
71	40	50		112	50	65					

In ordering, state catalogue and pattern number.
Numbers not listed in pearwood can not be so furnished.

1836 S. Set of 121 **Hard Rubber** Copenhagen Ship Curves, No. 31 to 151, as listed above under No. 1836, in hardwood Case . Set $ 56 00

1837. Mech. Engineer's Curves, see page 205.

1865 S. Set of 121 **Xylonite** (transparant) Copenhagen Ship Curves, No. 31 to 151, as listed above under No. 1864, in hardwood Case . . . . . " 70 00

1866. Protractors, see page 169.

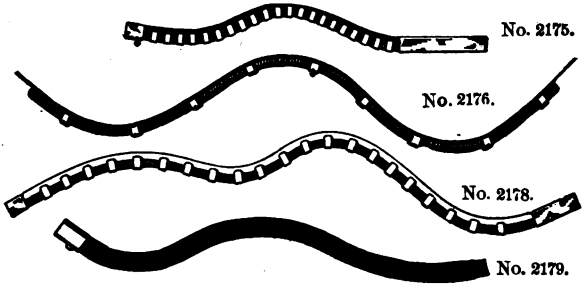
2195 S. Set of 45 **Pearwood** Copenhagen Ship Curves, cont'g one each curve as listed above under No. 2195, in hardwood Case " 18 00

2000. Metal Triangles, see page 219.

For sequence of numbers, see list page 198.

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ADJUSTABLE CURVE RULES.



These patent curve rules consist of a ruling edge of rubber (except No. 2176, which has steel ruling edge) in combination with a bar of soft lead. They will hold any curve into which they are bent.

2175. Adjustable Curve Rule, 14½ in. long . . . . . each $ 2 25
2176. do. do. 30 " " . . . . . " 3 30
2177. do. do. cheaper construction, 12 in. long " 1 00
2178. do. do. " " 24 " " " 1 75
2179. do. do. plain 7 15 31 in.
each $ .42 .87 1.70

2180. Wooden Ellipses see page 203.

SPLINES AND SPLINE WEIGHTS.



Section of 2185. Nos. 2185 with 2186 or 2186-1. 2187.

1859 B. **Black Xylonite** Splines, grooved,
12 18 24 30 36 42 48 in.
each $ 30 35 45 50 55 60 75

1860. Irregular Curves, see page 225.

2185. **Pearwood** Splines, grooved,
12 18 24 30 36 48 60 in.
each $ 10 15 20 25 30 40 50

These Splines are grooved as shown in the section, to admit the finger of the weights which hold them in position.

2186. Lead Weights for Splines, with finger, about 3¾ pounds . . each $ 85
2186-1. Lead do. " do " " " 8 " . . " 1 25
2187. Iron do. " do. (no finger) " 3¼ " . . " 50



"Copyright, 1894, by Keuffel & Esser Co."

2190. Set of Splines and Spline Weights in strong wooden Box, cont'g:
4 Spline Weights, No. 2186,
1 each Xylonite Splines, No. 1859B, 12, 18, 24, 30, 36, 42 in.
1 " Pearwood " " 2185, 12, 18, 24, 30, 36, 48 " set $ 10 00

2195. Pearwood Ship Curves, see page 207.

For sequence of numbers, see list page 198.

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K. & E. CO'S.

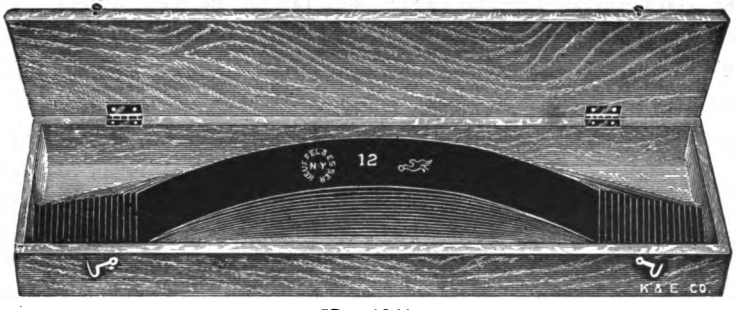
RAILROAD CURVES.



These curves are cut by special machinery and are true circular curves. They are the same on both edges, so that either edge can be used. Our curves will be found far more accurate than any others. Their edges have the same hand finish (not polish) as our other hard rubber and xylonite tools.

They are put up in wooden boxes, with partitions (except Nos. 1840, 1841, and 1891) to prevent warping of the curves from mutual pressure while in the box. Each compartment is plainly stamped with the value of the curves contained in it, so that the required curve is easily picked out.

HARD RUBBER RAILROAD CURVES.



No. 1841.



1840. Hard Rubber Railroad Curves, 10 in set, viz: 12, 24, 36, 48, 60, 72, 84, 96, 108, 120 in. radius, in wooden box . . set $ 7 00

1841. Hard Rubber Railroad Curves, 17 in set, viz: 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, 60 in. radius, in wooden box . . . . . " 12 00

1842. Hard Rubber Railroad Curves, 40 in set, viz: 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, 60, 66, 72, 78, 84, 90, 96, 102, 108, 114, 120 in. radius, 1 curve 1° to 100 foot scale, 57.30 in., 1 curve 2° to 100 foot scale, 28.65 in., in wooden **box with partitions.** (see cut, page 211.) . . . " 27 00

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1845. Hard Rubber Railroad Curves **with Tangent,** 55 in set, viz.: 3, 3½, 4, 4½, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 30, 32, 34, 35, 36, 38, 40, 45, 50, 55, 60, 65, 70, 75, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200 in. radius, in wooden **box with partitions.** (see cut, page 211.) set $ 40 00



1846. Hard Rubber Railroad Curves, **with Tangent, marked in degrees and inches** to scale 100 feet = 1 inch, 41 in set, viz.:

0°.30′ = 114.59 in.	3°.30′ = 16.37 in.	6° = 9.55 in.	8°.30′ = 6.75 in.
1°. = 57.30 "	3°.45′ = 15.28 "	6°.15′ = 9.17 "	8°.45′ = 6.55 "
1°.15′ = 45.84 "	4° = 14.33 "	6°.30′ = 8.82 "	9° = 6.37 "
1°.30′ = 38.20 "	4°.15′ = 13.48 "	6°.45′ = 8.49 "	9°.15′ = 6.20 "
1°.45′ = 32.74 "	4°.30′ = 12.73 "	7° = 8.19 "	9°.30′ = 6.04 "
2° = 28.65 "	4°.45′ = 12.07 "	7°.15′ = 7.91 "	9°.45′ = 5.88 "
2°.15′ = 25.47 "	5° = 11.46 "	7°.30′ = 7.64 "	10° = 5.74 "
2°.30′ = 22.92 "	5°.15′ = 10.92 "	7°.45′ = 7.40 "	10°.30′ = 5.46 "
2°.45′ = 20.84 "	5°.30′ = 10.42 "	8° = 7.17 "	11° = 5.22 "
3° = 19.10 "	5°.45′ = 9.97 "	8°.15′ = 6.95 "	11°.30′ = 4.99 "
3°.15′ = 17.63 "			

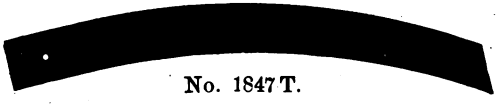
in wooden **box with partitions.** (see cut, page 211.) . . . . set $ 30 00

These Hard Rubber Railroad Curves are made to correct radii, to a scale of 1 inch = 100 feet, both edges having the same radius. Formula: radius = ½ chord ÷ sin. ½ angle = 50 ÷ sin. ½ angle. The short tangents are very useful, as they enable correct locating of the beginning of the curve on the drawing by means of the radial line separating the tangent from the curve.

SEPARATE RAILROAD CURVES.



No. 1847.



No. 1847 T.

Railroad Curves as described above, to any desired scale or radius, cut to order.

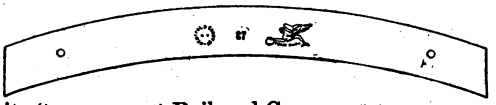
1847. Separate Hard Rubber Railroad Curves . . . . each $ 75

1847 T. do. do. do. with Tangent . " 90

1855. Xylonite Triangles, see page 200.

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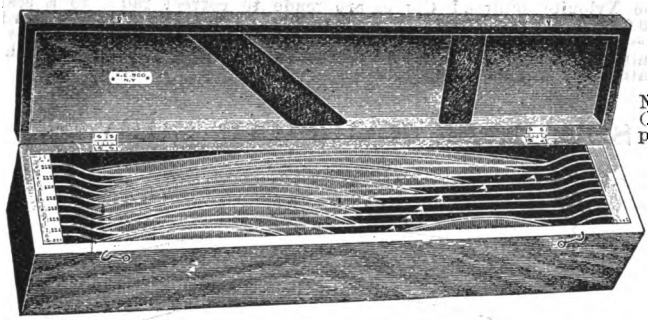
XYLONITE RAILROAD CURVES.



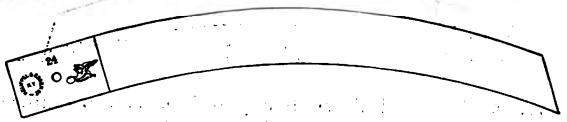
1891. Xylonite (transparent) Railroad Curves, 17 in set, viz: 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, 60 in. radius, in wooden box. (see cut No. 1841 page 209) set $ 15 00

1891 A. Xylonite (transparent) Railroad Curves, 30 in set, viz: 1½, 2, 2½, 3, 3½, 4, 4½, 5, 5½, 6, 7, 8, 9, 10, 11, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 35, 40, 45, 50, 60 in. radius, in wooden **box with partitions** . . . . . " 26 50

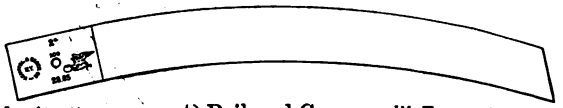
1891 B. Xylonite (transparent) Railroad Curves, 50 in set, viz.: 1½, 2, 2½, 3, 3½ 4, 4½, 5, 5½, 6, 6½, 7, 7½, 8, 8½, 9, 9½, 10, 10½, 11, 11½, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100, 110, 120 in. radius, in wooden **box with partitions** . " 42 00



No. 1891 C (Box with partitions)



1891 C. Xylonite (transparent) Railroad Curves, **with Tangent,** 55 in set, viz.: 3, 3½, 4, 4½, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21 22, 23, 24, 25, 26, 27. 28, 30, 32, 34, 35, 36, 38, 40, 45, 50, 55, 60, 65, 70, 75, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200 in radius, in wooden **box with partitions.** set $ 54 00



1891 D. Xylonite (transparent) Railroad Curves, **with Tangent, marked in degrees and inches,** to scale 100 feet = 1 inch, 41 in set, viz.:

0°.30′ = 114.59 in.	3°.30′ = 16.37 in.	6° = 9.55 in.	8°.30′ = 6.75 in.
1°. = 57.30 "	3°.45′ = 15 28 "	6°.15′ = 9.17 "	8°.45′ = 6.55 "
1°.15′ = 45.84 "	4° = 14.33 "	6°.30′ = 8.82 "	9° = 6.37 "
1° 30′ = 38.20 "	4°.15′ = 13.48 "	6°.45′ = 8.49 "	9°.15′ = 6.20 "
1°.45′ = 32.74 "	4°.30′ = 12.73 "	7°. = 8.19 "	9°.30′ = 6.04 "
2° = 28.65 "	4°.45′ = 12.07 "	7°.15′ = 7.91 "	9°.45′ = 5.88 "
2°.15′ = 25 47 "	5° = 11.46 "	7°.30′ = 7.64 "	10° = 5.74 "
2°.30′ = 22.92 "	5°.15′ = 10.92 "	7°.45′ = 7.40 "	10°.30′ = 5.46 "
2°.45′ = 20.84 "	5°.30′ = 10.42 "	8° = 7.17 "	11° = 5.22 "
3° = 19.10 "	5°.45′ = 9.97 "	8°.15′ = 6.95 "	11° 30′ = 4.99 "
3°.15′ = 17.63 "	in wooden **box with partitions.**		set $ 40 00

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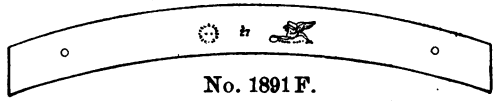
1891 E. Xylonite Railroad Curves, **with Tangent, marked in degrees and inches,** to scale 100 feet = 1 inch, 55 in set, viz.:

0°.15′ = 229.18 in.	3°.45′ = 15.28 in.	7°.15′ = 7.91 in.	11°.30′ = 4.99 in.
0°.30′ = 114.59 "	4° = 14.33 "	7°.30′ = 7.64 "	12°. = 4.78 "
0°.45′ = 76.39 "	4°.15′ = 13.48 "	7°.45′ = 7.40 "	12°.30′ = 4.59 "
1°. = 57 30 "	4°.30′ = 12.73 "	8° = 7.17 "	13° = 4.42 "
1°.15′ = 45 84 "	4°.45′ = 12 07 "	8°.15′ = 6.95 "	13°.30′ = 4.25 "
1°.30′ = 38.20 "	5° = 11 46 "	8°.30′ = 6 75 "	14° = 4.10 "
1°.45′ = 32.74 "	5°.15′ = 10.92 "	8°.45′ = 6.55 "	14°.30′ = 3.96 "
2°. = 28 65 "	5°.30′ = 10.42 "	9° = 6 37 "	15° = 3.83 "
2°.15′ = 25.47 "	5°.45′ = 9.97 "	9°.15′ = 6.20 "	16° = 3.59 "
2°.30′ = 22.92 "	6° = 9.55 "	9°.30′ = 6.04 "	17° = 3 38 "
2°.45′ = 20.84 "	6°.15′ = 9.17 "	9°.45′ = 5.88 "	18° = 3.20 "
3°. = 19.10 "	6°.30′ = 8.82 "	10°. = 5.74 "	19° = 3.03 "
3°.15′ = 17.63 "	6°.45′ = 8.49 "	10°.30′ = 5.46 "	20° = 2.88 "
3°.30′ = 16.37 "	7° = 8.19 "	11° = 5.22 "	

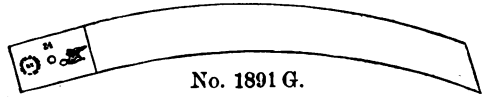
in wooden **box with partitions.** (see cut, page 211) set $ 54 00

These Xylonite Railroad Curves are made to correct radii, to a scale of 1 inch = 100 feet, both edges having the same radius. Formula: radius = ½ chord ÷ sin. ½ angle − 50 ÷ sin. ½ angle. The short tangents are very useful, as they enable the beginning of the curve to be correctly located on the drawing by means of the radial line separating the tangent from the curve.

SEPARATE RAILROAD CURVES.



No. 1891 F.

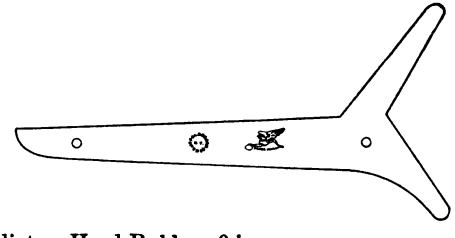


No. 1891 G.

Railroad Curves, as described above, to any desired scale or radius cut to order.

1891 F. Separate (transparent) Xylonite Railroad Curves. . . . . each $ 1 00
1891 G. do. do. do. do. with Tangent . " 1 20

CURVE RADIATORS.



No. 1891 R.

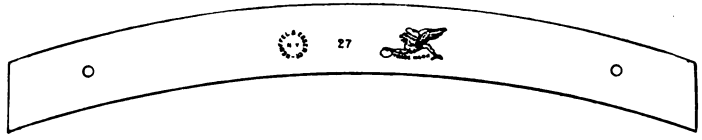
1848. Curve Radiator, Hard Rubber, 9 in. . . . . each $ 1 50
1891 R. Curve Radiator, Xylonite, (**transparent**) 9 in. . . . . each $ 2 00

A convenient tool for erecting perpendiculars on curves. It can be used on either the convex or the concave edge of the curve. The drawing edge of the arm gives the radial line.

2000. Metal Triangles, see page 219.

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PEARWOOD RAILROAD CURVES.

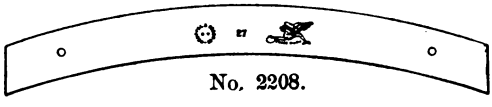


2200. Pearwood Railroad Curves, 10 in set, viz.: 12, 24, 36, 48, 60, 72, 84, 96, 108, 120 in. radius, in wooden Box . . . . . set $ 4 00

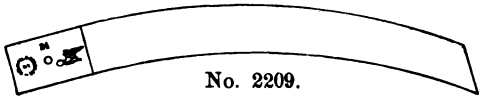
2202. Pearwood Railroad Curves, 17 in set, viz.: 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, 60 in. radius, in wooden Box . . . . . " 6 50

2204. Pearwood Railroad Curves, 44 in set, viz.: 3, 3½, 4, 4½, 5, 5½, 6, 6½, 7, 7½, 8, 8½, 9, 9½, 10, 12, 14, 16, 18, 20, 22, 24, 27, 30, 33, 36, 39, 42, 48, 54, 60, 66, 72, 78, 84, 90, 100, 110, 120, 130, 140, 160, 180, 200 in. radius, in wooden Box . . " 15 00

SEPARATE RAILROAD CURVES.



No. 2208.



No. 2209.

Railroad Curves, as described above, cut to order to any desired radius.

2208. Separate Pearwood Railroad Curves . . . . . each $ 50

2209. do. do. do. do. with Tangent . . . . . " 75

CARDBOARD RAILROAD CURVES.

2210. Cardboard Railroad Curves, 30 in set, viz.. 1½, 2, 2½, 3, 3½, 4, 4½, 5, 5½, 6, 7, 8, 9, 10, 11, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 35, 40, 45, 50, 60 in. radius, in wooden Box . set $ 6 00

2211. Cardboard Railroad Curves, 50 in set, viz.: 1½, 2, 2½, 3, 3½, 4, 4½, 5, 5½, 6, 6½, 7, 7½, 8, 8½, 9, 9½, 10, 10½, 11, 11½, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100, 110, 120 in. radius, in wooden Box . . . . . " 9 75

2212. Cardboard Railroad Curves, 100 in set, viz.: 1½, 2, 2½, 3, 3½, 4, 4½, 5, 5½, 6, 6½, 7, 7½, 8, 8½, 9, 9½, 10, 10½, 11, 11½, 12, 12½, 13, 13½, 14, 14½, 15, 15½, 16, 16½, 17, 17½, 18, 18½, 19, 19½, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 70, 75, 80, 85, 90, 95, 100, 110, 120, 130, 140, 150, 160, 180, 200, 220, 240 in. radius, in wooden Box . . " 18 00

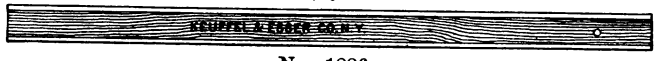
2250. Wooden Straightedges, see page 214.

For sequence of numbers, see list page 198.

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STRAIGHTEDGES.

"Copyright, 1894, by Keuffel & Esser Co."

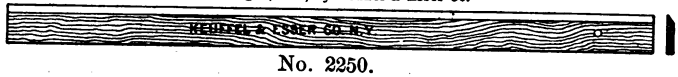


No. 1886.

1886. Xylonite Lined Straightedges, Maple, square edges,

	18	24	30	36	42	48	54	60 in.
each $	75	1 00	1 25	1 50	1 80	2 20	3 00	4 00

"Copyright, 1894, by Keuffel & Esser Co."

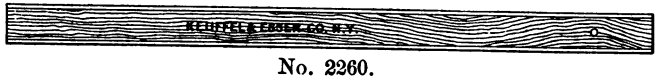


No. 2250.

2250. Pearwood Straightedges, thick, one edge beveled,

	12	15	18	24	30	36	42 in.
each $	12	15	20	25	30	40	50

"Copyright, 1894, by Keuffel & Esser Co."

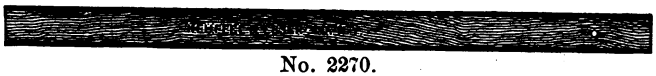


No. 2260.

2260. Hardwood lined Straightedges, thin, square edges,

	24	30	36	42	48	54	60	72	84	96	120 in.
each $	35	45	60	75	1 00	1 20	1 50	2 00	2 75	3 75	5 00

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No. 2270.

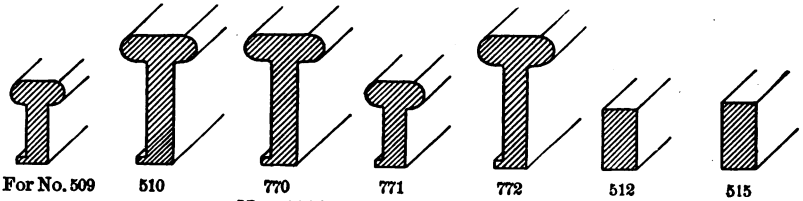
2270. Mahogany Straightedges, Ebony lined, thin, square edges,

	24	30	36	42	48	54	60	72 in.
each $	50	60	80	1 00	1 35	1 60	2 00	2 75

See Note about Ebony, page 201.

For Metal Straightedges see page 220.

BARS FOR BEAM COMPASSES.



For No. 509 | 510 | 770 | 771 | 772 | 512 | 515

No. 2280. 2281.

2280. Hardwood Bars for Beam Compasses Nos. 509, 510, 770, 771 and 772.

	24	30	36	42	48	60 in.
each $	30	35	40	45	55	70

2281. Hardwood Bars for Beam Compasses Nos. 512 and 515,

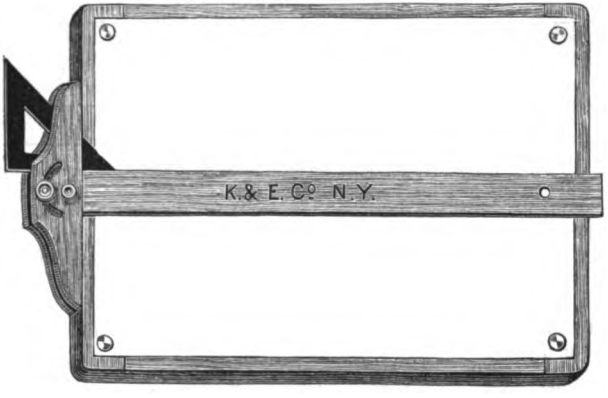
	24	30	36	42	48	60 in.
each $	20	25	30	35	40	50

In ordering these bars, please state catalogue number of beam compasses.

For sequence of numbers, see list page 198.

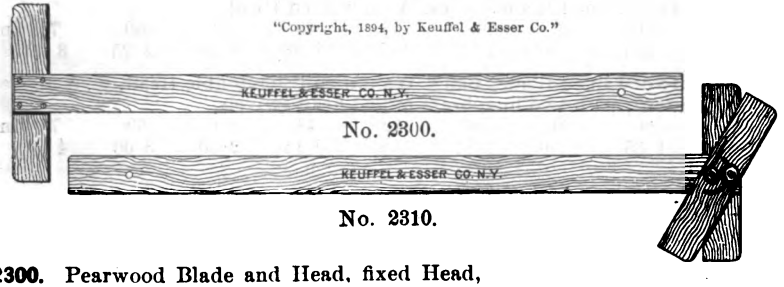
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WOODEN T SQUARES.



K. & E. CO. PATTERN.

We call attention to the K. & E. Co. pattern of double-head (shifting) T Squares. These T Squares have two swivels, of which the smaller serves as pivot on which the head shifts, while the larger, placed near the end of the blade for better leverage, and passing through an arched recess in the upper head, clamps the shifting head rigidly. The two heads of these T Squares are separated to the extent of the thickness of the blade, and either head is made to lie flush with the drawing board so that a triangle can be applied up to the edge of the board by passing it between the two heads of the T Square. A glance at the illustration will show the great superiority of these T Squares over all others.



No. 2300.

No. 2310.

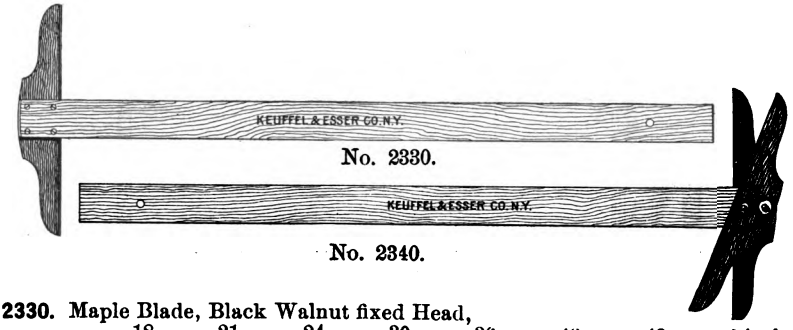
2300. Pearwood Blade and Head, fixed Head,

	15	18	21	24	30	36	42	48	in.
each $	25	28	30	35	45	55	65	90	

2310. Pearwood Blade and Head, shifting double Head K. & E. Co. pattern, with two brass milled-head swivels (the 15 and 18 in. squares have one swivel),

	15	18	21	24	30	36	42	48	in.
each $	70	75	80	90	1 00	1 15	1 25	1 50	

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No. 2330.

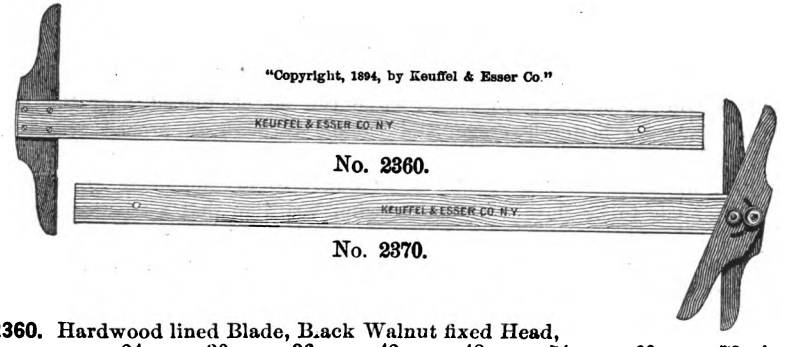
No. 2340.

2330. Maple Blade, Black Walnut fixed Head,

	18	21	24	30	36	42	48	54 in.
each $	45	50	60	75	90	1 05	1 20	140

2340. Maple Blade, Black Walnut shifting double Head, K. & E. Co. pattern, with two fine, brass milled-head swivels (the 18 in. square has one swivel),

	18	21	24	30	36	42	48	54 in.
each $	1 00	1 10	1 20	1 35	1 50	1 65	1 85	2 10


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No. 2360.

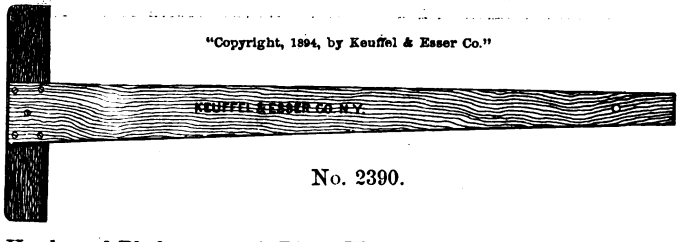
No. 2370.

2360. Hardwood lined Blade, Black Walnut fixed Head,

	24	30	36	42	48	54	60	72 in.
each $	75	90	1 05	1 25	1 50	1 75	2 25	3 00

2370. Hardwood lined Blade, Black Walnut shifting double Head, K. & E. Co. pattern, with two fine, brass milled-head swivels,

	24	30	36	42	48	54	60	72 in.
each $	1 35	1 50	1 65	1 85	2 15	2 50	3 00	4 00

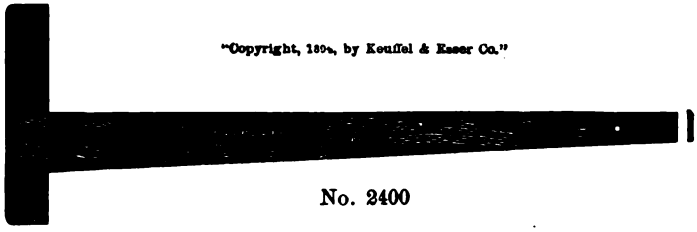

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No. 2390.

2390. Hardwood Blade, tapered, Black Walnut fixed Head,

	24	30	36	42	48 in.
each $	65	80	1 00	1 20	1 50

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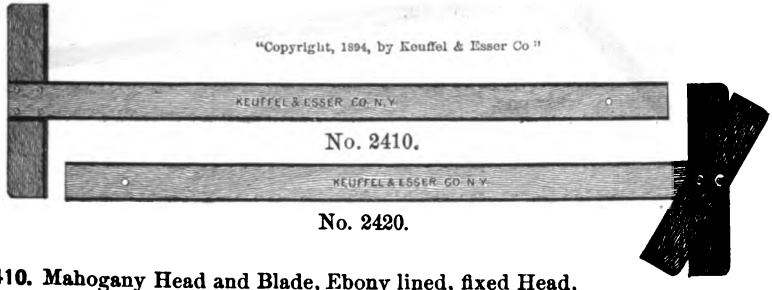


No. 2400

2400. Mahogany Head and Blade, Ebony lined, beveled edge, fixed Head.

The blade of Nos. 2390 and 2400 is tapered and very wide at the base, to prevent spring at the further (free) end. The drawing edge is in line with the middle of the head.

	24	30	36	42	48	54 in.
each	$ 1 00	1 20	1 40	1 60	1 85	2 25



No. 2420.

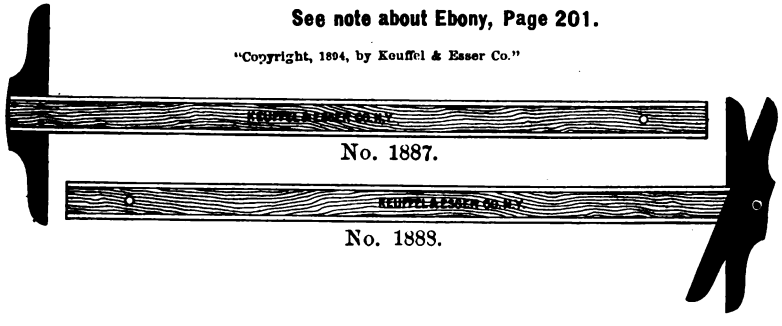
2410. Mahogany Head and Blade, Ebony lined, fixed Head,

	24	30	36	42	48	54 in.
each	$ 1 00	1 20	1 40	1 60	1 85	2 25

2420. Mahogany Head and Blade, Ebony lined, shifting double Head, K. & E. Co. pattern, with two fine brass milled-head swivels,

	24	30	36	42	48	54 in.
each	$ 1 75	2 00	2 25	2 50	2 80	3 25

See note about Ebony, Page 201.



1887. Xylonite Lined T Squares, Maple blade, ebonized fixed head,

	15	18	24	30	36	42	48	54	60 in.
each	$1 00	1 10	1 50	1 85	2 15	2 50	3 00	4 00	5 00

1888. Xylonite Lined T Squares, Maple blade, ebonized shifting head K. & E. Co. pattern, with 2 fine brass swivels. The 15 and 18-in. squares have one swivel.

	15	18	24	30	36	42	48	54	60 in.
each	$1 60	1 90	2 45	2 80	3 20	3 60	4 20	5 25	6 25

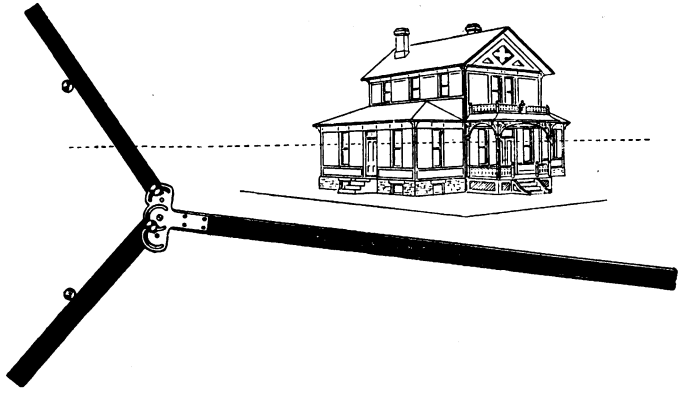
1891. Railroad Curves, see page 211.

For sequence of numbers, see list page 198.

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CENTROLINEADS

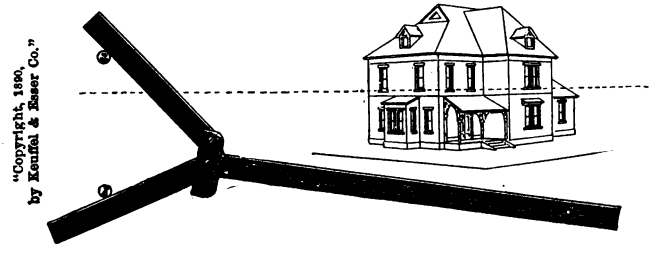
FOR PERSPECTIVE DRAWING.



2450. Centrolinead, Ebony, German silver mountings, Blade 42 in., Arms 15 in. with two Studs . . . . . each $ 11 00

See Note about Ebony, page 201.

2450-2. do. do. hardwood, ebonized, brass mountings, Blade 42 in., Arms 15 in., with two Studs, " 7 00



2451. Centrolinead, pearwood, brass swivels, with two Studs, Blade 24 in., Arms 10 in. each $ 3 00

2452. do. do. do. " 30 " " 11 " " 3 50

2453. do. do. do. " 36 " " 12 " " 4 00

Centrolineads are used when the vanishing point of a perspective drawing is beyond the drawing board. One of the blades can be shifted to the socket in the other end of the cross head, to use the instrument from the right-hand side.

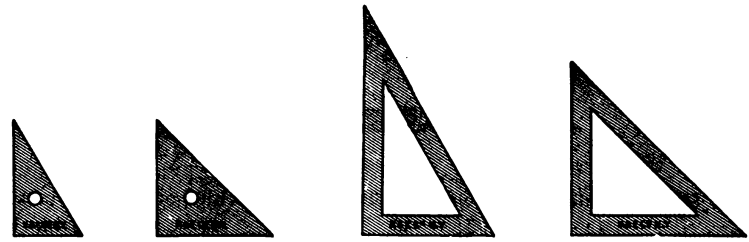
Directions furnished with Centrolineads.

2455. Printframes, see page 224.

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METAL TRIANGLES.

STEEL, NICKELPLATED.



No. 2000. 2001. 2002. 2003.

2000. Steel Triangles, **nickelplated**, solid, 30 × 60 degrees,

	2½	3	4	in.
each $	65	75	80	

2001. Steel Triangles, **nickelplated**, solid, 45 degrees,

	2	2⅞	in.
each $	65	75	

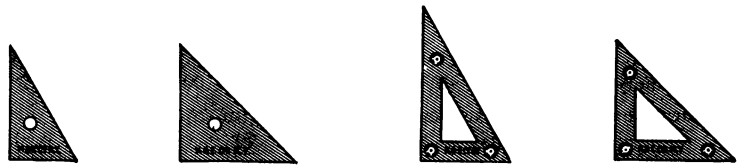
2002. Steel Triangles, **nickelplated**, open centre, 30 × 60 degrees,

	6	7	8	10½	15	in.
each $	3 20	3 50	3 85	4 25	6 50	

2003. Steel Triangles, **nickelplated**, open centre, 45 degrees,

	5	6½	8	10	12	in.
each $	3 20	3 50	4 25	5 50	6 50	

GERMAN SILVER.



No. 2005. 2006. 2007. 2008.

2005. German Silver Triangles, solid, 30 × 60 degrees,

	2	3	3¾	in.
each $	60	70	80	

2006. German Silver Triangles, solid, 45 degrees,

	2	2⅞	in.
each $	60	70	

2007. German Silver Triangles, open centre, 30 × 60 degrees,

	5½	7	8	10	12	14 in.
each $	2 50	2 75	3 00	4 00	5 00	6 50

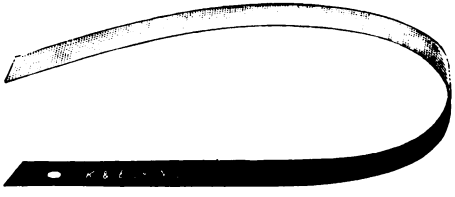
2008. German Silver Triangles, open centre, 45 degrees,

	5	6	8	10	12	in.
each $	2 50	2 75	4 00	5 00	6 50	

No. 2007 and 2008 have ivory buttons near the corners, to prevent soiling of the drawing. These buttons are thin and flat, to leave no impression on the paper.

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METAL STRAIGHTEDGES.



No. 2018.

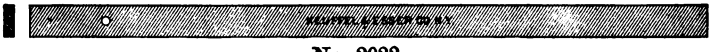
2018. Steel Straightedges, flexible, enameled, one side white, other side black.

15	18	24	30	36	42	48	60	72	in. long.
1½	1½	1½	1½	1½	2	2	2	2	in. wide.
each $1 00	1 20	1 60	2 20	2 65	3 10	3 70	4 60	5 50	

The Flexible Steel Straightedges are of well tempered spring steel 0.02 in. thick, and are coated with a flexible permanent enamel. They can be coiled up without injury, for carrying in hand baggage. (The 48-in. straightedge weighs but 10 oz.).



No. 2020.



No. 2022.



No. 2030.

2020. Steel Straightedges, nickelplated, with square edges,

15	18	24	30	36	42	48	60	72	in. long
1⅛	1¼	1½	1¾	2	2¼	2½	2¾	3	" wide
1/20	1/20	1/16	1/16	1/16	1/16	1/14	1/12	1/10	" thick
each $ 1 10	1 25	1 90	2 75	3 50	4 50	6 00	8 50	12 00	

2022. Steel Straightedges, nickelplated, extra heavy, with square edges,

36	42	48	60	72	84	96	in. long
2	2¼	2½	2¾	3	3¼	3½	" wide
1/8	9/64	5/32	11/64	3/16	13/64	7/32	" thick
each $ 5 25	6 60	8 25	11 25	14 75	19 00	24 00	

2030. Steel Straightedges, nickelplated, one edge beveled,

15	18	24	30	36	42	48	54	60	72	in. long
1⅛	1¼	1½	1¾	2	2¼	2½	2⅝	2¾	3	" wide
1/14	1/14	1/12	1/12	1/12	1/10	1/10	7/64	1/8	5/32	" thick
each $ 1 75	2 00	3 00	4 00	5 00	6 50	8 00	9 50	11 00	15 00	

2035. German Silver Straightedges, one edge beveled,

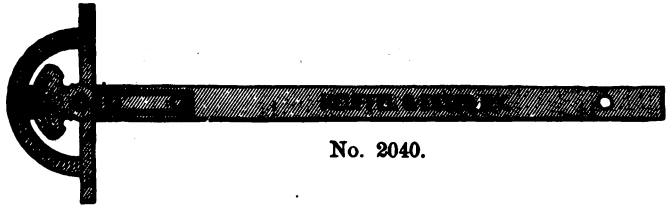
30	36	42	in. long
1¾	2	2¼	" wide
1/10	1/8	1/8	" thick
each $ 3 50	4 50	5 75	

D. Dividing **Metal** Straightedges to sixteenths inches . . . per foot. $ 1 00

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STEEL T SQUARES.

NICKELPLATED BLADES.

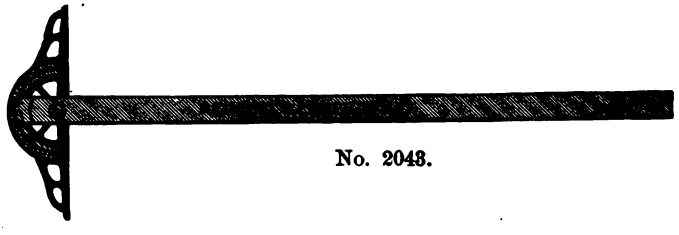


No. 2040.

2040. Protractor T Squares, Steel Blade **nickelplated** with **German silver** double Protractor Head, the outside one reading to 1 minute, the inside one to 5 minutes, both with vernier.

24	30	36	in. long
1¼	1½	1½	" wide
1/16	1/16	1/16	" thick
each $ 28 00	30 00	32 00	

The double protractor makes this T square especially adapted for plotting and of great advantage in mapping mine surveys.



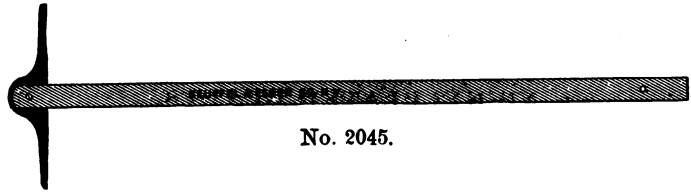
No. 2043.

2043. Protractor T Squares, Steel Blade **nickelplated,** shifting Bronze Head with Protractor divided to half-degrees, Vernier on end of blade, reading to minutes,

24	30	36	42	in. long
1¼	1½	1½	1¾	" wide
1/16	1/16	1/16	1/16	" thick
each $ 8 50	9 50	10 50	11 50	

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"Copyright 1894, by Keuffel & Esser Co."

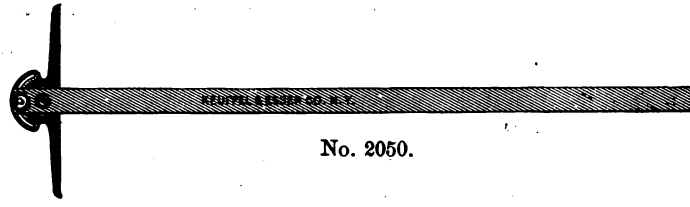


No. 2045.

2045. T Squares, Steel Blade, **nickelplated,** fixed enameled Steel Head,

	18	24	30	36	42 in. long
	1¼	1¼	1½	1½	1¾ " wide
	1/16	1/16	1/16	1/16	1/4 " thick
each	$ 3 00	3 50	4 50	5 50	6 50

"Copyright, 1894, by Keuffel & Esser Co."

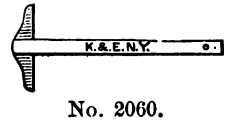


No. 2050.

2050. T Squares, Steel Blade, **nickelplated,** shifting enameled Steel Head, with nickelplated swivel,

	18	24	30	36	42 in. long
	1¼	1¼	1½	1½	1¾ " wide
	1/16	1/16	1/16	1/16	1/4 " thick
each	$ 4 25	4 75	5 75	6 75	7 75

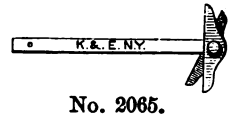
ENGRAVER'S T SQUARES.



No. 2060.

2060. Engraver's T Squares, Steel Blade, fixed brass head,

	4	6	8	10	12	in.
each	$ 1 00	1 25	1 50	2 00	2 50	



No. 2065.

2065. Engraver's T Squares, Steel Blade, shifting brass head, with swivel,

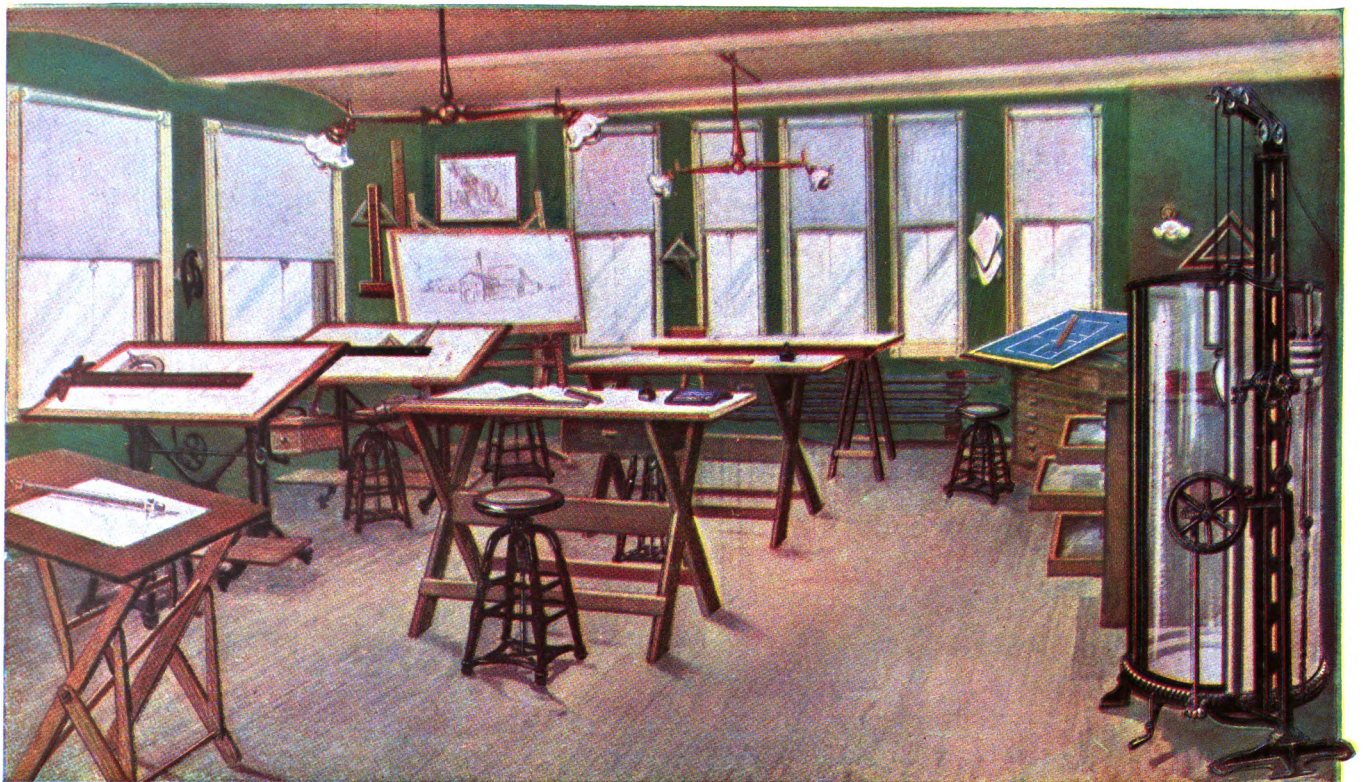
	4	6	8	10	12	in.
each	$ 1 25	1 50	1 75	2 25	2 75	

2100. Pearwood Triangles, see page 201.

For sequence of numbers, see list page 198.

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DRAFTING ROOM FURNITURE.

Our catalogue contains all Drafting Room Furniture in one group, thus facilitating the selection of this very important part of the office equipment of the Engineer, Architect and Draftsman.

The development of the making of Modern Drafting Room Furniture is of recent years, but it has made rapid strides and our assortment to-day comprises the latest and most complete line and the most improved designs in **Blueprinting Apparatus, Drawing Tables, Chests of Drawers, Filing Cabinets,** etc., for the Drafting Room of the professional and of schools.

All these goods are of our own manufacture and special facilities for making them have been provided in our factory. This is important, as it gives us absolute control of the quality of every component part of our products. Our workmanship is of the highest grade and we guarantee every piece of our Drafting Room Furniture to be exactly as we represent it.

The Hudson Drawing Tables No. 2591, pp. 248 to 251 are designed to meet the demand for a very substantial but inexpensive drawing table. While they are well made and compare very favorably with similar goods of other makes, they do not compare in quality and selection of material with our extra-fine office furniture here listed.

It is impossible to **show quality and finish** of such goods by illustration and description, and the buyer who does not want to be disappointed must rely on the reputation and standing of the manufacturer.

We are so well convinced of the superior quality of our Drafting Room Furniture that *we will take back, at our expense, any article which does not prove satisfactory to the buyer upon receipt.*

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K. & E. Co. Print Frames and Bath Trays.

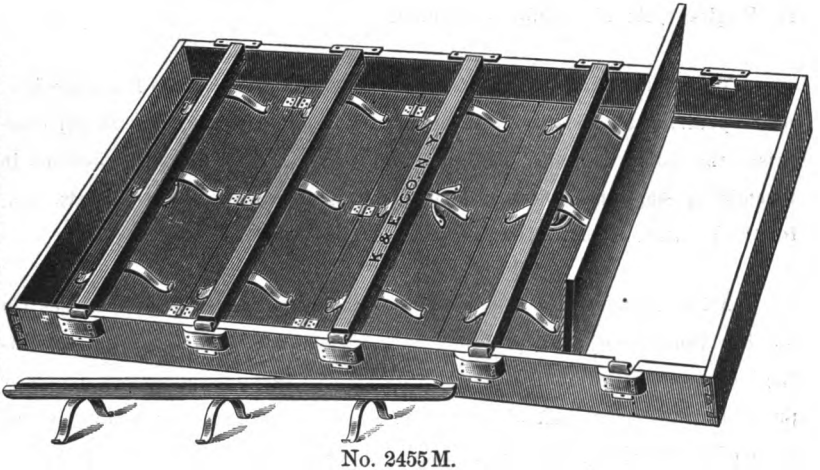
SUPERIOR QUALITY PRINT FRAMES OF SOLID OAK.

These print frames differ greatly from those usually offered. They are made of carefully selected, thoroughly seasoned oak, are of perfect workmanship and have brass trimmings. The springs are as heavy and as numerous as the strength of the glass will allow, to insure perfect contact. The spring catches for the bars are protected by wooden casings, as shown in the cut. The spring bars are metal-tipped at both ends to reduce wear. The frames are made to stand the exposure to the weather incidental to their use. The great advantage of solid oak frames of best quality and workmanship, over the cheaper kind, is their lesser liability to warp and shrink and thereby to break the glass.

For sizes larger than 24 × 30 in. only Plate Glass should be used, on account of its greater strength. It makes better prints and will be found more advantageous also for the smaller sizes.

The Pads listed with the frames are a thick elastic padded cotton fabric. (For Felt Pads see next page.)

"Copyright, 1897, by Keuffel & Esser Co."



No. 2455 M.

Ship'g weight frames about		Printing Surface	Frame only.	With cotton pad.	With pad and double thick glass.	With pad and polished plate glass.	Ship'g weight glass about
35 lb	2455 E.	20×24 in. . . . each	$ 7 60	$ 8 35	$ 10 00	$ 11 15	35 lb
40 lb	2455 G.	24×30 " . . . "	10 00	11 10	13 70	16 50	50 lb
70 lb	2455 H.	30×42 " . . . "	15 50	17 50		26 50	85 lb
85 lb	2455 L.	36×48 " . . . "	21 00	23 60		37 90	120 lb
120 lb	2455 M.	36×60 " . . . "	24 50	27 75		45 50	140 lb
140 lb	2455 O.	42×60 " . . . "	27 50	31 25		51 75	160 lb
170 lb	2455 P.	42×72 " . . . "	34 75	39 25		64 75	190 lb

The above prices cover crating for shipment.

Other sizes made to order.

In ordering Print Frames please state whether pad is wanted, and whether double-thick or polished plate glass, or none.

The Glass is packed by an expert glass-packer, but we are not responsible for breakage of glass in transit.

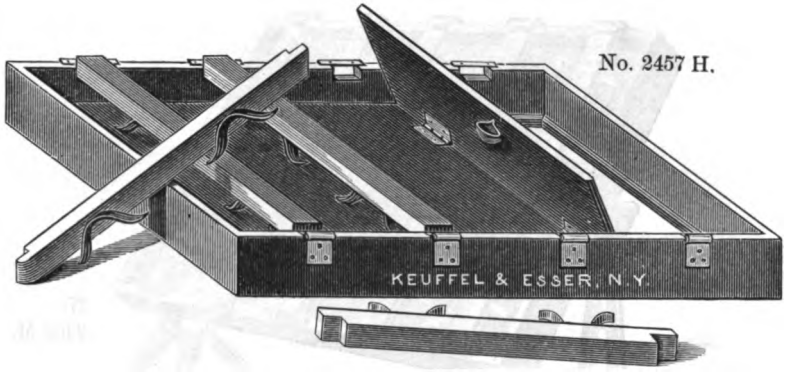
We insure Plate Glass against breakage, for consignee's account, unless instructed not to insure.

The prices on this page are f. o. b. New York. Owing to the relatively high cost of transportation we must add transportation charges when delivering these goods from our Branches.

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PRINT FRAMES.

TRADE QUALITY. (HARDWOOD.)



No. 2457 H.

Ship'g weight frames about		Printing Surface.		Frame only.	With cotton pad.	With pad and double thick glass.	With pad and polished plate glass.	Ship'g weight glass about
35 lb	2457 E.	20×24 in.	each	$ 6 80	$ 7 55	$ 9 20	$ 10 35	35 lb
40 lb	2457 G.	24×30 "	"	8 50	9 60	12 20	15 00	50 lb
70 lb	2457 H.	30×42 "	"	13 25	15 25		24 25	85 lb
85 lb	2457 L.	36×48 "	"	17 00	19 60		33 90	120 lb
120 lb	2457 M.	36×60 "	"	19 75	23 00		40 75	140 lb

PRINT FRAMES FOR PATENT OFFICE DRAWINGS, &c.

25 lb	2458 A.	11 × 16 in., hardwood, with double thick glass, felt pad, each	$ 4 15
30 lb	2458 C.	16 × 21 " " " " " " " " " "	6 25

The above prices cover crating for shipment.

See note on opposite page about packing of glass.

We insure Plate Glass against breakage, for consignee's account, unless instructed not to insure.

PADS FOR PRINT FRAMES.

	Padded Cotton.			Felt.
11×16 in.			2461 A. each	$ 50
16×21 "			2461 C. "	90
20×24 "	2460 E. each	$ 75	2461 E. "	1 30
24×30 "	2460 G. "	1 10	2461 G. "	2 00
30×42 "	2460 H. "	2 00	2461 H. "	3 50
36×48 "	2460 L. "	2 60	2461 L. "	4 75
36×60 "	2460 M. "	3 25	2461 M. "	6 00
42×60 "	2460 O. "	3 75	2461 O. "	7 00
42×72 "	2460 P. "	4 50	2461 P. "	8 50

The prices of print frames 2457 E to M, are f. o. b. New York. Owing to the relatively high cost of transportation we must add transportation charges when delivering these goods from our Branches.

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PRINT FRAMES ON WHEEL CARRIAGE.



No. 2462 M.

Carriage with Frame.

Ship'g weight frame and carriage, about		Printing Surface.	No glass or pad.	With cotton pad.	With pad and double thick glass.	With pad and polished plate glass.	Ship'g weight glass about
220 lb	**2462 G.**	24×30 in. each	$ 32 00	$ 33 10	$ 35 70	$ 38 50	50 lb
250 lb	**2462 H.**	30×42 " "	40 50	42 50		51 50	85 lb
300 lb	**2462 L.**	36×48 " "	48 50	51 10		65 40	120 lb
350 lb	**2462 M.**	36×60 " "	52 75	56 00		73 75	140 lb
400 lb	**2462 O.**	42×60 " "	57 25	61 00		81 50	160 lb
470 lb	**2462 P.**	42×72 " "	67 75	72 25		97 75	190 lb

The above prices cover crating for shipment.

The Carriages are of iron, of most practical and substantial construction. They have one pair of wheels on a common axle and two swiveling wheels. The print frame revolves in the standards and is provided with two spring stops which hold it horizontal and also serve as brakes to hold the frame at any slant during exposure. The Print Frames are our regular solid oak frames, as listed on page 224.

See note on page 224 about packing of glass.

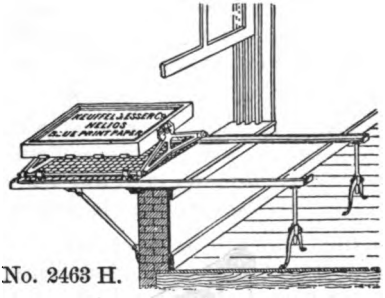
We insure Plate Glass against breakage, for consignee's account unless instructed not to insure.

The prices on this page are f. o. b. New York. Owing to the relatively high cost of transportation we must add transportation charges when delivering these goods from our Branches.

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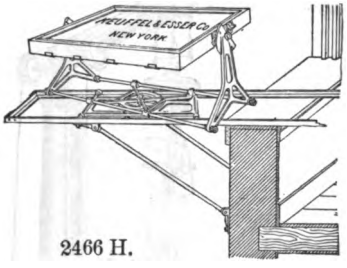
PRINT FRAMES ON CARRIAGE,

ON RAILS, FOR EXPOSING OUTSIDE OF WINDOW.



No. 2463 H.

Frame and Mountings
(carriage, rails and supports).



2466 H.

Frame on Revolving
Carriage, on rails.

PRINT FRAMES ON TILTING CARRIAGE, ON RAILS

Frame and Mountings.

Ship'g weight frame and mountings, about		Printing Surface.	No glass or pad	With cotton pad	With pad and polished plate glass	Ship'g weight glass, about
200 lb	**2463 H.**	30 × 42 in., each	$46 00	$48 00	$57 00	85 lb
270 lb	**2463 L.**	36 × 48 " "	57 00	59 60	73 90	120 lb
340 lb	**2463 M.**	36 × 60 " "	62 00	65 25	83 00	140 lb

PRINT FRAMES ON TILTING AND REVOLVING CARRIAGE, ON RAILS

Frame and Mountings.

		Printing Surface.	No glass or pad	With cotton pad	With pad and polished plate glass	
250 lb	**2466 H.**	30 × 42 in., each	$67 00	$69 00	$78 00	85 lb
300 lb	**2466 L.**	36 × 48 " "	78 00	80 60	94 90	120 lb
365 lb	**2466 M.**	36 × 60 " "	83 00	86 25	104 00	140 lb

The above prices include crating for shipment.

In ordering please state: 1. Width and height of open window. 2. Thickness of wall. 3. Width of window sill. 4. Height of window sill.

These frames represent the most practical, convenient and durable arrangement for exposing print frames outside of a window. The rails are of angle iron. The carriage, on four wheels, is well proportioned and less bulky and lighter than the usual ones, although stronger. The frame revolves in the standards of the carriage, which are provided with spring stops, as described under No. 2462, etc., page 226. The frames are our regular solid oak frames, as listed on page 224.

The carriage of frames No. 2466 is mounted on a turntable, so that the frame can be revolved on its vertical axis, to face the sun.

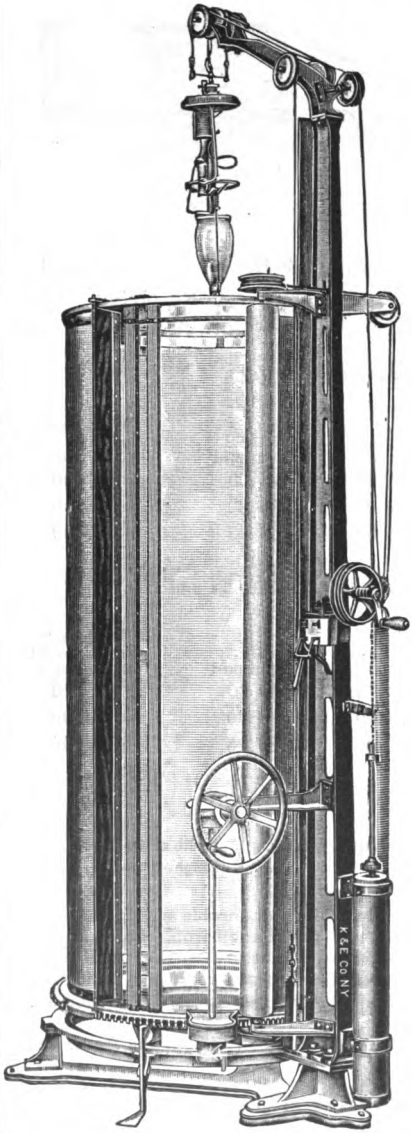
See note page 224 about packing of glass.

We insure Plate Glass against breakage, for consignee's account, unless instructed not to insure.

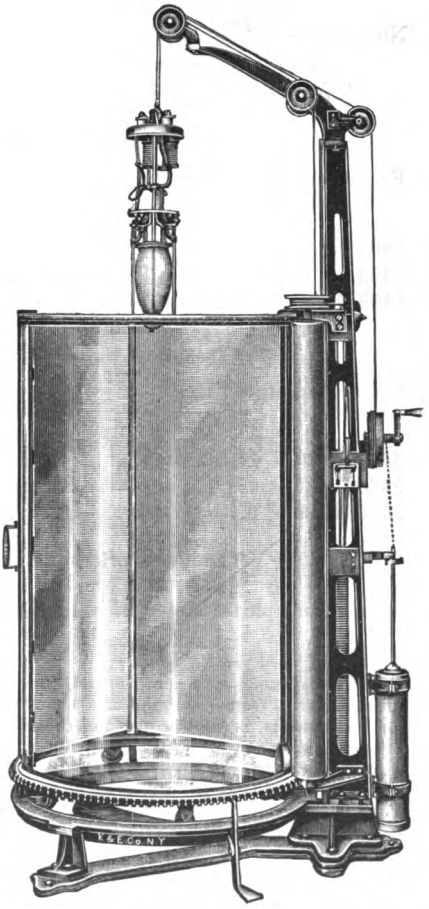
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K. & E. VERTICAL CYLINDRICAL ELECTRICAL PRINT FRAMES.



No. 2468-4.



2469-2.

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Nos. 2468-1 to 2468-4.

In the Electrical Print Frames Nos. 2468-1 to -4 the printing surface consists of two sections of curved glass, together forming a cylinder which rotates on a circular base. The lamp is suspended in the axial line of the cylinder, and its travel is delicately regulated by an adjustable hydraulic regulator. **These frames require a floor space of about 36 x 42 inches.**

Tracings and paper are fed between the curtain and the glass by revolving the cylinder and are held in perfect contact by the tension of the curtain. The curtain is mounted on a vertical spring roller, from which it is wrapped on to or unrolled from the cylinder by revolving the cylinder, by means of a conveniety placed hand wheel.

The lamp is of special pattern, combining maximum efficiency with perfect distribution of light. The speed and length of its travel and the locating of its starting and stopping points, are under instant control of the operator. At the end of the travel of the lamp, the current is automatically cut off.

This is a very economical apparatus because it requires only one lamp, even for large tracings, and no current passes except while the lamp is printing. Tracings and paper can be inserted and removed very quickly and conveniently.

No. 2469-2

The Electrical Print Frame No. 2469-2 is similar to No. 2468-2, except that it has only **one** printing surface (which forms a semi-cylinder) and the cylinder is revolved by hand, without any gearing.

			Ship'g weight about
2468-1.	Frame complete with lamp, with **two** semi-cylindrical printing surfaces, each 42 × 36 in.	$245 00	1200 lb
2468-2.	" " " " " " " 42 × 48 "	270 00	1350 lb
2468-3.	" " " " " " " 42 × 60 "	290 00	1450 lb
2468-4.	" " " " " " " 42 × 72 "	350 00	1550 lb
2469-2.	Frame complete with lamp, with **one** semi-cylindrical printing surface, 42 × 48 in. . .	$ 190 00	1000 lb

All of these frames can be furnished with lamps for either direct or alternating current, 110 or 220 volts.

In ordering, please state voltage and kind of current.

The apparatus is all complete, ready to connect with the feed wire and can be furnished from stock at short notice.

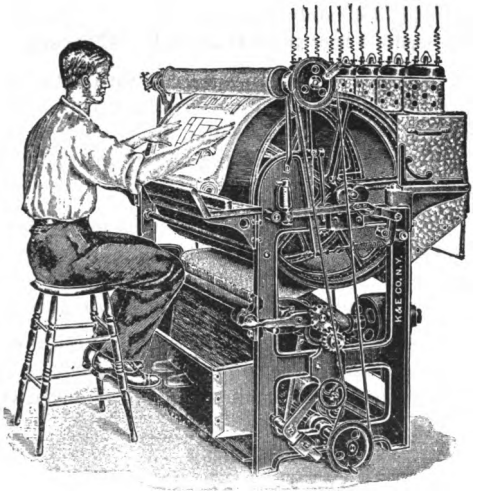
These prices include packing for shipment. The semi-cylindrical glasses are packed each in a separate case by an expert glass-packer. We are not responsible for breakage of glass in transit, but we insure Plate Glass against breakage, for consignee's account, unless instructed not to insure.

The prices on this page are f. o. b. New York. Owing to the relatively high cost of tr portation we must add transportation charges when delivering these frames from our Branc

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FEDERAL BLUEPRINTING MACHINE.

Patented.



No. 2470-2.

The Federal Blueprinting Machines have many points of superiority and are giving excellent satisfaction during years of use in busy offices. They are beyond question the most economical, quickest, most convenient, and most durable blueprinting machines on the market and so simple that they can be operated by a boy, as they are practically automatic. **Detailed description and directions for using furnished on request.**

Ship'g weight about

We make three sizes of this machine, to print up to 30, 42, 54 in. wide:

1350 lb	**2470-1.** Federal Blueprinting Machine, 30 in., 4 lamps	$450 00
1550 lb	**2470-2.** " " " 42 " 6 "	525 00
1800 lb	**2470-3.** " " " 54 " 8 "	600 00

The above prices include packing for shipment.

The price includes the motor and the lamps complete, which are for a 110-volt direct current. Alternating current equipment costs more than for the direct current; prices will be quoted on application. Voltage and frequency should be given.

The Federal Blueprinting Machine makes **continuous** prints by electric light nearly as fast as they can be made by the brightest sunlight. The time of exposure is governed by the speed at which the drum revolves and can be changed instantly by the shifting of a readily accessible lever, while the machine is running and it is therefore not necessary that the successive tracings be alike in printing qualities. For prints narrower than the capacity of the machine, the superfluous lamps can be cut out.

The usual speed for printing is 4 to 5 lineal feet per minute, but it can be increased to 7 feet per minute with suitable tracings and paper.

The prices on this page are **f. o. b. New York.** Owing to the relatively high cost of transportation we must add transportation charges **when delivering these goods from our Branches.**

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The prints, after exposure, pass into a box under the drum, and the apron, having passed between the pulling rolls, is taken up automatically by another roll underneath. When the end of the apron is reached, it is readily wound back on its original roll by a multiplying gearing operated by hand.

For the apron we employ tracing cloth in rolls of 24 yards, but can furnish also rolls of 48 yards. It is very transparent when held under proper tension in close contact with the tracings and impedes light hardly more than plate glass would.

The lamps are placed but 5 inches from the tracing cloth apron, which materially adds to the intensity and effectiveness of the illumination and permits of printing at a greater speed, and with economy of current.

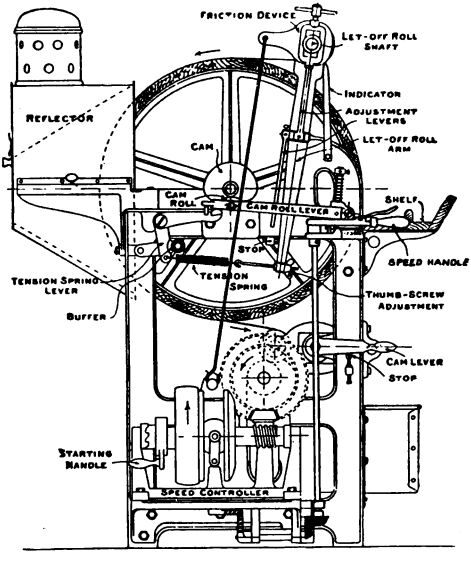
The work is fed and discharged on the same side of the machine, which saves much time, and is of the greatest possible advantage to the operator, as he is able at all times to examine the prints coming from the exposing chamber and to vary the speed of travel accordingly, without moving from his position at the feeding side of the machine.

A ½ H. P. motor is used for power, or a belt may be connected from an over-head shaft to the controller, if the machine is placed in a room provided with power.

As a time-saver the Federal Blueprinting Machine is far ahead of all others, as it prints in one-quarter to one-half of the time usually required by other styles of apparatus.

DIMENSIONS:

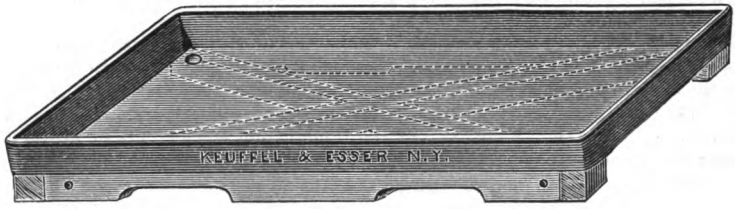
The height of the machine from floor to top of lamps is 4 ft. 10 in.
The 30-inch machine requires a floor space of 4 ft. × 4 ft. 6 in.
" 42 " " " " " " " 6 " × 4 " 6 "
" 54 " " " " " " " 7 " × 4 " 6 "



SIDE ELEVATION
FEDERAL ELECTRIC BLUE PRINTING MACHINE.

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SUPERIOR QUALITY ZINC BATH TRAYS.

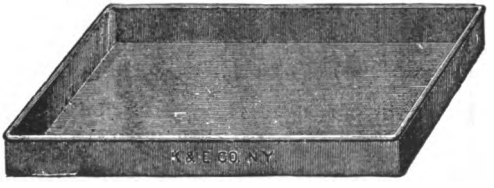


No. 2480 H.

WITH DRAIN-PIPE, STRONG WIRED RIM AND HARDWOOD BRACES.

2480 E.	Zinc Bath Tray	20×24 in.	each	$	5 00
2480 G.	do.	do.	24×30 "	"	6 25
2480 H.	do.	do.	30×42 "	"	8 75
2480 L.	do.	do.	36×48 "	"	11 00
2480 M.	do.	do.	36×60 "	"	12 50
2480 O.	do.	do.	42×60 "	"	15 00
2480 P.	do.	do.	42×72 "	"	17 75

PLAIN BATH TRAYS OF ZINC, WIRED RIM.



No. 2484 E.

2484 A.	Plain Bath Tray,	12×17 in.	each	$	2 00
2484 C.	do.	do.	17×22 "	"	2 50
2484 E.	do.	do.	20×24 "	"	3 50
2484 G.	do.	do.	24×30 "	"	5 00
2484 H.	do.	do.	30×42 " on wooden cross, with drain-pipe	"	8 00
2484 L.	do.	do.	36×48 " do. do. do. do.	"	10 25
2484 M.	do.	do.	36×60 " do. do. do. do.	"	12 00

The prices of bath trays cover crating for shipment.

The prices on this page are f. o. b. New York. Owing to the relatively high cost of transportation we must add transportation charges when delivering these trays from our Branches.

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K. & E. CO. DRAWING BOARDS.

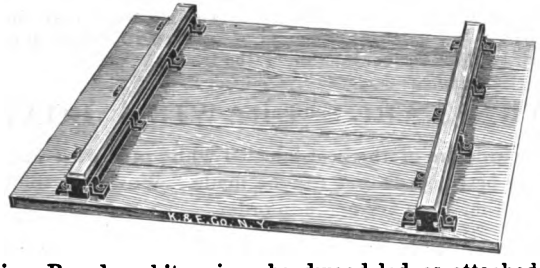
K. & E. Co. Drawing Boards are the best that can be produced. They are of thoroughly seasoned, selected, narrow strips of white pine, and have a light coat of shellac. If wanted natural finish, this must be stated in the order.

Boards can be made for much less money, if other woods than white pine, which has become very scarce, are employed, the material is less carefully seasoned, selected and matched, and less attention is paid to workmanship and finish.

No. 2500. No. 2505.



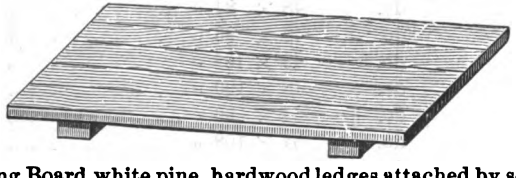
2500.	Drawing Board, white pine with end ledges of pine, clamped,		12 × 17 in.	each	$ 70
2501.	do.	do.	16 × 21 "	"	1 00
2502.	do.	do.	20 × 26 "	"	1 30
2505.	Drawing Board, white pine, with end ledges of pine, both sides presenting drawing surfaces,		12 × 17 in.	each	$ 70
2506.	do.	do.	16 × 21 "	"	1 00
2507.	do.	do.	20 × 26 "	"	1 30
2508.	do.	do.	23 × 31 "	"	1 80
2509.	do.	do.	27 × 34 "	"	3 00
2510.	do.	do.	31 × 42 "	"	4 00



No. 2512.

Patented.

2512.	Drawing Board, white pine, hardwood ledges attached by patent adjustable metal clamps, to allow contraction or expansion,		23 × 31 in.	each	$ 3 00
2513.	do.	do.	27 × 34 "	"	3 75
2514.	do.	do.	31 × 42 "	"	4 75
2515.	do.	do.	33 × 55 "	"	8 00
2516.	do.	do.	36 × 60 "	"	9 50



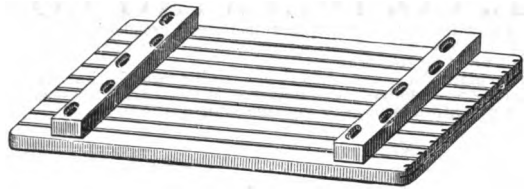
No. 2520.

2520.	Drawing Board, white pine, hardwood ledges attached by screws sunk in slots bushed with metal, to allow contraction or expansion,		16×21 in.	each	$ 1 50
2521.	do.	do.	20×26 "	"	2 20
2522.	do.	do.	23×31 "	"	3 25
2523.	do.	do.	31×42 "	"	5 25
2524.	do.	do.	33×55 "	"	8 50
2525.	do.	do.	36×60 "	"	10 00

The above prices cover crating for shipment.

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No. 2530.

2530.	Drawing Board white pine, hardwood ledges,				16 × 21	in.	each	$ 2 50
2531.	do.	"	"	"	20 × 26	"	"	3 20
2532.	do.	"	"	"	23 × 31	"	"	4 00
2533.	do.	"	"	"	31 × 42	"	"	6 50
2534.	do.	"	"	"	33 × 55	"	"	10 00
2535.	do.	"	"	"	36 × 60	"	"	12 00

The Drawing Boards No. 2530 to 2535 possess all the qualities a good and true board should have. They are of white pine, glued up to the required width, with the heart-side of each piece of wood to the surface. A pair of hardwood ledges is screwed to the back; the screws pass through the ledges in oblong slots with metal bushings, which fit closely under the heads and yet allow the screws to move freely when drawn by the contraction of the board. A series of grooves is sunk in the board on the under side. These grooves take the transverse strength out of the wood to allow it to be controiled by the ledges, leaving at the same time its longitudinal strength nearly unimpaired.

To make the working edge perfectly smooth, allowing easy movement of the T square, a strip of ebony is let into one end of the board. The strip is sawed apart at about every inch to allow for contraction of the board.

EXTRA LARGE DRAWING BOARDS.

These boards are of the best selected white pine with hardwood ledges and are the very best boards that can be made. We carry the more current sizes in stock; other sizes are made to order.

Ship'g weight about								
120 lb	**2538.**	Pinewood Drawing Board,			36 × 72	in.	each	$ 16 00
130 lb	"	do.	do.		36 × 84	"	"	18 00
120 lb	"	do.	do.		42 × 60	"	"	15 00
130 lb	"	do.	do.		42 × 72	"	"	18 00
140 lb	"	do.	do.		42 × 84	"	"	21 00
155 lb	"	do.	do.		42 × 96	"	"	26 00
140 lb	"	do.	do.		48 × 72	"	"	24 00
155 lb	"	do.	do.		48 × 84	"	"	27 00
175 lb	"	do.	do.		48 × 96	"	"	33 00
195 lb	"	do.	do.		48 × 108	"	"	38 00
215 lb	"	do.	do.		48 × 120	"	"	44 00
200 lb	"	do.	do.		54 × 96	"	"	41 00
220 lb	"	do.	do.		54 × 108	"	"	46 00
235 lb	"	do.	do.		54 × 120	"	"	50 00
235 lb	"	do.	do.		60 × 96	"	"	47 00
245 lb	"	do.	do.		60 × 108	"	"	50 00
255 lb	"	do.	do.		60 × 120	"	"	58 00

The above prices cover crating for shipment.

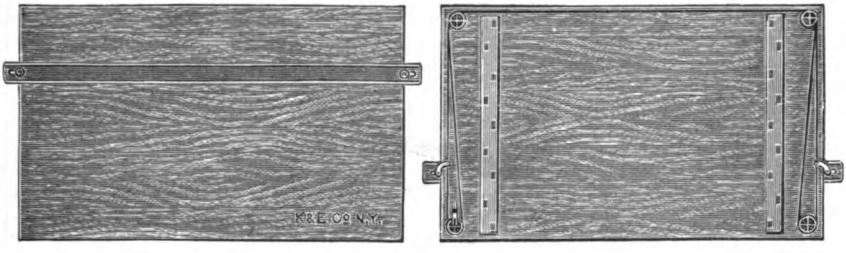
For Trestles and Horses for Boards see page 236.

The prices on this page are f. o. b. New York. Owing to the relatively high cost of transportation we must add transportation charges when delivering these boards from our Branches.

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K & E PARALLEL ATTACHMENT

FOR DRAWING BOARDS AND TABLES.



The K & E Parallel Attachment insures absolutely parallel motion of the straightedge, whether set horizontal or at an angle. The setting is quickly effected by releasing and tightening the clamps which hold the straightedge to the board. In the same way the straightedge can be readily removed when a T square is to be used on the board. The attachment can be applied without other directions than the above cut conveys, to any board having ledges or available space underneath.

The fixtures consist of 2 double and 2 single pulleys, one of which is adjustable for tension of the cord, 2 clamps, the cord, and the straightedge.

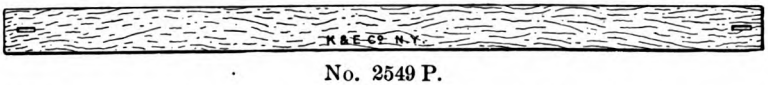
2549 M. Fixtures for K & E Parallel Attachment (**except straightedge**) for boards $\frac{3}{4}$ in. thick . . set $ 3 00

do. do. " " 1 " " . . " 3 25

do. do. " " $1\frac{1}{4}$ " " . . " 3 50

do. do. " " $1\frac{5}{8}$ " " . . " 3 75

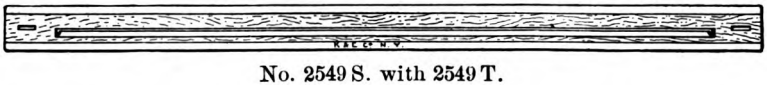
When ordering, please state thickness and size of the drawing board.



No. 2549 P.

2549 P. Hardwood Straightedge for K & E Parallel Attachment,

for boards	26	31	42	55	60	72	84	96	108	120 in.
each $	60	75	1 25	2 00	2 25	2 75	3 75	4 50	5 00	6 50



No. 2549 S. with 2549 T.

2549 S. Maple Straightedge, xylonite (transparent) lined, for K & E Parallel Attachment,

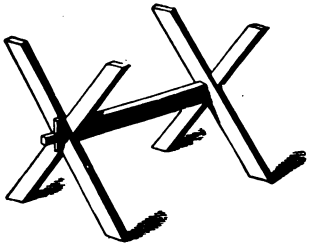
for boards	26	31	42	55	60	72	84	96 in.
each $	1 50	1 75	3 00	5 00	6 25	7 50	10 00	14 00

2549 T. Ledge on straightedge, for pencils and small tools, add per foot $ 20

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TRESTLES AND HORSES

FOR DRAWING BOARDS.

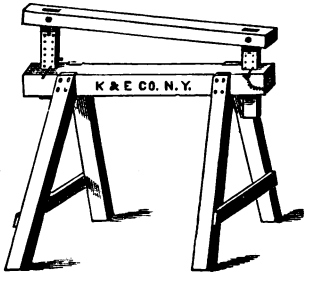


Wooden Trestles, made to order only. In ordering state size of board, to determine length and spread of trestle.



"Copyright, 1887, by Keuffel & Esser."

No. 2552 C.



"Copyright, 1890, by Keuffel & Esser Co."

2552 D.

Ship'g weight about

30 lb **2552 A.** Wooden Horses, light construction, 37 in. high, 35 in. long . . . . . per pair $ 8 40

40 lb **2552 B.** do. do. like No. 2552 A, **fine quality**, 37 in. high, 35 in. long . . . . . " " 5 80

45 lb **2552 C.** do. do. fine quality, with removable Sloping Ledges, 37 in. high, 35 in. long . . " " 6 80

2552 D. Adjustable Wooden Horses, best workmanship, 36 in. long, adjustable for height from 37 to 47 in. on level or slope . . . . . " " 8 00

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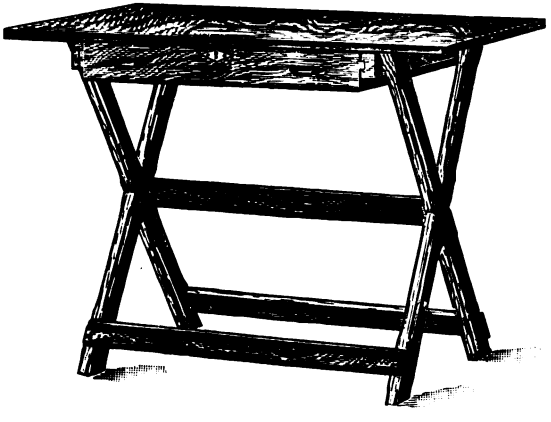
No. 2553.

Ship'g weight about

2553. Folding Hardwood Trestle, 37 in. high, with Drawing board 31 × 42 in. each $ 17 00 — 80 lb

2554. do. do. do. do. do. do. 33 × 55 in. " 21 00 — 90 lb

The Drawing Board is made of selected white pine and hinged to the Trestle, on which it can be slanted by means of supports catching in toothplates. Board and Trestle fold up compactly.



No. 2554N.

2554 N. Simplex Drawing Table, 38 in. high, board 36 x 60 in., drawer with lock, 24 × 32 × 2½ in . . . . . each $ 23 00 — 150 lb

The Simplex Drawing Table is substantially constructed, and the top is a high grade drawing board made like No. 2516. This is a very rigid and durable table, also well adapted for the drafting room in technical schools.
Quotations on other sizes of these tables or on modifications in design promptly furnished.

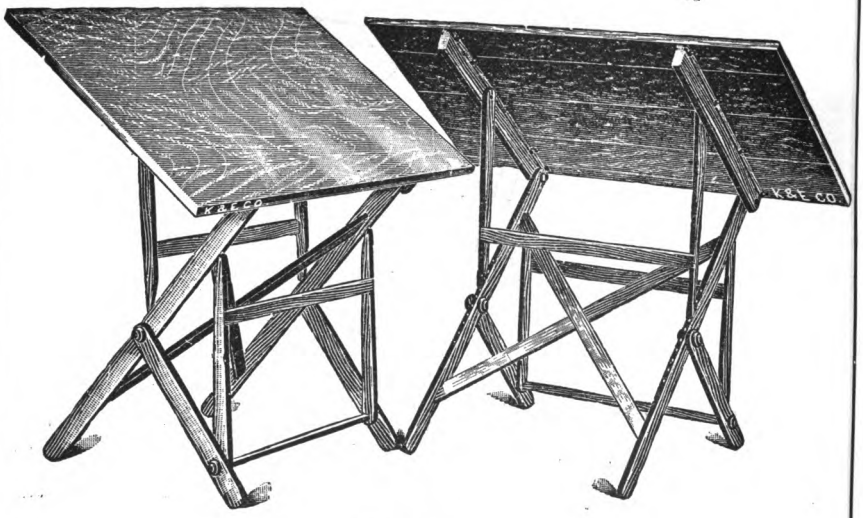
K & E Parallel Ruling Attachment (page 235) can be applied to No. 2553 to 2554 N.

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UNIQUE FOLDING TRESTLES WITH DRAWING BOARD.



No. 2555.

Ship'g weight about									
70 lb	**2555.**	Unique Trestle, Hardwood, fine Drawing Board	31 × 42 in.,	each	$	11	50
80 lb	**2556.**	do.	do.	"	"	"	33 × 55 "	"	15	25
110 lb	**2556½.**	do.	do.	"	"	"	36 × 60 "	"	17	50
60 lb	**2557.**	Unique Trestle, Pinewood, plain Drawing Board	23 × 31 "	each	$	8	25
70 lb	**2558.**	do.	do.	"	"	"	31 × 42 "	"	9	50
80 lb	**2559.**	do.	do.	"	"	"	33 × 55 "	"	12	50
110 lb	**2559½.**	do.	do.	"	"	"	36 × 60 "	"	14	25

The Unique Folding Trestles combine simplicity of construction with great range of adjustment and firmness in any position. The range of adjustment is from 31 to 41 inches for height and from horizontal to about 45 degrees for slant of board. When folded, these trestles occupy but a few inches in thickness. The drawing boards on trestles 2555 to 2556½ are like No. 2512, etc.

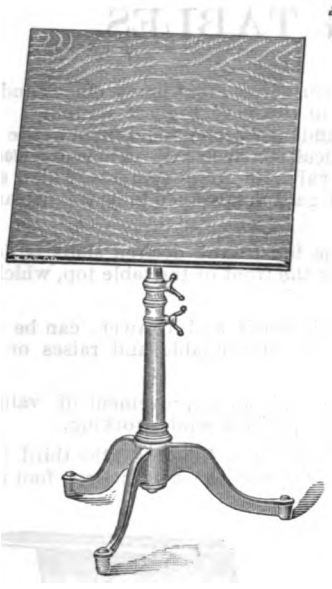
K & E Parallel Ruling Attachment (page 235), can be applied to these boards.

The above prices cover crating for shipment.

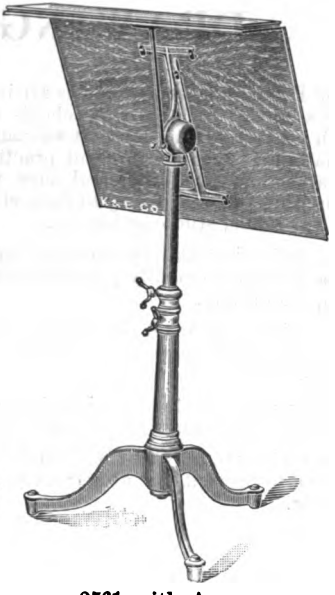
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COLLEGE DRAWING TABLES.



No. 2560.



2561 with Accessory T.S. $10 25.

			Ship'g weight about
2560.	College Drawing Table, ash top, 21x24 in. . . . . each	$ 8 50	60 lb
2561.	do. do " " 22x26 " . . . . . "	9 00	65 lb

These tables are crated for shipment without extra charge.

ACCESSORIES FOR COLLEGE DRAWING TABLES.

T. S.	Top Shelf, 6½ in. wide, remaining horizontal at any inclination of the table top . . . . . extra each	$ 1 25
D. S.	Top Shelf as above, but with two drawers . . . " "	2 50
	Casters on College Drawing Tables (2 casters and 1 iron foot), extra, per table	50

Our College Drawing Tables possess all the features of an efficient and satisfactory

DRAWING STAND FOR THE CLASS ROOM.

The top is of ashwood, highly finished, and can be clamped horizontal or at any angle by a conveniently placed clamp, which locks it absolutely and rigidly. It is attached to a strong spindle, an which it can be rotated after releasing the clamping screw. There is a sliding collar with a clamp screw on the spindle, by clamping which the height of the table is regulated. The table stands 30 inches high and can be raised to 42 inches, and the top can be placed at any height within this range or at any inclination. The top shelf or ledge (see cut No. 2561 with T.S.) for drawing instruments, inks, etc., remains horizontal at any inclination of the table top

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FAVORITE
DRAWING TABLES.

The Favorite Drawing Tables are in use in a great many offices and drafting rooms and in colleges and schools of the very highest standing. They give such perfect satisfaction that we confidently recommend them as the best of all in material, workmanship and practical construction. They are **more rigid** and durable than any other and have valuable improvements which are not found on other tables. Owing to their elegant appearance they are also an ornament to any office, studio or library.

The adjusting and clamping of the top to any desired slant is done by shifting a lever conveniently placed under the front of the table top, which locks the clamp absolutely.

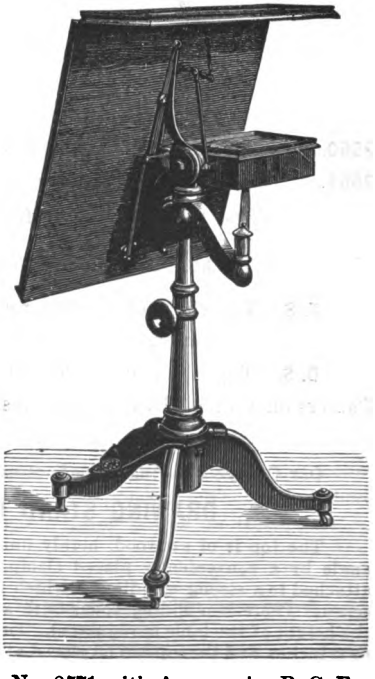
The jointed Bracket-arm, holding the Shelf and Drawer, can be readily moved to any desired point on either side of the table and raises or lowers with the table top.

The Iron Footrest, which is detachable, is an improvement of value, and is ornamental. It admits of a comfortable position while working.

The tables are provided with casters on two of the legs; the third leg has an iron foot to prevent the table from rolling, except when the iron foot is lifted off the floor.



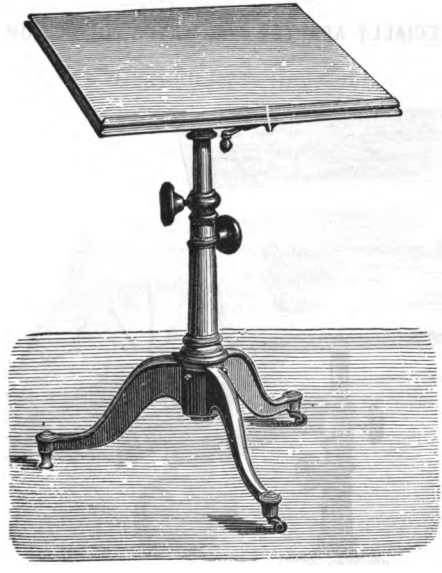
No. 2570.



No. 2571 with Accessories B. C. E

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FAVORITE DRAWING TABLES.



No. 2570.

				Ship'g weight about
2570.	Favorite Drawing Table, ash or oak Top 21 × 24 in. . . .	each	$ 9 75	70 lb
2571.	do. do. " " " " 22 × 26 " . . .	"	10 50	75 lb
M.	Polished Mahogany Top	extra "	2 25	

ACCESSORIES

FURNISHED TO ORDER WITH FAVORITE DRAWING TABLES.

A.	Folding Arm with plain Shelf	each	$ 1 75
B.	do. " Shelf and Drawer with Lock	"	2 75
C.	Detachable Iron Footrest	"	1 75
E.	Top Shelf, without Drawers	"	2 25
F.	do. with two "	"	3 25
G.	Folding Arm with large Shelf, Drawer, etc. as shown with table No. 2574 on next page	"	4 25

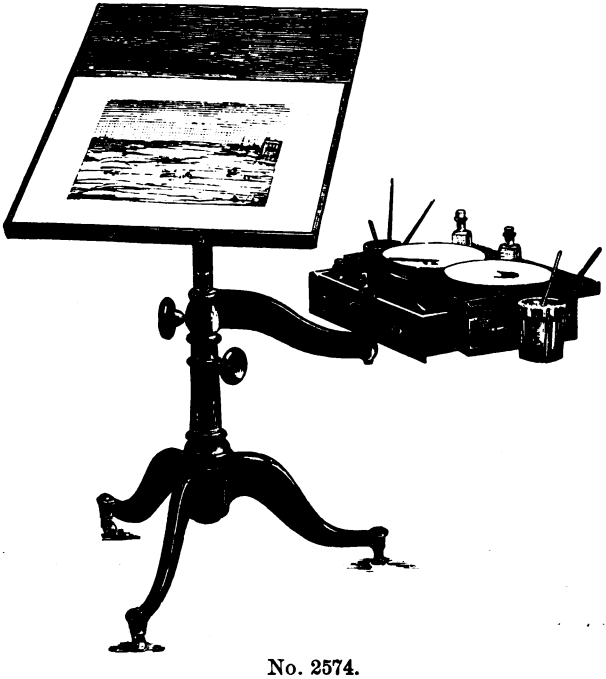
These Tables are crated for shipment without extra charge.

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FAVORITE DRAWING TABLE

SPECIALLY ADAPTED FOR WATER COLOR WORK.



No. 2574.

Ship'g weight about

75 lb

2574. Favorite Drawing Table, ash or oak Top 21 × 26 in., Folding-Arm with large Shelf, Drawer with Lock, and two Holders for water-glasses . . . . . each $ 14 50

M. Polished Mahogany Top . . . . . extra " 2 25

For Accessories see page 241.

These Tables are crated for shipment without extra charge.

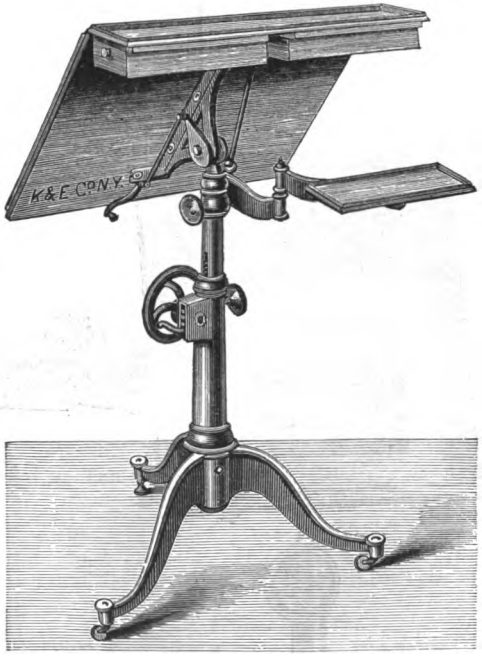
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FAVORITE DRAWING TABLES

WITH WHEEL LIFT.

These Tables have a Wheel-lift for raising and lowering the table top. It consists of a rack and pinion movement which is operated by a large hand-wheel and is so simple and easy to operate that a woman or child can handle it.



No. 2576 with Accessories, A. F. $ 18 50

			Ship'g weight about
2575.	Favorite Drawing Table, ash or oak Top 21 × 24 in. . . each	$ 13 00	75 lb
2576.	do. do. " " " " 23 × 26 " . . "	13 50	75 lb
M.	Polished Mahogany Top . . . . . extra "	2 25	

For Accessories see page 241.

These Tables are crated for shipment without extra charge.

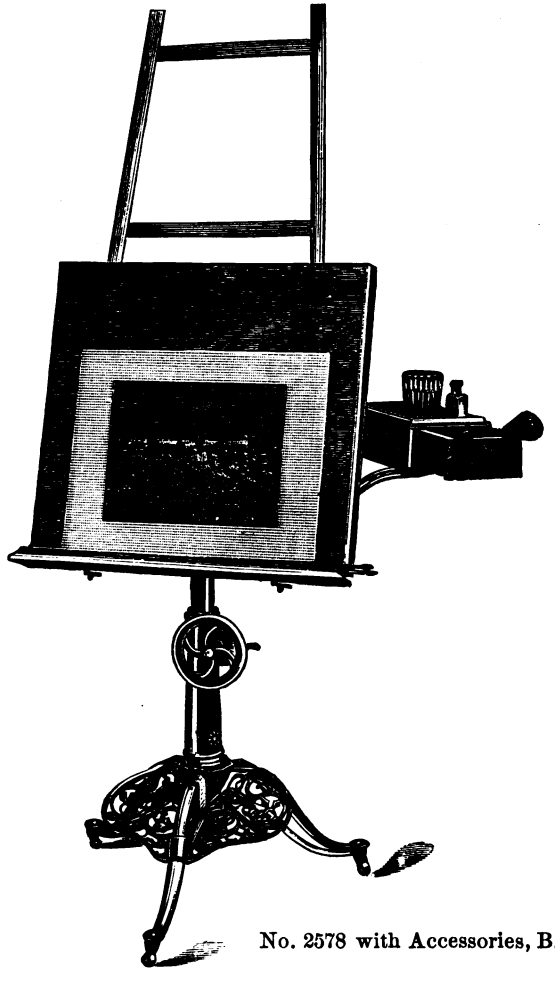
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FAVORITE DRAWING TABLE

WITH WHEEL LIFT.

This Table has the Wheel-Lift for raising and lowering the table top, as described on preceding page. The Table can be converted into an Easel by setting the hinged lower edge of the table top at right angle, where it is held by catches. The rack for studies, shown in the cut, can be folded behind the table top when not in use.



Ship'g weight about 80 lb

No. 2578 with Accessories, B. C. $ 21 50

2578. Favorite Drawing Table, Polished Ash Top 26 × 26 in. each $ 17 00

FOR ACCESSORIES SEE PAGE 241.

These Tables are crated for shipment without extra charge.

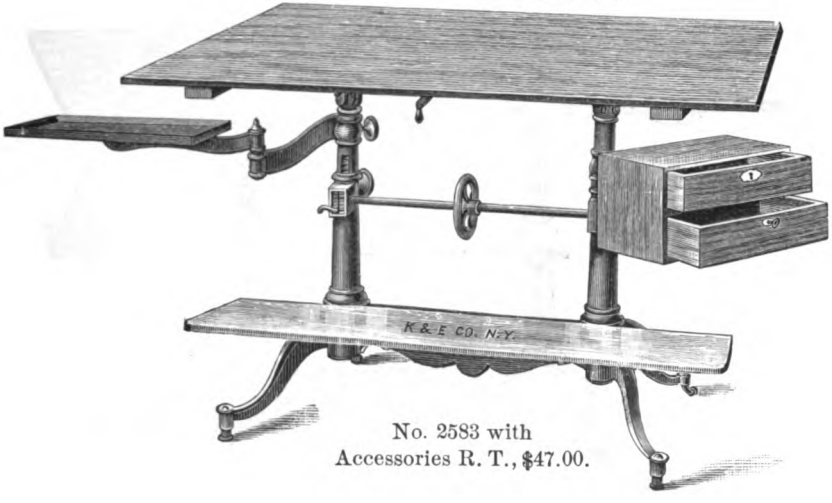
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OFFICE

FAVORITE DRAWING TABLES.

The top of these Tables is a fine white pine drawing board. On each of the two columns is a rack and pinion for raising and lowering the top and a patent clamping attachment for adjusting the slant. The two racks and pinions are operated by one wheel (Wheel-lift) and the two clamps for the table top are locked by one lever, the handle of which is at the front edge of the table. The footrest is of hardwood. These tables are of very fine quality and highly finished.

"Copyright, 1894, by Keuffel & Esser Co."



No. 2583 with
Accessories R. T., $47.00.

								Ship'g weight about
2582.	Office Drawing Table,	with	Drawing Board	31 × 42 in.,	each	$ 35 00		200 lb
2583.	do.	do.	"	"	"	33 × 55 " "	38 50	250 lb
2583-1.	do.	do.	"	"	"	36 × 60 " "	41 00	270 lb
2583-2.	do.	do.	"	"	"	42 × 72 " "	47 50	300 lb

These Tables are crated for shipment without extra charge.

ACCESSORIES

FOR "OFFICE" DRAWING TABLES.

R.	Folding Arm with Shelf	each	$ 2 50
S.	Folding Arm with Shelf and Drawer with Lock	"	3 75
T.	Bracket with Hardwood Cabinet with 2 Drawers with Locks	"	6 00

T SQUARE AND GUIDE.

The T Square Guide is an iron bar, fastened to the left-hand side of the board, on which the specially constructed T Square moves freely, or is held at any point by a spring clamp. The T Squares have shifting head with clamping swivel.

2585.	T Square Guide,	with	T Square,	for board	31 × 42 in. .	each	$ 10 50
2586.	do.	do.	"	do.	" " 33 × 55 " .	"	11 50
2586-1.	do.	do.	"	do.	" " 36 × 60 " .	"	12 25
2586-2.	do.	do.	"	do.	" " 42 × 72 " .	"	13 25

K & E Parallel Attachment (page 235) can be applied to these tables.

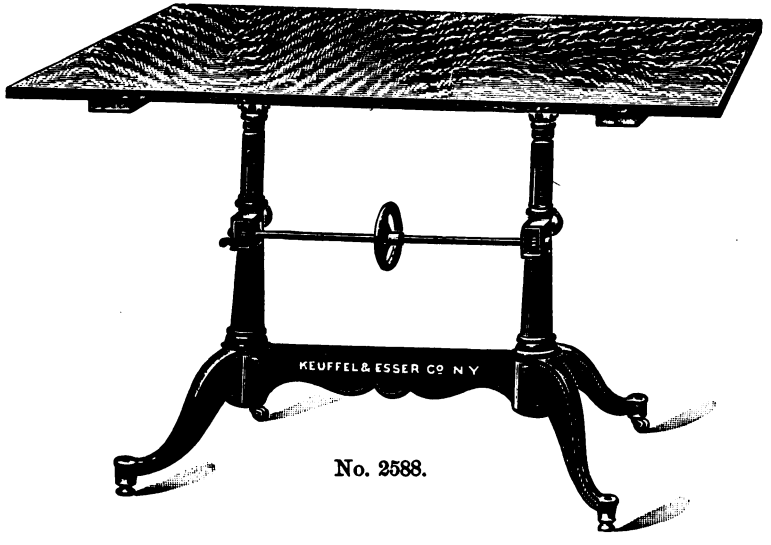
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CONSTRUCTOR'S
FAVORITE DRAWING TABLES.

The Constructor's Drawing Tables are similar to the Office Tables described on the preceding page, and they have the same device for raising and lowering the top. The iron parts are nicely finished and painted in one color.

The top is a regular white pine drawing board, and can be inclined and clamped at any angle by a clamping rod connecting with both joints.



No. 2588.

Ship'g weight about							
200 lb	**2587.**	Constructor's Drawing Table,	board	31 × 42 in.	each	$	29 50
250 lb	**2588.**	do.	do.	" 33 × 55 "	"		32 00
270 lb	**2588-1.**	do.	do.	" 36 × 60 "	"		34 50
300 lb	**2588-2.**	do.	do.	" 42 × 72 "	"		40 00

ACCESSORIES
FOR "CONSTRUCTOR'S" DRAWING TABLES.

P2.	Hardwood Footrest	each	$ 1 75
R2.	Folding Arm with Shelf	"	2 50
S2.	Folding Arm with Shelf and Drawer with Lock	"	3 75
T2.	Bracket with Hardwood Cabinet with Two Drawers with Locks	"	6 00

The **T Square and Guide** (page 245) or the **K & E Parallel Ruling Attachment** (page 235) can be applied to these tables.

These Tables are crated for shipment without extra charge.

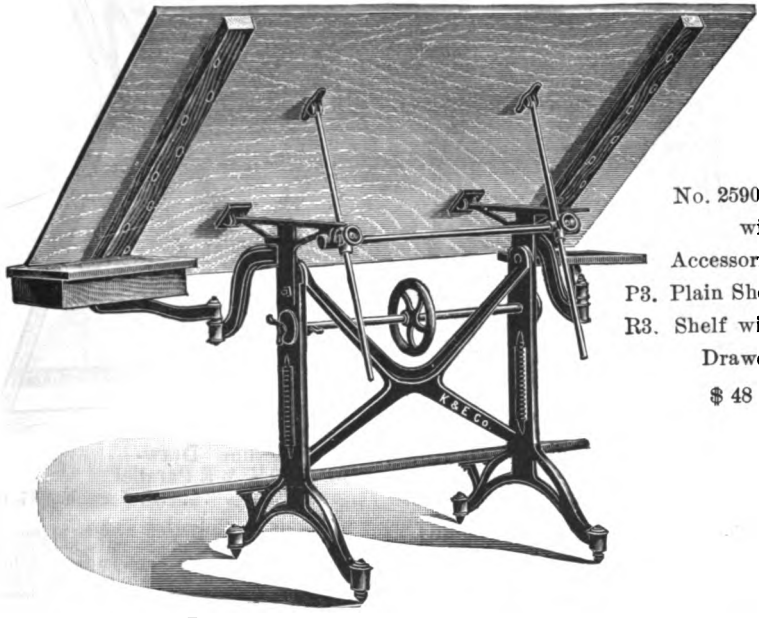
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KEUFFEL & ESSER CO. NEW YORK.

AMERICAN DRAWING TABLE.

The "American" is a very practical drawing table, rigid, substantial, capable of free adjustment, and durable. It is 36 in. high and can be raised to 48 in. by a rack and pinion in each of the two iron standards, operated by one large hand-wheel. The top is a white pine drawing board of fine quality, hinged to the standards. It can be slanted, up to the vertical, when it can be used as an upright board. It is held rigid by iron rods with clamp screws. The footboard is of hardwood.



No. 2590 E
with
Accessories
P3. Plain Shelf
R3. Shelf with
Drawer.
$ 48 25

						Ship'g weight about
2590 A.	American Drawing Table,	board	31 × 42 in.	each	$ 28 50	220 lb
2590 B.	do.	do.	33 × 55 "	"	32 00	230 lb
2590 C.	do.	do.	36 × 60 "	"	34 50	240 lb
2590 D.	do.	do.	36 × 72 "	"	40 00	250 lb
2590 E.	do.	do.	42 × 72 "	"	42 00	275 lb
2590 F.	do.	do.	42 × 84 "	"	45 00	340 lb
2590 G.	do.	do.	42 × 96 "	"	50 50	350 lb
2590 H.	do.	do.	48 × 72 "	"	48 50	330 lb
2590 J.	do.	do.	48 × 84 "	"	52 00	350 lb
2590 K.	do.	do.	48 × 96 "	"	59 00	375 lb
2590 L.	do.	do.	48 × 108 "	"	63 00	400 lb
2590 M.	do.	do.	48 × 120 "	"	70 00	425 lb
2590 O.	do.	do.	54 × 120 "	"	78 00	450 lb

These Tables are crated for shipment without extra charge.

ACCESSORIES FOR AMERICAN DRAWING TABLES.

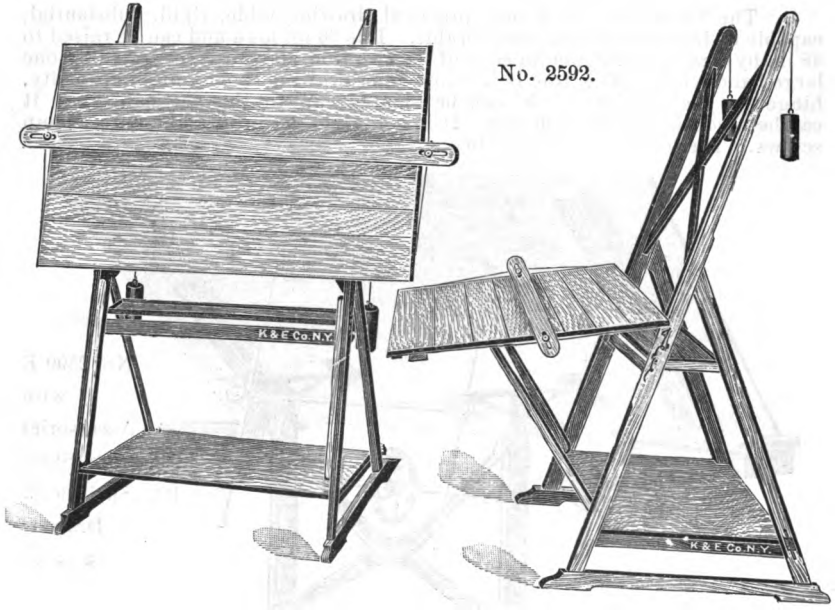
P 3.	Jointed Arm with plain Shelf	each	$ 2 50
R 3.	" " " Shelf and one Drawer with Lock	"	3 75
T 3.	Bracket with Hardwood Cabinet with 3 Drawers, 16 × 6¾ × 8 in. inside, with Locks	"	8 00

The T-SQUARE GUIDE described on page 245 or the K & E PARALLEL ATTACHMENT (page 235) can be applied to these tables.

The prices on this page are f. o. b. New York. Owing to the relatively high cost of transportation we must add transportation charges when delivering these goods from our Branch

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VERTICAL DRAWING TABLE.



No. 2592.

Ship'g weight about

230 lb **2592.** Vertical Drawing Table, hardwood with fine Drawing Board of white pine 33×55 in. with K & E Parallel Attachment, (see page 235.) . . . . . each $37 00

The Vertical Drawing Table is of light but rigid construction, and so arranged that the drawing board can also be placed flat at table height, where it is held by an automatic catch and folding braces. The rigid hardwood frame, 6 ft. high, supports a fine white pine drawing board, 33 x 55 in. by metal cleats sliding in grooves in the frame and held by counter-weights suspended over rollers. At its highest vertical position its lower edge is 38 in. above the floor. It has the K & E Parallel Attachment and Straightedge (page 235). There is a sliding shelf 11 x 36 in. for tools and instruments, at mid-height of the frame and a larger shelf below which serves also as a footrest.

DRAFTSMEN'S STOOLS

These stools are of practical construction and especially designed for the requirements of the draftsman. They are of good quality and firmly mounted on iron base, with casters, to allow them to be easily moved along the drawing board.



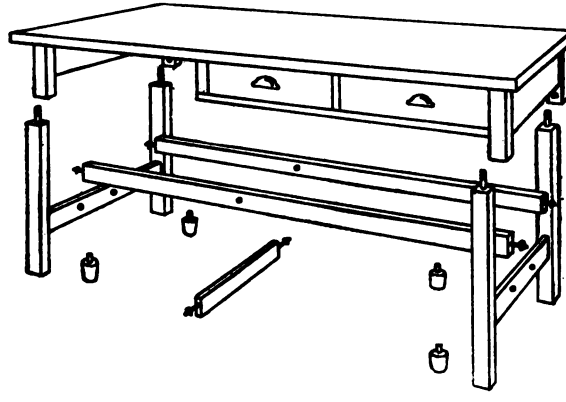
No. 2593-5.

30 lb **2593-1.** Draftsman's Stool, cane seat, 20½ in. each $4 50
35 lb **2593-2.** do. do. do. 26½ " " 4 75
40 lb **2593-3.** do. do. do. 32½ " " 5 15
35 lb **2593-4.** do. do. swiveling cane seat with screw; raising of seat independent of swiveling device, 22½ in. cane seat, each $8 00
40 lb **2593-5.** do. do. 26½ " do. " 8 25
45 lb **2593-6.** do. do. 32½ " do. " 8 65

The above prices cover crating for shipment.

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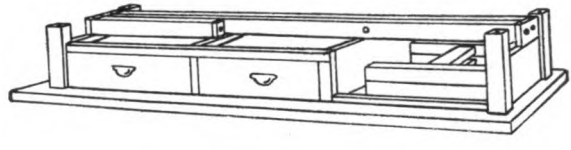
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HUDSON DRAWING TABLES

"Knocked down" for shipment.

To reduce cost of transportation, Hudson Drawing Tables Nos. 2599 W to 2599 S are now built with the main parts BOLTED to allow of being "KNOCKED DOWN" for compact crating. This construction permits of quickly and easily setting up or taking down these tables, makes them very convenient to move or transport, and does not detract in any degree from their strength or rigidity.



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HUDSON DRAWING TABLES

The Hudson Tables are of practical design, and well made. (See description, page 223.)

We frequently furnish drawing tables of these and similar styles in large lots to Schools and Drafting rooms, and solicit an opportunity to submit designs and estimates when drawing tables are wanted.

For description of quality, see page 223.



2599 W.

Ship'g weight about 165 lb

2599 W. Hudson Drawing Table, hardwood. The top is a drawing board of white pine 33 × 55 inches. The table stands 36 in. high. Two drawers 20 × 24 × 4 in. inside. Cabinet about 10½ × 29 × 20 in. with grooves for drawing boards. **Made to order only.**

This type represents a special drawing table with cabinet for storing drawing boards, suitable for schools.

We make drawing tables according to design or specifications.

We solicit correspondence and would cheerfully furnish estimates.

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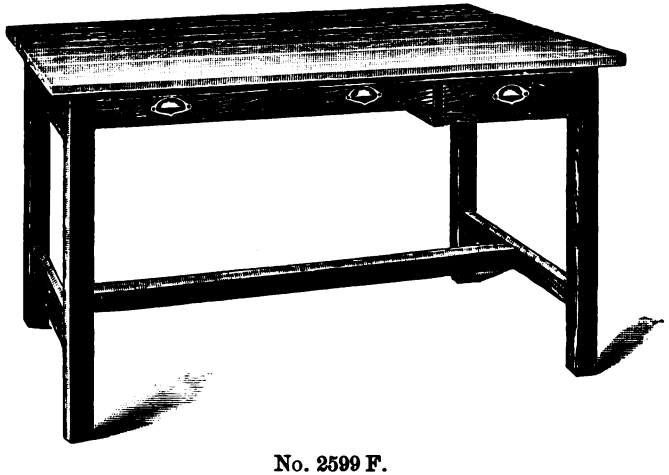
HUDSON DRAWING TABLES.



No. 2599 C.

Ship'g weight about 135 lb

2599 C. Hudson Drawing Table, hardwood. The top is a drawing board of white pine 33 × 55 inches. Two drawers, 20 × 24 × 4 in. inside. The table stands 36 in. high. each $ 17 00



No. 2599 F.

160 lb

2599 F. Hudson Drawing Table, hardwood. The top is a drawing board of white pine 36 × 60 inches. One drawer 24 × 34 × 2 in., other drawer 14 × 24 × 4 in. inside. The table stands 34 in. high . . . . . each $ 20 00

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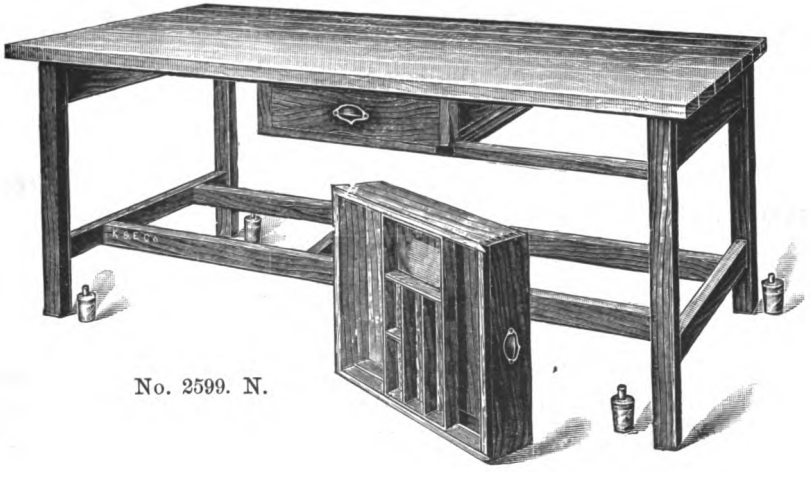
HUDSON DRAWING TABLES



No. 2599. K.

2599 K. Hudson Drawing Table hardwood. The top is a drawing board of white pine 36 × 60 inches. One drawer 24 × 34 × 2 in., other drawer 14 × 24 × 4 in. inside. Paneled cabinet with 4 drawers 14 × 24 × 4 in. inside. The table stands 34 in. high . . . . . each $ 32 00

Ship'g weight about 215 lb



No. 2599. N.

2599 N. Hudson Drawing Table, hardwood. The top is a white pine drawing board, 42×84 inches. Two drawers 20×24×4 in. inside, one of them with partitioned sliding tray. The table stands 34 in. high, and is furnished with raising blocks 3 in. high . . . . . each $ 30 00

250 lb

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HUDSON DRAWING TABLE



No. 2599 S.

2599 S. Hudson Drawing Table, hardwood. The top is a drawing board of white pine, 42 × 84 inches. Two drawers 20 × 24 × 4 in., one of them with partitioned sliding tray. Paneled cabinet with 4 drawers 31 × 42 × 2½ in. inside with guard across rear end to prevent papers from working over the end. The table stands 34 in. high and is provided with raising blocks 3 in. high . . . . . each $ 50 00

Ship'g weight about 335 lb

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MAGAZINE DRAWING TABLE

QUARTERED OAK, FINEST GOLDEN OAK FINISH.

A COMPACT, PRACTICAL COMBINATION OF DRAWING TABLE AND CHEST OF DRAWERS.



No. 2594.

Ship'g weight about

2594. Magazine Drawing Table, **quartered oak**, finest golden oak finish . . . . . each $ 60 00 — 360 lb

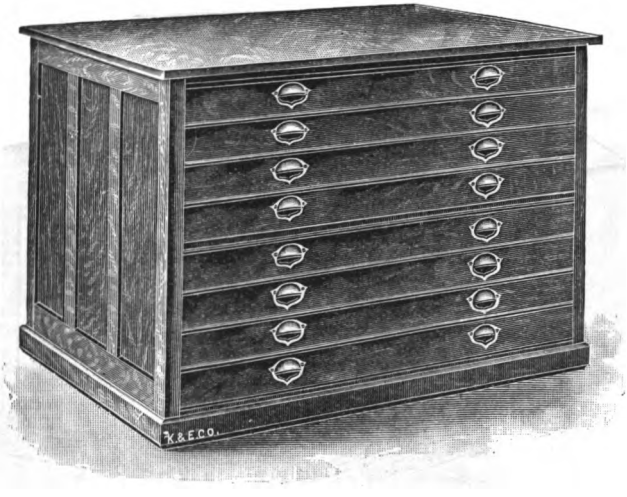
The price covers crating for shipment.

This combined Chest and Drawing Table is 34 in. high. The sides and back of the chest are paneled. 7 drawers 31 × 42 in., 2½ in. deep, **with lock.** The drawers have a guard across the rear end to prevent papers from working out. The top is a fine drawing board 35 × 48 in., of selected white pine and is hinged to a sliding frame, on which it can be slanted by means of supports catching in tooth plates. This sliding frame can be moved out beyond the front edge of the chest (as shown in cut) where it is held by a catch engaging automatically in a rack. The spaces on the top of the table, under the drawing board, can be used for tools, etc.

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CHESTS OF DRAWERS.



No. 2596.

Ship'g weight about

340 lb **2595.** Chest of Drawers, **quartered oak, paneled, finest golden oak finish,** 33 in. high, top 35 × 48 in., 7 drawers 31 × 42 in., 2½ in. deep, with guard across their rear end to prevent papers from working out, drawers with Lock . each $ 52 00

320 lb **2596.** Chest of Drawers, **hardwood, paneled, antique oak finish** similar to No. 2595, 33 in. high, top 35 × 48 in., 8 drawers 31 × 42 in., 2½ in. deep, with guard across their rear end to prevent papers from working out. (no lock) . " 38 00

The above prices cover crating for shipment.

Chests of Drawers of other dimensions or design made to order from drawings and specifications.

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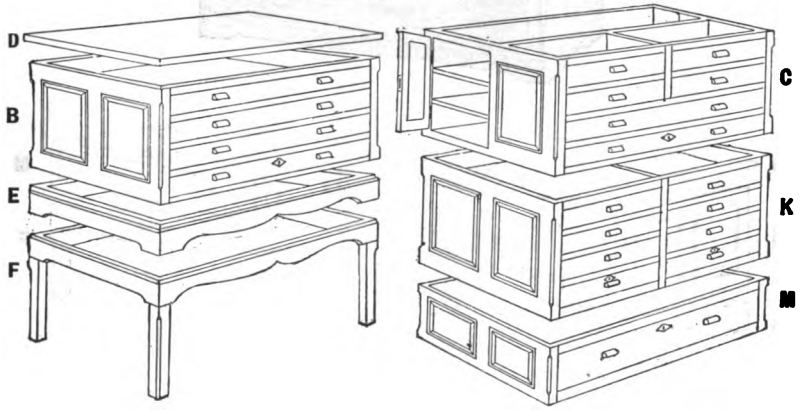
CHESTS OF DRAWERS, IN SECTIONS

QUARTERED OAK, FINEST GOLDEN OAK FINISH.



No. 2597.
B. B. D. E.
$ 62 75

Ship'g weight about 390 lb



2597 B.	Regular Section, 4 Drawers 31 ×42×2½ in. inside . . . each		$26 00
2597 C.	Special Section, 4 Drawers 15½×20×2½ in., 2 Drawers 15½×42×2½ in. inside and 3 full length Compartments for rolls of paper &c., both ends with door with spring catch	"	31 50
2597 K.	Special Section, 8 Drawers 20×31×2½ in. inside	"	30 00
2597 M.	" " with 1 deep Drawer with Lock, 31×42× 6 in. inside	"	10 00
2597 D.	Polished Hardwood Top 35×48 in.	"	6 50
2597 E.	" " Base, ...	"	4 25
2597 F.	" " Sanitary Base	"	7 00

The above prices cover crating for shipment.

These Sectional Chests, consisting of base, sections and top, admit of arbitrarily changing the capacity of the composite chest, somewhat like the well-known sectional book cases can be changed. They are of quartered oak, golden oak finish and of very best workmanship.

The drawers in Sections (B. C. and K.) are simultaneously locked or unlocked by an ingenious device. A chest consisting of two sections with base E, and top is 38 in. high. Sections B, C, K are 16½ in. high, Section M 8 in. high. Base E 3½ in , and Base F 16½ in.

The drawers have a guard across their rear end to prevent papers from working out

CHESTS OF DRAWERS IN SECTIONS

of other sizes, for storing drawings, tracings and paper, made to order. When writing for estimates please give all particulars, such as dimensions of chest, number and depth of drawers, kind and finish of wood, whether drawers are to be on rollers, with lock, &c., &c.

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CHESTS OF DRAWERS IN SECTIONS

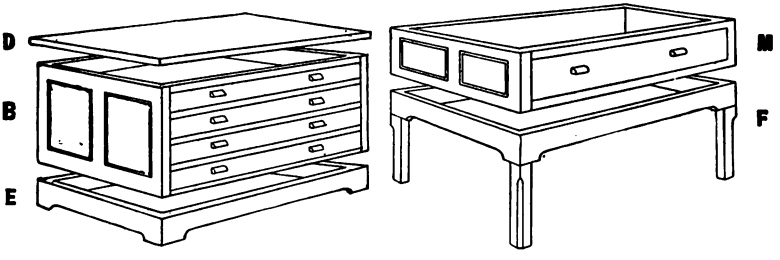
HARDWOOD, ANTIQUE OAK FINISH.

Ship'g weight about 380 lb



No. 2598
B. B. D. E.
$ 51 75

230 lb



2598 B.	Regular Section of 4 Drawers, 31 × 42 × 2½ in. inside . each	$ 21	50
2598 M.	Special " with one deep drawer 31 × 42 × 6 in. inside "	8	50
2598 D.	Polished Hardwood Top, 35 × 48 in. . . . . "	5	50
2598 E.	" " Base . . . . . "	3	25
2598 F.	" " Sanitary Base, 16½ in. high . . . . . "	6	00

The above prices cover crating for shipment.

These Sectional Chests, consisting of base, sections and top, admit of arbitrarily changing the capacity of the composite chest, somewhat like the well-known sectional book cases can be changed. They are thoroughly well made, of **hardwood, antique oak finish.** The drawers have a guard across their rear end to prevent papers from working out (no lock).

Section B is 14½ in. high,—Section M 8 in.,—Base E 3½ in.,—Base F 16½ in.

CHESTS OF DRAWERS IN SECTIONS

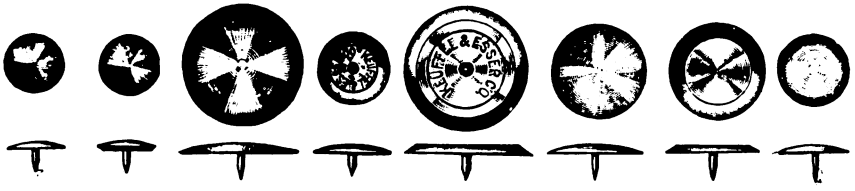
of other sizes, for storing drawings, tracings and paper, made to order. When writing for estimates please give all particulars, such as dimensions of chest, number and depth of drawers, kind and finish of wood, whether drawers are to be on rollers, with lock, &c., &c.

The prices on this page are f. o. b. New York. Owing to the relatively high cost of transportation we must add transportation charges when delivering these goods from our Branches.

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KEUFFEL & ESSER CO. NEW YORK.

DRAWING PINS OR THUMB TACKS.



2600. 2601. 2616. 2622. 2636. 2644. 2654. 2662.

STEEL TACKS.

HEAD AND POINT ONE PIECE.

2600. Solid Steel Tacks, fine, $\frac{5}{16}$ in. diam. (one doz. on a card) . doz. $ 80
2601. do. $\frac{5}{16}$ in. diam. (not mounted) . . . . . " 20

STEEL POINTS SWAGED. ONE DOZEN ON A CARD.

2612. Steel Tacks, Round head $\frac{3}{8}$ in. diam. . . . . doz. $ 10
2614. do. do. $\frac{1}{2}$ " " . . . . . " 12
2616. do. do. $\frac{5}{8}$ " " . . . . . " 15

These steel-head tacks are very flat, so that they will not obstruct the T square. They are good durable tacks, and their points will not come through.

FINE GERMAN SILVER TACKS.

TOOL STEEL POINTS SCREWED IN AND RIVETED. ONE DOZEN ON A CARD

Round Head.		Beveled Head.	
2622. $\frac{3}{8}$ in., diam. . . . . doz.	$ 60	**2632.** $\frac{3}{8}$ in., diam. . . . . doz.	$ 60
2624. $\frac{1}{2}$ " " . . . . "	70	**2634.** $\frac{1}{2}$ " " . . . . "	70
2626. $\frac{5}{8}$ " " . . . . "	90	**2636.** $\frac{5}{8}$ " " . . . . "	90

GERMAN SILVER TACKS.

STEEL POINTS SWAGED. ONE DOZEN ON A CARD.

Round Head.		Beveled Head.	
2642. $\frac{3}{8}$ in., diam. . . . . doz.	$ 25	**2652.** $\frac{3}{8}$ in., diam. . . . . doz.	$ 25
2644. $\frac{1}{2}$ " " . . . . "	30	**2654.** $\frac{1}{2}$ " " . . . . "	30
2646. $\frac{5}{8}$ " " . . . . "	45	**2656.** $\frac{5}{8}$ " " . . . . "	45

BRASS TACKS.

STEEL POINTS SWAGED. NOT MOUNTED.

2662. Brass Tacks, Round head $\frac{3}{8}$ in. diam. . . gross $ 1 45 doz. $ 15
2664. do do $\frac{1}{2}$ " " . . " 2 40 " 25
2666. do do $\frac{5}{8}$ " " . . " 3 35 " 35

FOR STAMPED STEEL TACKS SEE NEXT PAGE.

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STAMPED STEEL TACKS.



No. 2677 L. 2677. 2678. 2679

PLAIN.

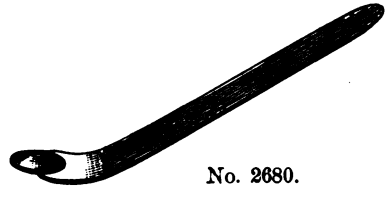
			box of 100	on card
2677 L.	Stamped Tacks, $\frac{5}{16}$ in. diam.	$	45	doz. $ 07
2677.	do. $\frac{3}{8}$ " "		55	" 08
2678.	do. $\frac{7}{16}$ " "		65	" 10
2679.	do. $\frac{9}{16}$ " "		80	" 12

NICKELPLATED.

			box of 100	on card
2677 N.	Stamped Tacks, $\frac{5}{16}$ in. diam.	$	65	doz. $ 10
2678 N.	do. $\frac{7}{16}$ " "		80	" 12
2679 N.	do. $\frac{9}{16}$ " "		1 00	" 15

These Stamped Steel Tacks are made of one piece of tough, hard steel (especially made for this purpose) and are of the very best quality. They have **needle finished points**, so that they make an excellent substitute for the regular thumb tacks, when it is desired to have a lower priced article

TACK LIFTER.



No. 2680.

2680. Tacklifter and Paper Knife, Brass, Nickelplated, $5\frac{1}{4}$ in. . . each $ 20

A handy and simple instrument for extracting thumb tacks. The end of the lifter is inserted under the head of the tack and takes it out without bending the point or wrenching off the head, as is often done by using a knife.

The handle of this instrument is a Paperknife, useful for removing drawings which have been glued to the board, etc.

(See also Lead Pencil File and Tacklifter page 286).

HORNCENTRES.



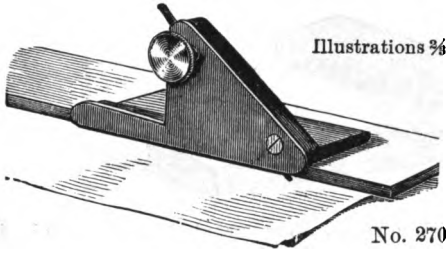
No. 2690. 2691.

2690. Horncentre, plain, $\frac{1}{2}$ in. diam. . . . . each $ 10

2691. do. with German silver rim, $\frac{3}{4}$ in. diam. . . . " 50

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PAPER CUTTERS.



Illustrations ⅔ size

No. 2700



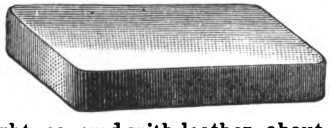
2703.

2700. Handy Paper Cutter, Brass . . . . . each $ 35
2701. do. do. Nickelplated . . . . . " 40
2703. Safety Paper Cutter, " . . . . . " 75

These little instruments are of important service to Draftsmen, for cutting drawings from the board, also for cutting any kind of paper or Bristol board. They are slid along the ruler or T Square and will not injure its edge, as an ordinary knife would do. The blade of these Cutters can be adjusted to cut only the thickness of the paper without striking the drawing board. The knife of No. 2700 is set and clamped while the cutter of No. 2703 is adjustable by means of the thumbscrew projecting above the instrument. The knife can be removed from either instrument, for sharpening.

PAPERWEIGHTS.

2705. Paperweight, Shot in lined chamois bag impervious to lead dust, a very practical paper weight, about 2 pounds . . . . . each $ 1 00
2706. Paperweight, like No. 2705, but weight about 3 pounds " 1 25

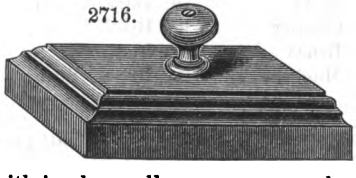


No. 2710.

2710. Lead Paperweight, covered with leather, about 4 × 2¼ × ¾ in., about 2¾ pounds, each $ 80
2711. do. do. 4¼ × 2½ × 1 " " 3¾ " " 1 00



No. 2715.



2716.

2715. Iron Paper Weight, round, with knob, small . . . . . each $ 50
2716. do. do. square, " " large . . . . . " 75

These Iron Paper Weights are finely finished and cloth lined. The knobs are of polished hardwood.

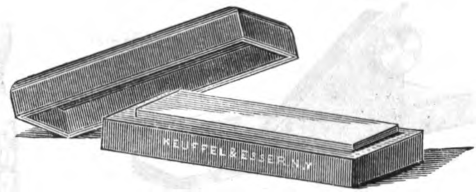


For Paperweight and Ink Bottle Holder see No. 3018, page 266.

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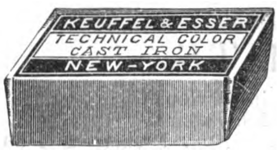
ARKANSAS OIL STONES.

No. 2720.



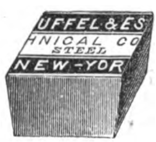
2720.	Arkansas Oil Stone, hard, in case with cover, about 3 in. .	each	$		75
2721.	do. do. do " " " " " 5 " .	"		2	00
2730N.	do. do. do. knife blade, about $3\frac{1}{2} \times \frac{3}{4} \times \frac{1}{4}$ in.	"			50

TECHNICAL (CONVENTIONAL) WATER COLORS.

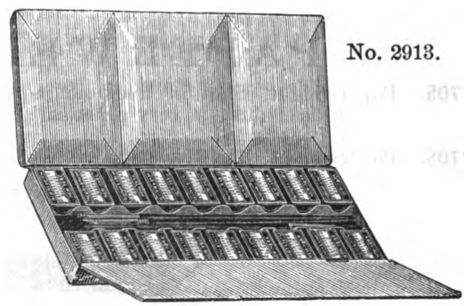


Full Pan.

No. 2900.



Half Pan.



No. 2913.

2900. 1. Cast Iron, 2. Wrought Iron, 3. Steel, 4. Copper, 5. Brass, 6. Machinery, 7. Leather, 8. Light Wood, 9. Dark Wood, 10. Brick, 11. Stone, 12. Brown Stone, 13. Prussian Blue, 14. Gamboge, 15. Yellow Ochre, 16. Vermilion, 17. Chinese White . . . . each

		Full Pans.	Half Pans.
2900.	1. Cast Iron 7. Leather 13. Prussian Blue; 2. Wrought Iron 8. Light Wood 14. Gamboge; 3. Steel 9. Dark Wood 15. Yellow Ochre; 4. Copper 10. Brick 16. Vermilion; 5. Brass 11. Stone 17. Chinese White; 6. Machinery 12. Brown Stone . . . . each	$ 18	$ 10
2901.	18. Carmine . . . . "	50	25

2910.	Japanned Tin Box, cont'g: 12 half pans, Nos. 1 to 12 of above, each	$	2	15
2911.	do. do. " 18 " " " 1 " 18 " " "		3	10
2912.	do. do. " 12 full pans " 1 " 12 " " "		3	45
2913.	do. do. " 18 " " " 1 " 18 " " "		5	00

Each box contains also 2 Brushes: No. 3132—2,—6.

The Technical Colors introduced by us many years ago, offer to the profession an always ready material for tinting drawings. As the tints are ready mixed, these moist colors save the work and time of mixing and warrant uniformity at all times.

For empty Tin Boxes see page 262.

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WINSOR & NEWTON'S

WATER COLORS.

Full Cake.





Full Pan.

Half Cake.





Half Pan.

2920.

1. Antwerp Blue
2. Bistre
3. Blue Black
*4. British Ink
5. Brown Ochre
6. Brown Pink
*7. Bronze
8. Burnt Sienna
9. Burnt Umber
94. Charcoal Grey
†115. Chinese Blue
10. Chinese White
14. Chrome, Deep
95. do. Lemon
32. do. Orange
11. do. Yellow
12. Cologne Earth
*13. Constant White
†116. Cyprus Umber
15. Dragon's Blood
16. Emerald Green
17. Flake White
18. Gamboge
19. Hooker's Green, No. 1
20. do do. 2
21. Indigo
22. Indian Red
23. Italian Pink
24. Ivory Black
25. King's Yellow
26. Lamp Black
27. Light Red
†100. Mauve
†117. Naples Yellow (deep)
28. Naples Yellow
29. Neutral Tint
30. New Blue
31. Olive Green
33. Payne's Grey
101. Permanent Blue
34. Prussian Blue
35. do. Green
36. Raw Sienna
37. Raw Umber
40. Roman Ochre
41. Sap Green.
42. Terre Verte
43. Vandyke Brown
44. Venetian Red
45. Vermilion
47. Yellow Lake
48. Yellow Ochre

	CAKE or PAN Full	Half
doz.	$3 00	$1 65

2921.

96. Alizarin Crimson
102. do. Green
103. do. Orange
104. do. Scarlet
105. do. Yellow
* 49. Black Lead
50. Brown Madder
51. Carmine Lake
89. Cerulean Blue
52. Crimson Lake
118. Cyanine Blue
53. Indian Yellow
106. Leitch's Blue
†119. Madder Carmine (Alizarin)
54. Mars Yellow
55. Neutral Orange
†120. Orange Madder (Alizarin)
64. Orange Vermilion
56. Purple Lake
57. Roman Sepia
58. Ruben's Madder
59. Scarlet Lake
60. do. Vermilion
61. Sepia
62. Warm Sepia

doz.	6 00	3 00

2922.

114. Cadmium Lemon
69. do. Orange
68. do. Yellow
†121. Cadmium Yellow (extra pale)
63. Cobalt Blue
97. do. Green
71. French Blue
†122. French Ultramarine
74. Indian Purple
75. Intense Blue
76. Lemon Yellow
87. Mars Orange
†123. Mineral Grey
†124. Mineral Violet
†107. Emerald Oxide of Chrome
73. Oxide of Chromium
†108. do. transparent
98. Permanent Mauve
99. Permanent Violet
77. Pale Cadmium Yellow
79. Pure Scarlet
†109. Ultramarine Ash-grey
125. Veronese Green
81. Viridian

doz.	7 50	3 75

2923.

66. Aureolin
91. Aurora Yellow
67. Burnt Carmine
70. Carmine
†126. Cobalt Yellow
85. Field's Orange Vermilion
110. Gallstone
86. Madder Carmine
111. do. Lake
†127. New Olive Green
78. Pink Madder
92. Primrose Aureolin
82. Purple Madder
112. Rose Dorée
90. Scarlet Madder
80. Rose Madder
65. Violet Carmine
93. Yellow Carmine

doz.	12 75	6 38

2924. 84. Ultramarine Ash Blue. doz. 18 00 9 00

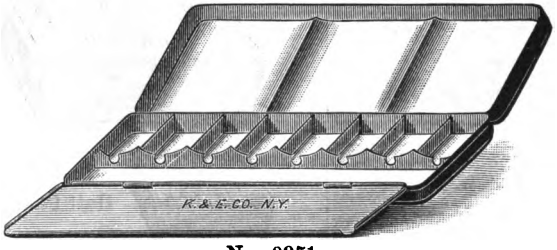
2925. 88. Genuine Ultramarine . . . . . ¼ Cake each $ 2 00

Colors marked * are made ONLY in CAKES, and those marked † ONLY in PANS.

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EMPTY JAPANNED TIN BOXES

for Moist Colors in Pans.



No. 2951.

2950.	For 6 full or 12 half Pans	each $	80
2951.	" 8 " " 16 " "	"	90
2952.	" 9 " " 18 " "	"	1 00
2953.	" 10 " " 20 " "	"	1 05
2954.	" 12 " " 24 " "	"	1 15
2955.	" 16 " " 32 " "	"	1 30
2956.	" 18 " " 36 " "	"	1 40
2957.	" 20 " " 40 " "	"	1 45
2958.	" 24 " " 48 " "	"	1 60

These boxes are fitted for the moist colors listed on pages 260 and 261.
Brushes are listed on pages 269 and following.

WINSOR & NEWTON'S WATER COLOR LIQUIDS.



No. 2961.

W & N Liquids,

2960.	Chinese White . . each $		30
2961.	Indian Ink . . . . "		30
2962.	Oxgall . . . . . "		30
2963.	Gold Ink . . . . . "		30
2964.	Carmine . . . . . each $		30
2965.	Indelible Brown Ink, "		30
2966.	Prout's Brown . . . "		30
2967.	Sepia . . . . . "		30
2968.	Blue . . . . . "		30

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HIGGINS' INKS AND ADHESIVES.



No. 2970.

Higgins' Drawing Inks,

2969. Black, **Waterproof.**
2970. " **General.**
2971. Carmine.
2972. Scarlet.
2973. Vermilion.
2974. Brick-red.
2975. Blue.
2976. Green.
2977. Violet.
2978. Indigo.
2979. Brown.
2980. Yellow.
2981. Orange.

Small	(¼ oz.) . .	each $ 25	Pints	(16 oz.) . . .	each $ 3 75
Half pints	(8 ") . .	" 2 00	Quarts	(32 ") . . .	" 7 00



No. 2985.



2986.



2987.

2985. Higgins' Drawing Board Mucilage,

	3 oz.	6 oz.	14 oz.	half-gallon	gallon.
each $	.15	.25	.50	2.00	3.50

2986. Higgins' Taurine Mucilage,

	2 oz.	4 oz.	½ pint	pint	quart.
each $	.10	.20	.30	.50	.80

2987. Higgins' Office Paste,

	4 oz.	8 oz.
each $	.15	.25

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COLUMBIA
LIQUID INDELIBLE DRAWING INKS.

Columbia Indelible Inks meet the requirements of a perfect Drawing Ink and are always ready for use and always uniform in quality and color. They flow freely, dry readily, and are not apt to gum. They therefore possess all features to recommend them as an always reliable ink for general drafting.

All these Inks are Indelible in that they will not re-dissolve after drying, a feature variously described as indelible, waterproof, washable, etc. Lines drawn with these inks will not blur nor be defaced by brush tints, even frequently applied, nor by exposure to moisture in out-door use.

The Colored Columbia Drawing Inks are all perfect of their kind, including the blue which is the most difficult color, and which has not been produced in perfection in any other ink. They all are freely miscible for producing other tints.

Columbia Inks No. 3000 to 3009 are put up in square bottles provided with our patent ink filler. This consists of a glass tube with flattened capillary end, which can be inserted *between* the blades of a drawing pen and is provided with a rubber suction bulb enclosed in a rigid annular collar, which protects it during transportation and serves as a handle to prevent deflection of the tube when filling a pen. This device is so cleanly that it dispenses with wiping the pen after filling (no pen-wiper). There is no soiling of the pen or fingers (nor of the drawing), and the glass filler cannot become soft and limp.

Columbia Inks No. 3000 R to 3009 R are put up in round bottles provided with quill filler.



No. 3000. Patented.

Illustrations about ½ size.



No. 3000 R.

Columbia Indelible Drawing Ink, **square** bottle, improved **glass filler,**

3000.	Black	each $	25	**3005.**	Carmine	each $	25
3001.	Brown	"	25	**3006.**	Yellow	"	25
3002.	Blue	"	25	**3007.**	Vermilion	"	25
3003.	Green	"	25	**3008.**	Orange	"	25
3004.	Scarlet	"	25	**3009.**	Violet	"	25

Mailing charges (postage and regulation mailing box) . . " 10

Columbia Indelible Drawing Ink, **round** bottle, **quill filler,**

3000 R.	Black	each $	25	**3005 R.**	Carmine	each $	25
3001 R.	Brown	"	25	**3006 R.**	Yellow	"	25
3002 R.	Blue	"	25	**3007 R.**	Vermilion	"	25
3003 R.	Green	"	25	**3008 R.**	Orange	"	25
3004 R.	Scarlet	"	25	**3009 R.**	Violet	"	25

Mailing charges (postage and regulation mailing box) . . " 10

For bottle holders for Columbia ink, see No. 3018 and 3019, page 266.

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COLUMBIA
LIQUID INDELIBLE DRAWING INKS

IN LARGE BOTTLES.



QUARTER-PINTS.

Black,	3000 C, each	$ 90
Brown,	3001 C, "	90
Blue,	3002 C, "	90
Green,	3003 C, "	90
Scarlet,	3004 C, "	90
Carmine,	3005 C, "	90
Yellow,	3006 C, "	90
Vermilion,	3007 C, "	90
Orange,	3008 C, "	90
Violet,	3009 C, "	90

HALF-PINTS.

Black,	3000 D, each	1 60
Brown,	3001 D, "	1 60
Blue,	3002 D, "	1 60
Green,	3003 D, "	1 60
Scarlet,	3004 D, "	1 60
Carmine,	3005 D, "	1 60
Yellow,	3006 D, "	1 60
Vermilion,	3007 D, "	1 60
Orange,	3008 D, "	1 60
Violet,	3009 D, "	1 60

PINTS.

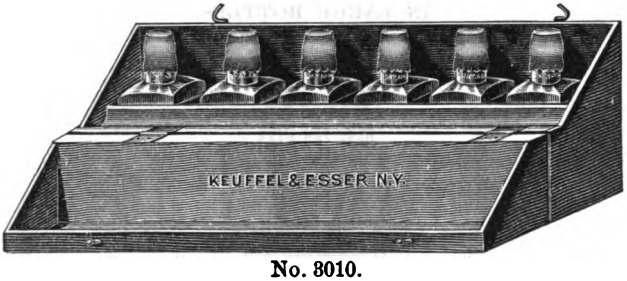
Black,	3000 E, each	$3 00
Brown,	3001 E, "	3 00
Blue,	3002 E, "	3 00
Green,	3003 E, "	3 00
Scarlet,	3004 E, "	3 00
Carmine,	3005 E, "	3 00
Yellow,	3006 E, "	3 00
Vermilion,	3007 E, "	3 00
Orange,	3008 E, "	3 00
Violet,	3009 E, "	3 00

QUARTS.

Black,	3000 F, each	5 75
Brown,	3001 F, "	5 75
Blue,	3002 F, "	5 75
Green,	3003 F, "	5 75
Scarlet,	3004 F, "	5 75
Carmine,	3005 F, "	5 75
Yellow,	3006 F, "	5 75
Vermilion,	3007 F, "	5 75
Orange,	3008 F, "	5 75
Violet,	3009 F, "	5 75

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COLORED COLUMBIA INKS IN SETS.



No. 3010.

3010. Polished Mahogany Box, containing 6 bottles of any colors of Nos. 3000 to 3009, set $ 2 25

3011. Plain Wooden Box, " " do. do. do. " 1 50

INK-BOTTLE HOLDERS.



No. 3018.

Illustrations about ½ size.



3019.

Old No. 2707

3018. Ink-bottle Holder and Paper weight, iron, enameled, weight about 2 pounds. . . . . each $ 75

The bottle is inserted from below and secured by a bayonet flange; it will hold any of the drawing ink bottles generally used.

3019. Ink-bottle Holder, iron, bronzed, weight about 8 oz., . . . each $ 30

This holder is adapted for either Columbia Inks, (both the square and the round bottle,) or Higgins'. The bottle is held by a steel spring inserted through one of the openings in the sides of the holder: for Columbia Inks through the opening marked C, for Higgins' through that marked H.

The holder is of iron, with a neat bronze finish and shaped to guard against tipping.

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CHINESE OR INDIAN INKS.

OUR DIRECT IMPORTATION.

Illustrations full size.



B. E. H. N. N-2.

3030 A.	Oval, black with Lion Head, $2\frac{5}{8}$ in. long	cake	$ 25
B.	" " " " " $3\frac{1}{4}$ " "	"	50
E.	Oblong, gilt, $2\frac{5}{8}$ in. long	"	60
G.	Square, black, gilt figures, $2\frac{1}{8}$ in. long	"	40
H.	" " " " $2\frac{3}{4}$ " "	"	75
N.	Square, black, gilt figures, Super Super, $3\frac{5}{8}$ in. long . .	"	1 00
N-2.	" " " " " " small, $2\frac{7}{8}$ in. long	"	50

For extra-fine India Inks see next page.

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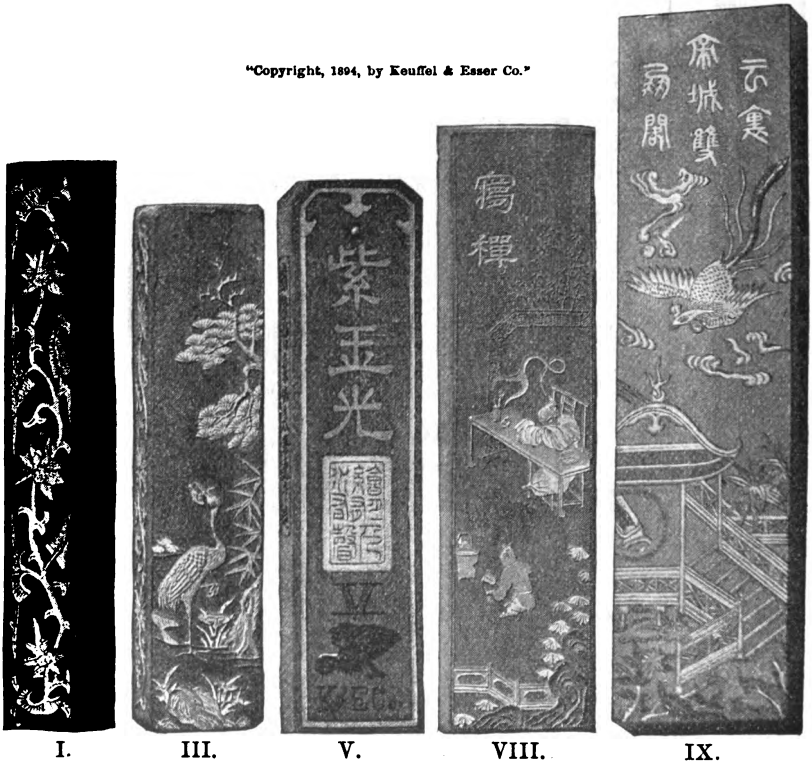
EXTRA FINE INDIA INKS.

TRADEMARK: K. & E. CO.

The inks No. 3031, I to IX are of extra-fine quality and the very finest that are made. As ALL the patterns of fine India inks are imitated in cheap grades in China and are so minutely copied that it is practically impossible to tell the counterfeit from the genuine by inspection, we mark our extra fine inks with our trademark and initials. This enables the buyer to have our guaranty that the ink is the genuine, fine article and not an imitation.

We highly recommend these fine inks to Draftsmen and Artists.

"Copyright, 1894, by Keuffel & Esser Co."



I. III. V. VIII. IX.

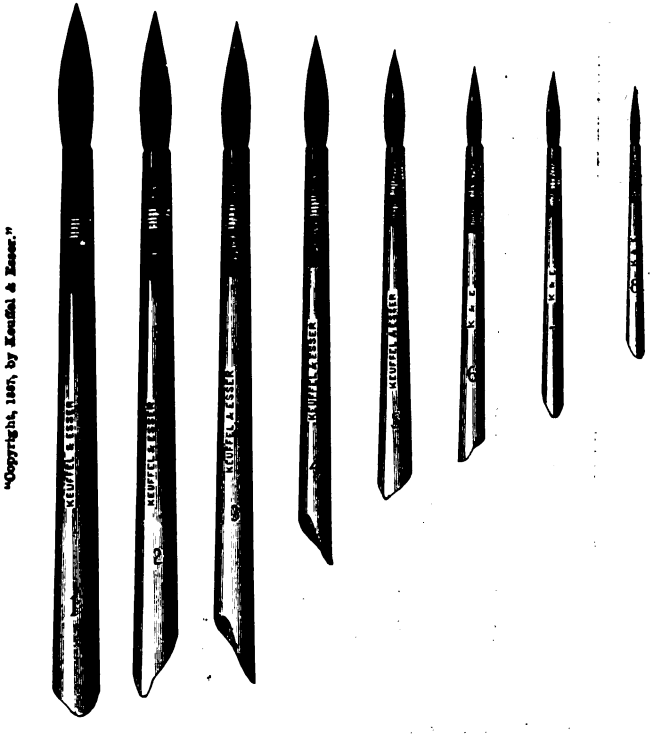
3031	I.	Oblong, black, 3 in. long	each	$	1 50
	III.	" " 2¾ " "	"		3 00
	V.	" " 2⅞ " "	"		2 50
	VIII.	" " 3½ " "	"		3 00
	IX.	" " 3¾ " "	"		4 50

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BRUSHES.

As the quality of brushes can not be exactly described and as illustrations can not be made to show quality, we mention that all the brushes we list are the very best of their respective kind. They are always of the kind of hair mentioned, without adulteration or substitution, and each size contains the proper quantity of hair. The numbering of our brushes is the same now for the same sizes which we so numbered over 40 years ago.

Illustrations full size.



"Copyright, 1897, by Keuffel & Esser."

3100. Black Sable in Quills,

No.	1	2	3	4	5	6	7	8
each $	70	60	45	35	30	25	20	15

3101. Red Sable in Quills,

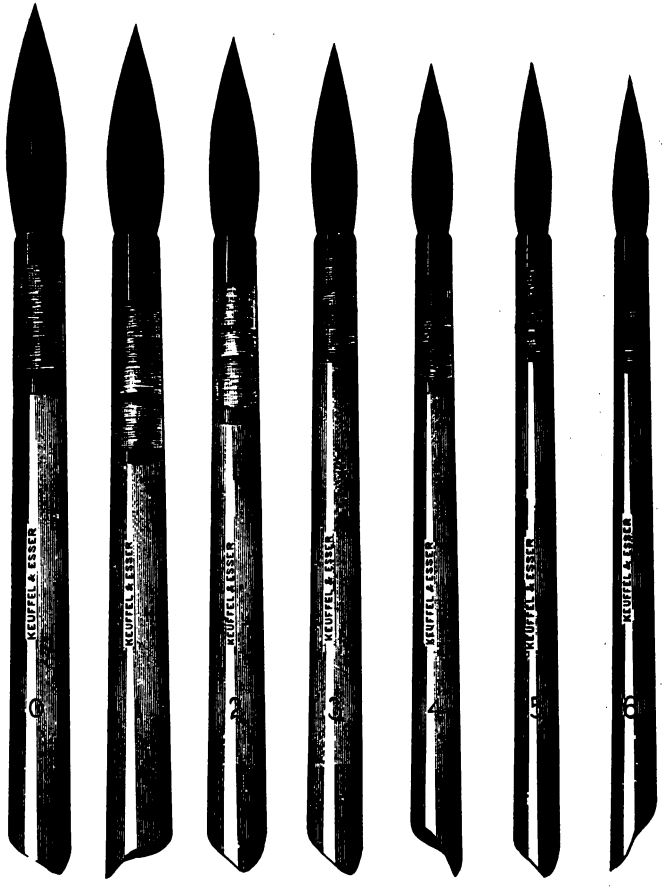
No.	1	2	3	4	5	6	7	8
each $	60	50	40	35	25	20	15	12

3102. Camel Hair in Quills,

No.	1	2	3	4	5	6	7	8
each $	10	10	08	08	06	06	05	05

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Illustrations full size.



"Copyright, 1887, by Keuffel & Esser."

3110. Black Sable in Swan Quills,

No.	0	1	2	3	4	5	6
each $	3 30	2 80	2 10	1 50	1 00	80	70

3111. Red Sable in Swan Quills,

No.	0	1	2	3	4	5	6
each $	2 15	1 85	1 50	1 10	95	75	55

3112. Camel Hair in Swan Quills,

No.	0	1	2	3	4	5	6
each $	60	50	35	25	15	12	09

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Illustrations full size.



"Copyright, 1897, by Keuffel & Esser."

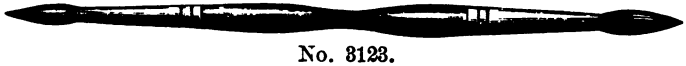
3120. Black Sable, round, in Albata, black Handle,

No.	1	2	4	6	8	10	12	14	16	18	20	22
each $	20	25	30	35	45	55	70	90	1 25	1 75	2 35	3 15

3121. Red Sable, round, in Albata, black Handle,

No.	1	2	4	6	8	10	12	14	16	18	20	22
each $	13	15	20	30	40	55	75	95	1 20	1 45	1 90	2 40

Illustration ½ size.



No. 3123.

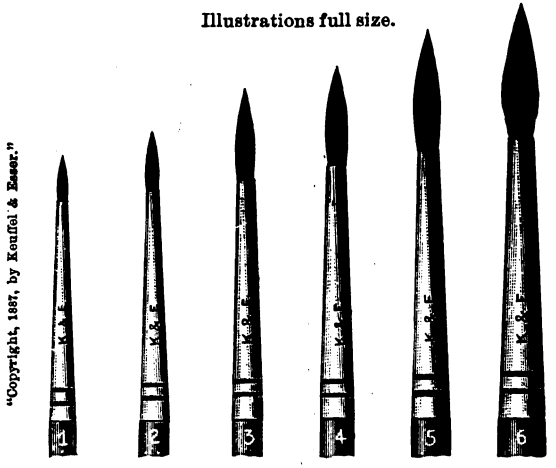
3123. Red Sable, round, in Albata, with two points,

No.	1	2
each	$ 1 00	1 40

Please note that ours are **real sable brushes.** We emphasize this because sable hair, on account of the advances in its price has been extensively adulterated. Real sable brushes form a finer point and retain this point longer than others and **remain elastic.**

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Illustrations full size.

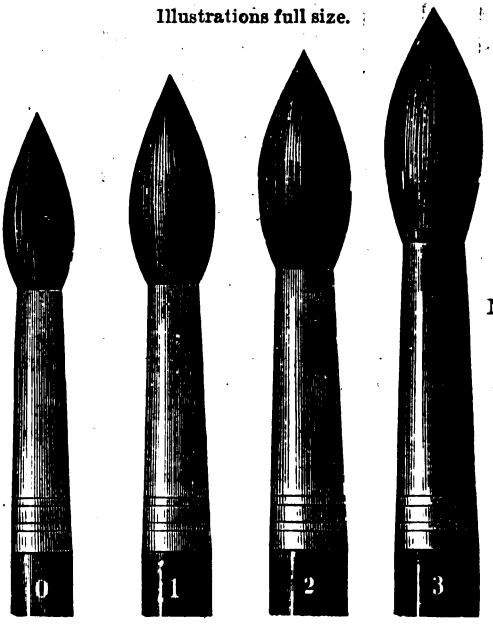


No. 3132.

3132. Camel Hair in Tin, red Handle,

No.	1	2	3	4	5	6
each $	07	08	08	10	10	12

Illustrations full size.



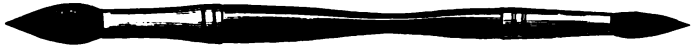
No. 3133.

3133. Camel Hair Sky or Wash Brush, in Tin, polished Handle,

No.	0	1	2	3
each $	20	25	30	35

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Illustration ½ size.



No. 3134, 3135.

3134. Camel Hair in Tin, with 2 points,

No.	0000	000	00
each $	30	35	40

3135. Camel Hair in Tin, with 2 points,

No.	0	1	2	3
each $	45	50	55	60

Illustration full size.



"Copyright, 1887, by Keuffel & Esser." No. 3136-3.

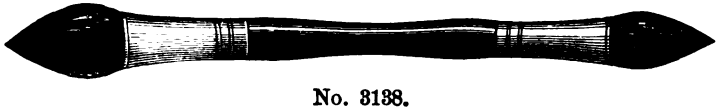
3136. Camel Hair Sky or Wash Brush, extra-fine, round, in Albata,

No.	1	2	3
each $	50	60	70

3137. Camel Hair Sky or Wash Brush, extra-fine, flat, in Albata,

No.	1	2	3
each $	50	60	70

Illustration ½ size.



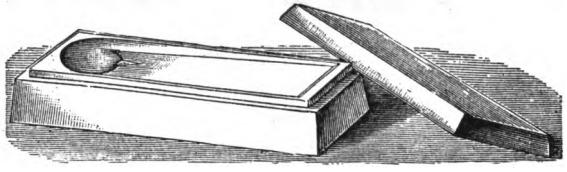
No. 3138.

3138. Camel Hair in Albata, with 2 flat points,

No.	1	2
each $	1 10	1 30

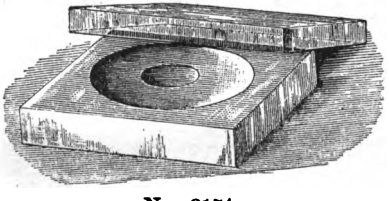
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CHINA AND GLASSWARE.



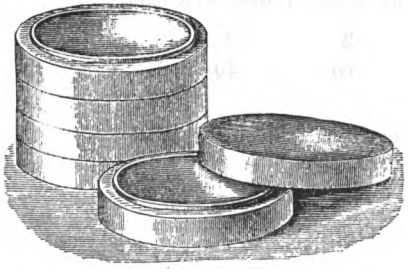
No. 3150.

3150. Keuffel & Esser Co. Pat. Ink Slab, China, with cover, $1\frac{3}{4} \times 4\frac{1}{2}$ in. each $ 35

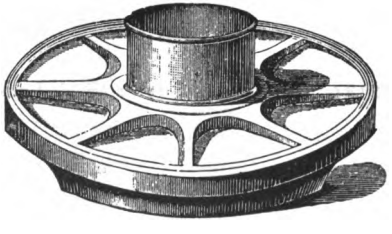


No. 3154.

3154. Slate Ink Cup, with glass cover, $3\frac{1}{2} \times 3\frac{1}{2}$ in. . . . . each $ 35



No. 3160.



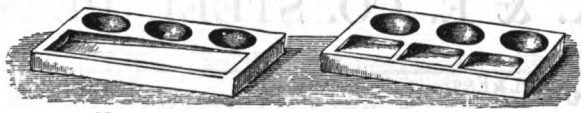
3169.

3160.	Nest of Cabinet Saucers,	6	in set,	$2\frac{3}{8}$	in.	set	$	55
3161.	do.	6	" "	$2\frac{5}{8}$	"	"		65
3162.	do.	6	" "	$3\frac{1}{4}$	"	"		75
3163.	do.	6	" "	$3\frac{3}{4}$	"	"		85
3164.	do. deep	4	" "	$2\frac{5}{8}$	"	"		70
3165.	do. "	4	" "	$3\frac{1}{4}$	"	"		80
3166.	do. "	4	" "	$3\frac{3}{4}$	"	"		90

A "Nest of 6" consists of 5 saucers and cover; a "Nest of 4" of 3 saucers and cover.

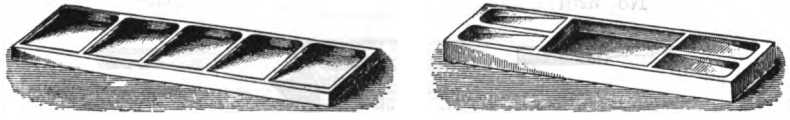
3169. Architect's Slant and Basin, 8 divisions and cup, 7 in. diam., each $ 1 50

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No. 3170. 3174.

3170.	Ink or Color Slab, 3 Wells, 1 Slope, $1\frac{1}{2} \times 2\frac{3}{4}$ in.	each $	10
3171.	do. 3 " 1 " $2\frac{1}{2} \times 4$ "	"	18
3172.	do. 3 " 1 " $2\frac{3}{4} \times 4\frac{1}{4}$ "	"	25
3173.	do. 3 " 1 " $3\frac{1}{4} \times 5$ "	"	30
3174.	do. 3 " 3 Slopes, $2\frac{1}{2} \times 4$ "	"	18
3175.	do. 5 " 5 " 4 $\times 7\frac{1}{2}$ "	"	55



No. 3178. 3183.

3176.	Sloping Tile, 3 divisions, $2\frac{1}{2} \times 4$ in.	each $	15
3177.	do. 4 " 3 $\times 7\frac{3}{4}$ "	"	30
3178.	do. 5 " 3 $\times 7\frac{3}{4}$ "	"	35
3179.	do. 6 " 3 $\times 7\frac{3}{4}$ "	"	40
3180.	do. 8 " 6 $\times 7\frac{1}{2}$ "	"	50
3183.	Centre Slab, 5 divisions, $2\frac{3}{8} \times 6$ in.	each $	20



No. 3184. 3185.

3184.	China Color Cups,	$2\frac{1}{2}$	3	$3\frac{1}{2}$	in. diam.
	each $	07	10	20	
3185.	China Brush Rest, $5\frac{1}{2}$ in. long	each $	15		



No. 3186.

3186.	Artist's Water Glass, $2\frac{3}{8}$ in. diam.	each $	12
3187.	do. $3\frac{1}{4}$ " "	"	25
3188.	do. $3\frac{3}{4}$ " "	"	30
3189.	do. $4\frac{1}{4}$ " "	"	35

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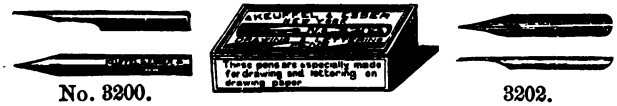
K. & E. CO. STEEL PENS.



No. 3201.



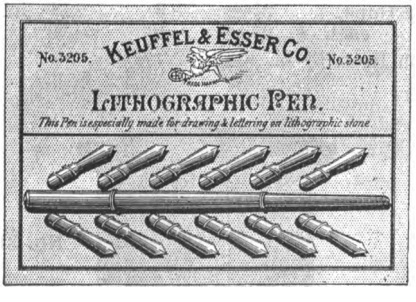
3203.



No. 3200. 3202.

3200.	Keuffel & Esser Co. Crow Quill Pens, 1 doz. in a box . .	doz.	$ 55
3201.	Keuffel & Esser Co. Crow Quill Pens, 1 doz. pens No. 3200 and Holder, on a card	card	60
3202.	Keuffel & Esser Co. Drawing and Lettering Pens, 1 doz. in a box	doz.	55
3203.	Keuffel & Esser Co. Drawing and Lettering Pens, 1 doz. pens No. 3202 and Holder, on a card	card	60

Pens No. 3200 and 3202 are specially made for Draftsmen for drawing and lettering on drawing paper, which has a more or less coarse surface. They have longer nibs and less sharp points than most others, possess great elasticity and permit of more rapid lettering or drawing, without scratching or catching in the grain of the paper. Draftsmen will prefer these pens to any other kind, as most others are intended principally for drawing on stone.



No. 3205.

3204.	Keuffel & Esser Co. Lithographic Pens, 1 doz. in a box,	doz.	$ 55
3205.	Keuffel & Esser Co. Lithographic Pens,1 doz. pens No.3204 and Holder, on a card	card	60

Pens No. 3204 differ from all other Lithographic Pens in having shorter (and therefore firmer) nibs, and points of the utmost fineness.

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No. 3206.



3206. Keuffel & Esser Co. Crow Quill Pens, No. 3200, in improved Holders with cork finger piece, each $ 10
Card of 10 Pens No. 3206, in improved Holders with cork finger piece . . . . . per card 1 00

STEEL PENS.

JOSEPH GILLOTT'S.

3210. Lithographic Crow Quill Pens, (No. 659), doz. cards $ 6 00 card $ 60
3211. Superfine long shoulder Crow Quill Pens, (No. 850) . . . . . " " 7 50 " 75
3212. Lithographic Pens, (No. 290) . . . . . " " 6 00 " 60
3213. Mapping Pens, (No. 291) . . . . . " " 6 00 " 60

A "card" has 12 pens and 1 holder.

3214. Mapping or Ladies Pens, (No. 170) . . gross 1 00 doz. 10
3215. Lettering Pens, (No. 303) . . . . . " 1 50 " 15
3216. do. (No. 404) . . . . . " 1 00 " 10

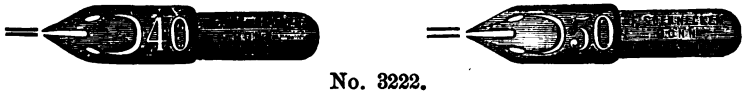
FRENCH (B. P. Co.)

3217. Crow Quill Pens, each with Holder, . . doz. cards $ 3 60 card $ 35

A "card" has 12 pens, each with holder.

3220. Penholders, see next page.

ROAD PENS.



No. 3222.

3222. Road Pens, Nos. 40 and 50 . per ¼ gross box $ 65 per dozen $ 35

These pens have two fine equal points and are used as road pens in map drawing.

For Round Writing Pens etc. see page 288.

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K. & E. CO. PENHOLDERS.



No. 3220.

3220. Improved Crow Quill Penholder . . . . . each $ 05



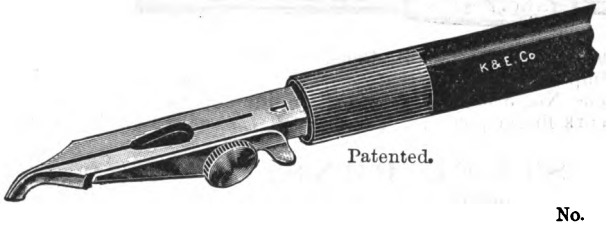
No. 3221

3221. Improved Lettering Penholder . . . . . each $ 05

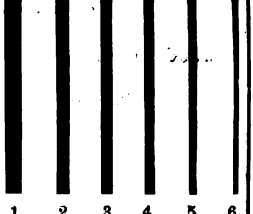
These holders for crow quill and lettering pens are of the thickness of an ordinary penholder, a great improvement over the thin sticks generally used.

PAYZANT (FREEHAND) LETTERING PENS

with Ink Reservoir.



Patented.



No. 1 2 3 4 5 6

BRASS.

3224. Payzant Lettering Pens, Brass, Nos. 1, 2, 3, 4, 5, 6. . . . . each $ 1 00

3225. do. do. do. Set of 6 pens, Nos. 1, 2, 3, 4, 5, 6, in partitioned paper box, set 6 00

GERMAN SILVER.

3224S. do. do. German Silver, Nos. 1, 2, 3, 4, 5, 6 . . each 1 35

3225S. do. do. do. do. Set of 6 pens, Nos. 1, 2, 3, 4, 5, 6, in partitioned paper box, set 8 10

The Payzant Lettering Pens are particularly adapted for lettering Engineers' and Architects' drawings and for the use of Merchants in writing price tags, show cards, etc.

The usual method of forming heavy letters with a fine pen is slow and tedious work and but few draftsmen are capable of executing neat lettering with reasonable rapidity. Therefore the Payzant Lettering Pens supply a long felt want at the drafting table, as the letters are completely formed in a single stroke in one-quarter of the time needed for outlining and filling in each letter with a fine pen.

There is no knack to acquire to use these pens, as the marking point is constructed to produce the same gauge of line no matter in what direction the pen is moved over the paper. Owing to the absolute uniformity of the lines in width and density, any draftsman, novice or expert, can do finer and neater lettering with these pens than by the

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fine-pen method. It is unnecessary, even on the finest plans, to carefully draw the letters in pencil before inking; a rough draft to obtain proper spacing is all that is needed.

The reservoir attachment gives the No. 1 pen a capacity of 100 or more words with each filling of ink; the capacity of the smaller sizes is progrssively greater.

For border lines or any heavy line work they are far superior to the usual ruling pen, as 25 to 30 feet can easily be ruled without re-filling the reservoir. There are no delicate parts to get out of order and with ordinary care a set of these pens will last a lifetime.

These pens are manufactured in six graded sizes. We give a few reproductions of letters made with them.

BLOCKS

No. 1 No. 2 No. 3 No. 4 No. 5 No. 6.

Vertica | Sloping.

SHADE | & WIDE.

ARCMI | Scroll

SHAD | HIGH & NARR

Fac-simile of letters made with Payzant Pens.

Suggestions for using the Payzant Block Lettering Pen:

Fill the pen by quill or dropper, the same as a ruling pen is filled; never dip it into the ink.

After filling, adjust the nibs to the proper feeding distance, and test on scrap paper.

Should the pen become clogged while in use, open the nibs slightly and insert the edge of a piece of paper.

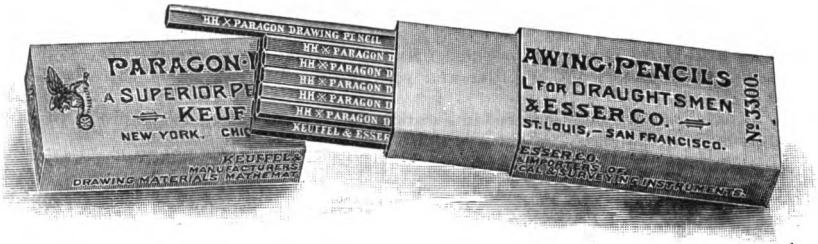
On drawings for which a fine finish is desired, add sharp corners to the letters with a fine pen and shade as required.

After using, open the reservoir (by loosening the clamp screw) and clean thoroughly.

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LEAD PENCILS.

KEUFFEL & ESSER CO'S.



Our Paragon Pencils and Colored Pencils, are of the very best quality and possess all the merits of other best makes established in this market. They excel in correctness and uniformity of grading, and cost less than other similar pencils. We fully warrant these pencils and solicit a trial of them.



3300. Paragon Pencils, extra fine quality, hexagon, yellow polish and gilt: HB, F, H, HH, 3H, 4H, 5H, 6H. . . . . per doz. $ 60



No. 3330.

3330. K & E Red Hexagon Pencils, finest quality . . . . per doz. $ 1 00
3331. do. Blue " " " " . . . . " " 1 00



No. 3335.

3335. K & E Red Round Pencils, finest quality . . . . . per doz. $ 75
3336. do. Blue " " " " . . . . . " " 75



No. 3340.

3340. K & E Red and Blue Hexagon Pencils, finest quality, per doz. $ 1 25
3345. K & E Round White Pencils (for blueprints etc.) . . " " 75

See also: Colored Pencils, No. 3375, on page 282.

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K. & E. CO. DETAIL PENCILS.



No. 3348.

3348. K. & E. Co. Detail Pencils, hexagon, gilt,
Nos. 2. 3. 4. 5 . . . . . gross $ 3 50 doz. $ 35

We recommend these Detail Pencils as being of excellent quality and carefully graded.

PENCIL HOLDERS.

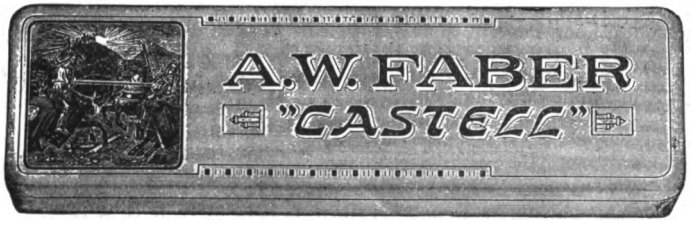


No. 3349.

3349. Holder for pencil stumps, 4½ in. hexagonal, metal ferrule . each $ 05

3349 D. do. do. do. do. 6 " do. do. do.
at each end " 10

A. W. FABER'S CASTELL PENCILS.



No. 3350.

3350. Castell Pencils, hexagon, very best, green polished,
6 B, 5 B, 4 B, 3 B, BB, B, F, HB, H, HH, 3 H,
4 H, 5 H, 6 H, 7 H, 8 H . . . . . doz. $ 1 25

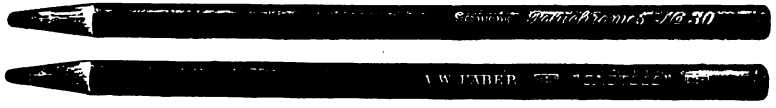
3360. Castell Artist Pencils, hexagon, double pointed,
green polished, F HH and BB HB . . . . . each 35

3361. Castell Artist Pencils, single point, hexagon, green
polished, BB, B, F, HB, H, HH, 3 H, 4 H, 5 H,
6 H, 7 H, 8 H . . . . . " 25

3370. Castell Leads for Artist Pencils, BB, B, F, HB, H,
HH, 3 H, 4 H, 5 H, 6 H, 7 H, 8 H . . . . . box of 6 60

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A. W. FABER'S CASTELL POLYCHROMOS COLORED PENCILS.



No. 3375.

3375. A. W. Faber's Polychromos Pencils . . . . doz. $ 1 00 each $ 10

No.	1.	White,	No.	9.	Orange,
"	4.	Light chrome,	"	14.	Green bice.
"	24.	Ultramarine,	"	17.	Hooker's green No. 2,
"	49.	Indian red,	"	32.	Madder Carmine,
"	38.	Pale vermilion,	"	21.	Light blue,
"	29.	Red violet lake,	"	60.	Ivory black.

3376. A. W. Faber's Polychromos Pencils in boxes,

box of	6	12	18	24	36	48 ass'td. colors
per box	$ 75	1 10	1 65	2 15	2 90	4 00

HARDTMUTH'S KOH-I-NOOR PENCILS.



No. 3380.

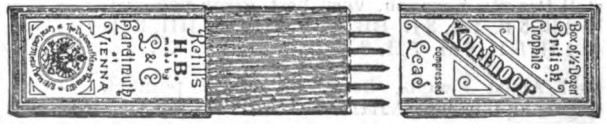
3380. Koh-i-noor Pencils, hexagon, yellow polish, 6 B, 5 B, 4 B, 3 B, BB, B, F, HB, H, HH, 3 H, 4 H, 5 H, 6 H, 7 H, 8 H, 9 H . . . . . doz. $ 1 25

3381. Koh-i-noor Copying Pencils . . . . . " 1 25



No. 3383.

3383. Koh-i-noor Artist Pencils, yellow polish, 6 B, 5 B, 4 B, 3 B, BB, B, F, HB, H, HH, 3 H, 4 H, 5 H, 6 H, 7 H, 8 H, 9 H . . . . . each $ 25



No. 3385.

3385. Koh-i-noor leads for Artist Pencils, 6 B, 5 B, 4 B, 3 B, BB, B, F, HB, H, HH, 3 H, 4 H, 5 H, 6 H, 7 H, 8 H, 9 H . . . . . per box of 6 $ 60

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MEPHISTO COPYING PENCILS.

3390.	Mephisto Copying Pencils (No. 73 B)				doz.	$ 75
3391.	do.	do.	do.	(No. 73 B hard)	"	85
3392.	do.	do.	do.	with red tip (No. 77)	"	85

RED CHALK CRAYONS.



No. 3401.



3404.

3400.	Red Chalk (Keel) in Cedar, for marking stakes			(7 × $\frac{3}{8}$ in.)	doz.	$ 60
3401.	do.	"	"	(4$\frac{3}{4}$ × $\frac{3}{4}$ ")	"	1 00
3402.	Red Chalk (Keel) in Sticks, covered with paper,			(3$\frac{1}{2}$ × $\frac{3}{8}$ ")	"	20
3403.	do.	"	"	(4 × $\frac{9}{16}$ ")	"	40
3404.	do.	"	"	(4 × $\frac{3}{4}$ ")	"	60
3405.	Keel, in lumps				per pound	15

Dixon's Lumber Crayons.

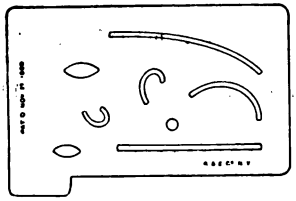


No. 3405 A.

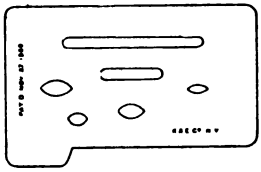
3405A. Dixon's Colored Crayons, 4$\frac{1}{2}$×$\frac{1}{2}$ in., paper covered, Yellow, Brown, Red, Blue, Green . . . . . doz. $ 1 20

3406. Sponge Rubber, see page 284.

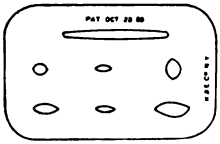
ERASING SHIELDS.



No. 3411.



3411 S.



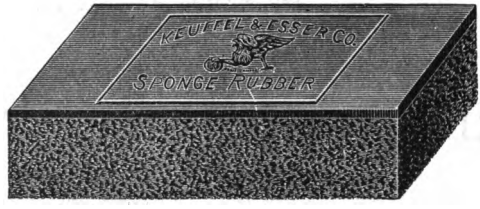
3411 M

3411.	Xylonite Erasing Shield for Draftsmen, 3$\frac{3}{8}$ × 5 in.			each	$ 20
3411 S.	do.	do.	. . . . . 2$\frac{7}{8}$ × 4$\frac{1}{2}$ "	"	15
3411 M.	Metal	do.	nickelplated 2$\frac{3}{8}$ × 3$\frac{1}{4}$ "	"	20

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SPONGE RUBBER

for Cleaning Drawings.



No. 3408.

3406.	Sponge Rubber, with solid back, 1 × 1 × 1 in.	each $	10
3407.	do. " " " $2\frac{1}{2} \times 1\frac{3}{4} \times \frac{5}{8}$ "	"	30
3408.	do. " " " 4 × 2 × 1 "	"	60
3409.	do. " " " 6 × 4 × 1 "	"	1 80

ALBA RUBBER.



No. 3415.



3416.

The ALBA is a high-grade eraser, smooth finish and of exceptional purity. It takes hold readily, will not smudge nor stain the paper and retains its excellent qualities for a long time.

3415.	Alba Pencil Rubber, flat,	40	30	20	16	12	8	4	to lb.
	per cake $	6	8	12	15	20	30	60	
3416.	Alba Pencil Rubber, oblong,	40	30	20	16	12	8	to lb.	
	per cake $	6	8	12	15	20	30		



No. 3417.



3418.

3417.	Alba Ink Eraser, flat, $1\frac{1}{2} \times 1 \times \frac{3}{16}$ in.	per cake $	05
3418.	do. oblong, $2\frac{7}{8} \times \frac{1}{2} \times \frac{5}{16}$ "	" "	06
3419.	do. " $3\frac{1}{4} \times \frac{5}{8} \times \frac{3}{8}$ "	" "	10

A. W. FABER'S RUBBERS.

3425.	Artist Rubber, flat,	40	30	24	20	16	12	8	4 to lb.
	per cake $	06	08	10	12	15	20	30	60

3440.	Ink Eraser, flat	per cake $	05
3441.	do. " large	" "	10
3442.	do. " extra large	" "	20

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HARDTMUTH'S PLIABLE RUBBER.



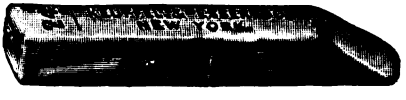
3450.	Pliable Rubber, grey, flat,	40	30	24	20	16	12	8	4 to lb.
	per cake $	6	8	10	12	15	20	30	60
3451.	Pliable Rubber, pink, flat,	40	30	24	20	16	12	8	4 to lb.
	per cake $	6	8	10	12	15	20	30	60

EMERALD AND RUBY RUBBER.



No. 3455 G.

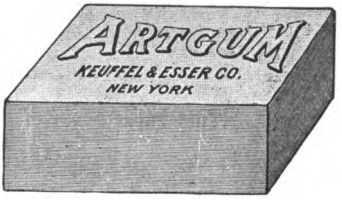
3455 G.	Emerald Rubber, oblong, wedge edge,	48	36	24	20	12	to lb.
	per cake $	05	07	10	12	20	



No. 3455 R.

3455R.	Ruby Rubber, oblong, wedge edge,	48	36	24	20	12	to lb.
	per cake $	05	07	10	12	20	

ART GUM.



3460 A.	Art Gum, $1\frac{1}{8} \times 1\frac{1}{8} \times 1\frac{1}{8}$ in.	each $	05
3460 B.	do. do. $2 \times 1 \times 1$ "	"	07
3460 C.	do. do. $2\frac{1}{4} \times 1\frac{1}{8} \times 1\frac{1}{8}$ "	"	10
3460 D.	do. do. $3 \times 2 \times 1$ "	"	15
3460 E.	do. do. $3 \times 3 \times 2$ "	"	25

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STEEL ERASERS.



No. 3480 and 3480½.

3480.	Steel Eraser with long blade,			Bone	Handle,		Domestic . .	each	$ 50
3480½.	do.	"	"	"	"	"	Rodger's . .	"	1 25
3481.	do.	"	"	Coco	"		Domestic . .	"	45
3481½.	do.	"	"	"	"	"	Rodger's . .	"	80



No. 3486 and 3486½.

3485.	Steel Eraser with short blade,			Bone	Handle,		Domestic . .	each	$ 50
3485½.	do.	"	"	"	"	"	Rodger's . .	"	75
3486.	do.	"	"	Coco	"		Domestic . .	"	35
3486½.	do.	"	"	"	"	"	Rodger's . .	"	60

LEAD PENCIL FILE.



No. 3488.

3488. Lead Pencil File and Tack Lifter, 6 in. . . . . each $ 25

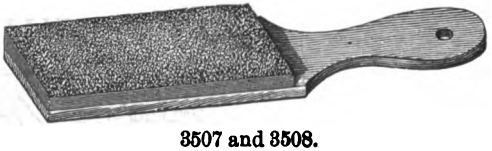
A convenient little tool, consisting of a steel file with a steel tack lifter at the end, black wooden handle.

PENCIL POINTERS.

These Pencil Pointers consist of 12 sheets made into a block.



No. 3501.



3507 and 3508.

Flint Paper

3501.	Pencil Pointer, 2½ × 4	in.						each	$ 15
3502.	do.	1¼ × 4	"					"	10
3506.	Pencil Pointer with wooden handle, 2½ × 4 in.							"	20
3507.	do.	"	"	"	1¼ × 4	"		"	15

Emery Paper

3508.	Pencil Pointer with wooden handle, like No. 3507 but of emery paper, 1¼ × 4 in.	"	20

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PENCIL SHARPENERS.

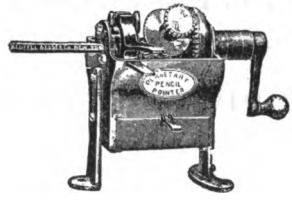


No. 3511 and 3513.

3511. "Useful" Pencil Pointer and Paper Weight, iron, enameled, about 1½ lbs. . . . . each $ 40

3513. "Useful" Pencil Pointer and Paper Weight, like No. 3511, but of bright bronze, finely finished . . . . . " 1 00

The Useful Pencil Sharpener is a roller covered with flint paper and mounted in a heavy metal box with cloth-lined bottom. The roller has six faces so that it will last a long time. The box catches the debris, and is heavy enough to require no holding when sharpening a pencil while the other hand is engaged. It is also a good paper weight. With each pencil pointer we furnish 2 extra sandpaper coverings for the roller.

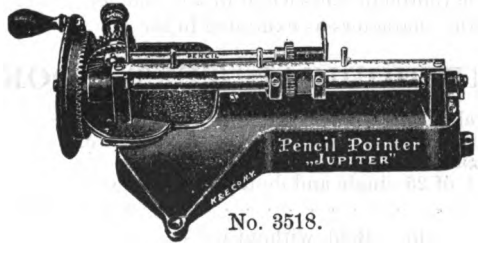


No. 3515.

3515. Planetary Pencil Sharpener . . . . . each $ 4 50

3516. Extra Knives for Planetary Pencil Sharpener . . . . . pair 65

The Planetary Pencil Sharpener makes a perfect point on all kinds, grades and sizes of lead or slate pencils, wax crayons etc. It can be attached to the wall or table.



No. 3518.

3518. Jupiter Pencil Sharpener, with Compensatory Weight, one extra Cutting Wheel and Oil can, with Directions . . each $ 7 50

3518W. New Cutting Wheel . . . . . " 75

The Jupiter Pencil Sharpener is of excellent workmanship and can be operated easily and very quickly. The cutting wheel can not be re-cut when it has worn dull, but must be replaced. The compensatory weight holds the Sharpener during use, when it is to be used at several places and is not fastened with screws.

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Round Writing

F. SOENNECKEN'S system of ornamental writing, called Round Writing, needs hardly any recommendation on our part.

The Methodical Text-Book for self-instruction is a complete guide for acquiring this beautiful hand in a very short time (ten to fourteen lessons suffice for a complete course in schools), and there is scarcely any profession but could advantageously make use of this writing in many ways.

Engineers, Architects and Draftsmen are enabled to letter drawings, maps, etc. in Round Writing elegantly and quickly.

Bankers and Merchants will find it most valuable and appropriate in heading books, filling out check blanks, price lists, etc., etc.

Insurance Companies and Lawyers cannot use more distinct letters for filling out or writing policies and legal documents.

Storekeepers can write neat show cards or price-tags in this hand.

IN ORDER TO LEARN ROUND WRITING

it is **indispensable** to thoroughly study and strictly observe the directions given in the

METHODICAL TEXT BOOK

especially with respect to the holding of the pen and to the exercises in writing.

The book plainly shows the scientific principles on which this Writing System is based; all efforts to master it by using the pens without the Text Book will be unsuccessful, vainly wasting time and labor. The correct and artistic execution of the characters does not depend, as may erroneously be supposed, on the

ADROITNESS OF THE HAND,

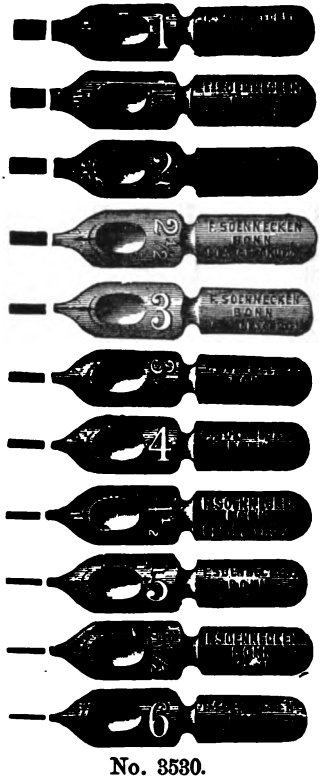
but merely on the thorough knowledge of the manner of holding the pen and of the system of the characters as exhibited in the

METHODICAL TEXT BOOK.

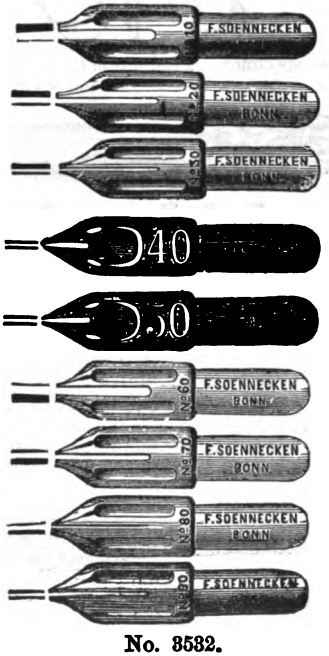
3520.	Methodical Text-Book to Round Writing by F. SOENNECKEN, (published by KEUFFEL & ESSER Co., New York) including an assortment of 25 single and double-pointed pens.	each	$ 1 00	post paid	$ 1 10
3521.	do. do. do. Book without pens .	"	65	" "	70
3522.	do. do. do. do. bound in cloth, with an assortment of 25 pens . . .	"	1 60	" "	1 78
3523.	Copy Book without Instructions (School Ed.) including an assortment of 25 single and double-pointed pens . .	"	70	" "	80
3524.	do. do. do. Book without pens .	"	35	" "	39

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ROUND WRITING PENS
GENUINE SOENNECKEN'S.



No. 3530.



No. 3532.

3530. Single-Pointed Pens, No. 1, 1½, 2, 2½, 3, 3½, 4, 4½, 5, 5½, 6, any one number, per gross $ 85 post paid $ 1 00
3531. do. do. do. do. " ¼ " 25 " " 31
3532. Double-Pointed Pens, No. 10, 20, 30, 40, 50, 60, 70, 80, 90, any one number . . . " ¼ " 65 " " 71
" doz. 35 " " 41

Each gross or quarter-gross box contains Pens of one number only.

3533. Sample Assortment of Single and Double-Pointed Pens, with Inkholder, 25 in a box $ 35 post paid 41



No. 3532½.



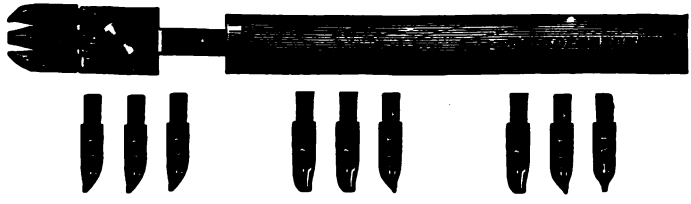
No. 3535.

3532½. Three-Pointed Pen, for ornamental work, doz. $ 50 post paid $ 56
3535. Inkholder for single-pointed Pens, specially for writing with India or Autograph Ink, per box of 6 $ 25 each 05

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Musica

The above specimen is a reduction to one-half size of the original, as executed with the Round Writing Instrument.



3536. Round Writing Instrument, complete with 9 minute pens . . . . . each $ 1 00 postpaid $ 1 10

3537. Minute Pens for above . . . . . doz. 75 each 10

With this instrument 2 or 3 parallel lines can be made with one motion. It is used in exactly the same manner as the single and double round writing pens.

The accompanying 9 minute pens admit of producing 144 different double and 504 different triple lines, by changing or interchanging the pens in the different places in the holder.



3560. Penholder for Round Writing Pens . . . . . each $ 10



3561. Double Penholder for Round Writing Pens . . . . . each $ 10



3564. Parcel Pens, in 4 widths, for bold and large lettering,

No.	F	M	B	BB	
	1/100	1/10	1 1/10	1 1/10	in. wide . . each $ 25

MAHOGANY BOXES WITH ROUND WRITING PENS.

3565. Box with 11 penholders, each with 2 pens . . . . . box $ 2 00

RULED SHEETS.

3568. Ruled Sheets for the different sizes of letters of Round Writing, both sides, one pattern on each page, imprint 6½ × 8 in., 5 patterns . . . . . per sheet $ 06

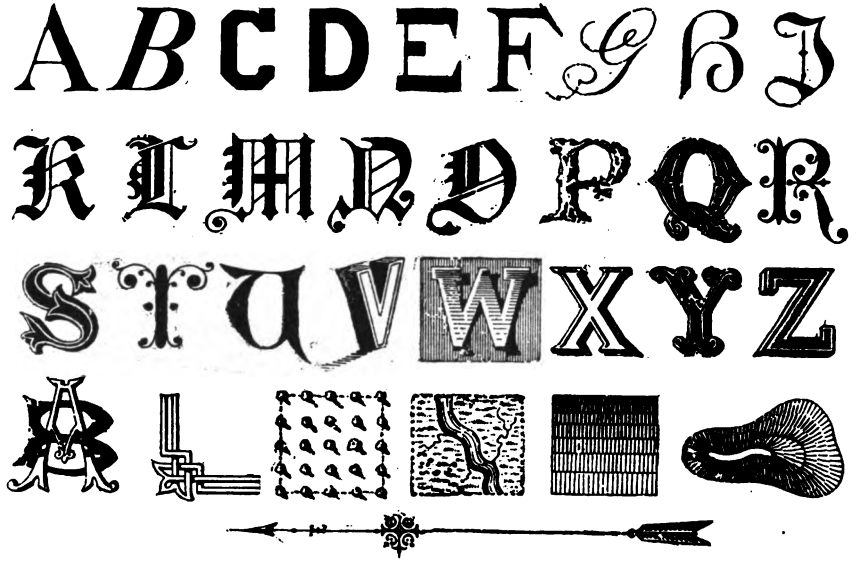
These sheets are placed under blank paper to serve as rulings for writing

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DRAFTSMAN'S ALPHABETS

BY

KEUFFEL & ESSER CO.



3570. Draftsman's Alphabets, cloth bound, board cover with gilt imprint, size 7 × 10½ in. . . . . each $ 1 00
post paid . . . " 1 10

The above cut shows reduced specimens of our "Draftsman's Alphabet", which gives on 31 pages a large variety of Alphabets, Numbers, Topographical Signs, etc. It will be found the most useful to draftsmen as the selection is made with great care, and the letters are engraved with reference to practical use, so that each letter, number or sign may be copied without difficulty.

Students' Alphabets

3571. Student's Alphabets, a selection of the most useful alphabets from above book, paper cover . . . . . each, $ 25
post paid . . . " 27

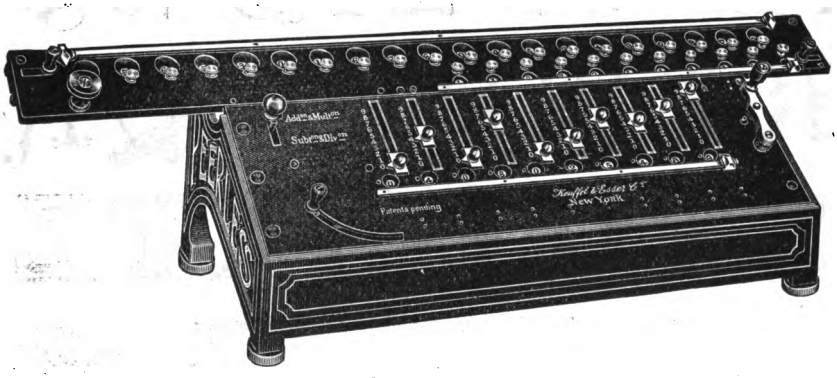
For other Alphabet Books see list of books at end of catalogue.

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THE IMPROVED

RECKONING MACHINE.

A PERFECT MECHANICAL CALCULATOR.



No. 4007.

4005. Reckoning Machine 6 figures for Multiplicand or Divisor, 7 figures for Multiplier or Quotient, 12 figures for Product or Dividend . . . . . each $250 00

4006. do. do. 8 figures for Multiplicand or Divisor, 9 figures for Multiplier or Quotient, 16 figures for Product or Dividend . . . . . " 300 00

4007. do. do. 10 figures for Multiplicand or Divisor, 11 figures for Multiplier or Quotient, 20 figures for Product or Dividend . . . . . " 375 00

The K & E Improved Reckoning Machines which we now offer represent the most advanced progress in the art of making mechanical calculators. They embody the latest improvements which considerably increase their value as savers of time and mental drudgery and as a guarantee of accuracy. They are perfect instruments, both mechanically, and in their functions.

Any arithmetical problem

from multiplication, division, simple addition and subtraction to the most

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intricate calculations can be solved, without mental effort, with unfailing accuracy and surprising rapidity.

The tiresome mental labor of calculating in the ordinary way, is reduced by the Reckoning Machine to a simple jotting down of the results obtained.

Squaring, Cubing, Extracting square roots, Percentage, Conversion of monies, weights and measures, Prorating, any kind of Commercial, Statistical or Scientific calculation can be done by the Reckoning Machine without effort with the greatest precision and extreme rapidity.

The Machine is built in the most substantial manner so that it will retain its efficiency and accuracy for a very long time. There are a great many of our Machines in use in public and private offices and scientific laboratories and they are giving the greatest satisfaction.

It is supported at a convenient working angle on a metal frame which is open at the sides and back, and is provided with rubber bumpers to reduce the noise of the mechanism. The metal cover (with handle) and the wooden base are not shown in the cut.

The valuable patented improvements which we have recently added to our Reckoning Machines are:

The **new cancelling device** which, at one shift of the handle sets all the keys in the grooves of the key-plate back to zero, thus saving the time lost in moving each key to the zero position separately.

A **line of windows below the grooves** of the key-plate, in which the settings of the several keys are indicated by figures, so that on our Machines the two factors of a calculation and their product, each appear in one straight line of figures. This feature is a safeguard against error in reading the settings of the keys, which otherwise often present a very irregular line.

Decimal pointers, arranged to slide on bars so that they may be set quickly and permanently wherever a decimal point is to be indicated. This device will be found much handier and safer than the old method of using pegs, which are inconvenient to handle, liable to drop out and easily lost.

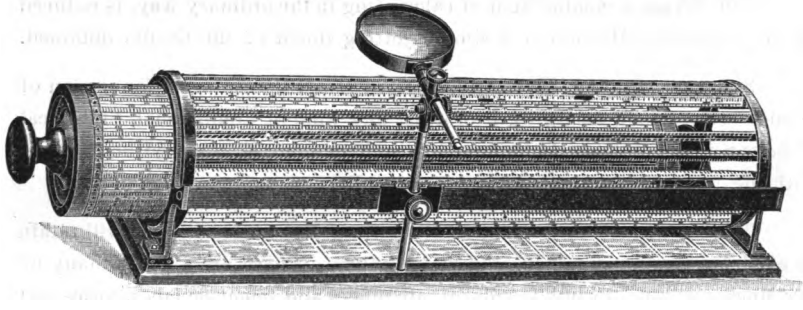
Additional **safety devices** in connection with the tens-carrying mechanism, eliminate the possibility of "sticking" or error in the rapid operation of the machine.

A book containing a full description, all the necessary rules for operating and numerous examples, both general and special, accompanies each one of our Reckoning Machines.

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SLIDE RULES.

THACHER'S CALCULATING INSTRUMENT.



No. 4013.

4012. Thacher's Calculating Instrument, cylinder 18 in., in polished mahogany Box, with full Directions . . . . . each $ 35 00

4013. do. do. do. with 3-in. reading glass sliding on brass bar, adjustable to any part of the instrument and for focus . . . . . " 45 00

Thacher's Calculating Instrument is a device for performing a great variety of useful arithmetical calculations with rapidity and accuracy. Its operation is simple and readily learned. By its use the tedious drudgery of calculation is avoided and the chance of error eliminated.

As is shown in the illustration the instrument consists of a cylinder 4 in. in diam. and 18 in. long, which revolves in an open framework composed of 20 angular bars held between two metal rings. The cylinder bears a scale corresponding to the scale of the Slide Rule, which is duplicated on the exposed sides of the bars. Results can be obtained to the fourth and usually to the fifth place of figures with a surprising degree of accuracy, sufficient for nearly every requirement of the professional or business man. Examples in multiplication, division, proportion, powers or roots involving not more than three quantities, are solved by one operation. and any number of values of an algebraic function composed of two constants and a single variable may generally be found by one setting.

The useful applications of the instrument are almost unlimited; among them may be mentioned finding the stresses and sections in trusses and girders, mensuration, estimates of work and material, solving trigonometrical formulas, making and applying tables, problems in mechanical powers, machinery and hydraulics, problems in simple and compound interest, discount, pro-rating, the conversion of weights and measures, cost of merchandise with per cent. of duty or profit added.

For example, any of the formulas

$$\frac{ax}{b}, \quad \frac{ax^2}{b}, \quad \frac{ax}{b^2}, \quad \frac{ax^2}{b^2}, \quad \sqrt{\frac{ax}{b}}, \quad \sqrt{\frac{a^2x}{b}}$$

in which a and b may have any values and x any number of values are readily solved by one setting. Squares, square roots, cube roots and reciprocals are also readily worked.

The following are a few problems which may be readily solved by the use of Thacher's Calculating Instrument:

A 15-in. "I" beam, resting upon supports 14.5 ft. apart sustains a load of 17500 lbs. at the centre. What weight of beam is required if S = 10000 lbs. per sq. in.? (This problem is solved in three settings of the instrument.)

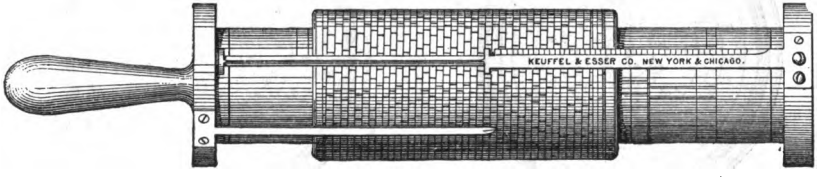
$541.36 are to be divided pro-rata among various accounts amounting to $7486.00. Required, the amount, going to account of $427.50, $763.80, etc. (The several amounts are each found in one setting.)

A train weighing 2500 lbs. per lineal foot passes over a bridge on a 4° curve at a speed of 30 miles an hour; required, its effect upon the lateral system. (This problem is solved in one setting.)

What will be the amount of $250.00 placed at compound interest for 10 years at 6%? (This problem is solved in one setting.)

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FULLER'S SLIDE RULE.



No. 4015.

4015. Fuller's Spiral Slide Rule, in mahogany Box, with Directions . . . . . each $ 30 00

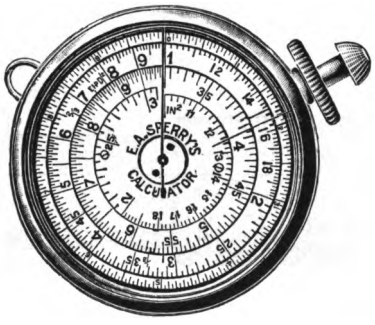
Fuller's Spiral Slide Rule consists of a hollow cylinder which can be moved up or down or around an inner cylinder provided with a handle. A single logarithmic scale nearly 42 feet long, is wound spirally around the outer cylinder. There are two indexes: a fixed one attached to the handle, and a movable one attached to a brass tube sliding in the inner cylinder. This latter bears two indexes (whose distance apart is the axial length of the complete spiral) and a scale of equal parts for the rapid finding of logarithms. On the inner cylinder is a number of valuable tables and settings.

Ratios are established by setting a given number to the fixed index, setting the movable index to another given number, bringing any other number to the fixed index and reading the fourth term at the movable index. Hence the Fuller Rule requires setting each time the third term of a proportion changes, and it does not give a complete series of equal ratios at sight, like the Thacher, Mannheim and Duplex Rules. In prolonged use the weight of the rule is a disadvantage, as it must be held by hand.

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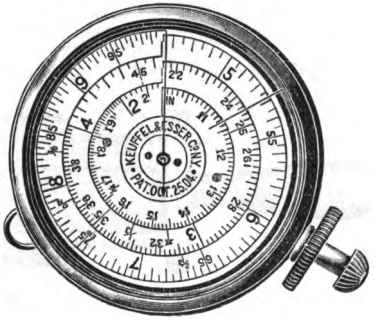
SPERRY'S POCKET CALCULATORS.

(Patented.)



S dial

No. 4017.



L dial

4017. Sperry's Pocket Calculator, watch pattern, 2⅛ in. diam., two glass covered engraved metal dials, with Directions. . . . . each $ 15 00

Sperry's Pocket Calculator represents a new departure in pocket calculators, as by its construction the length of the logarithmic scale is increased from about 6½ in. (in other calculators) to an actual length of about 12½ inches which, however, owing to the arrangement of the scales, allows of reading results nearly as close as on the C D scales of a 20-in. straight slide rule. The instrument has the form of a watch, with an engraved, glass covered metal dial on each side. Each dial has an index hand and a stationary pointer, which together take the place of the indicator (runner) of a straight slide rule. There is a small ring on the case for attaching the instrument to the watch chain. The two dials are revolved together by a milled thumbnut which is concentric with the knob which revolves the two indexes (hands) together.

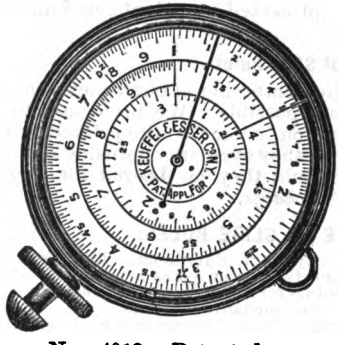
The S dial bears a scale of equal parts, a circular logarithmic scale and a scale of square roots. It corresponds to the two outer scales and the scale of equal parts of the straight slide rule. The L dial bears a logarithmic scale arranged in three spiral rings beginning and ending on the same radial line.

Sperry's Pocket Calculator can neither warp nor shrink as it is entirely of metal. The scales are circular and are therefore practically endless, so that they can be used "around and around," each "re-set" multiplying or dividing the value of the reading without loss of time or interruption. The result never lies beyond the end of the scales as it sometimes does in the straight slide rule.

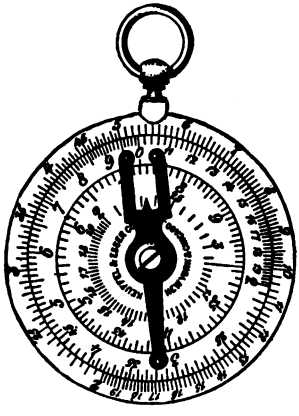
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K & E CIRCULAR CALCULATORS.

CHARPENTIER CALCULATORS.



No. 4018. Patented.



4020.

4018. K & E Calculator, patented, watch pattern, 2⅛ in. diam., two glass covered engraved metal dials, with Directions, each $ 13 50

The K & E Calculator is practically a circular Mannheim Rule. It has two dials, one of them revolving, the other stationary.

The revolving dial has a scale of logarithmic numbers corresponding to the C D scales of the straight Mannheim rule and a scale of squares corresponding to the A B scales of the straight rule. There is a reading line (index) engraved on the glass of the movable dial.

The stationary dial has a scale of tangents scale of equal parts and a scale of sines, the latter on a two-turn spiral line.

The pointers (hands) of the two dials move simultaneously. The movable dial and the pointers are revolved respectively by a concentric thumb nut and knob. There is a small ring on the case for attaching the instrument to the watch chain.

This form of Mannheim rule has the advantage over the straight rule that the scales are practically endless, so that they can be used "around and around," each "re-set" multiplying or dividing the value of the readings without loss of time or interruption. The result never lies beyond the end of the scale, as it sometimes does in the straight slide rule.

4020. Charpentier Calculator . . . . . each $ 5 00

The Charpentier Calculator is a circular slide rule 2⅝ in. diameter, with a circular slide which is revolved and set by the handle. This instrument being made of metal is but slightly affected by atmospheric variations. On the face of the calculator (shown in cut) there is a logarithmic scale on the slide corresponding to another such, external to it on the body of the rule. On the surface within the slide are the square roots in two circles, one from 0 to 3.162, the other from 3.162 to 10. They are made to coincide with the outermost scale by means of an index. On the other side of the rule there are three scales, an outer one of equal parts and two inner ones of angles from 0 to 90 and from 0 to 45 respectively; the latter two give the sines of the first and the tangents of the second on the scale of equal parts, by means of an index. The indexes on the two faces correspond, so that the logarithms of the numbers on the logarithmic scale can be read on the scale of equal parts.

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K & E SLIDE RULES.

The Slide Rule in its present perfected form has become an indispensable aid not only to the engineer and scientist, but also to the manufacturer, the merchant, accountant, and all others whose occupation or business involves calculations.

We manufacture slide rules and devote to them a separate department of our factory which is thoroughly equipped with the most improved special machinery.

Several of our improvements are protected by patents, and are therefore not embodied in other Rules.

Numbering of Slide Rules.

Great care has been bestowed on the numbering of our Rules to make them as clear and distinct and as permanent as possible. We prefer not to number the subdivisions throughout, as is done on some of the printed rules. The **sub-numbers** are not required by the adept, they even are confusing and interfere with rapid and accurate reading. Should they be desired for any special purpose, *we will put them on without extra charge.*

MANNHEIM STYLE OF SLIDE RULES.

This form of slide rule was originated by Lieut. Mannheim. The lower scales (on the rule and on the slide) are single while the two upper scales are double. There is an indicator (runner) for finding co-inciding points on the scales, which admits of working out extensive calculations without taking intermediate readings.

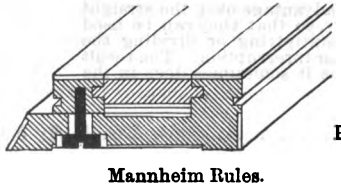
On the under face of the slide are scales of sines tangents and equal parts. The index mark on the under side of the body of the rule permits of reading the scales on the under face of the slide without reversing it. The under surface of the rule has tables giving a number of settings and ratios.

DUPLEX STYLE OF SLIDE RULES.

In the **"DUPLEX" SLIDE RULES** the slide is of the same thickness as the rule and has its two faces flush with those of the rule. The rule and slide are fully graduated on both sides. See description on page 302.

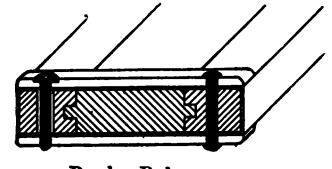
K & E PATENT ADJUSTMENT.

It is well known that the materials of which most slide rules are made, wood and zylonite or celluloid, are affected by the atmospheric changes, incidental to the different seasons, notwithstanding previous treatment or seasoning. Even in the best rules, except those of metal, the slide is liable to work too tight or too loose from such changes in the materials. Various means have been devised to overcome this condition but each of them had some serious drawback. In those in which the base or stock is cut lengthwise into halves which are approximated by springs, there is danger of their shrinking unevenly, and they do not afford a rigid bed for the slide. In those which have springs to hold one edge of the slide against the rule, there is a corresponding gap at the other edge of the slide.



Mannheim Rules.

Patented.



Duplex Rules.

Cross section of K. & E. Patent Adjustable Slide Rules

The **K & E Patent Adjustment** has successfully overcome these various drawbacks and solves the problem perfectly. In the Mannheim Rules one of the grooved guide pieces in which the slide moves, is held in place by setscrews which hold it rigidly but still permit of quick and exact adjustment when they are released, as they pass through oblong slots giving ample play. If adjusting should become necessary it is effected by loosening the screws and bringing the movable guide piece against the slide, according to the friction desired, when the screws are again tightened.

In the **Duplex Slide Rule**, the German silver bars which join the two side bars of the rule are provided with setscrews moving in oblong slots. On releasing these screws, one side piece of the rule can be shifted towards or away from the slide, to obtain the desired friction, when it is clamped in place by tightening the setscrews.

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MANNHEIM SLIDE RULES,

K & E ADJUSTABLE.

Patented.

5-INCH RULE.

4031. K & E Patent Adjustable (Mannheim) Slide Rule, 5-in., engine divided, divisions on white facings, with glass Indicator, in sewed Leather Case, with Directions each $4 50

This rule is subdivided as closely as the 10-in. rule, No. 4041.

8-INCH RULE.

4035. K & E Patent Adjustable (Mannheim) Slide Rule, 8-in., engine divided, divisions on white facings, with glass Indicator, in sewed Leather Case with Directions " 4 50

This rule is subdivided as closely as the 10-inch rule, No. 4041.

10-INCH RULES.

4041. K & E Patent Adjustable (Mannheim) Slide Rule, 10-in., engine divided, divisions on white facings, with glass Indicator, in Morocco Case, with Directions . . . . " 4 50

4041 F. K & E Patent Adjustable (Mannheim) Slide Rule, like 4041, but subdivided as closely as the 20-in. rule . . . . . " 8 00

16-INCH RULE.

4045. K & E Patent Adjustable (Mannheim) Slide Rule, 16-in., engine divided, divisions on white facings, with glass Indicator, in Morocco Case, with Directions . . . . " 10 00

20-INCH RULE.

4051. K & E Patent Adjustable (Mannheim) Slide Rule, 20-in., engine divided, divisions on white facings, with glass Indicator, in Morocco Case, with Directions . . . . " 12 50

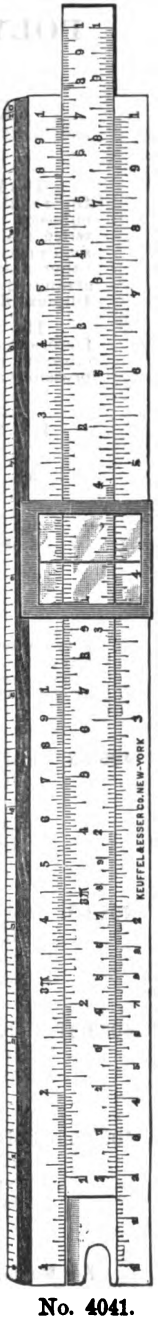
Rules 4041 F., 4045 and 4051 are divided more closely than the others. They have from 200 to 20 subdivisions between the prime numbers, while the other rules have from 100 to 10, so that reading is closer by at least one figure.

4052 D. L. Glass Indicator with two Hairlines (instead of one) . . . extra " 20

do. do. but with the two Hairlines spaced to a stated ratio . . extra " 40

(For Indicator with Decimal Pointer, see No. 4086, page 305.)

For Magnifiers and Books on the Slide Rule see page 305.
For Leather Cases see page 301.



No. 4041.

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POLYPHASE SLIDE RULES,

MANNHEIM STYLE

K & E ADJUSTABLE.

PATENTED

The Polyphase Slide Rule has in addition to the regular scales of the Mannheim, a scale of cubes on the vertical edge of the rule and an inverted scale (CI) on the face of the slide, which scales may readily be used in conjunction with the other scales, by means of the indicator. This arrangement combines some of the features of the Duplex Rule with the regular Mannheim type.

The inverted scale enables taking three factors at one setting of the slide, and reading reciprocals by means of the indicator. Such expressions as

$$\sqrt{a^2} \quad ; \quad \sqrt[3]{a^2} \quad ; \quad \sqrt[3]{\frac{1}{a^2}} \quad ;$$

$$a^5 \quad ; \quad a^6 \quad ; \quad a^3 \quad ; \quad \sqrt{a^5} \quad ; \quad \sqrt[3]{a^5} \quad ;$$

$$\sqrt[6]{a^5} \quad ; \quad \sqrt[3]{a^4} \quad ; \quad \sqrt[3]{\frac{a}{b^2}} \quad ;$$

$$a^2 \times \sqrt[3]{b^2} \quad ; \quad \frac{\sqrt{a^3 \times b^3}}{c^3}$$

may be read by means of the indicator and almost any combination of three factors involving square, square root, cube and cube root, may be solved at one setting of the slide.

8-IN. RULE

4053-2. Polyphase (Mannheim) Slide Rule, K & E Patent Adjustable, 8 in., engine divided, divisions on white facings, glass Indicator, in sewed Leather Case, with Directions . . . each $ 5 00

10-INCH RULES

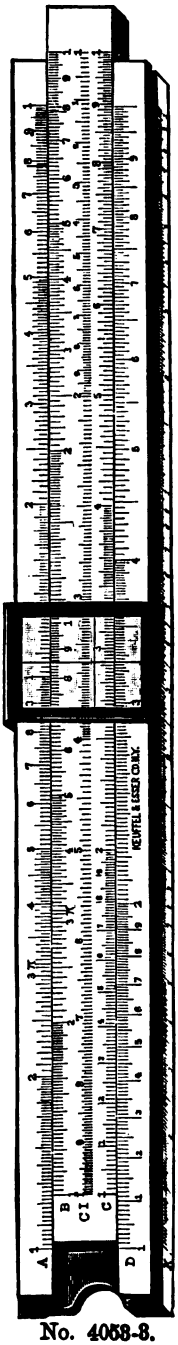
4053-3. Polyphase (Mannheim) Slide Rule, K & E Patent Adjustable, 10 in., engine divided, divisions on white facings, glass Indicator, in morocco Case, with Directions . . . . . " 5 00

4053-3 F. Polyphase (Mannheim) Slide Rule, like No. 4053-3, 10 in., but subdivided as closely as the 20-in. rule . . . . . " 8 50

20-INCH RULE

4053-5. Polyphase (Mannheim) Slide Rule, K & E Patent Adjustable, 20-in.; engine divided, divisions on white facings, glass Indicator, in morocco Case, with Directions . . . . . " 14 00

For Magnifiers and Books on the Slide Rule see page 305.
For Leather Cases see page 301.

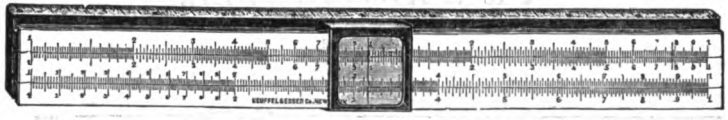


No. 4053-3.

Digitized by Google

FAVORITE SLIDE RULES.

MANNHEIM STYLE.



No. 4054.

4054. Favorite (Mannheim) Slide Rule, 10 in., divided on white facings, with glass Indicator, in Case, with Directions . each $ 3 00

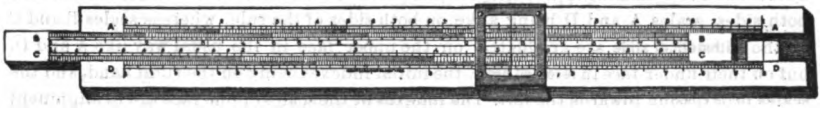
4056. Favorite (Mannheim) Slide Rule, 10 in., polished boxwood, with metal Indicator, in Case, with Directions . . . . " 2 75

FOR SUB-NUMBERING SEE PAGE 298.

The Favorite Slide Rules are of the same pattern as No. 4041, but they are not adjustable. They are an improvement over the imported rules, being made of materials seasoned here and therefore less liable to warp or shrink.

For Magnifiers and Books on the Slide Rule, see page 305.

STUDENT'S SLIDE RULE.



No. 4058.

4058. Student's Slide Rule, (Mannheim), 10 in., transparent Xylonite Indicator in metal frame, with Directions . . each $ 1 00

The Student's Slide Rule is intended only for the use of students, to enable them to become familiar with the slide rule without incurring the expense of obtaining the regular rule.

It is similar to our Mannheim Slide Rule. The graduations are printed and plain Directions are furnished with each rule.

CASES FOR SLIDE RULES.

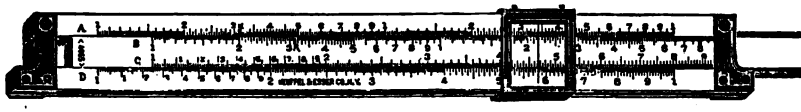
Morocco covered Case for			10	16	20 in. rule
		each $	40	60	80
Sewed leather Case for	5	8	10	16	20 in. rule
each $	70	80	90	1 10	1 40
Sewed leather Case, with space for Magnifier No. 4085,					
for	5	8	10	16	20 in. rule
each $	1 20	1 80	1 40	1 80	2 10

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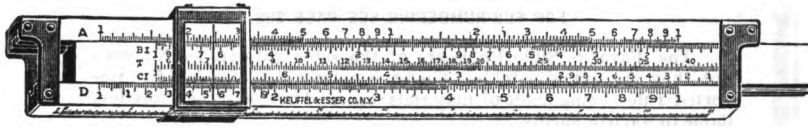
DUPLEX SLIDE RULES,

K & E ADJUSTABLE.

Patented.



No. 4065 (front)



No. 4065 T (back)

In the "**DUPLEX" SLIDE RULE** the slide is of the same thickness as the rule and has its two faces flush with those of the rule. The rule and slide are fully graduated on both sides, scales A and D being alike on both sides of the rule, whereas scales B and C on the **arithmetical slide** are graduated on the upper face in the usual way like A and D, but on their under face in **reversed order**, the initial indexes being on the right hand, and the scales progressing towards the left. The indexes of the scales of one face are in alignment with those of the other face, and an indicator (runner), encircling the whole rule, enables coinciding points on any scales of either face to be at once found.

This improvement simplifies considerably the working out of many complex calculations, for example such operations as

$$a \times b \times c = x; \quad a^c = x; \quad \frac{a}{b \times c \times d} = x; \quad \sqrt{a^5} = x$$

may be readily performed. Besides, there is on the Duplex Rule an inverted slide always in position, with the numbers right-side up and the corresponding scales contiguous, instead of the numbers inverted and scale C next to A and B next to D.

To still further increase the value of the Duplex Rule we furnish it also with **trigonometrical scales**, Sines, Tangents and Scale of equal parts, in addition to the arithmetical scales enumerated in the above description. In this form the Scale of Sines and of Tangents are each on one side (face) of the slide, on the median line, and the scale of equal parts is on the vertical edge of the rule, on a white facing. The S and T scales and the scale of equal parts are read by means of the indicator. The rules having these additional scales are designated as "**with trig. scales**" in this list.

The Duplex Slide Rules are engine divided, the divisions on white facings.

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5-INCH RULES.

4061. Duplex Slide Rule, K & E Patent Adjustable, 5 in., engine divided, divisions on white facings, glass Indicator, in sewed leather Case, with Directions . . . . . each $ 5 00

4061 T. Duplex Slide Rule, 5 in., like No. 4061, but with **trig. scales,** glass Indicator, in sewed Leather case with Directions. " 6 50

8-INCH RULES.

4065. Duplex Slide Rule, K & E Adjustable, 8 in., engine divided, divisions on white facings, glass Indicator, in sewed leather Case, with Directions . . . . " . . . . . each 5 00

4065 T. Duplex Slide Rule, 8 in., like No. 4065, but with **trig. scales,** glass Indicator, in sewed leather Case, with Directions " 6 50

10-INCH RULES

4071. Duplex Slide Rule, K & E Patent Adjustable, 10 in., engine divided, divisions on white facings, glass Indicator, in morocco Case, with Directions . . . . . each 5 00

4071 T. Duplex Slide Rule, 10 in., like No. 4071 but with **trig. scales,** glass Indicator, in Case, with Directions . . . . " 6 50

16-INCH RULES

4083. Duplex Slide Rule, K & E Patent Adjustable, 16 in., engine divided, divisions on white facings, glass Indicator, in morocco Case, with Directions . . . . . each 12 00

4083 T. Duplex Slide Rule, 16 in., like No. 4083 but with **trig. scales,** glass Indicator, in Case, with Directions . . . . " 15 00

20-INCH RULES

4087. Duplex Slide Rule, K & E Patent Adjustable, 20 in., engine divided, divisions on white facings, glass Indicator, in morocco Case, with Directions . . . . . each 15 00

4087 T. Duplex Slide Rule, 20 in., like No. 4087 but with **trig. scales,** glass Indicator, in Case, with Directions . . . . " 18 00

For Magnifiers and Books on the Slide Rule see page 305.

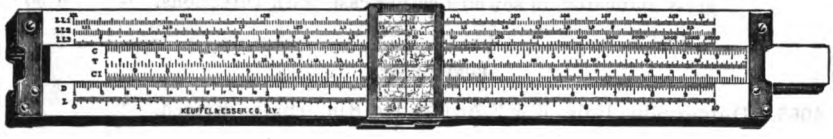
For Leather Cases see page 301.

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LOG LOG DUPLEX SLIDE RULE,

K & E ADJUSTABLE.

Patented.



No. 4092.

4092. Log Log Duplex Rule, K & E Patent Adjustable, 10 in., engine divided, divisions on white facings, glass Indicator, in morocco case, with Directions . . . . . each $ 8 00

The Log Log Duplex Slide Rule has, in addition to the scales of the regular Duplex slide rule, a Log Log scale, three fold, graduated from 1.01 to 22000. with which any root or power of any quantity up to 22000, may be determined by direct operation at one setting of the slide.

Exponentials generally and the many formulas in electrical and mechanical engineering involving fractional powers or roots, hyperbolic logarithms, etc., are readily handled with the help of this scale.

The hyperbolic or natural logarithm of a quantity with its characteristic may be read by means of the indicator without setting the slide, or may be used directly as a factor when required in any formula.

The scales are arranged as follows:

On the front face are the regular A, B, C and D scales, and a scale of sines, in the usual order.

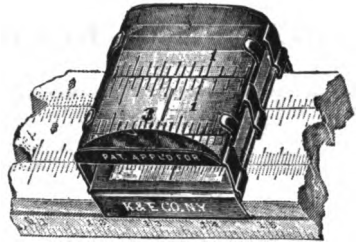
On the reverse face there are, in the order named,
Log Log scale, in three parts,
The C scale,
The scale of tangents,
The CI scale (C Inverted),
The D scale,
The scale of equal parts,

By the arrangement of the C and CI scales on the slide with the scale of tangents between, the tangent or co-tangent of any angle from 5° 43′ to 84° 17′ can be read on the slide, or used as a factor if so required.

For Magnifiers and Books on the Slide Rule see page 305.
For Leather Cases see page 301.

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MAGNIFIERS FOR SLIDE RULES.



No. 4085 B.

Patented.

4085 A. Magnifiers for Mannheim Slide Rules 5 in., 8 in. . . . . each $ 2 00

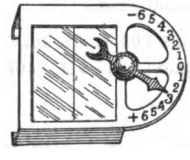
4085 B. Magnifiers for Mannheim 10 in., 16 in., 20 in., Polyphase, Favorite, Duplex 5 in., 8 in., 10 in., Stadia 10 in., 20 in. Slide Rules . . . . . " 2 00

4085 C. Magnifiers for Duplex 16 in., 20 in. and Log. Log., Slide Rules . . . . . " 2 50

When ordering please state for which kind of slide rule the magnifier is wanted.

The Magnifiers are mounted in a metal frame and are applied to the rule by springing them on the frame of the glass indicator. The lens is thus always in position for reading and is always in focus. The magnification is ample for even the finest graduations, the field covers the full area of the indicator and the lines do not appear distorted. These Magnifiers can not be used on glass indicators with two hairlines.

INDICATOR WITH DECIMAL POINTER.



No. 4086.

4086. Glass Indicator with Decimal Pointer . . . . . each $1 00

do. in place of plain Glass Indicator, add . . . . " 50

No. 4086 is furnished for Mannheim and Favorite Slide Rules only. The Magnifiers No. 4085 do not fit on these Indicators.

METAL SLIDE RULES.

4096. K & E Mannheim Slide Rule, 10 in., German silver, engine divided, with glass Indicator, in Case, with Manual . . each $15 00

4098. Duplex Slide Rule, 10 in., German silver, engine divided, for arithmetical computations, with glass Indicator, in Case, with Manual . . . . . " 20 00

BOOKS ON THE SLIDE RULE.

PUBLISHED BY KEUFFEL & ESSER CO.

4087 B. "The Slide Rule," complete Manual, by Wm. Cox (furnished with Mannheim Rules) . . . . . each $ 50

4087 E. Directions for Duplex and Mannheim Rules, bound together, (furnished with Duplex Rules) . . . . . " 50

4087 D. Mannheim Manual (B.), and Directions for Duplex Rule, bound together . . . . . " 75

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K & E ADJUSTABLE STADIA SLIDE RULES.



No. 4100.

4100. K & E Stadia Slide Rule, engine divided, 10 in., divisions on white facings, glass indicator, in morocco Case . . each $ 4 50

4101. K & E Stadia Slide Rule, like No. 4100, but 20 in., in morocco Case. . . . . " 12 50

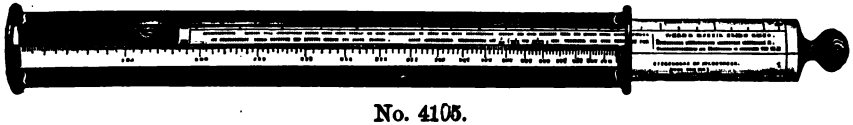
The very simple Directions are printed on the rule.

This form of Stadia Slide Rule is remarkable for its simplicity. By one setting of the slide (always to the left), the horizontal distance and vertical height can be in every case at once obtained when the Stadia rod reading and elevation of the telescope are known. The two equations thus solved are those generally used for inclined stadia measurements, viz.: Horizontal Distance = Rod reading $\times$ $\cos.^2\alpha$. Vertical Height = Rod Reading $\times \frac{\sin 2\,\alpha.}{2}$

The under side of the slide has a scale corresponding to the lower scale of the rule and resembling the A and B scales of the Mannheim and Duplex rules, so that the rule can be used also for ordinary slide rule computations.

FOR LEATHER CASES FOR SLIDE RULES SEE PAGE 301.
FOR MAGNIFIERS SEE PAGE 305.

WEBB'S STADIA SLIDE RULE.



No. 4105.

4105. Webb's Stadia Slide Rule (cylindrical). . . . . each $ 5 00

The Webb Stadia Slide Rule is so designed that its capacity and accuracy is equal to that of a straight slide rule of a length of more than four feet, but it has been compacted in a cylindrical form about 15 inches long, diameter 1½ inches.

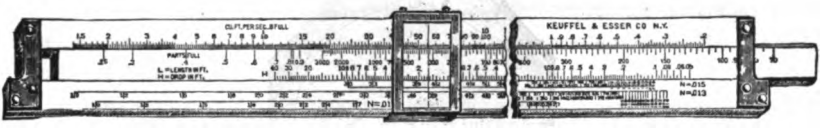
It is therefore of a convenient size to carry and use in the field, thus facilitating the drawing of field maps. The desired quantities are given with a degree of accuracy which is commensurate with the probable accuracy of the observations as read, the "logarithmic unit" being 12½ inches long.

The graduations on the wooden cylinder and the metal sleeve are on paper protected by a hard transparent coating. The directions, which are very simple are printed on the rule.

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NORDELL SEWER SLIDE RULE, K & E ADJUSTABLE.

DUPLEX STYLE. PATENTED.



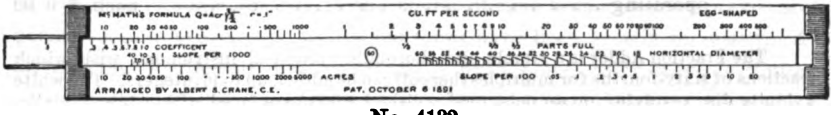
No. 4128.

4128. Nordell Sewer Slide Rule, K & E Patent Adjustable, 20 in., Duplex style, engine divided, divisions on white facings, glass Indicator, in morocco Case, with Directions . . each $ 18 00

This slide rule is based on Kutter's formula for circular sewers. It greatly simplifies the method of determining the time of flow, and is adapted for the ready solution of problems involving sizes, capacities, drops and velocities of sewers. The reverse face has the regular Mannheim 20″ A, B, C and D scales for general computations.

CRANE'S SEWER SLIDE RULE.

Patented.

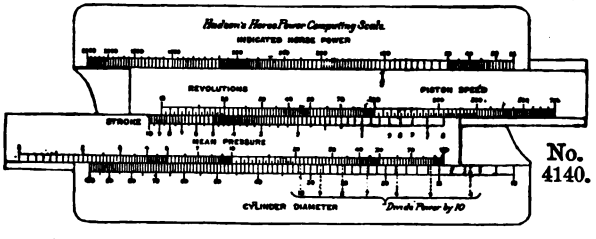


No. 4132.

4132. Crane's Sewer Slide Rule, 10 in., printed graduations, with Directions . . . . . each $ 2 00

Crane's Sewer Slide Rule is based on McMath's formula for amount of storm water and Kutter's formula for capacities, for circular sewers from 6 to 180 in. diam. and eggshaped sewers from 18 to 60 in. horizontal diameter, ratio of radii 3 : 2.

HUDSON'S HORSEPOWER COMPUTING SCALE.



No. 4140.

4140. Hudson's Horsepower Computing Scale, 4½ in., cardboard, in leather covered Sheath, with Directions . . . . . each $ 3 00

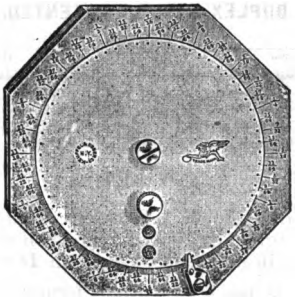
4141. do. do. do. do. but boxwood, divisions on white facings. . . . . " 6 50

This slide rule consists of a body and two contiguous slides.

With it can be found at once: the indicated horsepower of an engine, the size of cylinder required for any desired power, the piston speed due to any stroke, or revolutions per minute, the ratio of compound cylinders and the proportion of initial pressure realized as mean pressure with the steam cut off at different percentages of stroke.

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FRACTION ADDER.



No. 4180.

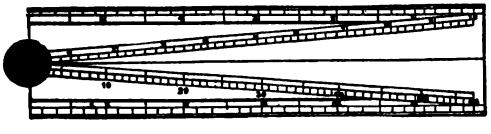
4180. Fraction Adder, white xylonite disc, about 4 in. diameter, on white-faced polished wood base, for adding fractions by 64ths up to a total of 16 integers, with Stylus for operating . . . . . each $ 6 00

The Fraction Adder is a simple and thoroughly practical instrument, with which fractions of sixty-fourths (or multiples thereof) can be added, up to 16 integers. The white xylonite disc revolving on an octagonal polished wood base faced with white xylonite, has near its circumference 64 small indentations, corresponding in position to the fractional graduations marked on the base. The totals are clearly shown through two windows in the disc,—one window showing the integer and the other the fraction. At the lower edge of the base is a nickelplated stop.

The operator places the stylus point in the small indentation at the circumference of the disc, opposite the fraction he desires to add, and rotates the disc clockwise until arrested by the stop. If the figures in the windows are set to zero by means of the milled-head screw, before performing this operation, the fraction at which the stylus was originally set will apear in the window To add to this any number of fractions, it is only necessary to place the stylus in the indentation opposite each fraction to be added, and rotate the disc each time until the stylus comes against the stop, when the window will show each successive total.

The usefulness of this device will be at once appreciated by those who are called upon to check dimensions on drawings or plans, or do any other computation involving the addition of fractional parts

IVORY AND BOXWOOD SECTORS.



No. 4176.

4175. Boxwood Sector, 12 in., brass joint, hand divided . . . each $ 1 00

4176. Ivory Sector, 12 in., German silver joint, " " . . . " 2 75

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PLANIMETERS AND INTEGRATORS.

Of all mechanical devices for computation **Planimeters** and **Integrators** rank foremost as the most ingenious and useful aid to the modern Civil, Mechanical, Mining or Marine Engineer.

Planimeters are designed for ascertaining by a simple mechanical operation the area of any plane surface represented by a figure drawn to any scale, such as indicator diagrams, profiles, plans, sections, etc. They are classed in **Polar Planimeters** and **Rolling Planimeters.**

The **Polar Planimeter,** invented by Prof. Amsler in 1856, consists of two principal parts, the **tracer arm** carrying the tracing point and the carriage with the measuring wheel, and the **pole arm** affixed to the pole around which the instrument revolves. The area of any figure is readily and accurately obtained by tracing its boundary line with the tracing point, whereupon the result is computed from the reading of the graduated measuring wheel. This original design of the Polar Planimeter has in the course of time been greatly improved and perfected, and its accuracy, utility and range have been greatly increased. As all the Polar Planimeters revolve around a fixed point, their scope is limited by the length of the arms of the instrument, which necessitates measuring large figures in sections.

The **Rolling Planimeter** measures by one operation figures of any length and up to a width equal to the length of the tracer arm. It moves in a straight line on broad and heavy rollers and is especially adapted for measuring the area of profiles, deck-plans of ships, etc.

INTEGRATORS AND THE INTEGRAPH

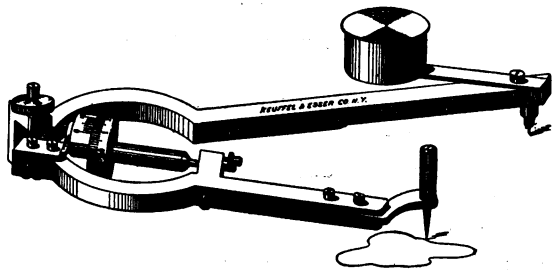
ascertain the area and moments relative to any axis of any figure, by simply tracing its outline. They are an invaluable aid to Civil and Mechanical Engineers, Bridge Builders, Naval Architects, etc. They greatly facilitate the finding of the displacement, moments of stability and inertia, centre of gravity, etc., of ships, the tensile strength, resistance, safe load, etc., of cables, tracks, beams and girders, contents of embankments, cuttings, etc. On the Integrators the readings are taken from recording discs. The Integraph draws automatically the integral curves giving a graphic representation of the integration, a feature very valuable to ship builders and others as they save the computing of these curves.

Planimeters and Integrators are so simple, that they can be used by anybody after a little practice. They will soon pay for themselves through saving time and labor, and give more accurate results than any other method.

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POLAR PLANIMETERS.

Illustration about ½ size.

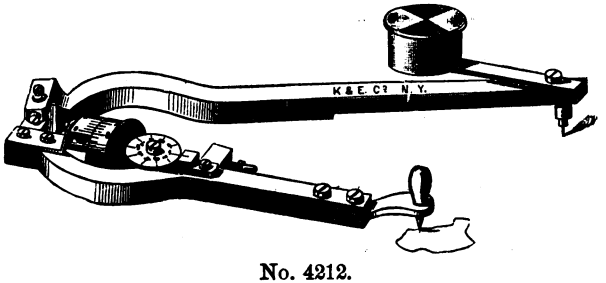


No. 4210.

4210. Polar Planimeter, German silver, fixed tracer arm, improved needle pole*; with table of settings, in polished mahogany Case, with Manual . . . . . each **$14 00**

No. 4210 represents the Polar Planimeter in its simplest form. It measures up to 10 square inches in tenths and hundredths of a square inch.

Illustration about ½ size.



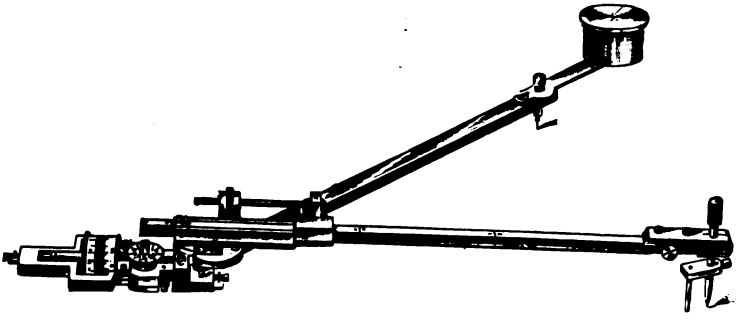
No. 4212.

4212. Polar Planimeter, German silver, fixed tracer-arm, improved needle pole*; with horizontal recording wheel engaging with the measuring wheel and registering its revolutions; with table of settings, in polished mahogany case, with Manual . . . . . each **$16 50**

The horizontal recording wheel registers 10 revolutions of the measuring wheel, so that areas of figures up to 100 square inches can be measured. The areas of small drawings made to scale may be obtained by reduction.

* The improvement of the needle-pole consists in having a counter weight attached to a bar which revolves around the pole, and can be directed to counterbalance the weight of the instrument proper in any position.

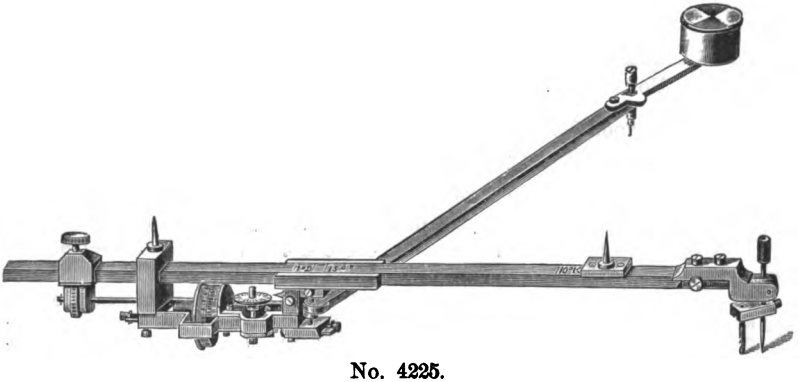
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No. 4220.

4220. Polar Planimeter (Amsler's pattern), German silver; adjustable tracer-arm about 7 in. with 4 index marks and table giving settings for 14 ratios, and with clamp and slow-motion screw. Improved needle pole; in polished mahogany Case, with Manual. . . . . each $28 00

This instrument embodies several improvements over the regular Amsler Planimeter. The flange of the roller wheel is at the middle of the wheel axis, thus distributing the wear. The horizontal disc is so placed that it is always visible and not concealed beneath the tracer-arm like on the older style of instruments. The tracer-arm is adjustable, and marks for setting to several scales are indicated on it. The tracing point is adjustable, so that it can be brought into alignment with the axis of the roller-wheel. It is also provided with a support, which keeps the point just clear of the paper.

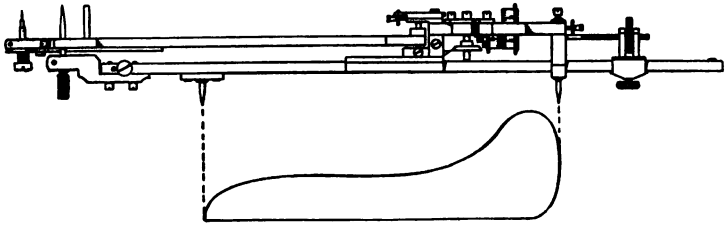


No. 4225.

4225. Polar Planimeter (Amsler's pattern), German silver, similar to 4220, but with 4 index marks and table giving settings for 7 ratios, with steel points (with German silver caps see cut 4235, page 313) on top of bars, for rapidly finding the **Mean Height of Indicator Diagrams** (see next page), tracer arm about 10 in., in mahogany Case, with Manual. each $30 00

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DEVICE FOR FINDING THE MEAN HEIGHT OF INDICATOR DIAGRAMS.



(See Nos. 4225 and 4235.)

This device consists of two fine steel points, one attached to the upper side of the tracer arm, and the other to the surface of the carriage in which this arm slides.

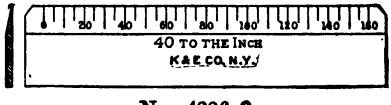
To obtain the mean height of the diagram, hold the planimeter up-side down and adjust these points so that the distance between them shall coincide exactly with the length of the diagram, then clamp the arm and proceed in the usual way exactly as if the area of the diagram were sought. Instead of giving, however, the area, the setting of the tracer arm is by this means such that the difference of the readings at the beginning and end of the operation, divided by 0.4 is the mean height of the diagram in inches.

Example: Second reading.....4.786
First reading.....4.322

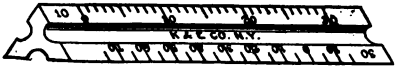
Then 4.786 — 4.322 ÷ 0.4 = 1.16 inches = the mean height.

SCALES FOR INDICATOR DIAGRAMS.

U. S. Standard. Engine divided.



No. 4226 C.



4228 M.

4226. Flat Boxwood Scales, 4 in., one edge beveled and divided,

	A.	B.	C.	D.	E.	F.	G.	H.	J.	K.	L.
parts to inch:	10	20	40	50	60	80	100	12	24	32	64
each $	25	25	25	25	25	35	35	25	25	25	25

4227. Set of 11 Scales No. 4226, A. to L., in mahogany Case with numbered slots . . . . . set $ 3 25

4228. Triangular Boxwood Scale, 3 in., six edges divided,

M. Indicator Scales, graduated 10, 20, 30, 40, 50, 60 parts to in., each $ 75
N. " " " 20, 40, 50, 60, 80, 100 " " " " 75
O. " " " 10, 15, 25, 30, 40, 70 " " " " 75
P. " " " 10, 20, 25, 60, 80, 100 " " " " 75
R. " " " 12, 24, 32, 64, 40, 60 " " " " 75

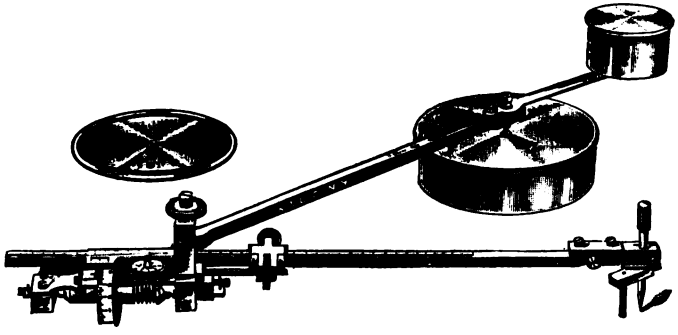
Indicator Scales with other graduations made to order.

METALLIC PAPER.

4229. Metallic Paper for Indicator Cards, sheets 20 × 25 in., . . quire $ 2 00
4229C. " " cut blanks, $3\frac{1}{4} \times 7\frac{1}{8}$ in. . . . . " 25

Metallic paper, for use on recording instruments, is coated with a preparation on which the metal recording pencil leaves a distinct colored mark, similar to a lead pencil mark.

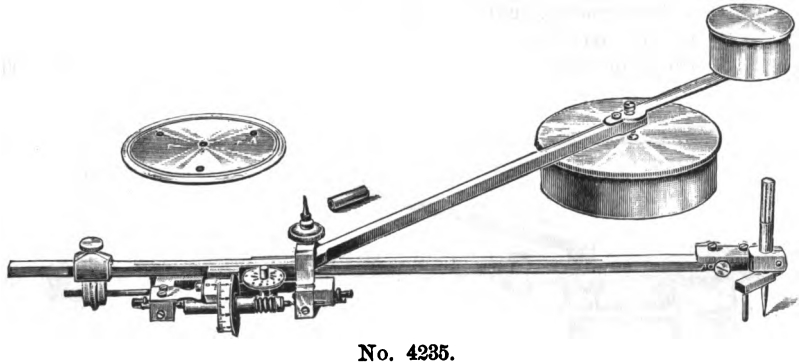
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No. 4230.

4230. Improved Polar Planimeter, German silver, adjustable tracer-arm about 8½ in., fully graduated, with vernier and clamp with slow-motion screw; ball-pole, pole-weight and balancing weight; with Testing Disc and table of settings for inches and metric measure; in polished mahogany Case, accommodating the instrument when set to any scale, with Manual . . . . . each $32 00

As the tracer-arm is fully graduated, very fine settings can be effected with great accuracy for any scale in U. S. Standard or any foreign measurement, and allowance can be made for the shrinkage of drawings. The tracer-arm is also provided with index marks for a number of scales for Inches and Metric measurements. The Testing Disc greatly facilitates the rapid finding of these settings, and also serves to prove the accuracy of the instrument and as an aid in adjusting it. By shifting the pole weight, which is smooth underneath, the measuring wheel can be easily set to zero. The different parts of the instrument are adjustable and provided with set screws, so that corrections can be made for instrumental errors.



No. 4235.

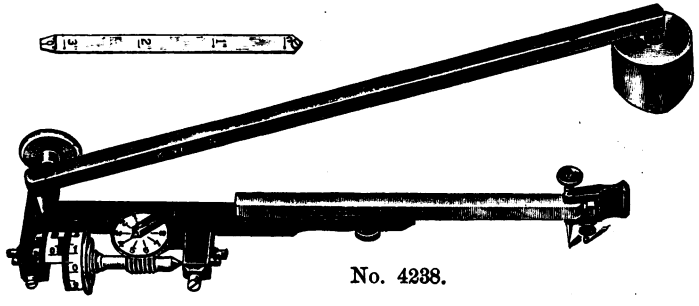
4235. Improved Polar Planimeter, German silver, like 4230, but with steel points (with German silver screw caps) for finding the **Mean Height of Indicator Diagrams** (as explained on opposite page.) . . . . . each $34 00

The Steel Points of this instrument when not in use, are protected by German silver caps.

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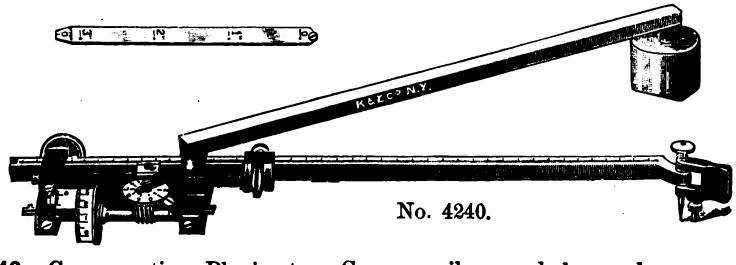
In the Compensating Planimeters No. 4238, 4240 and 4242 (on opposite page), the pole arm is held in the wheel carriage of the tracer arm by a pivot which ends in a steel ball, forming a ball joint with the wheel carriage. The ball joint can not become loose or shaky, nor is it liable to be injured when adjusting the tracer-arm or during shipment, as each part can be handled and is stored in the case separately (see cut No. 4242). This construction gives the tracer-arm an angular motion of 180 degrees in either direction, and the range of this instrument is therefore much greater than that of the usual planimeters. By measuring a diagram with the pole on the left and then again with the pole on the right side of the tracer-arm and taking the mean of the readings, all instrumental errors are compensated. The pole is of improved pattern, combining the advantages of the pole-weight and needle-pole. The tracing point has also been improved; its construction can be clearly seen in the cuts.

These Planimeters are also equipped for finding the mean height of indicator diagrams, as the tracer arm can be easily adjusted to the length of the base, by placing the tracer point at the right-hand end of the base, and sliding it in its sleeve until the other end of the base becomes visible in the centre of the small opening in the pole bearing, the pole arm being removed. (See also page 312.)



No. 4238.

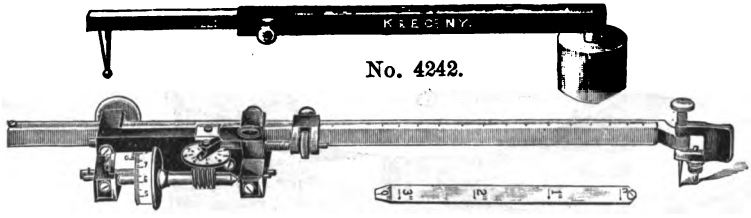
4238. Compensating Planimeter, German silver and bronzed brass, adjustable tracer arm about 6¾ in. provided with a short graduation (from 270 to 350), pole arm about 7¾ in. improved pole-weight; Testing Rule and table of settings for inches, in velvet-lined Case, with Manual . . each $24 00



No. 4240.

4240. Compensating Planimeter, German silver and bronzed brass; adjustable tracer-arm about 9 in., fully graduated (see note under No. 4230 on preceding page), pole arm about 7½ in., improved pole-weight; Testing Rule and table of settings for inches, in velvet lined Case accommodating the instrument set to any scale, with Manual . . . . . each $35 00

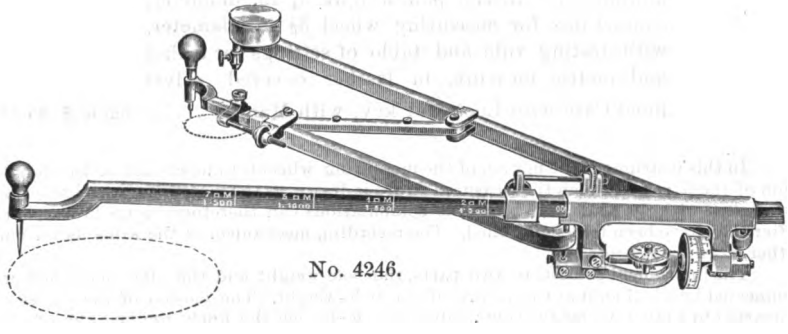
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No. 4242.

4242. Compensating Planimeter like 4240, but with adjustable pole-arm extending to about 13 in. with Manual . . . . each $44 00

The adjustable Pole Arm, bears index marks for the different settings furnished with the instrument, and can be adjusted so that when the instrument is used with the pole inside of a figure, the constant is a round number, 20,000, for any setting. The instrument is used in the same way with the pole inside as with the pole outside, and by tracing the figure with the pole on theright and on the left of the tracer-arm (about 13 inches) and taking the mean of the readings, large areas can be measured with great accuracy. The extensibility of the pole-arm and the great range of the tracer-arm permit of measuring very large figures with the pole outside. By reducing the length of the pole and tracer-arms, the instrument can be used on a very small surface.



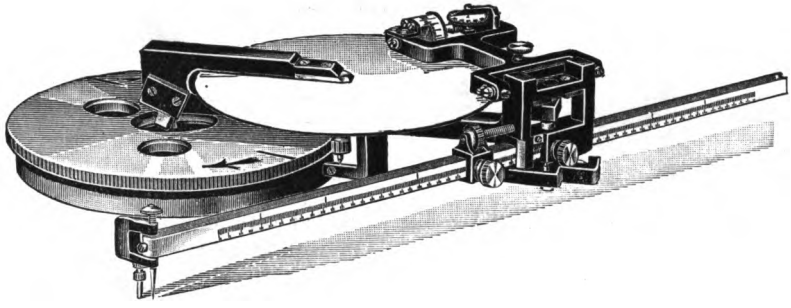
No. 4246.

4246. Pantograph Polar Planimeter, German silver, two adjustable tracer-arms with index marks for different ratios, clamp and slow motion screw to each tracer-arm, with needle-pole; in velvet lined Case, with Manual . . . . each, $65 00

This Planimeter is especially adapted for measuring very large and very small figures. The long tracer-arm (about 11 in.) has a range covering a circle 88 in. diameter and is used for measuring large figures. It is adjusted to the required scale, and the figure is traced in the usual manner. During the operation the tracing point of the shorter tracer-arm had better be removed.

The smaller tracer-arm (about 7½ in.) is used for measuring very small figures. It is set to the proper index mark and the figure is traced by so guiding with the tracing point of the longer arm that the point of the smaller arm follows the outline. This is not at all difficult as the two tracing points travel alike. The setting of the longer tracer-arm is indifferent in this case. The starting point is best taken at the tracer of the longer arm. The construction of the instrument is such, that, when the smaller tracer-arm is used, a greater travel of the measuring wheel for a given area is effected; consequently the value of the wheel unit is smaller and the result more accurate.

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No. 4251.

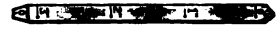
4251. Precision Polar Disc Planimeter, German silver and brass, with aluminum paper-faced contact disc for the measuring wheel, latest construction, adjustable tracer arm 13¾ in. fully graduated to ½ millimeters, with micrometer screw to vernier reading to $\frac{1}{10}$ millimeter. Heavy pole-weight 5¾ in. diameter, contact disc for measuring wheel 5⅛ in. diameter, with testing rule and table of settings for inches and metric measure, in leather covered velvet lined Case with Lock and key, with Manual . . . each $ 85 00

In this instrument the motion of the measuring wheel is independent of the condition of the paper on which the measured figure is drawn, as the measuring wheel revolves by contact with the plane disc. Reliable computations can therefore be made on plans after they have been folded or rolled. The recording mechanism is the same as on our other large planimeters.

The instrument consists of two parts, the pole-weight and the planimeter proper, connected by a ball joint at the centre of the pole-weight. The motion of the tracer is imparted to a pivot (under the contact disc) which engages the finely toothed rim of the pole-weight, transmitting rotary motion to the contact disc. The hinged carriage can be folded back to facilitate cleaning the disc. Improved tracer point with spring, with a support to keep it clear of the drawing, with winged handle.



No. 4248.



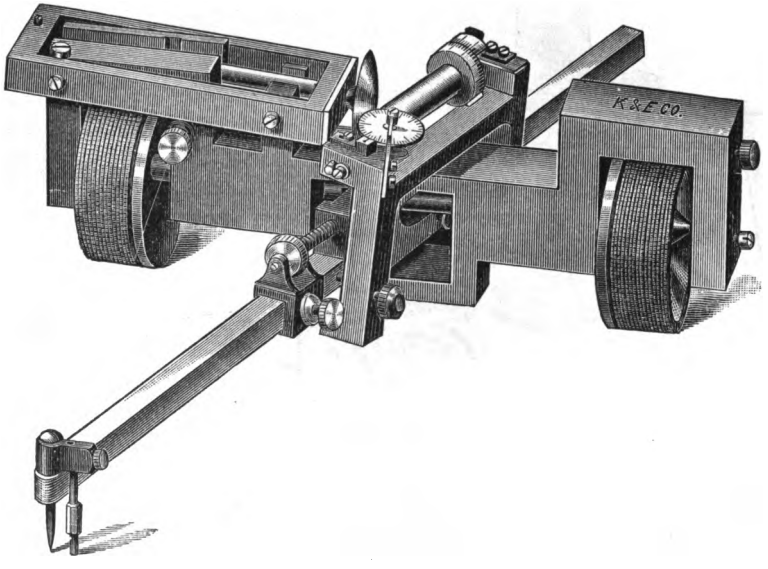
4249.

4248. Testing Disc, brass, engraved circle encloses an area of exactly 4 square inches, with three pins to prevent slipping. . . . . each. $ 2 25

4249. Testing Rule, German silver, for radii of 1, 2 and 3 inches, with centre-pin . . . . . each, $ 1 50

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ROLLING PLANIMETERS.



No. 4262.

4260. Precision Rolling Planimeter, German silver and brass, adjustable tracer-arm fully graduated, 10 inches long, with 8-inch telescoping extension piece, with Testing Rule and Table of Settings for inches and metric measure, morocco Case accommodating the instrument when set to any ratio, with Lock and key; with Manual . . . . . each $82 50

4262. Precision Rolling Planimeter like No. 4260, but larger, tracer-arm 12 inches long, telescoping extension piece 10 inches " 95 00

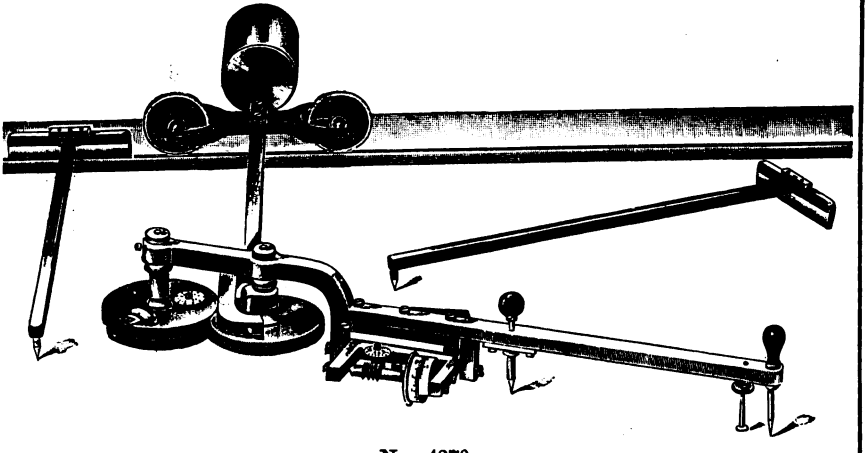
The Rolling Planimeter moves on two broad rollers, from one of which motion is imparted to the recording mechanism. The measuring wheel revolves by contact with a polished sphere segment. Only the rollers and the tracer are in contact with the drawing, and the results are therefore not affected by irregularity of the paper. The area of a figure of any length, the width of which does not exceed the length of the extended tracer-arm, can be measured in one operation.

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AMSLER'S MECHANICAL INTEGRATORS.

"Copyright, 1894, by Keuffel & Esser Co."

Illustration about ⅓ size.



No. 4270.

4270. Amsler's Integrator, German silver, with **two Recording Mechanisms** giving the **Area** and **Moment** of any figure; two Tracing Points, two Gauges for adjusting instrument to axis of moments; grooved Steel Rail 29 inches; in hardwood Case, with Directions . . . . . each $110 00

***4272.** Amsler's Integrator, like No. 4270, but **Brass** . . . . . " 90 00

Grooved Steel Rails of other length furnished to order

Integrators Nos. 4270 and 4272 give the area and moment of any figure by a simple mechanical operation. They are provided with two tracing points, for large and small figures. The one nearest to the centre of rotation of the instrument effects a greater travel of the measuring wheel; consequently the area value of the wheel unit is smaller and the result more accurate. Large figures can be measured in sections. Area and moment of figures drawn to scale can be easily obtained by means of a formula furnished with each instrument.

The range of the instrument is:

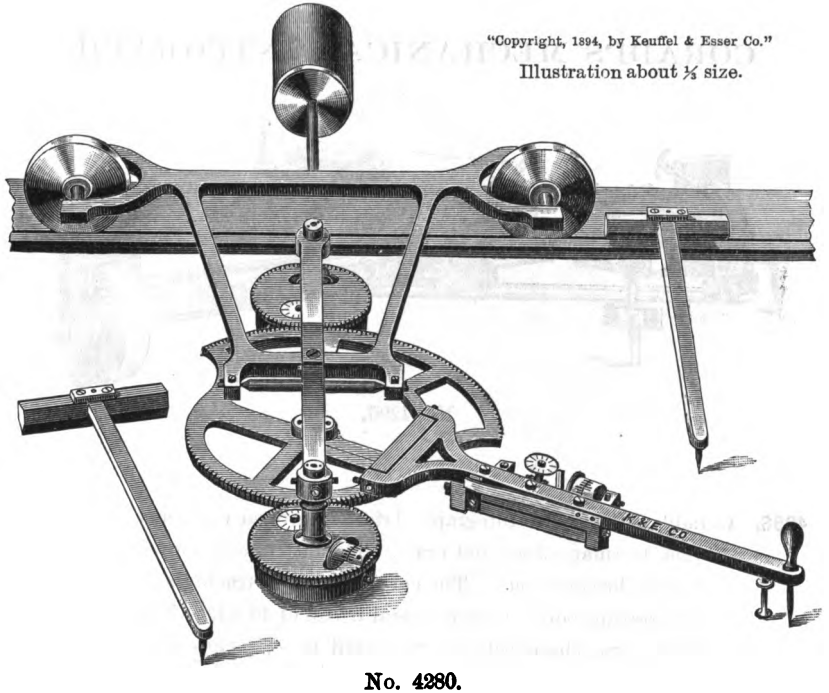
Longitudinal	26 in.
Transverse	15 in.

*** These Integrators are not carried in stock and are imported to order only.**

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"Copyright, 1894, by Keuffel & Esser Co."

Illustration about ⅓ size.



No. 4280.

4280. Amsler's Integrator, German silver, with **three Measuring Wheels with Recording Discs** giving the **Area, Moment, and Moment of Inertia** of any figure; two Tracing Points: **two** Gauges for adjusting instrument to axis of moments; instrument in hardwood Case; grooved Steel Rail 59 in., in separate hardwood Case; with Directions . . . . each **$175 00**

***4282.** Amsler's Integrator, like No. 4280, but **Brass** . . . . . " **150 00**

Integrators No. 4280 and 4282 are provided with a third train of recording wheels, which renders the moment of inertia of the figure measured.

Their range is: Longitudinal . . . . . 50 inches
Transverse . . . . . 13 "

***4286.** Amsler's Integrator, like No. 4280, but **Extra Large,** German silver, three Tracing Points, grooved Steel Rail 78 in. each **$280 00**

***4288.** Amsler's Integrator, like No. 4286, but **Brass** . . . . . " **230 00**

Integrators No. 4286 and 4288 are practically the same instruments as No. 4280 and 4282, but built on a larger scale, so that they measure proportionately larger figures by one operation.

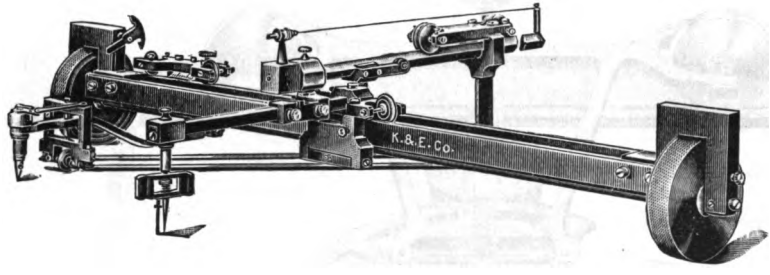
Their range is: Longitudinal . . . . . 67 inches
Transverse . . . . . 26 "

Grooved Steel Rails of other length furnished to order.

*** These Integrators are not carried in stock and are imported to order only.**

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CORADI'S MECHANICAL INTEGRAPH.

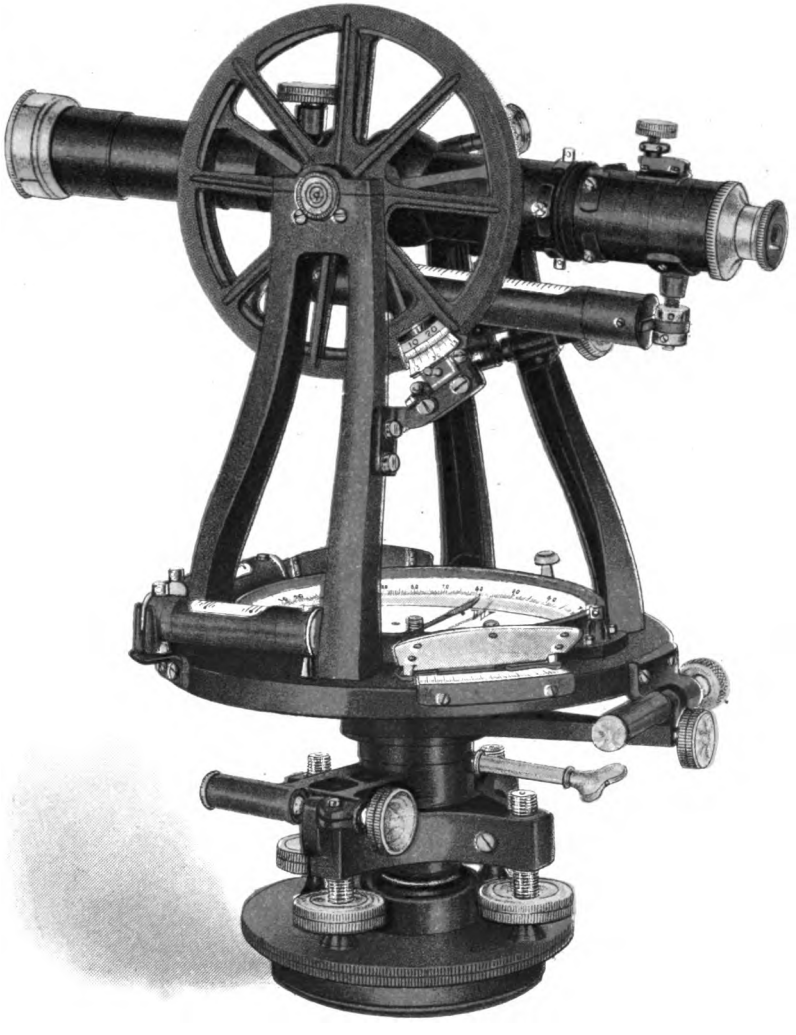


No. 4296.

4296. Coradi's Mechanical Integraph, latest improved construction, German silver and brass. The instrument moves on two broad rollers. The carriages of the tracing and integrating points have a lateral travel of 10.3 in. The tracer arm (base rule) is graduated to $\frac{1}{10}$ inches with vernier reading to $\frac{1}{100}$ inches and micrometer screw. The base can be set from 1.5 to 5.2 inches. Instrument complete, with testing rule, in walnut Case, with Lock and Key, with Directions . . . . . each $240 00

Like the Mechanical Integrators, the Integraph has proved in a comparatively very short time to be an aid of no small consideration to Civil and Mechanical Engineers and especially Naval Architects. While it is necessary with the Integrator to compute the several curves point by point and to construct them by means of the computed points, the Integraph directly draws the curves on the paper, thus giving a graphical representation of the integration. The operator traces the outline of the figure, i. e., the differential curve, and the pen or pencil point automatically draws the integral curve. The value of the ordinate of this integral curve can be measured off on the paper or read on a finely graduated bar. This value multiplied by the constant furnished with the instrument, gives the area of the figure. By regarding the new curve as the differential curve and tracing it in the same manner in which the first one was traced, the integral curve of the next higher order is drawn, the ordinate of which multiplied by the constant gives the moment of the original diagram. By repeating this operation, the moment of inertia, moments of the 4th, 5th, etc., order can be readily found. By this means practically all problems of stability, etc., may be solved almost entirely by mechanical operations, and much labor and brain work saved.

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PART II
INSTRUMENTS FOR FIELD USE

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IMPROVED
SURVEYING INSTRUMENTS
MADE BY
KEUFFEL & ESSER CO.

Our Surveying Instruments, especially Transits and Levels have many important improvements. We constantly endeavor to perfect them and they represent a specific type of such instruments excelling in Construction, Material, Workmanship and Precision. Many of their features can be found in our instruments only, as they are protected by a number of patents.

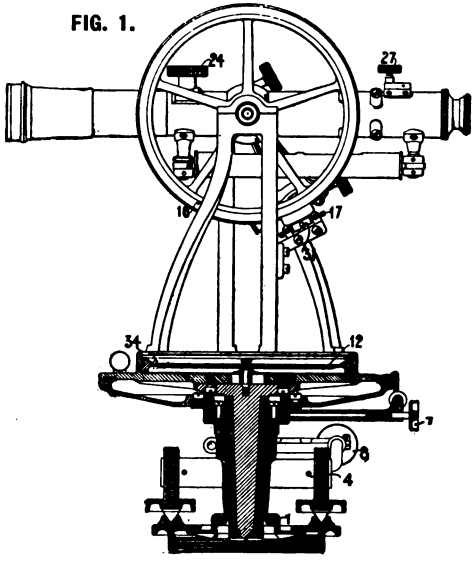
The instruments described and illustrated in this Catalogue are our regular patterns which we carry in stock, but we are prepared to carry out, as far as feasible, any suggestions as to details of construction which the practical experience of our professional friends may lead them to desire. For convenience in ordering special instruments, we describe some of them, and some of the accessories and attachments (see pages 891, 892) which we have made to order from time to time.

We take this opportunity to thank our friends in the Engineering profession who, through their criticisms and suggestions, have assisted us in the development of our Surveying Instruments to their present high state of perfection.

The description which we give in the following pages refers particularly to our extra-fine Engineer's Transits and Levels, No. 5030 to 5088 and 5003 to 5027, but the construction of the more important parts, such as centres, graduations, etc., is practically the same in all of our instruments.

TRANSITS.

FIG. 1.



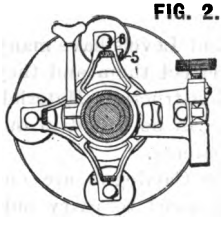
The most important parts of a transit, upon which the accuracy of the instrument depends to the largest extent, are the centres with the leveling part, the plates carrying the graduations, and the telescope.

Centres. The centres of our transits are extra long to give stability and accuracy. They are made of metals of different hardness to reduce friction and to allow of their moving upon each other with the least possible wear. The half ball joint (Fig. 1, 1,) instead of being cast integrally with the leveling arms, forms part of a sleeve or collar which is attached to the leveling arm piece only throughout its upper half. This leaves a small annular space between this sleeve and the delicately fitted centres, effectually protecting them.

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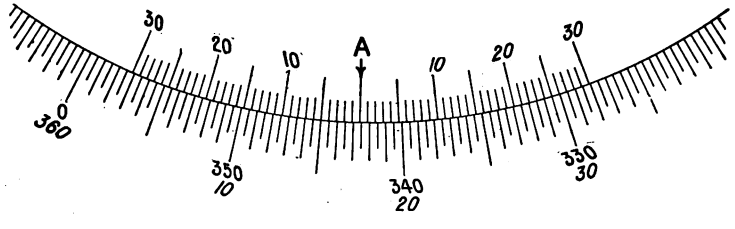
Leveling Arms (Fig. 1, 4 and Fig. 2). The Leveling piece is substantially constructed and allows ample shifting space. The arms are slotted and provided with set screws (Fig. 2, 5.) to take up the wear of the leveling screws or to provide against binding due to sudden changes of temperature. The German silver Leveling Screws as well as the Clamp and Tangent Screws are cut on a precision lathe insuring a thread which on account of its smoothness and uniformity will give long service. All clamp and tangent screws are conveniently located, and are well protected and out of the way.

FIG. 2.



Horizontal Limb. A strip of rolled silver is inlaid in the upper surface of the horizontal limb and into this the graduations are cut by an automatic dividing engine of our own design and construction. The uniformity and accuracy of their graduations have won for our instruments a recognized position among users of precision instruments, including many branches of the U. S. and Municipal Governments and scientific institutions of the highest standing.

The Limbs of Transits are graduated in various ways. The ordinary surveying instrument is usually graduated to read to single minutes, but we make and list instruments to read to 30, 20, 10 and 5 seconds; or to decimals of a degree (10ths, 50ths, 100ths or 200ths, see style G, page 325). We are also prepared to furnish to order circles graduated centesimally (100 grades to the quadrant). The style of graduation and method of numbering the horizontal limb is shown below.



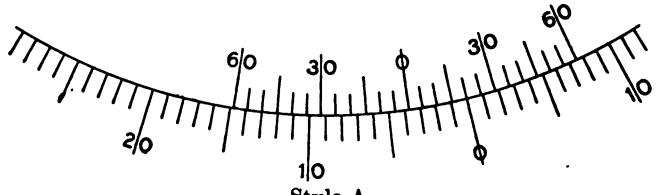
The two rows of numbers of the horizontal limb incline in opposite directions corresponding to the direction in which the vernier reads for each row of figures, instead of being placed radial, although so shown in some of the following illustrations of verniers.

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GRADUATIONS.

Correct and distinct graduation of the limbs and verniers is of great importance in all surveying instruments. The following illustrations represent the different styles adopted by us for our Transits and Architect's Levels; they will be found convenient in arrangement and easy to read. They are in detail as follows:

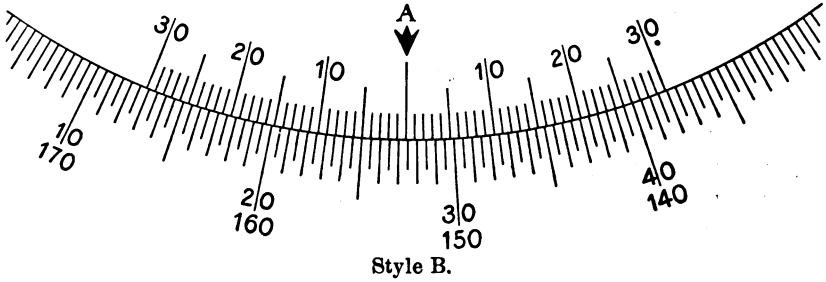
Style.	Reading of Limb.	Divisions of Limb.	=	Divisions of Vernier.	Reading of Vernier.	Kind of Vernier.
A.	Degrees	11	=	12	5 minutes	Double direct
B.	30 minutes	29	=	30	1 "	" "
C.	20 "	39	=	40	30 seconds	" "
D.	20 "	59	=	60	20 "	Folded.
E.	30 "	29	=	30	1 minute	"
F.	15 "	44	=	45	20 seconds	Double direct
G.	15 "	49	=	50	$\frac{1}{100}$ degree	" "



Style A.

Style A represents the method of graduating the horizontal circle of our Architect's or Builder's Levels, with the corresponding vernier. This vernier, which is a **double-direct vernier**, reads, from the centre to either extreme division (60), that part being used in which the direction of the numbering corresponds to the direction in which the limb is numbered and read. The limb is graduated to degrees and the vernier (from 0 to 60) comprises 12 divisions, therefore the reading of the vernier is 60 minutes ÷ 12 = 5 minutes.

The figure reads 3° + 50′ = 3° 50′ from right to left.

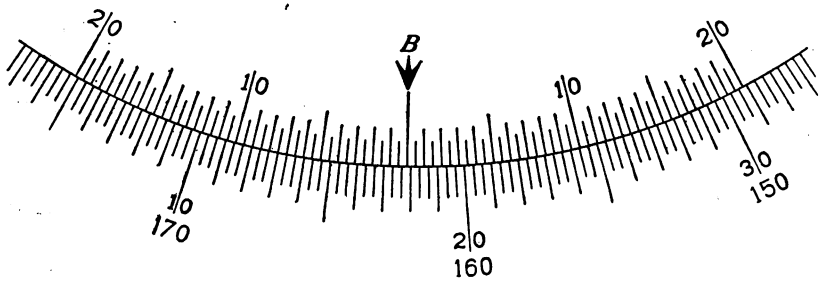


Style B.

Style B represents the usual graduation of the horizontal limb of an Engineer's Transit with its vernier. This is an ordinary **double direct vernier** reading from the centre, to either extreme division (30). The limb is graduated to half degrees and the vernier (from 0 to 30) comprises 30 divisions, therefore the reading of the vernier is 30 minutes ÷ 30 = 1 minute.

The figure reads 27° + 25′ = 27° 25′ from left to right, and 152° 30′ + 05′ = 152° 35′ from right to left.

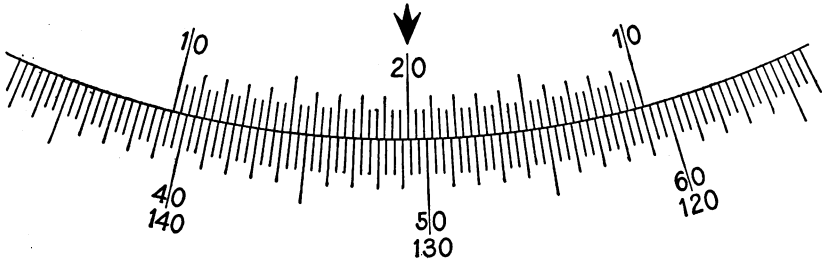
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Style C.

Style C represents the graduation and vernier of an Engineer's Transit, having finer divisions than style B. This is also a **double direct vernier**, reading from the centre to either extreme division (20). The limb is graduated to 20 minutes and there are 40 divisions in the vernier, consequently the reading of the vernier is 1200 seconds ÷ 40 = 30 seconds.

The figure reads 17° 40′ + 12′ 30″ = 17° 52′ 30″ from left to right, and 162° + 7′ 30″ = 162° 7′ 30″ from right to left.

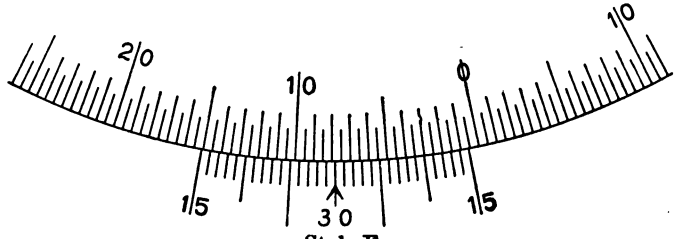


Style D.

Style D represents part of the horizontal limb with the vernier, of an Engineer's Transit having still finer divisions than those of style C. The vernier is a **folded** one reading from the centre, indicated by the arrow, to either of the extreme divisions (10), and then forward in the same direction from the other extreme division (10) to the centre division (20), the direction being determined by the numbering and reading of the limb. The limb is graduated to 20 minutes, while the vernier is composed of 60 equal parts, consequently the reading of the vernier is 1200 seconds ÷ 60 = 20 seconds.

The figure reads 49° + 14′ 20″ = 49° 14′ 20″ from left to right, and 130° 40′ + 5′ 40″ = 130° 45′ 40″ from right to left.

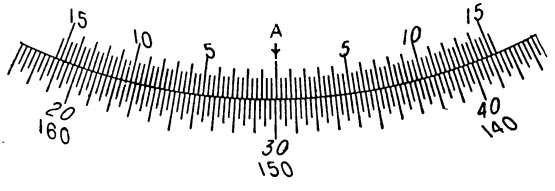
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Style E

Style E represents a portion of the vertical circle or arc of an Engineer's Transit with its vernier (folded). The circle or arc is graduated to half-degrees, and the vernier is divided into 30 equal parts, so that the reading of the vernier is 30 minutes ÷ 30 = 1 minute.

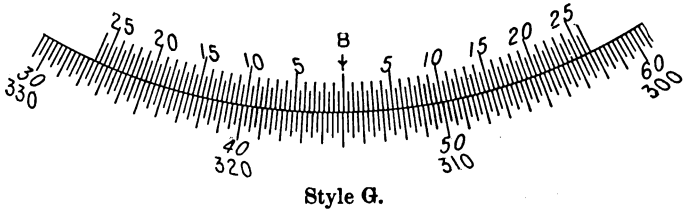
The figure reads 7° 30′ + 21′ = 7° 51′ from right to left.



Style F.

Style F represents the graduation of the horizontal limb and vernier of an Engineer's Transit having somewhat finer divisions than style D. This is a **double direct vernier** reading from the centre to either extreme division (45). The limb is graduated to 15 minutes and there are 45 divisions in the vernier, consequently the reading of the vernier is 900 seconds ÷ 45 = 20 seconds.

The figure reads 30° + 4′ 20″ = 30° 4′ 20″ from left to right and 149° 45′ + 10′ 40″ = 149° 55′ 40″ from right to left.



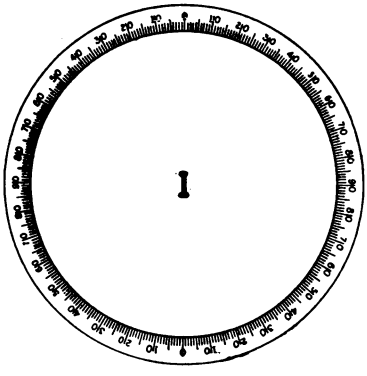
Style G.

Style G shows the method of graduating the horizontal limb and vernier to read to decimals of a degree. This vernier is a **double direct vernier** reading from the centre to either extreme division (25) that part being used on which the direction of the numbering corresponds to the direction in which the limb is numbered and read. The limb is graduated to 0.25° and the vernier divided into 50 parts, consequently the reading of the vernier is 0.25 ÷ 50 = .005° which equals $\frac{1}{200}$th of a degree.

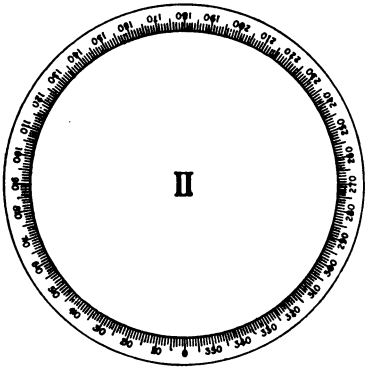
The figure reads 45° + .055 = 45.055° from left to right and 314.75° + .195 = 314.945° from right to left.

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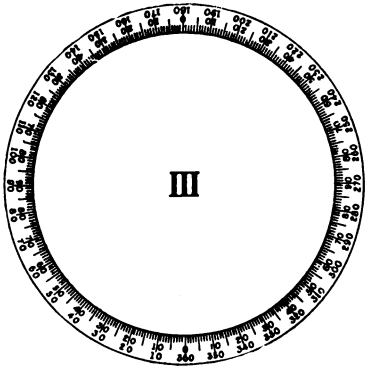
NUMBERING OF LIMBS.



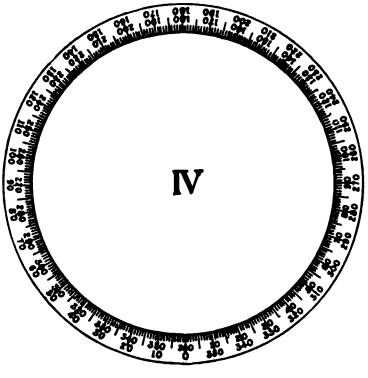
Vertical Circle,
numbered in quadrants.



Horizontal Limb,
numbered 0—360.



Horizontal Limb,
numbered 0 360
and in quadrants.



Horizontal Limb,
numbered 0-360
and 360—0.

The above illustrations show some of the various methods of numbering the graduations of the horizontal and vertical limbs of transits. Unless other methods of numbering are specified in the order, *we furnish our transits with the horizontal limb numbered double, in opposite directions, from 0 to 360° like cut IV and the vertical circle numbered in quadrants like cut I*, which is the most generally preferred method of numbering.

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Verniers of the horizontal limbs are usually placed at about 45° with the telescope, enabling the observer to read them without changing position. The vernier glasses are covered by hinged metal plates which protect the glass and, being lined with a white material, serve as reflectors when folded back, to facilitate reading of the verniers. Fixed ground glass reflectors are furnished in place of metal reflectors without extra charge when new instruments are so ordered.

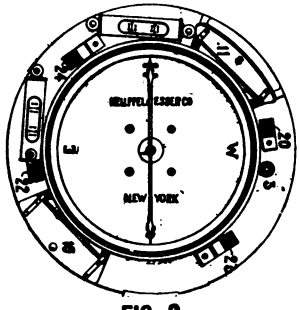


FIG. 3.

The **Compass Circle** is beveled to facilitate reading, and faced with solid silver to insure the accuracy and legibility of the graduations. This circle, unless otherwise ordered, is graduated to half-degrees and numbered in quadrants from 0 to 90°.

The **Needle** of our Compass has a distinctive shape. It has a fine jeweled centre and is bent upward at the ends to bring the points into closer coincidence with the graduations on the Compass Circle. Comparison with needles of other construction has proven it to be of superior accuracy and sensitiveness. The north end is marked with an arrow → while the south end is weighted with a few turns of silver wire to compensate for the magnetic inclination (for the northern hemisphere). This wire can be shifted to correct for changes in the inclination, which varies in different localities. Instruments are shipped adjusted for the inclination at New York.

Variation Plate. The accurate setting off of the magnetic declination is effected by a graduated arc on the face of the compass box in conjunction with a vernier on the compass circle. The circle is rotated by means of a rack and capstan-head pinion conveniently located on the upper plate. For this adjustment we furnish a special non-magnetic adjusting pin of phosphor bronze to avoid the deflection of the needle which a steel pin would cause. The capstan-head has the advantage over the ordinary thumb screw that the variation when once set cannot be accidentally disturbed. The compasses of all our transits are provided with this improved variation plate.

To Remove the Compass Glass: The cover-glass of the compass which is held in place by an expanding ring, fits snugly and is sealed with soft cement, to prevent the entrance of moisture. This cement offers but slight resistance in removing the glass, which can be lifted off by means of a piece of wood or paper temporarily glued or cemented to it for that purpose.

Standards. The bent Standards used by us on high grade instruments are the result of careful study supplemented by practical experience. They are well spread and their feet are placed close to the Compass Box where the top plate is strongest and offers the most substantial support, insuring great steadiness to the telescope.

A-shaped Standards. In addition to the bent standards which have long been a distinctive feature of our high grade instruments, we now build (see No. 5060A. pp. 348.) a straight ribbed standard, remarkable for both lightness and strength. In order to obtain the high degree of strength peculiar to this new standard, the hard exterior crust is not removed from the casting, and all standards of this type are furnished with cloth or a morocco-like finish only.

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U-shaped Standards. Our transits with U-shaped Standards (Fig. 4) are of improved **patented** construction. The standards are directly and rigidly mounted on the flange of the inner center and are essentially a part of it. The vital importance of this improvement is obvious, as it insures the greatest steadiness of the telescope. Standards of this type are always made with cloth or morocco-like finish.

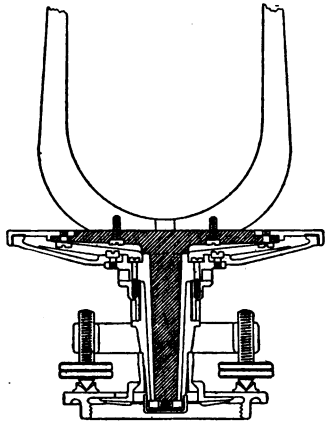


FIG. 4.

The Vertical Circle of our transits is usually graduated to read to single minutes, although finer graduations are regularly furnished with some of the larger instruments. Where a hinged vernier is used, the graduations of the circle are protected by an outer edge of bronze. With flush verniers the graduations extend to the edge of the circle. Peripheral graduations are furnished with our Wet Mine Transit and Solar Transit, see page 357, and with others to order.

Telescope. All of our lenses are made by us of the finest optical glass and are subjected both during manufacture and when finished, to the most rigid tests to insure perfection of material and workmanship. Each instrument is equipped with lenses which will enable the observer to sight with a degree of accuracy well within that required by the instrument. Excessive magnification is to be avoided since it decreases the brightness of the image, lessens the field of view and at the same time accentuates the vibration of the atmosphere.

The eyepieces supplied with our telescopes are either of the astronomical (inverting) or terrestrial (erecting) type. The terrestrial telescope shows objects in their right position, while the astronomical telescope shows the image inverted. The former is somewhat more convenient to use, but on the other hand the latter has a clearer and larger field. The inverting eyepiece is considerably shorter than the erecting, and allows of a greater focal length for the objective, which is a great advantage, particularly for stadia work.

Focusing Device. All instruments with erecting eyepiece, with the exception of our Preliminary Survey Transits, Builder's Transits and Levels and Railroad Levels, are provided with our special cross-hair focusing device shown in Fig. 5. The bellcrank operated by the focusing screw acts directly against a collar on the eyepiece, forcing the latter outward. The return motion is controlled by a strong spiral spring, which not only makes the motion positive, but also serves to control the position of the eyepiece. The focusing screw is provided with a lock-nut operated by an adjusting pin, to make the adjustment permanent for the same observer. When requested we can also furnish instruments equipped with the spiral adjustment; all instruments with the inverting eyepiece are so furnished.

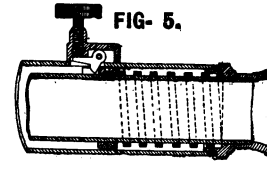


FIG. 5.

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Stadia Hairs. The relation between the size and distance of an object and the size of its image in a telescope is given by the formula

$$\frac{Y^1}{Y} = \frac{F}{X}, \qquad or \quad X = \frac{F.Y}{Y^1}$$

where Y denotes the linear size of the object, Y^1 that of its image (the distance of the stadia wires in this case) F the focal length of the objective and X the distance of the object (the rod) from the first principal focal point. This point lies in front of the objective at a distance nearly equal to its focal length. To reduce the measured distance X to the true distance from the center of the instrument, add to X a **constant** equal to the distance of the first principal focal point from the center of the instrument.

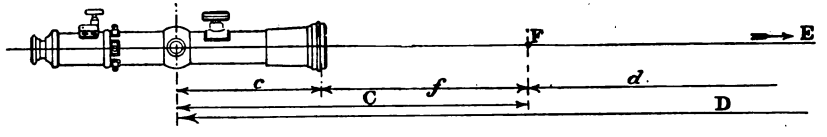


FIG. 6.

The stadia hairs in our transits are adjusted in the proportion $\frac{Y^1}{F} = \frac{1}{100}$, to intercept one foot at a distance of 100 feet or one meter at a distance of 100 meters, etc. This proportion reduces the above formula to the simple relation $X = 100$ Y, to which must be added the constant (C) as explained. For example, assuming the stadia reading to be 1.37, the focal length (F) .62, and the distance from objective to center of the instrument .45 then the constant (C) would be equal to .62 + .45 = 1.07, and the total distance (D) would be (100 × 1.37) + 1 07 = 138.07. The value of this constant which is correct for distances beyond about 100 feet, is stated on the label in the box of each instrument provided with stadia hairs. For sights not on the horizontal, the horizontal distance must be computed, which can be readily done by means of the **stadia slide rule.** (See page 306.)

All our Transits with the exception of the Builders Transit are now furnished with Stadia Hairs.

Disappearing Stadia Hairs are stadia hairs not in the same focal plane with the cross hairs so that either the cross hairs or the stadia hairs can be brought into focus, thereby removing the chance for incorrect rod readings which sometimes occurs through reading the wrong hair.

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The **Level Vials** (spirit levels) are of special glass made for this purpose. They are ground to a true curve and contain a very mobile fluid which will not form a sediment. The telescope level vials are longer than those usually employed and all vials are graduated on the glass to 2 mm. and are sensitive in keeping with the grade of the instrument.

It should be borne in mind that the accuracy of the results obtainable, if the instrument be otherwise well made, depends on the sensitiveness of the level vials, and that the results cannot be accurate if the bubble does not readily respond to the slightest change in adjustment. Coarse and sluggish level vials are easily brought into **apparent** adjustment, but the actual results obtained with them are very uncertain. Even when fine and sensitive vials seem to be a "little out", the actual results are far better than those obtained with sluggish level vials which **seem** to indicate perfect adjustment.

The **Gradienter Screw** is a modification of the telescope tangent screw, so designed as to elevate or depress the line of sight according to a predetermined extent. The silvered drum attached to the head of the screw is generally divided into 100 parts and the pitch of the screw and the length of the clamp arm so calculated that one complete revolution of the screw head moves the line of sight 1 foot vertically at a horizontal distance of 100 feet. A graduated bar opposite the graduations on the drum indicates the number of complete revolutions of the Gradienter Screw.

THREE LEVELING SCREWS.

Three-screw instruments are beginning to find more favor with American Engineers, as the three-screw leveling head as now constructed by us possesses many distinct advantages. Our three screw transits have shifting plate and can be as readily mounted upon the tripod as the four screw instruments.

CLOTH FINISH.

Because of the protection afforded against sudden temperature changes, the cloth finish is prefered by many engineers. In addition to the instruments listed as with cloth finish, we furnish to order, without extra charge, Transits with cloth finished Standards and Levels with cloth finished bar, telescope and spirit level case. We can also furnish Transits with the telescope cloth finished. Instruments with regular finish cannot be changed to cloth finished instruments.

ALUMINUM.

We make to order Surveying Instruments of Aluminum, employing this metal for all parts for which it is adaptable. Price quoted on application.

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LEVELS.

The levels manufactured by us represent the highest state of development of these important engineering instruments. The construction of the centres, leveling parts and telescopes is similar to that of the transits described in the preceding pages.

The Engineer's Dumpy Level presents some novel and very practical features. The tubular bar gives the instrument unusual rigidity and compactness and at the same time effectually protects the level vial against accidental breakage and sudden temperature changes. The adjustment of the vial is accomplished by a single Capstan-head screw at the under side of the bar.

For all extra-fine levels, with the exception of our Engineer's Dumpy Level, we have adopted a new style of bar of approximately triangular cross-section, which offers very little resistance to the wind and consequently gives added stability to the instrument.

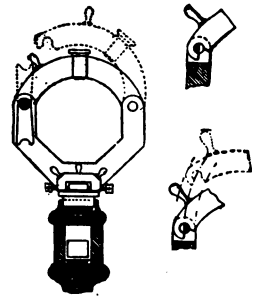


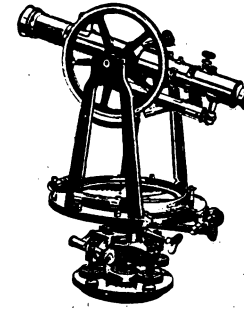
FIG. 7.

The Y's are strong and have an improved locking qevice (Fig. 7) in place of the pin bolts. They are provided with an improved stop by means of which the position of the telescope can be adjusted to have the cross hairs vertical and horizontal. This stop is adjusted by capstan-head screws and made to fold out of the way when rotating the telescope.

For our three-screw Precision Levels and also for the Precision Level of the U. S. C. and G. S. pattern we use iron and steel wherever possible, as this material has a lower coefficient of expansion and is more durable than any composition metal could be.

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ENGINEER'S RAILROAD TRANSITS AND LEVELS.



In addition to the list of extra fine transits and levels described in the preceding pages, we build and list another series of instruments known as Engineer's Railroad Transits and Levels. They are of fine quality and workmanship and while they do not embody all of our patented improvements, they compare favorably in accuracy and reliability with other makes of instrument. They are illustrated and described in detail on pages 381, 385.

BUILDER'S TRANSITS AND LEVELS.

(See pages 382, 383.)

Our Builder's Transits and Levels meet the demand for well-made and durable instruments at very moderate prices. They are fairly accurate and reliable and for the ordinary needs of the builder or contractor give very good results.

ARCHITECT'S CONVERTIBLE LEVELS.

(See pages 377, 378.)

Our **Architect's Convertible Levels**, through their patented arrangement, can be used also for sighting objects above or below the horizontal plane and for sighting vertical lines. At the middle of the telescope there is a bearing piece with a threaded socket at each side, into which the strong trunnions can be screwed, to form a rigid axis at right angles to the telescope. The further ends of the trunnions have bearing surfaces which fit into the Y's like the collars of the telescope. When they rest in the Y's, the telescope can be moved in altitude, so that vertical lines may be determined, and also horizontal angles between two points not in the same plane. When the instrument is used as a Level, the trunnions are removed and placed in the box. Architects and Builders will find this addition a very useful one and well worth the extra cost.

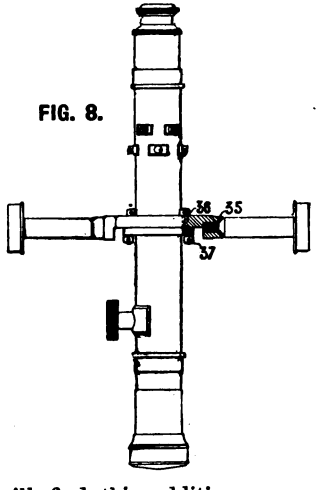


FIG. 8.

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FARM LEVELS.

These Instruments are designed for laying out parks, gardens and agricultural plots, draining, ditching, road-making and similar uses which do not require the accuracy of an Engineer's Level. See page 437.

PACKING OF INSTRUMENTS.

Our Levels and Transits are furnished with mahogany boxes, in which they are accurately and securely fitted, to protect them. The boxes have lock and key. Transit boxes have also safety hooks with patent catch. The boxes contain all accessories and tools, as stated in the description of each instrument.

SHIPPING OF INSTRUMENTS.

We ship our instruments by express without designating the contents on the cases and our uniform experience is that they arrive in good condition when so shipped, but we do not assume any responsibility after having delivered the instrument to the Express Company. If the instruments are designated as such on the boxes and their value is declared, the Express Companies assume the responsibility for the declared value and for breakage, in consideration of a higher rate. When instruments are shipped by freight and declared as such, the carriers also assume liability for damage in transit. If such declaration is desired, it must be mentioned when ordering.

NOTE. Instruments will be shipped in United States C. O. D. on approval with privelege of three days trial. If, after three days trial, the instrument is found unsuitable, Agent will be instructed to refund money upon receipt of instrument in good condition.

For Stadia Hand Transit, see page 425.

For Pocket Transits, see pages 422, 423.

For Hand Levels, see page 439.

For Surveying Compasses, etc., see page 417.

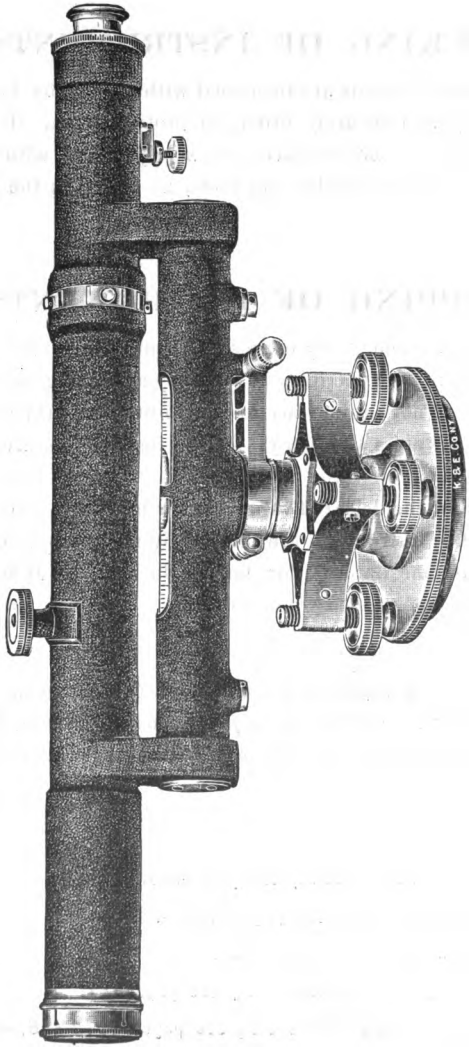
For Tripods, Jacob Staffs etc., see pages 397, 398, 421.

For Leveling Rods, see page 463, etc.

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EXTRA-FINE

ENGINEER'S DUMPY LEVEL



No. 5003

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EXTRA-FINE

ENGINEER'S DUMPY LEVEL

(Four Leveling Screws.)

(See also general description, page 331.)

5003. Engineer's Dumpy Level.

Telescope 18 in., achromatic terrestrial, with dust cap and sun shade. OBJECT GLASS $1\frac{3}{8}$ in., focused by improved rack and pinion movement. EYEPIECE, erecting, with patent micrometer focusing arrangement with locknut. MAGNIFYING POWER 28 diameters.

Level Bar tubular in form, very strong, encasing fine spirit level. LEVEL VIAL graduated on the glass and ground to a sensitiveness of about 25 seconds of arc per graduation. Improved adjusting device for level vial. Very stout supports to telescope.

Centre of gun-metal, carefully fitted. Centre and Level Bar are cast in one piece. Improved CLAMP and TANGENT SCREW with counter spring. Tangent and Leveling Screws of German silver. Telescope barrel and its supports, the leveling bar and the level tube are *cloth finished.*

Instrument complete, with adjusting pins, waterproof cover, etc., in fine polished mahogany Box with Split Tripod No. 5178 . . $ 100 00

Weight of instrument with tripod, about 18 pounds.

5003A. Engineer's Dumpy Level, like No. 5003, but with **astronomical** (inverting) **telescope, made to order only** 100 00

For other Dumpy Levels see pages 374, 379.

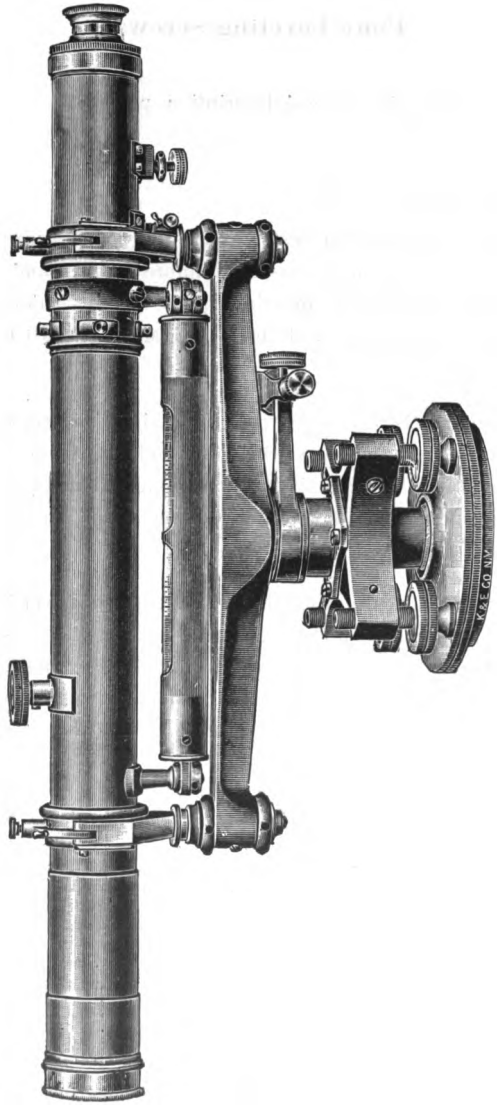
For Engineer's Railroad Levels see page 381, etc.

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EXTRA-FINE

ENGINEER'S Y LEVEL.

(Four Leveling Screws)



No. 5010.

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EXTRA-FINE

ENGINEER'S Y LEVELS.

(Four Leveling Screws)

(See also general description, page, 331.)

5005. Engineer's Y Level.

Telescope 15 in., achromatic terrestrial, with dust cap and sun-shade. OBJECT GLASS $1\frac{5}{16}$ in., focused by improved rack and pinion movement. EYEPIECE, erecting, with patent micrometer focusing arrangement with lock-nut. MAGNIFYING POWER 24 diameters. Fine SPIRIT LEVEL to telescope, graduated on the glass and ground to a sensitiveness of about 20 seconds of arc per graduation. Level tube adjustable vertically and horizontally.

Level Bar of gun-metal, improved construction, of great strength and rigidity. Shaped to offer least resistance to the wind. The Y's, one of which is adjustable for altitude, are provided with an ADJUSTABLE HINGED STOP for placing the telescope with the cross hairs in a vertical and horizontal position. The Y's are locked by a patented arrangement dispensing with pin bolts.

Centre of hard bell-metal, carefully fitted. Improved CLAMP and TANGENT SCREW with counter spring. Tangent and Leveling Screws of German silver.

Instrument complete with adjusting pins, waterproof cover, etc., in fine polished mahogany Box with No. 5177 Split Tripod, $ 100 00

Weight of instrument with Tripod about $18\frac{1}{2}$ lbs.

5010. Engineer's Y Level, like No. 5005, but **telescope 18 in., object-glass $1\frac{3}{8}$ in.**, MAGNIFYING POWER 28 diameters, with No. 5178 Split Tripod 130 00

Weight of instrument with Tripod about $20\frac{1}{2}$ lbs.

5012. Engineer's Y Level, like No. 5010, but **telescope 20 in., object-glass $1\frac{5}{8}$ in**, MAGNIFYING POWER 32 diameters, with No. 5178 Split Tripod 135 00

Weight of instrument with Tripod about $23\frac{1}{2}$ lbs.

5013. Engineer's Y Level, like No. 5010, but **telescope 22 in., object-glass $1\frac{3}{4}$ in.**, MAGNIFYING POWER 38 diameters, with No. 5178 Split Tripod 140 00

Weight of instrument with Tripod about 24 lbs.

The above levels, with **steel centre, made to order only** . . . extra 10 00

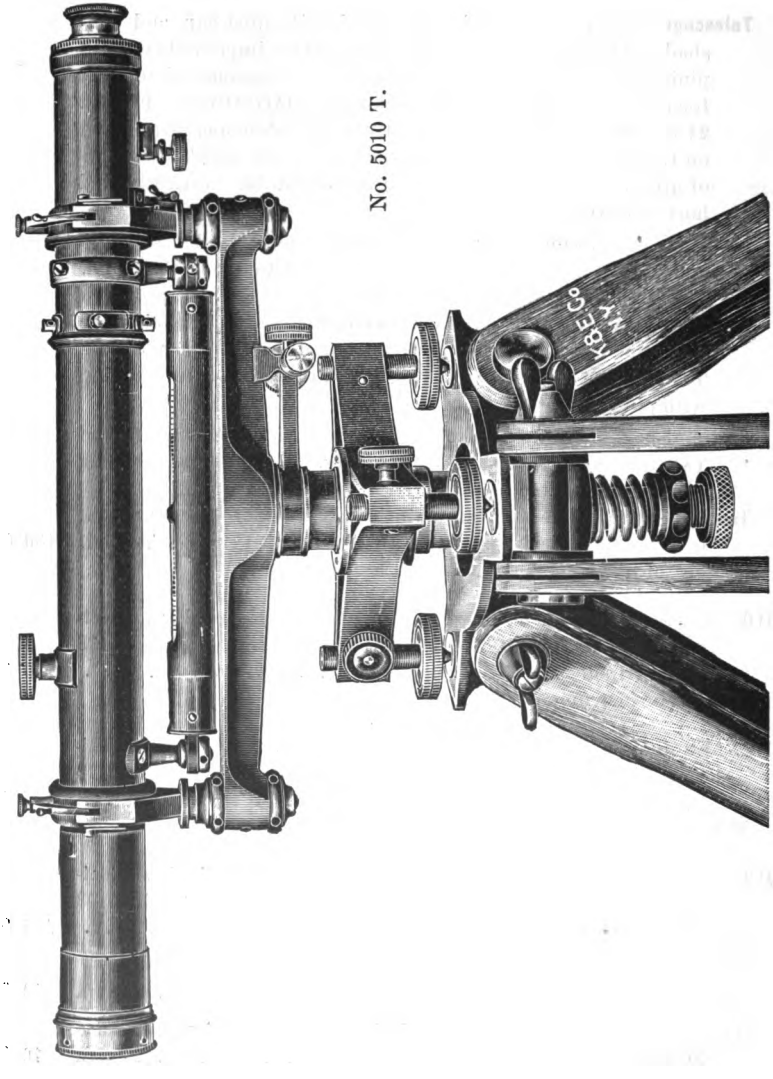
The above levels with **astronomical** (inverting) **telescope, made to order only** . . . . . extra 10 00

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EXTRA-FINE

ENGINEER'S Y LEVEL.

(Three Leveling Screws.)



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EXTRA-FINE

ENGINEER'S Y LEVELS.

(Three Leveling Screws.)

(See also general description, page 331.)

MADE TO ORDER ONLY.

5005 T. Engineer's Y Level, as described under No. 5005, with 15 in. achromatic terrestrial TELESCOPE, but with **three leveling screws.**

Instrument complete, with No. 5177 Split Tripod . . . . . $ 115 00

Weight of instrument with Tripod, about 21 lbs.

5010 T. Engineer's Y Level, as described under No. 5010, with 18 in. achromatic terrestrial TELESCOPE, but with **three leveling screws.**

Instrument complete, with No. 5178 Split Tripod 145 00

Weight of instrument with Tripod, about 23 lbs.

5012 T. Engineer's Y Level, as described under No. 5012, with 20 in. achromatic terrestrial TELESCOPE, but with **three leveling screws.**

Instrument complete, with No. 5178 Split Tripod 150 00

Weight of instrument with Tripod, about 24½ lbs.

5013 T. Engineer's Y Level, as described under No. 5013, with 22 in. achromatic terrestrial TELESCOPE, but with **three leveling screws.**

Instrument complete, with No. 5178 Split Tripod 155 00

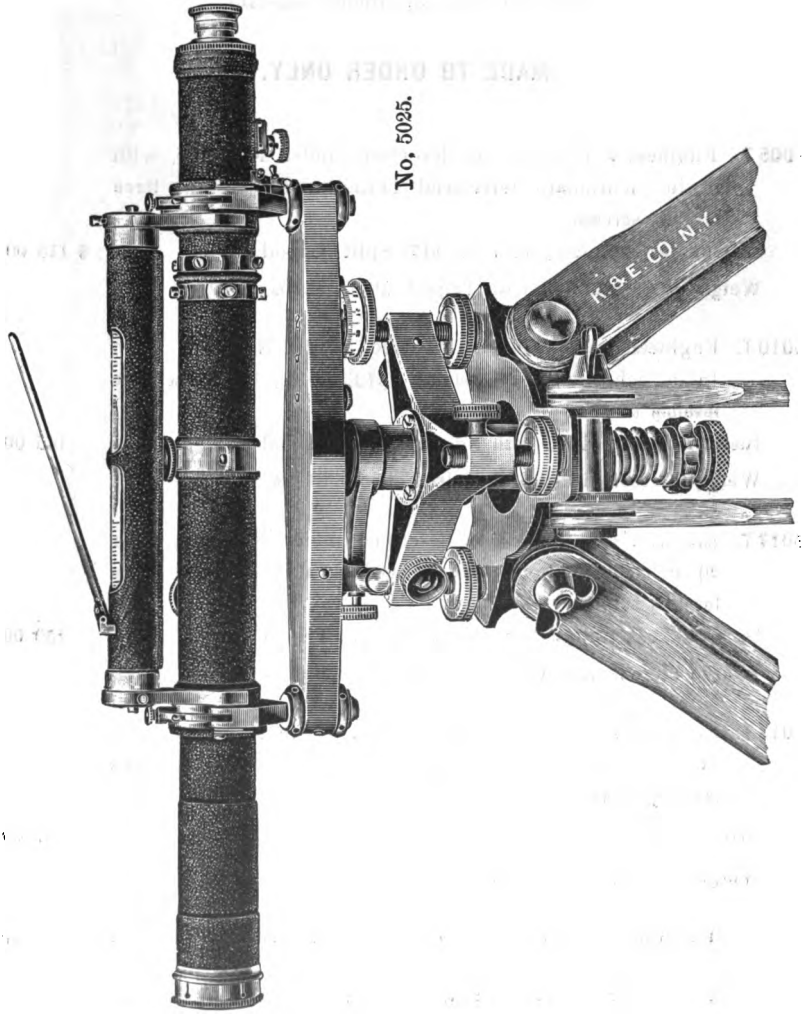
Weight of instrument with Tripod, about 25 lbs.

The above levels with steel centre, made to order only . extra 10 00

The above levels with astronomical (inverting) **telescope, made to order only** . . . . . extra 10 00

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K & E
PRECISION Y LEVEL



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K & E
PRECISION Y LEVEL

(Three Leveling Screws.)

5025. K & E Precision Y Level,

Telescope 18 in., achromatic terrestrial, with dust-cap and sun-shade. OBJECT GLASS 1⅜ in., focused by improved rack and pinion movement. EYEPIECE erecting, with patent micrometer focusing arrangement with lock nut. MAGNIFYING POWER 28 diameters. Striding SPIRIT LEVEL to telescope, graduated on the glass and ground to a sensitiveness of about 10 seconds of arc per graduation. HINGED MIRROR, for observing level vial, mounted in aluminum.

Level Bar of gunmetal, of great strength and rigidity. Within this bar is another bar rigidly attached to the centre. The outer bar carrying the Y's is pivoted on the inner bar, its movement in altitude being controlled by a graduated micrometer screw and a strong counter-spring. The Y's, one of which is adjustable for altitude, are provided with an adjustable HINGED STOP for placing the telescope with the cross hairs in a vertical and horizontal position. The Y's are locked by a patented arrangement dispensing with pin bolts.

Centre of steel, extra long, carefully fitted into socket of the cast iron leveling head. Improved CLAMP and TANGENT SCREW with counterspring. Tangent and Leveling Screws of German silver.

Instrument complete with adjusting pins, waterproof cover, etc., in fine polished mahogany Box with extra-strong Split Tripod . . . . . $ 175 00

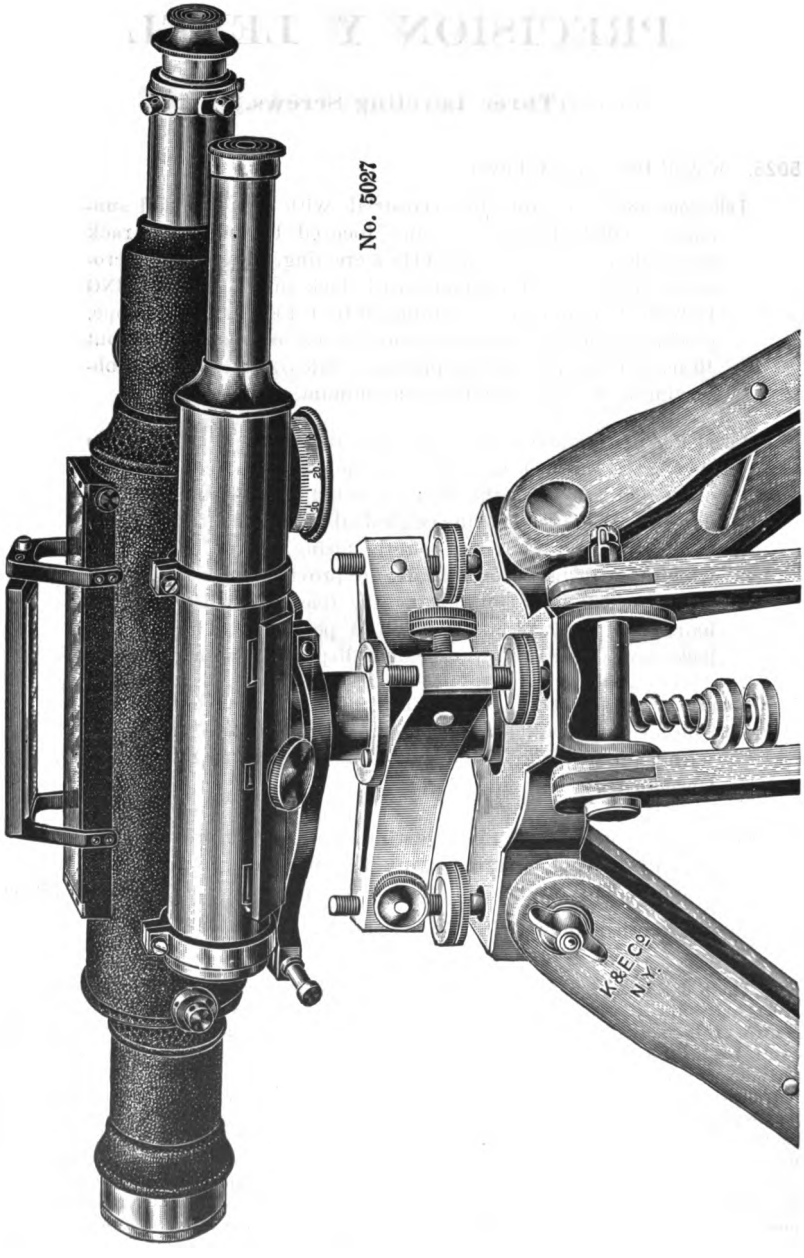
Weight of instrument with Tripod about 21 lbs.

The K & E Precision Y Level, (3 leveling screws) is of highest grade workmanship. It has extra-fine lenses, a very sensitive spirit level and an extra-long and strong steel centre. It is so constructed that the level of the telescope is constantly under immediate control of the observer. The head of the micrometer screw is graduated and reads opposite an index which registers the number of revolutions of the screw. Two full revolutions will move the crosshair to the extent of 1 foot on a rod at a distance of about 100 feet. By means of this micrometer screw, delicate re-adjustment of the level can be made for each sighting and the difference in level can be read off like with a gradienter. A mirror, mounted above the level, enables the observer to watch the bubble from his position at the eyepiece. Where the station is frequently changed or where the ground is not firm, the Precision Level will save much time and will give closer results than a plain Y level because the level of the telescope can be corrected for each sight.

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PRECISION LEVEL.

(Made after the U. S. C. & G. Survey Level.)



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PRECISION LEVEL

(Three Leveling Screws.)

(Made after the U. S. C. & G. Survey Level)

5027. Precision Level made after the U. S. C. & G. Survey Level.

Telescope 16 in., achromatic astronomical (inverting) with dust-cap and sun-shade, improved rack and pinion movement. OBJECT GLASS $1\frac{1}{16}$ in. diameter. EYEPIECE with improved spiral focusing arrangement. The telescope is mounted within a tubular support, at one end of which two pivot screws provide a horizontal axis about which the telescope can be moved in altitude and the line of collimation put into the horizon by means of a MICROMETER SCREW at the other end of the tubular support. The head of this micrometer screw is divided into 100 parts on a graduated ring. A lever handle raises the telescope off the micrometer screw and presses it against a spring sunk into the upper part of the tubular support to prevent jarring the telescope while the instrument is carried about.

Level to Telescope. The high grade CHAMBERED level vial is placed in a recess of the telescope barrel. It is graduated on the glass and ground to a sensitiveness of about 2 seconds of arc per graduation. The level is observed by means of a device mounted in a tube placed alongside of the telescope. It consists of 2 prisms so arranged as to reflect the image of the bubble to the eye of the observer. The prisms are adjustable for the length of the bubble, which varies with the temperature.

A circular spirit level for approximate leveling is placed at the right-hand side of the telescope support and may be observed by means of a reflector attached to it.

Centre of steel, extra long, very carefully fitted into socket of cast iron leveling head. Improved CLAMP and TANGENT SCREW with counterspring. Tangent and Leveling Screws of German silver.

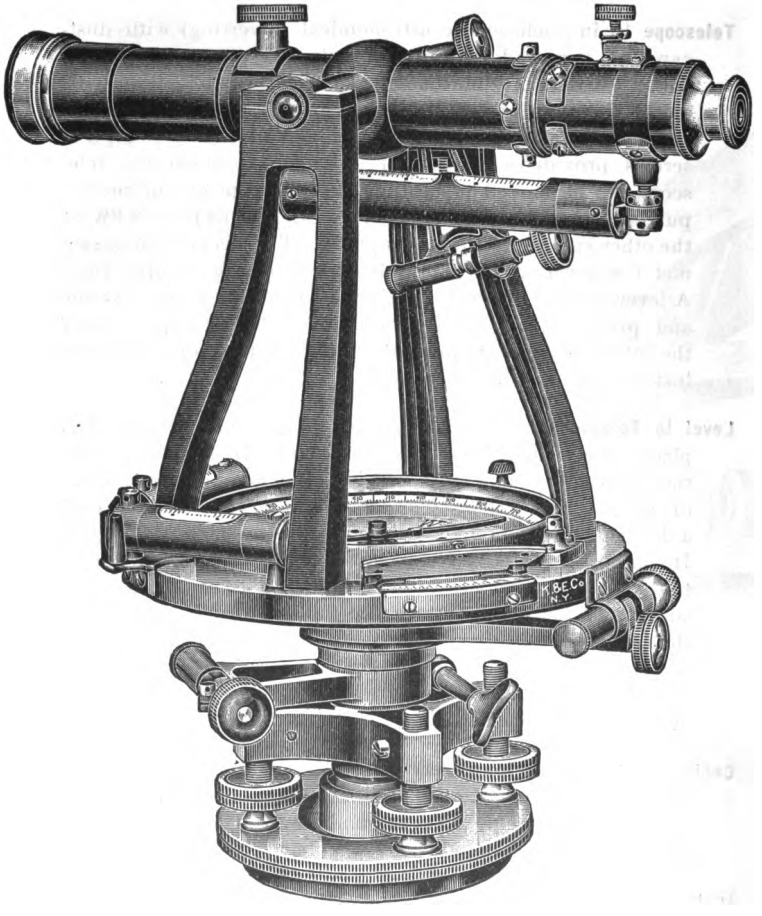
Instrument complete with adjusting pins and waterproof cover in fine polished mahogany Box, with an extra-strong Split Tripod . . . . . $ 800 00

Weight of instrument with tripod, about 25 pounds.

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EXTRA-FINE

ENGINEER'S TRANSIT.



No. 5040.

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EXTRA-FINE

ENGINEER'S TRANSITS.

See also general description, page 321, etc.

For Synopsis of Transits, see page 390.

5030. Engineer's Transit (plain).

Telescope 11½ in., achromatic terrestrial, with dust cap and sun-shade, OBJECT GLASS $1\frac{5}{16}$ in. with improved rack and pinion movement. EYEPIECE with patent micrometer focusing arrangement with lock-nut. MAGNIFYING POWER 24 diameters. STADIA HAIRS fixed, ratio 1:100. Improved CLAMP and TANGENT SCREW with counter-spring.

Horizontal Limb 6¼ in. diameter, graduated on solid silver to half degrees and numbered like Fig. IV, page 326. Opposite VERNIERS at about 45° with telescope, reading to one minute. Hinged REFLECTORS. Two fine SPIRIT LEVELS graduated on the glass and ground to a sensitiveness of about 60 seconds of arc per graduation.

Compass. NEEDLE about 4½ in. COMPASS RING, beveled, graduated on solid silver to half degrees. VARIATION PLATE.

Centres, anti-friction composition, extra long and carefully fitted. FOUR LEVELING SCREWS. SHIFTING CENTRE. Improved CLAMP and TANGENT SCREW with counter-spring. Tangent and Leveling Screws of German silver.

Instrument complete with plumb bob, magnifying glass, adjusting pins, waterproof cover, etc., packed in fine polished mahogany Box, and with No. 5178 Split Tripod . . . . . $ 185 00

Weight of instrument with tripod about 23 lbs.

5040. Engineer's Transit as described under No. 5030, but with fine **Spirit Level** to Telescope, graduated on the glass and ground to a sensitiveness of about 30 seconds of arc per graduation. Instrument complete with No. 5178 Split Tripod etc. 205 00

Weight of instrument with tripod about 23 lbs.

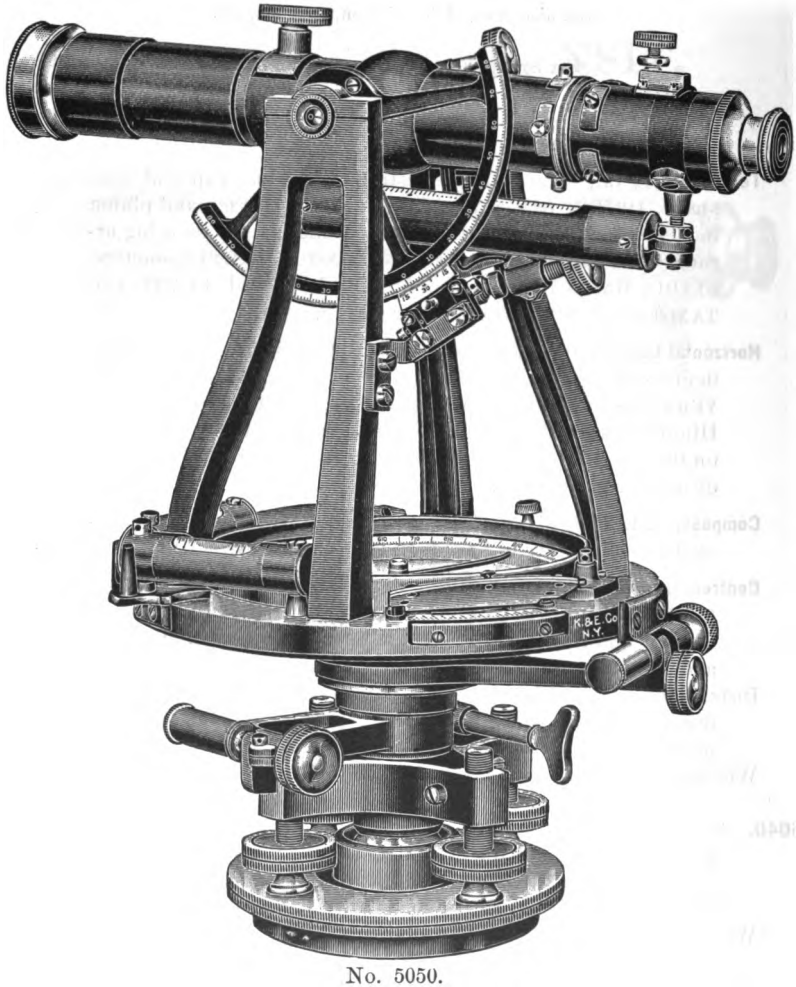
Above instruments with **three leveling screws, (made to order only)** . . . . . extra 15 00

Above instruments with **astronomical** (inverting) **telescope (made to order only)** . . . . . extra 10 00

For furnishing these instruments with other graduations, see page 395.

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EXTRA-FINE
ENGINEER'S TRANSIT
WITH VERTICAL ARC.



No. 5050.

For Synopsis of Transits, see page 390.

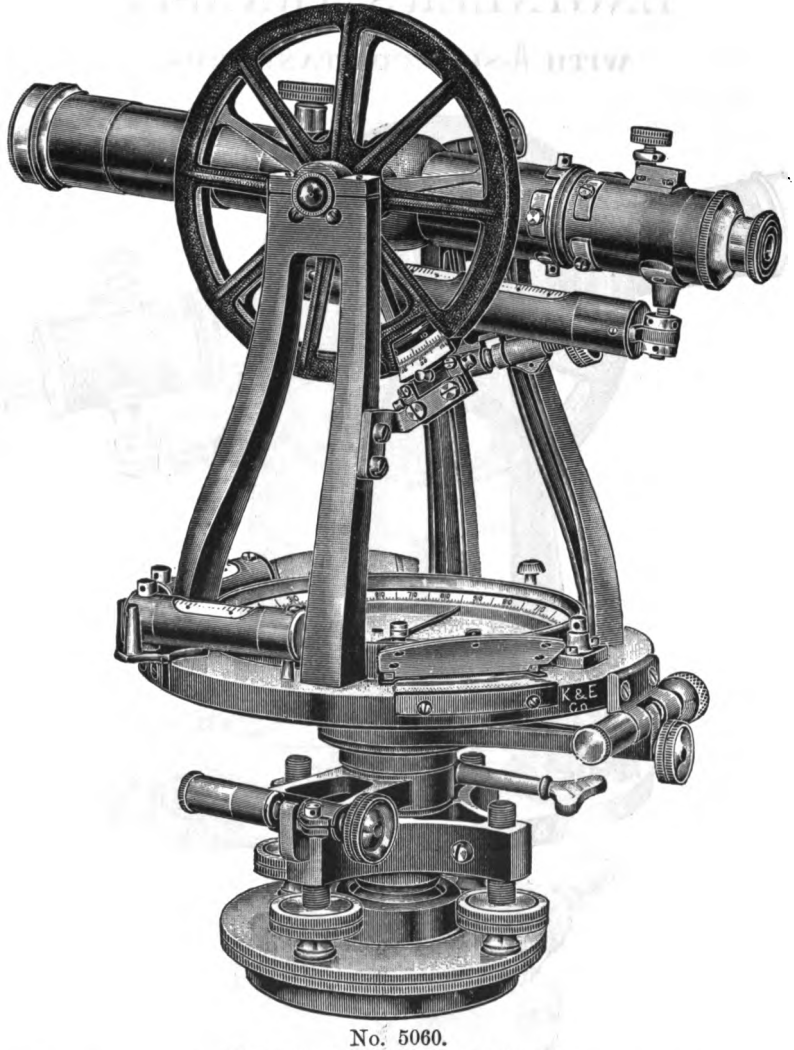
5050. Engineers Transit as described under No. 5030, (see page 345) with SPIRIT LEVEL to Telescope and **vertical arc** of 5 in. diameter, graduated on solid silver to half degrees, vernier reading to one minute. Instrument, complete with No. 5178 Split Tripod, etc. . . . . $ 220 00

Weight of instrument with Tripod about 28½ lbs.

For furnishing these instruments with other graduations, see page 395.

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EXTRA-FINE
ENGINEER'S TRANSIT
WITH VERTICAL CIRCLE.



No. 5060.

For synopsis of Transits see page 390.

5060. Engineer's Transit as described under No. 5030 (page 345) with SPIRIT LEVEL to telescope and with **full Vertical Circle** 5 in. diameter, graduated on solid silver to half degrees, vernier reading to one minute. GUARD to Circle. Instrument complete with No. 5178 Split Tripod, etc. . . . . $ 230 00

Weight of instrument with Tripod about 24 lbs.

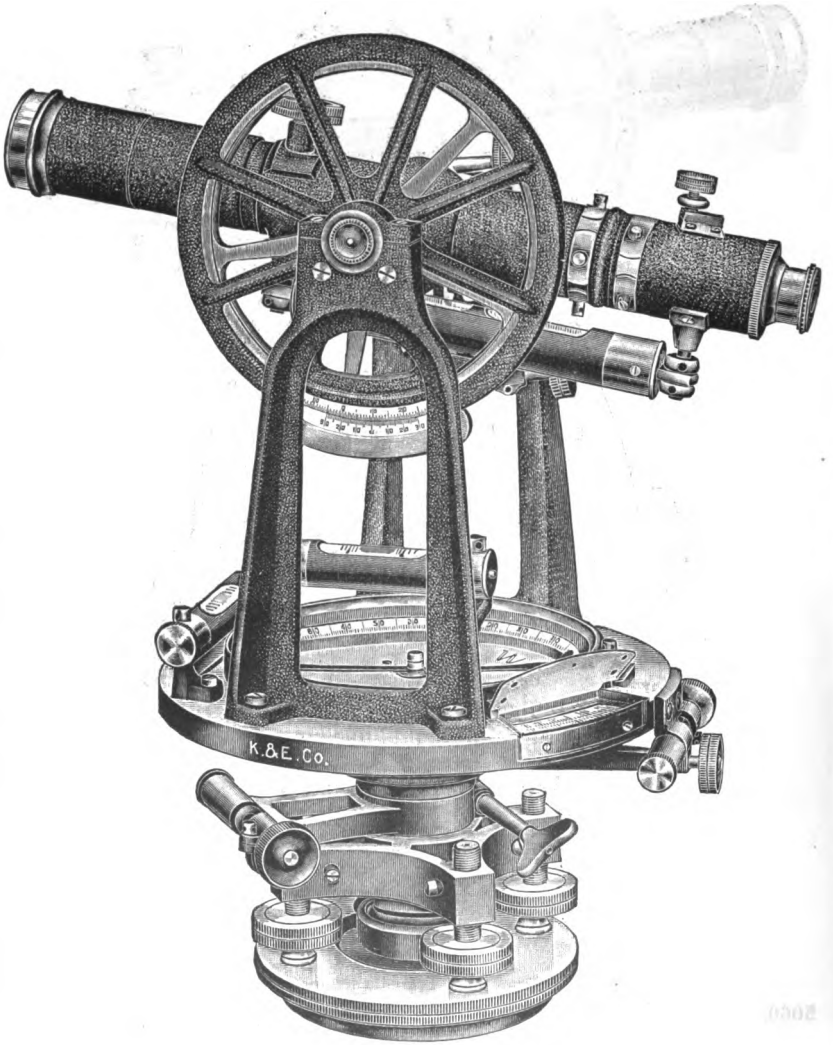
For furnishing these instruments with other graduations, see page 395.

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EXTRA-FINE

ENGINEER'S TRANSIT

WITH A-SHAPED STANDARDS.



No. 5060 A.

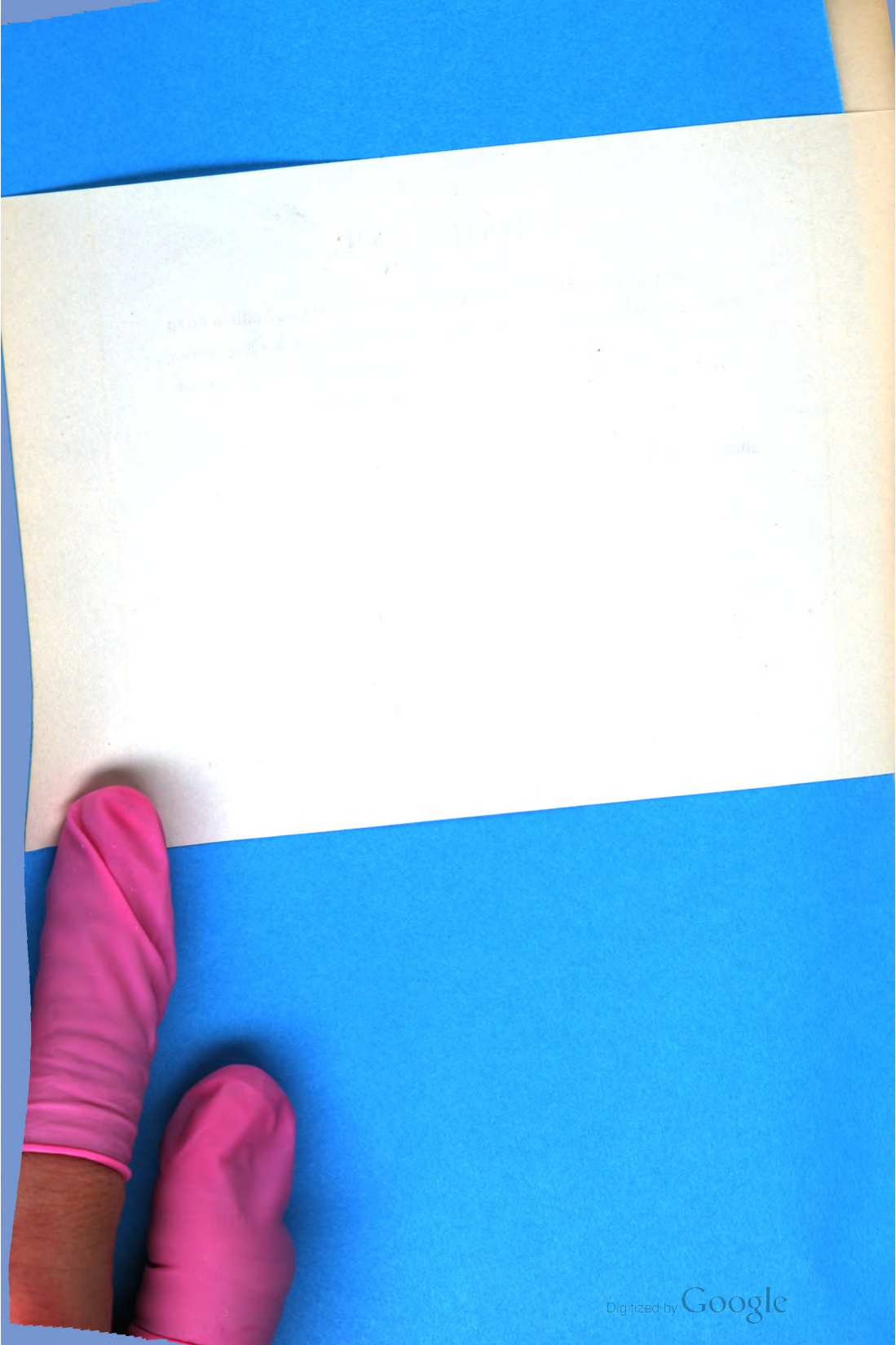
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IMPORTANT.

Since introducing our Extra-Fine Engineer's Transits Nos. 5030 to 5079 with A-shaped Standards they have found so much favor with our Engineering friends that we have decided to carry the instruments listed below in stock, so that they can be furnished promptly upon receipt of order.

5030A,	with A-shaped Standards, otherwise as described under 5030, page 345 . .						$ 185 00
5040A,	do.	do.	do	5040,	"	345 . .	205 00
5050A,	do.	do.	do.	5050,	"	346 . .	220 00
5060A,	do.	do.	do.	5060,	"	347 . .	230 00
5076A,	do.	do.	do.	5076,	"	353 . .	220 00
5077A,	do.	do.	do.	5077,	"	355 . .	220 00
5079A,	do.	do.	do.	5079,	"	359 . .	220 00

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EXTRA FINE

ENGINEER'S TRANSITS

With A-shaped Standards.

MADE TO ORDER ONLY

We are prepared to furnish at the same prices, **to order only**, instruments Nos.

5030.	**5060.**	**5076.**
5040.	**5072.**	**5077.**
5050.	**5074.**	**5079.**

with A-SHAPED STANDARDS as illustrated on opposite page (for description see page 827.) When ordering above instruments equipped with A standards please add letter **A** to instrument number.

For Synopsis of Transits, see page 390.

For Engineer's Railroad Transits, see page 385.

For Engineer's Railroad Levels, see page 381.

For Plane Tables, etc., see page 400 etc.

For Attachments and Parts, see page 394.

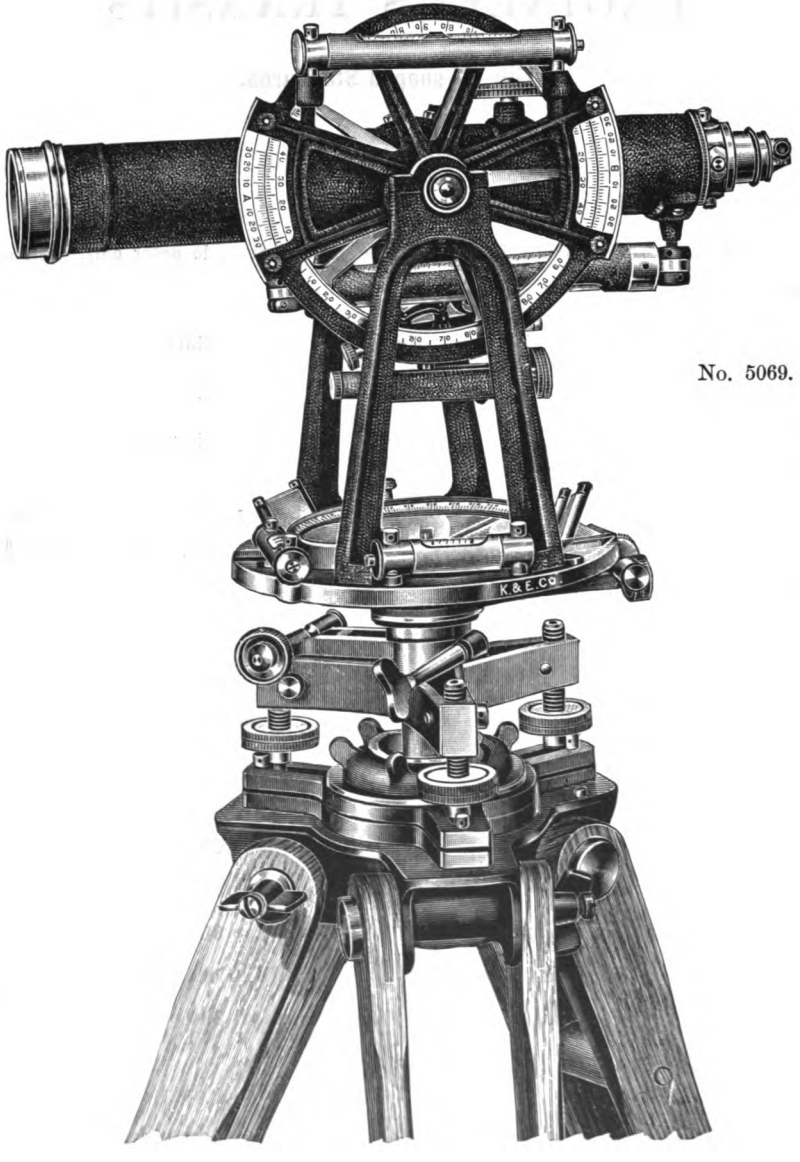
For furnishing these instruments with other graduations, see page 395.

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EXTRA-FINE

ENGINEER'S TRANSIT.

(WISCONSIN TRANSIT.)



No. 5069.

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EXTRA-FINE

ENGINEER'S TRANSIT.

(WISCONSIN TRANSIT.)

(Designed by Professor Leonard S. Smith, Madison, Wis.)

(For Synopsis of Transits see page 390.)

5069. Wisconsin Transit.

Telescope 11 in., achromatic astronomical (inverting), with dust cap and sunshade. OBJECT GLASS 1⅞ in. with improved rack and pinion movement. EYEPIECE with prism and colored glass shutter, spiral focusing arrangement. MAGNIFYING POWER 25 diameters. STADIA HAIRS fixed, ratio 1:100. SPIRIT LEVEL to telescope, graduated on the glass and ground to a sensitiveness of about 25 seconds of arc per graduation. Improved CLAMP and TANGENT SCREW with counterspring.

Horizontal Limb 5 in. diameter, graduated on solid silver to half degrees and numbered like Fig. IV, page 326. Opposite VERNIERS reading to one minute, placed at about 30° with telescope. GROUND GLASS REFLECTORS. Two fine SPIRIT LEVELS graduated on the glass and ground to a sensitiveness of about 60 seconds of arc per graduation.

Compass, NEEDLE about 8½ in. COMPASS RING beveled, graduated on solid silver to half degrees. VARIATION PLATE.

Vertical Circle 5 in. diameter, graduated on solid silver to half degrees, reading to one minute by opposite verniers. Provided with GUARD carrying sensitive SPIRIT LEVEL.

Centres anti-friction composition, extra long and carefully fitted. THREE LEVELING SCREWS. SHIFTING PLATE. Improved CLAMP and TANGENT SCREW with counterspring. Tangent and Leveling Screws of German silver.

The telescope, the tube of the spirit level, guard to vertical circle and standards are *cloth finished.*

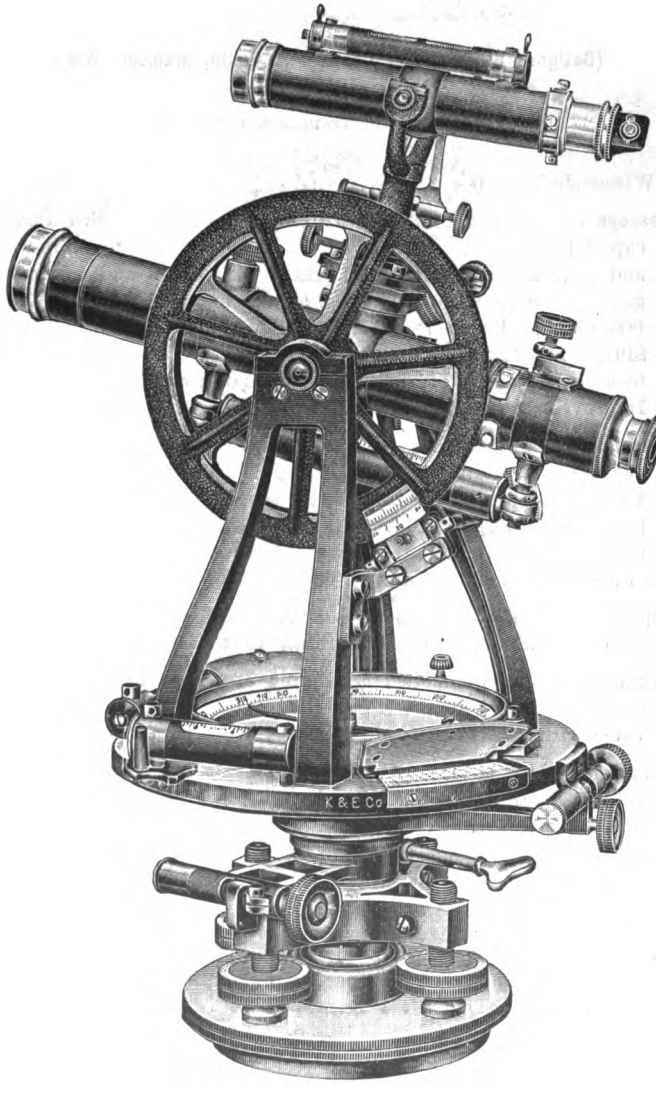
Instrument complete with plumb bob, magnifying glass, adjusting pins, waterproof cover, etc., packed in fine polished mahogany Box with Split Tripod . . . . . $ 265 00

Weight of instrument with tripod about 22 pounds.

Above instrument with fine **Reversible Spirit Level** to telescope, in place of regular spirit level, extra 15 00

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EXTRA-FINE ENGINEER'S MOUNTAIN AND MINING TRANSIT.



No. 5076, with Solar attachment No. 5090.
(For Solar Attachment see page 372).

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EXTRA-FINE

ENGINEER'S MOUNTAIN AND MINING TRANSITS

(See also general description, page 321, etc.)

For Synopsis of Transits, see page 390.

***5072.** Engineer's Mountain and Mining Transit.

Telescope 9 in., achromatic terrestrial, with dust cap and sunshade. OBJECT GLASS 1⅛ in., with improved rack and pinion movement. EYEPIECE with patent micrometer focusing arrangement with lock-nut. MAGNIFYING POWER 17 diameters. STADIA HAIRS fixed, ratio 1:100. Fine SPIRIT LEVEL to telescope, graduated on the glass and ground to a sensitiveness of about 30 seconds of arc per graduation. Improved CLAMP and TANGENT SCREW with counterspring. Telescope axis has center point for plumbing from overhead and is prepared to take Solar attachment No. 5090.

Horizontal Limb 5½ in. diameter, graduated on solid silver to half degrees and numbered like Fig. IV, page 326. Two opposite VERNIERS at about 45° with telescope reading to one minute. HINGED REFLECTORS Two fine SPIRIT LEVELS graduated on the glass and ground to a sensitiveness of about 60 seconds of arc per graduation.

Compass. NEEDLE about 4 in. COMPASS RING beveled, graduated on solid silver to half degrees. VARIATION PLATE.

Centres, anti-friction composition, extra long and carefully fitted. FOUR LEVELING SCREWS. SHIFTING CENTER Improved CLAMP and TANGENT SCREW with counterspring. Tangent and Leveling Screws of German Silver.

Instrument complete with plumb bob, magnifying glass, adjusting pins, waterproof cover etc., packed in fine polished mahogany Box, and with No. 5177 Split Tripod . . . . . $ 195 00
Weight of Instrument with Tripod about 20 lbs.

***5074.** Engineer's Mountain and Mining Transit, as described under No. 5072, but with **Vertical Arc** of 4½ in. diameter, graduated on solid silver to half degrees, VERNIER reading to one minute. Instrument complete with No. 5177 Split Tripod etc. 210 00
Weight of instrument with Tripod about 20 lbs.

5076. Engineer's Mountain and Mining Transit, as described under No. 5072, but with **full Vertical Circle** 4½ in. diameter, graduated on solid silver to half degrees, vernier reading to one minute. GUARD to Circle. Instrument, complete with No. 5177 Tripod, etc. 220 00
Weight of instrument with Tripod about 21 lbs.

The above instruments, with **three leveling screws, made to order only** . . . . . .extra 15 00

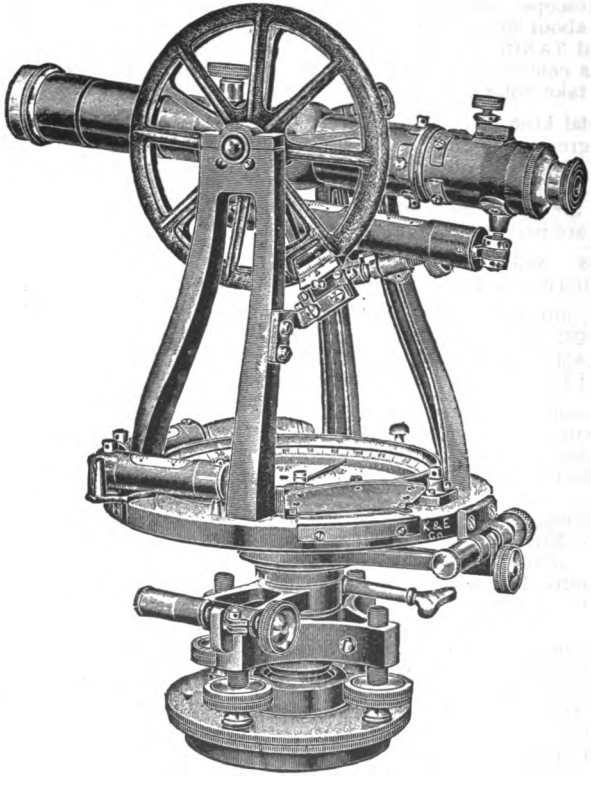
The above instruments, with **astronomical** (inverting) **telescope, made to order only** . . . . . .extra 10 00

***NOTE. Instruments No. 5072 and No. 5074 are not regularly carried in stock, but are made to order only.**

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EXTRA-FINE

ENGINEER'S LIGHT MOUNTAIN TRANSIT.



No. 5077.

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EXTRA-FINE

ENGINEER'S LIGHT MOUNTAIN TRANSIT.

(See also general description, page 321.)

(For Synopsis of Transits, see page 390.)

5077. Engineer's Light Mountain Transit.

Telescope 8 in., achromatic terrestrial with dust cap and sunshade. OBJECT GLASS 1⅛ in., with improved rack and pinion movement. EYEPIECE with patent micrometer focusing arrangement with lock-nut. MAGNIFYING POWER 15 diameters. STADIA HAIRS fixed, ratio 1:100. Fine SPIRIT LEVEL to telescope, graduated on the glass and ground to a sensitiveness of about 30 seconds of arc per graduation. Improved CLAMP and TANGENT SCREW with counterspring. Telescope has centre point for plumbing from overhead and is arranged to take Solar Attachment No. 5090, (page 372).

Horizontal Limb 4¾ in. diameter. Graduated on solid silver and numbered like Fig. IV, page 326. Opposite VERNIERS at about 45° with telescope, reading to one minute. HINGED REFLECTORS. Two fine SPIRIT LEVELS graduated on the glass and ground to a sensitiveness of about 60 seconds of arc per graduation.

Compass. NEEDLE about 3¼ in. COMPASS RING beveled, graduated on solid silver to half-degrees. VARIATION PLATE.

Vertical Circle 4 in. diameter, graduated on solid silver to half degrees. Hinged VERNIER reading to one minute. GUARD to Circle.

Centres, anti-friction composition, extra long and carefully fitted. FOUR LEVELING SCREWS. SHIFTING CENTRE. Improved CLAMP and TANGENT SCREW with counterspring. Tangent and Leveling Screws of German Silver.

Instrument complete, with plumb bob, adjusting pins, waterproof cover, etc., packed in fine polished mahogany Box and with Split Tripod . . . . . $ 220 00

Weight of Instrument with Tripod about 16 lbs.

The above instrument with **three leveling screws, made to order only** . . . . . extra 15 00

The above instrument with **astronomical** (inverting) **telescope, made to order only**. . . . . extra 10 00

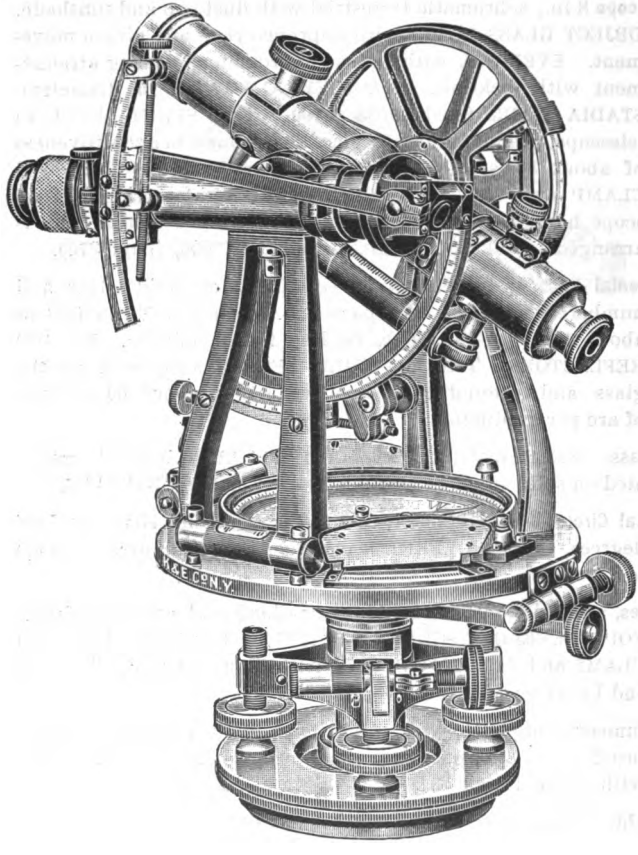
For Solar Attachment see page 372.

For furnishing this instrument with other graduations, see page 395.

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EXTRA-FINE

ENGINEER'S SOLAR TRANSIT.



No. 5078

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EXTRA-FINE

ENGINEER'S SOLAR TRANSIT.

This instrument is used by the U. S. Land Office. It has the advantage that the solar telescope is independent of that of the transit and therefore does not require re-adjusting for each observation.

For Synopsis of Engineer's Transits, see page 390.

5078. Engineer's Solar Transit.

Telescope 9 in., achromatic terrestrial, with dust cap and sunshade. OBJECT CLASS 1⅛ in. diameter, with improved rack and pinion movement. EYEPIECE with patent micrometer focusing arrangement. MAGNIFYING POWER 17 diameters. STADIA HAIRS fixed, ratio 1:100. Fine SPIRIT LEVEL to telescope, graduated on the glass and ground to a sensitiveness of about 80 seconds of arc per graduation. Improved CLAMP and TANGENT SCREW with counterspring.

Horizontal Limb 5½ in. diameter, graduated on solid silver to half-degrees and numbered like Fig. IV. page 326. Opposite VERNIERS, set at about 45° with telescope, reading to one minute. HINGED REFLECTORS. Two fine SPIRIT LEVELS graduated on the glass and ground to a sensitiveness of about 60 seconds of arc per graduation.

Compass. NEEDLE about 3¾ in. Compass Ring beveled, graduated on solid silver to half degrees. VARIATION PLATE.

Vertical Circle 4½ in. diameter. PERIPHERAL GRADUATION, on solid silver to half degrees, reading by vernier to one minute. GUARD to Circle.

Solar Telescope 6½ in. mounted on the horizontal axis of the main telescope, with hour circle reading to 10 minutes of time, collars for striding bubble, knurled sleeve protecting cross-hair screws, which serves also as grip for rotating telescope.

Striding level, fitting the solar telescope and the axis of the main telescope.

Declination arc 4¾ in. radius, graduated to half-degrees reading by VERNIER to one minute, with tangent screw. Axis of vernier arm carries firmly attached the solar reflector.

Latitude Arc 3 in. radius, graduated on solid silver, reading to one minute, with CLAMP and TANGENT SCREW

Centres, anti-friction composition, extra long and carefully fitted. FOUR LEVELING SCREWS. SHIFTING CENTRE. Improved CLAMP and TANGENT SCREW with counterspring. Tangent and Leveling Screws of German silver.

Instrument complete, with plumb bob, adjusting pins, waterproof cover, etc., packed in fine polished mahogany Box and with No. 5178 Split Tripod . . . . . $ 330 00

Weight of Instrument with Tripod about 22 lbs.

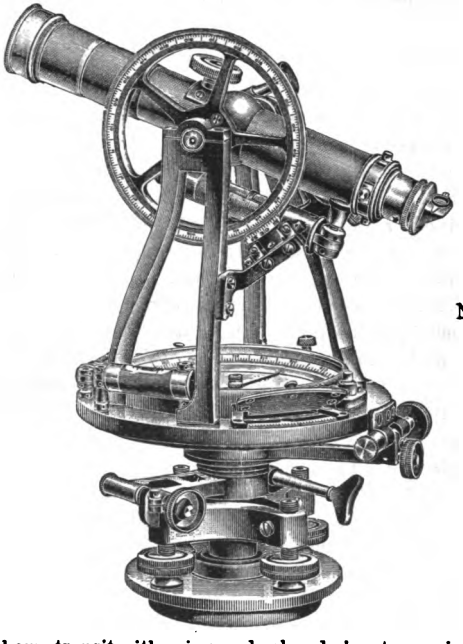
For Solar Attachment for Transits see page 372.

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EXTRA-FINE

ENGINEER'S EXPEDITION TRANSIT.

Illustration about ⅜ size:



No. 5079.

Cut shows transit with prism and colored glass to eyepiece
(For price of Prism see page 395.)



Leather covered Box with shoulder strap for transit No. 5079, and leather skeleton case with shoulder strap for tripod.

For sole-leather carrying cases for other transits see page 394.

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EXTRA-FINE

ENGINEER'S EXPEDITION TRANSIT.

(For Synopsis of Transits see page 390.)

5079. Engineer's Expedition Transit.

Telescope 6½ in., achromatic astronomical, (inverting) with dust cap and sun shade. OBJECT GLASS ⅞ in. diameter with improved rack and pinion movement. EYEPIECE with spiral focusing arrangement. MAGNIFYING POWER 14 diameters. STADIA HAIRS, fixed, ratio 1:100. Fine SPIRIT LEVEL to telescope graduated on the glass and ground to a sensitiveness of about 35 second of arc per graduation. Improved CLAMP and TANGENT SCREW with counterspring.

Horizontal Limb 4 in. diameter, graduated on solid silver to half degrees and numbered like Fig. IV, page 326. Opposite VERNIERS at 45° with telescope, reading to one minute. HINGED REFLECTORS. Two fine SPIRIT LEVELS graduated on the glass and ground to a sensitiveness of about 70 seconds of arc per graduation.

Compass. NEEDLE about 2¾ in. COMPASS RING beveled, graduated on solid silver to half degrees. VARIATION PLATE.

Vertical Circle 3½ in. diameter, graduated on solid silver to half degrees. HINGED VERNIER reading to one minute. GUARD to Circle.

Centres, anti-friction composition, extra long and carefully fitted. FOUR LEVELING SCREWS. SHIFTING CENTRE. Improved CLAMP and TANGENT SCREW with counterspring. Tangent and Leveling Screws of German silver.

Instrument complete, with plumb bob, adjusting pins, waterproof cover etc., fine **leather covered mahogany box** with shoulder strap, and with No. 5183 Extension Tripod in leather skeleton Case . . . . . **$ 220 00**

The Expedition Transit is of the same grade and quality as our finest Engineer's transits and of corresponding accuracy; the centres are 3 in. long. It is about 8⅛ in. high, the outer diameter of the horizontal limb is 4⅛ in. and its packing case measures about 11 x 8 x 6 in. outside. The complete transit weighs about 4½ pounds. The tripod can be extended to 59 inches and weighs about 3½ pounds. With the leather covered case for transit and Sling Case for tripod, this makes the most portable *accurate* instrument for the many occasions where the combination of these features is of value.

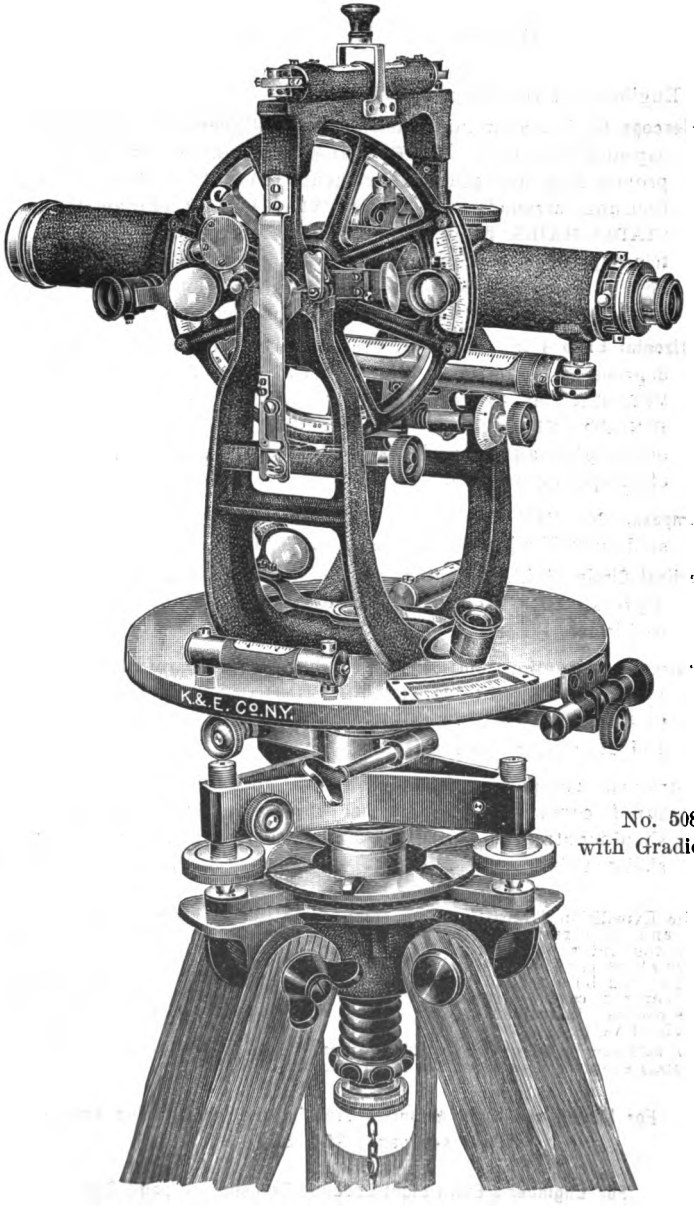
No. 5079 can be furnished, without extra charge, with telescope with erecting (terrestrial) eyepiece instead of the inverting one.

For Mining and Light Mountain Transits and for Locating Transit see pages 353, 387.

For Engineer's Extra Light Locating Transit, see page 389.

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IMPROVED THEODOLITE.



No. 5081
with Gradienter.

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IMPROVED THEODOLITE.

5081. Improved Theodolite with U-shaped Standards.

Telescope 14 in., achromatic astronomical (inverting), with dust cap and sunshade. OBJECT GLASS 1½ in. diameter with improved rack and pinion movement. TWO EYEPIECES, with spiral focusing arrangement. MAGNIFYING POWERS 24 and 32 diameters. STADIA HAIRS fixed, ratio 1 : 100. Fine REVERSIBLE SPIRIT LEVEL to telescope, graduated on the glass and ground to a sensitiveness of about 20 seconds of arc per graduation. STRIDING SPIRIT LEVEL to telescope axis, graduated on the glass and ground to a sensitiveness of about 20 seconds of arc per graduation. Improved CLAMP and TANGENT SCREW with counterspring.

Horizontal Limb, 8 in. diameter, graduated on solid silver to ten minutes. Opposite VERNIERS at about 30° with telescope reading to ten seconds. MOUNTED MICROSCOPES to verniers. Two fine SPIRIT LEVELS graduated on the glass and ground to a sensitiveness of about 40 seconds of arc per graduation.

Vertical Circle, 5½ in. diameter, graduated on solid silver to twenty minutes. Opposite VERNIERS reading to twenty seconds. GUARD to Circle. MOUNTED MICROSCOPES to verniers. Improved TANGENT SCREW with counterspring to vernier.

Centres, anti-friction composition, extra long and carefully fitted. U-shaped Standards mounted directly on flange of inner centre (patented). THREE LEVELING SCREWS. SHIFTING PLATE. Improved CLAMP and TANGENT SCREW with counterspring. Tangent and Leveling Screws of German silver.

Instrument complete, with plumb bob, adjusting pins, etc., packed in two fine polished mahogany Boxes and with fine Split Tripod . . . . . $ 375 00

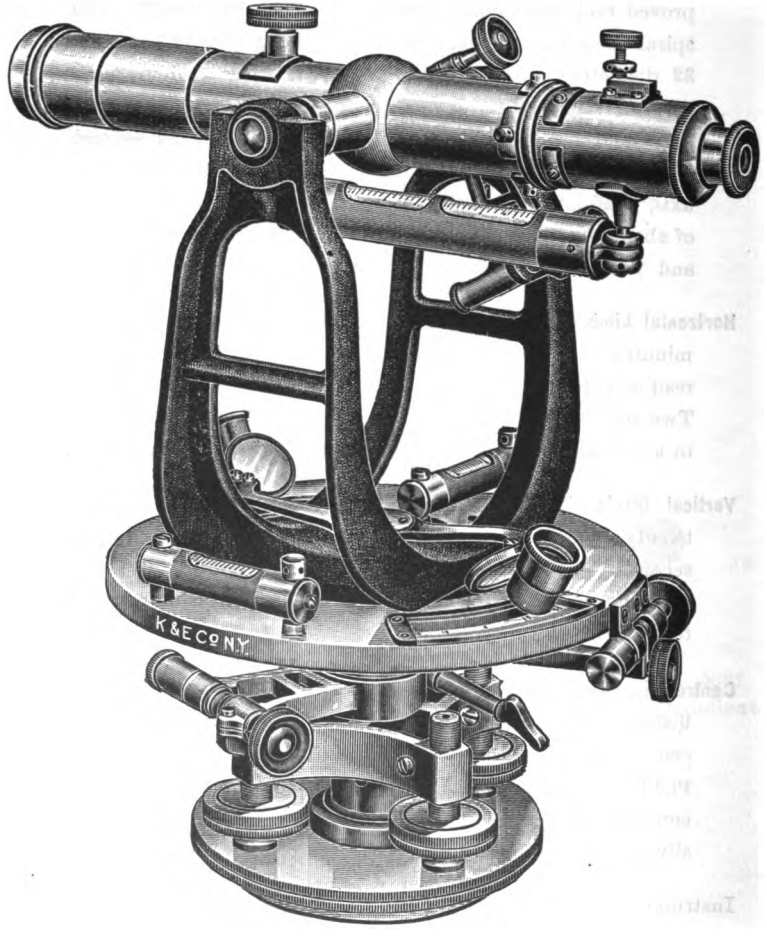
Weight of Instrument with Tripod about 36 lbs.

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K & E

IMPROVED TRANSIT

WITH U-SHAPED STANDARDS.



No. 5082.

Mounted Microscopes with reflectors, as shown in the illustration, extra $ 15 00

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K & E IMPROVED TRANSITS

For Precision Work, Triangulation, etc.

(For Synopsis of Transits see page 390.)

These instruments are of improved design and have all our latest improvements. They should be used where greater accuracy is required than the usual types of transits afford.

5082. Improved Transit with U-shaped Standards.

Telescope 11½ in., achromatic terrestrial, with dust cap and sun-shade. OBJECT GLASS 1 1/16 in., with improved rack and pinion movement. EYEPIECE with patent micrometer focusing arrangement with lock-nut. MAGNIFYING POWER 24 diameters. STADIA HAIRS, fixed, ratio 1:100. Fine SPIRIT LEVEL to telescope, graduated on the glass and ground to a sensitiveness of about 30 seconds of arc per graduation. Improved CLAMP and TANGENT SCREW with counterspring.

Horizontal Limb 6¼ in. diameter graduated on solid silver to half degrees and numbered like Fig. IV, page 326. Opposite VERNIERS, set at about 30° with telescope, reading to one minute. HINGED REFLECTORS.** Two fine SPIRIT LEVELS graduated on the glass and ground to a sensitiveness of about 60 seconds of arc per graduation.

Centres, anti-friction composition, extra-long and carefully fitted. U-shaped Standards, cloth finished, mounted directly on flange of the inner centre (patented). FOUR LEVELING SCREWS. SHIFTING CENTRE. Improved CLAMP and TANGENT SCREW with counterspring. Tangent and Leveling Screws of German silver.

Instrument complete with plumb bob, waterproof cover, adjusting pins, etc., packed in fine polished mahogany Box and with No. 5178 Split Tripod . . . . . $ 195 00

Weight of Instrument with Tripod about 25 lbs.

5084. Improved Transit as described under No. 5082, but with **vertical arc** of 5 in. diameter, graduated on solid silver to half-degrees, VERNIER reading to one minute. Instrument complete, with No. 5178 Split Tripod, etc. 210 00

Weight of Instrument with Tripod about 25 lbs.

5085. Improved Transit as described under No. 5082, but with **full Vertical Circle** 5 in. diameter, graduated on solid silver to half-degrees, VERNIER reading to one minute. GUARD to Circle. Instrument complete, with No. 5178 Split Tripod, etc 220 00

Weight of Instrument with Tripod about 26 lbs.

The above instruments with fine **striding level to telescope axis, made to order only** . . . . . extra 20 00

The above instruments with **three leveling screws, made to order only** . . . . . extra 15 00

The above instruments with **astronomical** (inverting) **telescope, made to order only** . . . . . extra 10 00

***Mounted Microscopes with reflectors, as shown in illustration, furnished to order only** . . . . . extra 15 00

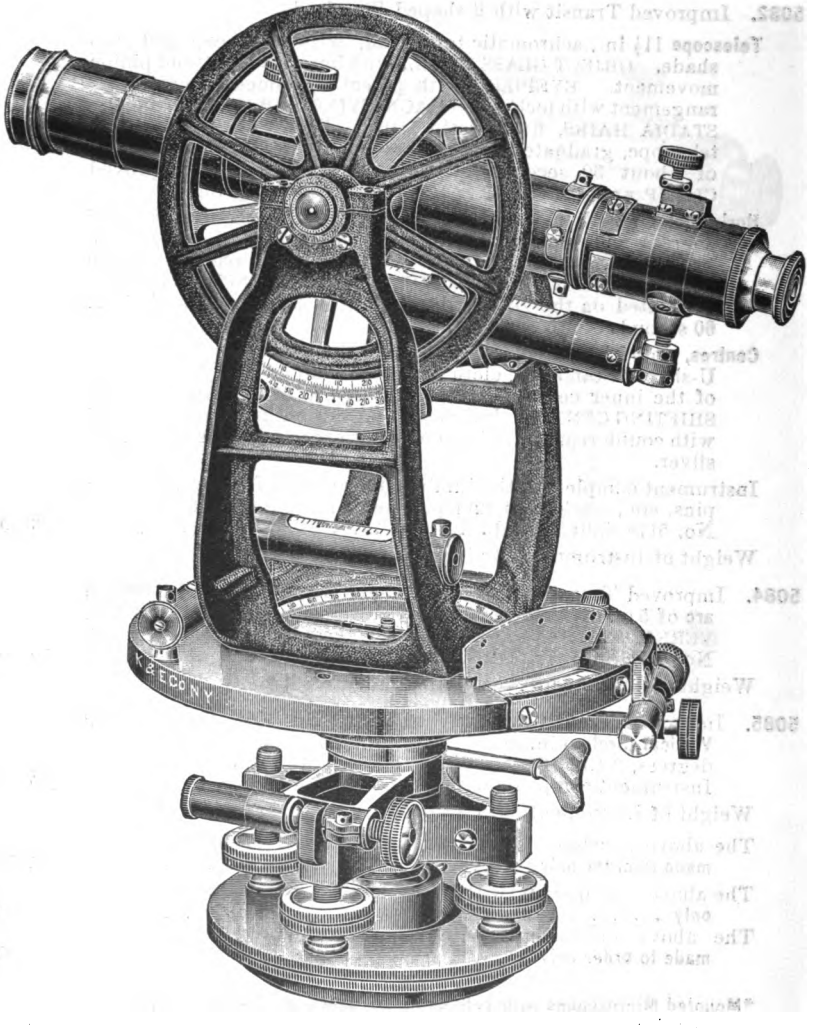
For furnishing these instruments with other graduations, see page 395.

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K & E

IMPROVED TRANSIT

With U-shaped Standards and with Compass.



No. 5085 C.

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K & E

IMPROVED TRANSIT

With U-Shaped Standards and with Compass.

(For Synopsis of Transits see page 390.)

5082 C. Improved Transit with Compass.

Telescope 11½ in., achromatic terrestrial, with dust cap and sun shade. OBJECT GLASS 1 5/8 in. with improved rack and pinion movement. EYEPIECE with patent micrometer focusing arrangement with lock-nut. MAGNIFYING POWER 24 diameters. STADIA HAIRS fixed, ratio 1 : 100. Fine SPIRIT LEVEL to telescope, graduated on the glass and ground to a sensitiveness of about 30 seconds of arc per graduation. Improved CLAMP and TANGENT SCREW with counterspring.

Horizontal Limb 6¼ in. diameter, graduated on solid silver to half degrees and numbered like Fig. IV, page 326. Opposite VERNIERS, set at about 30° with telescope, reading to one minute. HINGED REFLECTORS. Two fine SPIRIT LEVELS graduated on the glass and ground to a sensitiveness of about 60 seconds of arc per graduation.

Compass. NEEDLE about 3 in. COMPASS RING beveled, graduated on solid silver to half degrees. VARIATION PLATE.

Centres, anti-friction composition, extra long, and carefully fitted. U-shaped Standards, cloth finished, mounted directly on flange of inner center (patented). FOUR LEVELING SCREWS. SHIFTING CENTRE. Improved CLAMP and TANGENT SCREW with counterspring. Tangent and Leveling Screws of German silver.

Instrument complete with plumb bob, magnifying glass, adjusting pins, waterproof cover, etc., packed in fine polished mahogany Box, and with No. 5178 Split Tripod, ... $ 210 00

Weight of instrument with tripod about 25 lbs.

5084 C. Improved Transit with Compass as described under No. 5082 C, but with **Vertical Arc** of 5 in. diameter, graduated on solid silver to half degrees, VERNIER reading to one minute. Instrument complete with No. 5178 Split Tripod, etc. 225 00

Weight of instrument with tripod about 25½ lbs.

5085 C. Improved Transit with Compass as described under No. 5082 C, but with **full Vertical Circle** 5 in. diameter, graduated on solid silver to half degrees, VERNIER reading to one minute. GUARD to Circle. Instrument complete with No. 5178 Split Tripod, etc. 235 00

Weight of instrument with tripod about 26 lbs.

The above Instrument with **three leveling screws, made to order only** . . . . . extra 15 00

The above instrument with **astronomical** (inverting) **telescope, made to order only** . . . . . extra 10 00

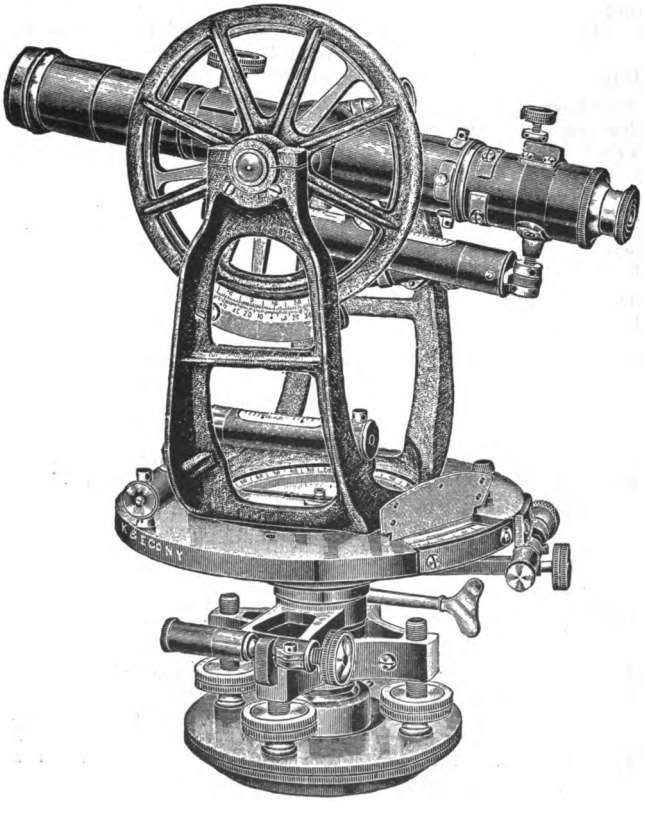
For furnishing these instruments with other graduations, see page 395.

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K & E IMPROVED

MOUNTAIN AND MINING TRANSIT

With U-shaped Standards and with Compass.



No. 5085 MC.

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K & E IMPROVED

MOUNTAIN AND MINING TRANSIT

with U-shaped Standards and with Compass.

For Synopsis of Transits see page 390.

***5082 M.C.** Improved Mountain and Mining Transit.

Telescope 8 in., achromatic terrestrial, with dust cap and sunshade. OBJECT GLASS $1\frac{1}{8}$ in. with improved rack and pinion movement. EYEPIECE with patent micrometer focusing arrangement with lock-nut. MAGNIFYING POWER 15 diameters. STADIA HAIRS fixed, ratio 1:100. Fine SPIRIT LEVEL to telescope, graduated on the glass and ground to a sensitivenness of about 30 seconds of arc per graduation. Improved CLAMP and TANGENT SCREW with counterspring.

Horizontal Limb $4\frac{3}{4}$ in. diameter, graduated on solid silver to half degrees and numbered like Fig. IV, page 326. Opposite VERNIERS, set at about 30° with telescope, reading to one minute. HINGED REFLECTORS. Two fine SPIRIT LEVELS graduated on the glass and ground to a sensitiveness of about 60 seconds of arc per graduation.

Compass. NEEDLE about $2\frac{1}{2}$ in. COMPASS RING beveled, graduated on solid silver to half-degrees. VARIATION PLATE.

Centres, anti-friction composition, extra long, and carefully fitted. **U-shaped Standards cloth finished** mounted directly on flange of inner centre (patented). FOUR LEVELING SCREWS. SHIFTING CENTRE. Improved CLAMP and TANGENT SCREW with counter-spring. Tangent and Leveling Screws of German silver.

Instrument complete with plumb bob, magnifying glass, adjusting pins, waterproof cover etc., packed in fine polished mahogany Box and with No. 5179 Split Tripod, etc. . . . . $ 200 00

Weight of instrument with Tripod about 19 lbs.

***5084 M.C.** Improved Mountain and Mining Transit as described under No. 5082 M.C. but with **vertical arc** 4 in. diameter graduated on solid silver to half degrees, VERNIER reading to one minute. Instrument complete with No. 5179 Split Tripod etc. 215 00

Weight of instrument with Tripod about 19 lbs.

5085 M.C. Improved Mountain and Mining Transit as described under No. 5082 M. C. but with **full Vertical Circle** 4 in. diameter, graduated on solid silver to half degrees, VERNIER reading to one minute. GUARD to circle. Instrument complete with No. 5179 Split Tripod, etc. 225 00

Weight of instrument with Tripod about 20 lbs.

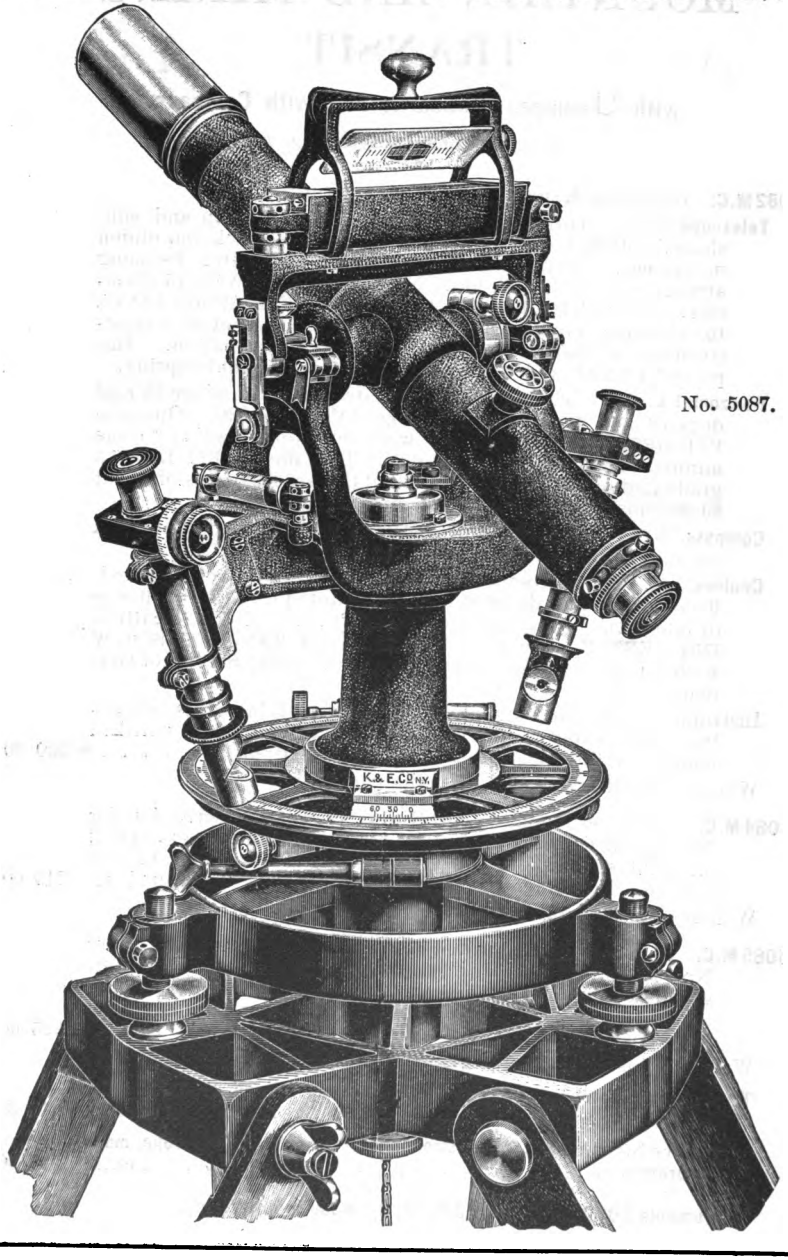
The above instruments with **three leveling screws, made to order only** . . . . . extra 15 00

The above instruments with **astronomical** (inverting) **Telescope, made to order only** . . . . . extra 10 00

***Instruments 5082 M. C. and 5084 M. C., made to order only.**

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K & E
TRIANGULATION INSTRUMENT.



No. 5087.

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K & E
TRIANGULATION INSTRUMENT

For Repeating Angles.

Three Leveling Screws.

5087. Precision Theodolite for Triangulation and Repeating Angles.

Telescope 16 in. achromatic astronomical (inverting), with dust cap and sunshade. OBJECT GLASS $1\frac{9}{16}$ in., with improved rack and pinion movement. TWO INTERCHANGEABLE EYEPIECES with spiral focusing arrangement. MAGNIFYING POWER 24 and 38 diameters. Strong telescope axis with STEEL TRUNNIONS in wide bearings with patent locking device. Fine STRIDING SPIRIT LEVEL, in glass covered trough, graduated on the glass and ground to a sensitiveness of about 10 seconds of arc per graduation. REFLECTING MIRROR for observing spirit level. Improved CLAMP and TANGENT SCREW with counterspring

Horizontal Limb 8 in., diameter, graduated on solid silver to five minutes. Opposite FILAR MICROMETER MICROSCOPES reading to five seconds, rigidly mounted and so adjusted that one full turn of the screw covers one division of the horizontal limb. INNER CIRCLE, for approximate setting, graduated to read by VERNIER to five minutes. Fine SPIRIT LEVEL graduated on the glass, and ground to a sensitiveness of about 40 seconds of arc per graduation.

Centres compound. Inner centre STEEL. Column bearing telescope is a heavy ribbed U-shaped casting. THREE LEVELING SCREWS. Improved CLAMP and TANGENT SCREW with counter spring. Clamp and Tangent Screws of German silver. Leveling Screws of steel.

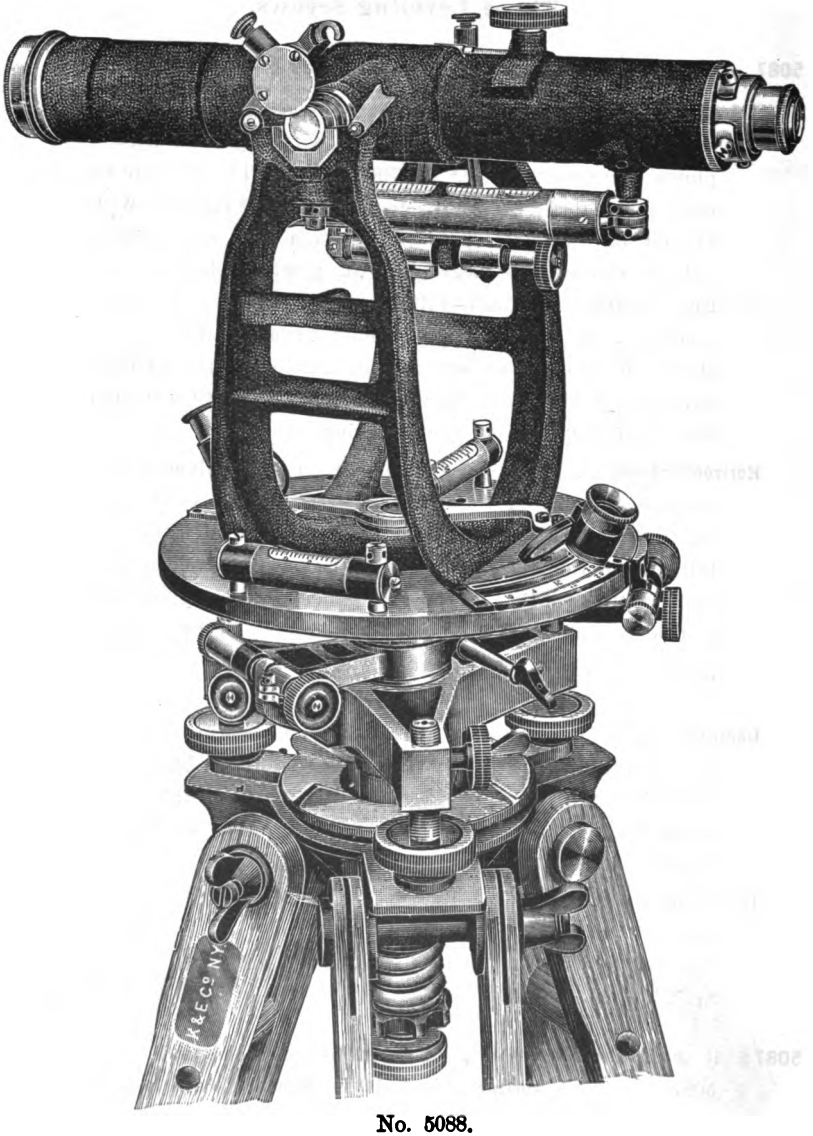
Instrument complete, with improved sunshade with reflector, plumb bob, adjusting pins, waterproof cover, etc., packed in two fine polished mahogany Boxes and with very strong Split Tripod. . . . . $ 475 00

5087 B. K & E Triangulation Instrument as described under No. 5087, but with **horizontal limb 10 in. diameter, made to order only** 550 00

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K & E

MUNICIPAL TRIANGULATION THEODOLITE.



No. 5088.

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K & E

MUNICIPAL

TRIANGULATION THEODOLITE.

Three Leveling Screws.

(For Synopsis of Transits, see page 390.)

5088. Municipal Triangulation Theodolite.

Telescope 12 in., achromatic astronomical (inverting), with dust cap and sunshade. OBJECT GLASS 1⅝ in. with improved rack and pinion movement. EYEPIECE, with spiral focusing arrangement. MAGNIFYING POWER 28 diameters. STADIA HAIRS fixed; ratio 1:100. Fine SPIRIT LEVEL to telescope graduated on the glass and ground to a sensitiveness of about 25 seconds of arc per graduation. THEODOLITE AXIS has large trunnions resting in wide bearings, held by our patent locking device. Improved CLAMP and TANGENT SCREW with counterspring.

Horizontal Limb 6½ in. diameter, graduated on solid silver to twenty minutes and numbered like Fig. IV, page 326. OPPOSITE VERNIERS, set at about 30° with telescope, reading to twenty seconds. MOUNTED MICROSCOPES with reflectors for reading verniers. Two fine SPIRIT LEVELS graduated on the glass and ground to a sensitiveness of about 60 seconds of arc per graduation.

Centres, anti-friction composition, extra long, and carefully fitted. U-shaped Standards, *cloth finished,* mounted directly on flange of inner center (patented) THREE LEVELING SCREWS. SHIFTING PLATE. Improved CLAMP and TANGENT SCREW with counterspring. Tangent and Leveling Screws of German silver.

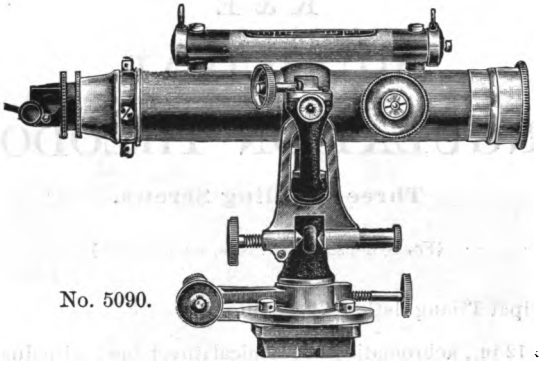
Instrument Complete, with plumb bob, waterproof cover, adjusting pins, etc., packed in fine polished mahogany Box and with very firm Split Tripod . . . . . $ 275 00

Weight of instrument with Tripod about 26 lbs.

For Engineer's City Transit see page 393.

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SOLAR ATTACHMENT.



No. 5090.

5090. Solar Attachment, Bronze and Aluminum, achromatic astronomical (inverting) telescope 5¼ in., object glass 1⅜ in., with prism and colored glass, Magnifying Power 12 diameters. Cloth-finished standard, (price includes mounting, if ordered with transit) . . . . . **$ 50 00**

Transits No. 5076, 5077 and 5165 are provided with screws for attaching No. 5090. **See also page 392.**

The astronomical meridian, the latitude and time may be obtained with this Solar Attachment with great accuracy by a simple operation explained in the following. **It serves also as vertical sighting telescope,** making a valuable addition for mine work, etc. (see page 392.)

It consists of a small telescope with prism to eyepiece, mounted in a Y-shaped standard which revolves upon a vertical axis attached on top of the telescope of the transit. This small telescope, called the solar telescope, is capable of rotation in altitude and azimuth, slow motion being imparted to it in either direction by means of tangent screws. The vertical axis, called the polar axis, can be inclined to correspond with the axis of the earth's rotation by inclining the transit telescope to which it is attached, the vertical limb giving the inclination. A spirit level which surmounts the solar telescope is provided with two pointers, so placed that when the shadow of one of them falls upon the other, the sun will be in the field of view.

DIRECTIONS FOR DETERMINING THE MERIDIAN.

1. Incline the transit telescope until the angle of declination, corrected for refraction, is indicated by the vertical circle or arc, depressing the telescope if the sun's declination is north, and elevating it if it is south. See Fig. 1.

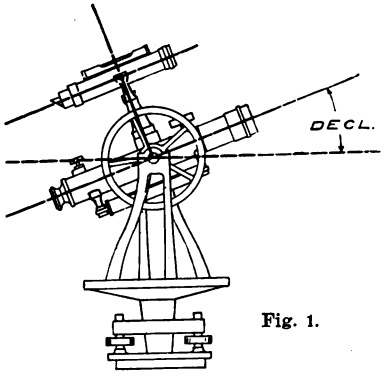


Fig. 1.

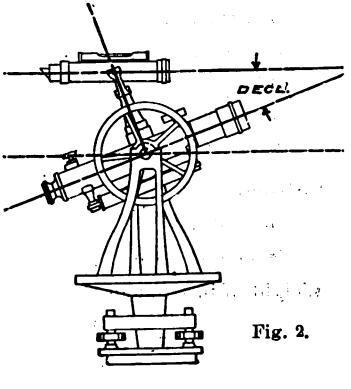


Fig. 2.

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2. Bring the solar telescope into the vertical plane of the transit telescope, (without disturbing the position of the latter) and also to a horizontal position by means of its level. The two telescopes will now enclose an angle equal to the amount of the declination. See Fig. 2.

3. Without disturbing the relative positions of the two telescopes, elevate the transit telescope (and with it the solar) until the amount of the co-latitude is indicated by the vernier of the vertical circle. See Fig. 3.

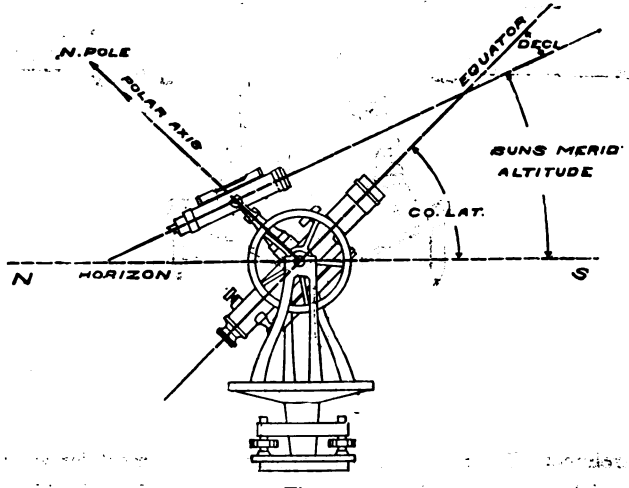


Fig. 3.

4. Revolve the transit on its vertical axis, and the solar apparatus about its polar axis (taking care not to revolve either telescope on its horizontal axis) until the image of the sun is brought into the field of the solar telescope; when the sun is accurately bisected the transit telescope will be in the meridian and the compass needle will indicate the amount of its declination at the place of observation. It will of course considerably facilitate this last operation if, before commencing to revolve the two telescopes, the transit one is approximately pointed toward the south by means of the transit compass needle.

DIRECTIONS FOR ASCERTAINING THE LATITUDE.

Direct the transit telescope towards the south, incline it to an amount equal to the sun's meridian declination uncorrected for refraction, depressing the telescope if the declination is north and elevating it if it is south. Now bring the solar telescope into the vertical plane of the transit telescope and to a perfectly horizontal position by means of its level, then clamp it. A few minutes before apparent noon (the moment of the sun's culmination) bring the sun's image between the two horizontal wires of the solar telescope by moving *only* the *transit telescope* in altitude and azimuth. By means of the tangent screws of the transit, keep the sun, as it continues to rise and travel southwards, in this position relative to the cross hairs of the solar telescope. When it has ceased to rise, take the reading of the vertical arc of the transit, deduct from it the refraction due to this altitude, and the remainder is the co-latitude, which deducted from 90° gives the latitude. The position of the two telescopes is identical with that shown in Fig. 3

OBSERVATION FOR TIME.

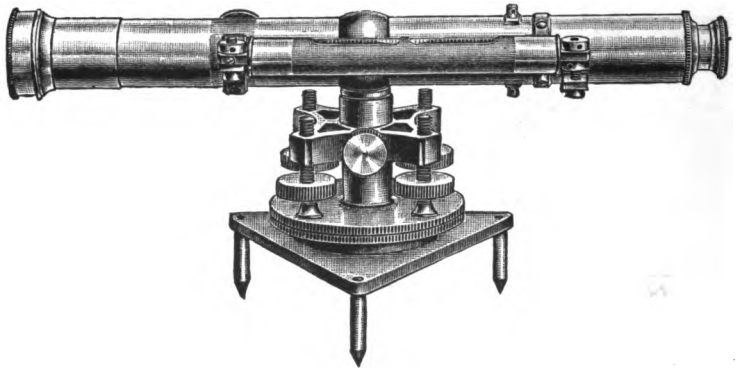
Having brought the two telescopes into their final positions for determining the meridian, that is the transit one in the meridian and the solar telescope bisecting the sun, revolve each one upon its *horizontal* axis, without disturbing the vertical axis, until they are both perfectly level. The angle formed by their respective lines of sight, which can be determined by sighting with the two telescopes upon any clearly defined distant object, and taking the difference of the respective readings of the transit horizontal limb, is the hour angle. This is then reduced to time before or after apparent noon: 1 degree of arc = 4 minutes of time and 1 minute of arc = 4 seconds of time. The time obtained by such an observation is reliable to a few seconds.

SOLAR EPHEMERIS.

We publish annually a Solar Ephemeris, vest pocket size, containing those data from the Nautical Almanac which are used in solar observations. This book we furnish free of charge to users of our instruments.

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ARCHITECT'S DUMPY LEVEL.



No. 5107.

5107. **Architect's Dumpy Level.** An excellent instrument for work which does not require very great accuracy, such as ditching, draining, road-leveling, etc.

Telescope 11 in., achromatic terrestrial. OBJECT GLASS 1⅛ in., with improved rack and pinion movement. EYEPIECE with sliding adjustment for focusing cross hairs. MAGNIFYING POWER 18 diameters. SPIRIT LEVEL to telescope graduated on the glass and ground to a sensitiveness of about 75 seconds of arc per graduation. CLAMP SCREW. FOUR LEVELING SCREWS.

Instrument complete, with metal trivet, plumb bob, etc., in strong Box and with No. 5176 hardwood Tripod . . . . . $ 35 00

Weight of Instrument with Tripod, about 9½ lbs.

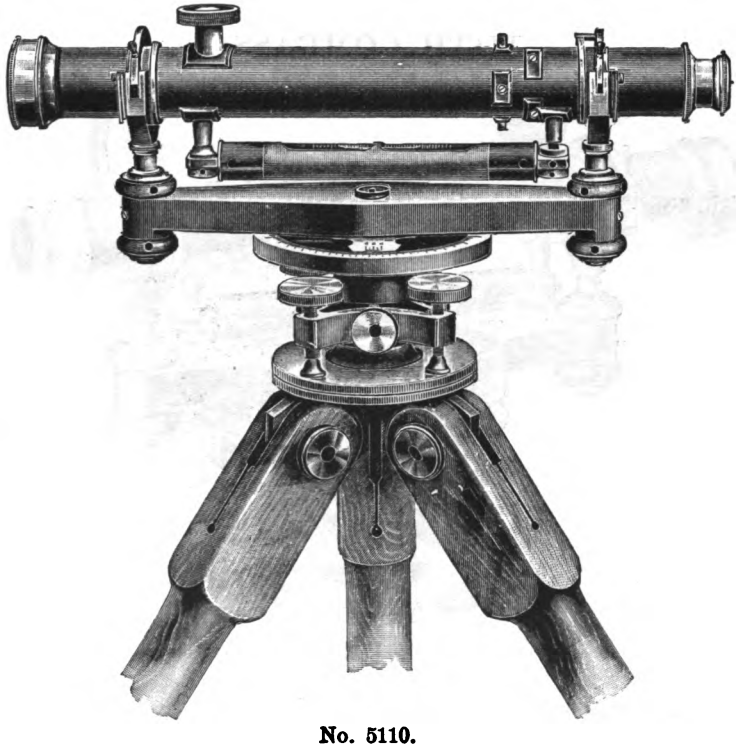
For Extra-fine Engineer's Dumpy Levels see page 335.

For Railroad Dumpy Level see page 379.

We have the best facilities for repairing Surveying Instruments of any make promptly and satisfactorily.

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ARCHITECT'S Y LEVEL.



No. 5110.

5110. Architect's or Builder's Y Level A most serviceable and compact instrument.

Telescope 11 in., achromatic terrestrial with dust cap. OBJECT GLASS 1⅛ in. with improved rack and pinion movement. EYEPIECE with sliding adjustment for focusing cross hairs. MAGNIFYING POWER 18 diameters. SPIRIT LEVEL to telescope, graduated on the glass and ground to a sensitiveness of about 60 seconds of arc per graduation.

Level Bar of gun-metal. Y's fitted with patent locking arrangement dispensing with pin bolts.

Horizontal Limb 3 in. diameter, graduated to degrees with VERNIER reading to 5 minutes. CLAMP SCREW. FOUR LEVELING SCREWS.

Instrument complete, with metal trivet, plumb bob and adjusting pins, in polished mahogany Box and with No. 5176 hardwood Tripod . . . . . $ 45 00

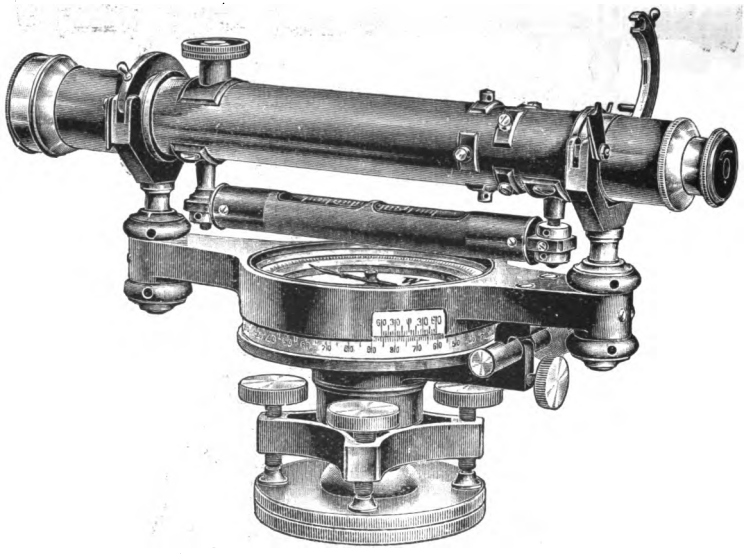
Weight of Instrument with Tripod about 12½ lbs.

5111. Architect's or Builder's Y Level, like No. 5110, but with improved **Clamp** and **Tangent Screw** with counter-spring . . . 50 00

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ARCHITECT'S Y LEVEL

WITH COMPASS.



No. 5113.

5113. Architect's or Builder's Y Level with Compass.

Telescope 11 in., achromatic terrestrial, with dust cap. OBJECT GLASS 1⅛ in., with improved rack and pinion movement. EYEPIECE with sliding adjustment for focusing cross hairs. MAGNIFYING POWER 18 diameters. SPIRIT LEVEL to telescope graduated on the glass and ground to a sensitiveness of about 60 seconds of arc per graduation.

Level Bar of gun-metal. Y's fitted with patent locking arrangement dispensing with pin bolts.

Compass Needle about 3 in. long. Circle divided on raised ring to degrees.

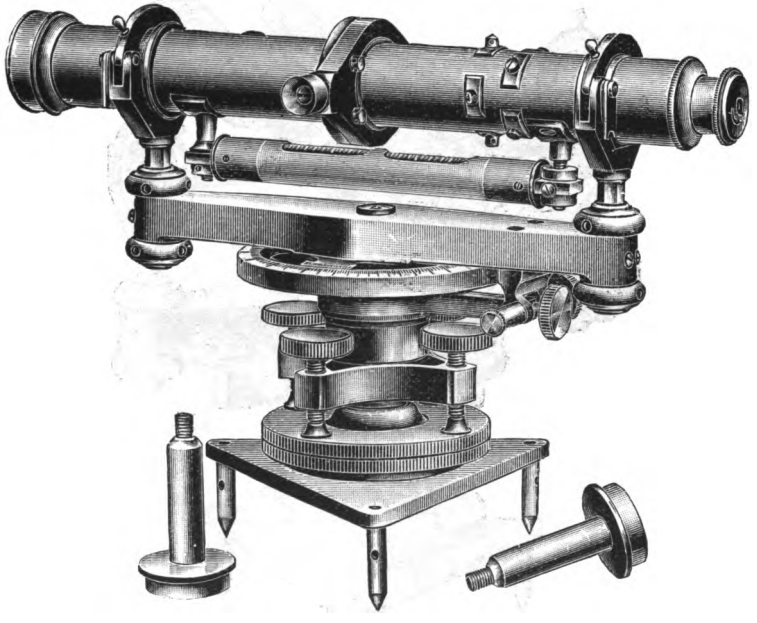
Horizontal Limb 3¾ in. diameter, graduated to degrees with VERNIER reading to 5 minutes. Improved CLAMP and TANGENT SCREW with Counterspring. FOUR LEVELING SCREWS.

Instrument complete, with metal trivet, plumb bob and adjusting pins, in polished mahogany Box and with No. 5176 hardwood Tripod . . . . . $ 62 50

Weight of Instrument with Tripod about 12½ lbs.

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ARCHITECT'S CONVERTIBLE Y LEVEL.



No. 5115. (Sighting a Horizontal Line; telescope in Y's, trunnions detached.)

(See also description on page 332.)

5115. Architect's Convertible Y Level.

Telescope 11 in., achromatic terrestrial with dust cap. OBJECT GLASS 1⅛ in., with improved rack and pinion movement. EYEPIECE with sliding adjustment for focusing cross hairs, MAGNIFYING POWER 18 diameters. SPIRIT LEVEL to telescope graduated on the glass, and ground to a sensitiveness of about 60 seconds of arc per graduation.

Level Bar of gun-metal. Y's fitted with patent locking arrangement dispensing with pin bolts.

Horizontal Limb 3 in. diameter, graduated to degrees with VERNIER reading to 5 minutes. Improved CLAMP and TANGENT SCREW with counterspring. FOUR LEVELING SCREWS.

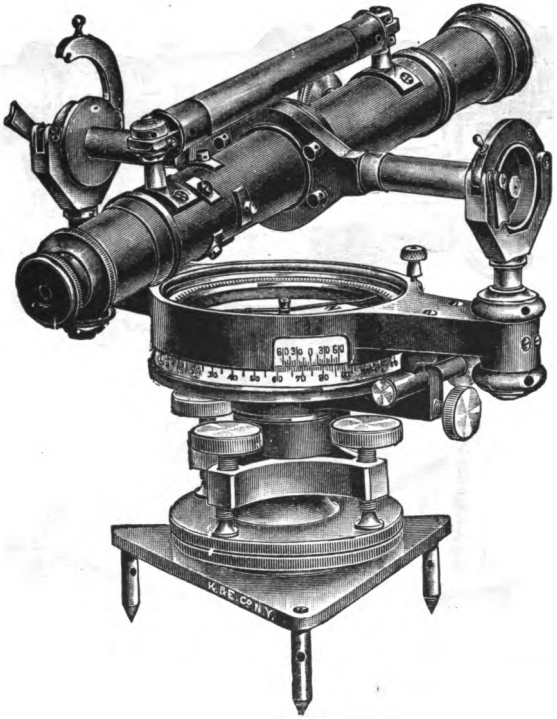
Extra Removable Axis to adapt telescope to sighting vertical lines, as described on page 332.

Instrument complete, with metal trivet, plumb bob, etc., in polished mahogany Box, and with No. 5176 hardwood Tripod $ 57 50

Weight of Instrument with Tripod about 12½ lbs.

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ARCHITECT'S CONVERTIBLE Y LEVEL WITH COMPASS.



No. 5117. (Sighting a Vertical Line; trunnions in Y's.)
(See also description on page 332.)

5117. Architect's Convertible Y Level with Compass.

Telescope 11 in., achromatic terrestrial, with dust cap. OBJECT GLASS 1⅛ in., with improved rack and pinion movement. EYEPIECE with sliding adjustment for focusing cross hairs. MAGNIFYING POWER 18 diameters. SPIRIT LEVEL to telescope graduated on the glass and ground to a sensitiveness of about 60 seconds of arc per graduation.

Level Bar of gun metal. Y's fitted with patent locking arrangement dispensing with pin bolts.

Compass Needle about 8 in. long. Circle divided on raised ring to degrees.

Horizontal Limb 3¾ in. diam., divided to degrees with VERNIER reading to 5 minutes. Improved CLAMP and TANGENT SCREW with counterspring.

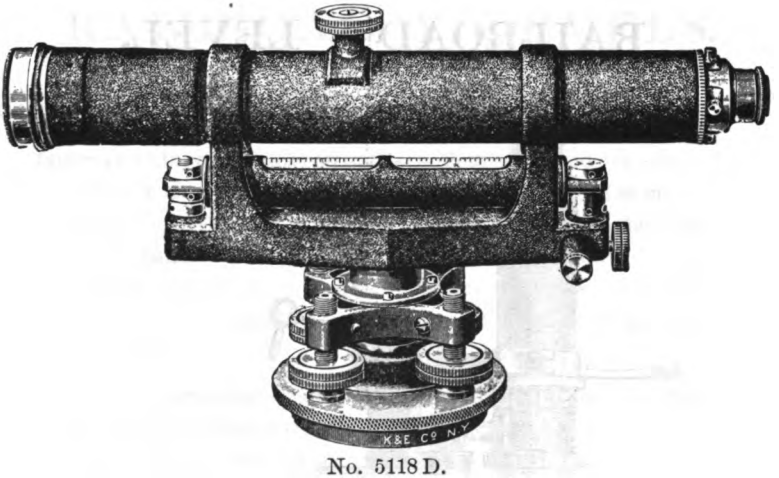
Extra Removable Axis to adapt telescope to sighting vertical lines as described on page 332.

Instrument complete, with metal trivet, plumb bob, etc., in polished mahogany Box and with No. 5176 hardwood Tripod. . . . . $ 72 50

Weight of instrument with Tripod about 12½ lbs.

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RAILROAD DUMPY LEVEL.



No. 5118 D.

5118 D. Railroad Dumpy Level.

Telescope 12 in., achromatic astronomical (inverting), with dust cap and sunshade. OBJECT GLASS 1⅜ in., with improved rack and pinion movement. EYEPIECE, with spiral adjustment for focusing cross hairs. MAGNIFYING POWER 24 diameters. SPIRIT LEVEL extra long, graduated on the glass and ground to a sensitiveness of about 30 seconds of arc per graduation.

Level Bar; unique design, allowing use of spirit level of unusual length, and combining great strength and stability. Improved CLAMP and TANGENT SCREW with counterspring. Telescope, tube of spirit level and level bar are *cloth-finished.* FOUR LEVELING SCREWS.

Centre of hard bell-metal, carefully fitted. Level bar and centre are cast in one piece.

Instrument complete, with adjusting pins, waterproof cover etc., in fine polished mahogany Box and with No. 5175-1 Tripod . . $ 70 00

Weight of instrument with Tripod about 14 lbs.

5119 D. Railroad Dumpy Level as described under 5118 D, but **Telescope 15 in.**, achromatic terrestrial (erecting), with dust cap and sunshade. OBJECT GLASS 1⅝ in. EYEPIECE with sliding adjustment for focusing cross hairs. MAGNIFYING POWER 23 diameters.

Instrument complete, with adjusting pins, waterproof cover etc., in fine polished mahogany Box and with No. 5175-1 Tripod . . 75 00

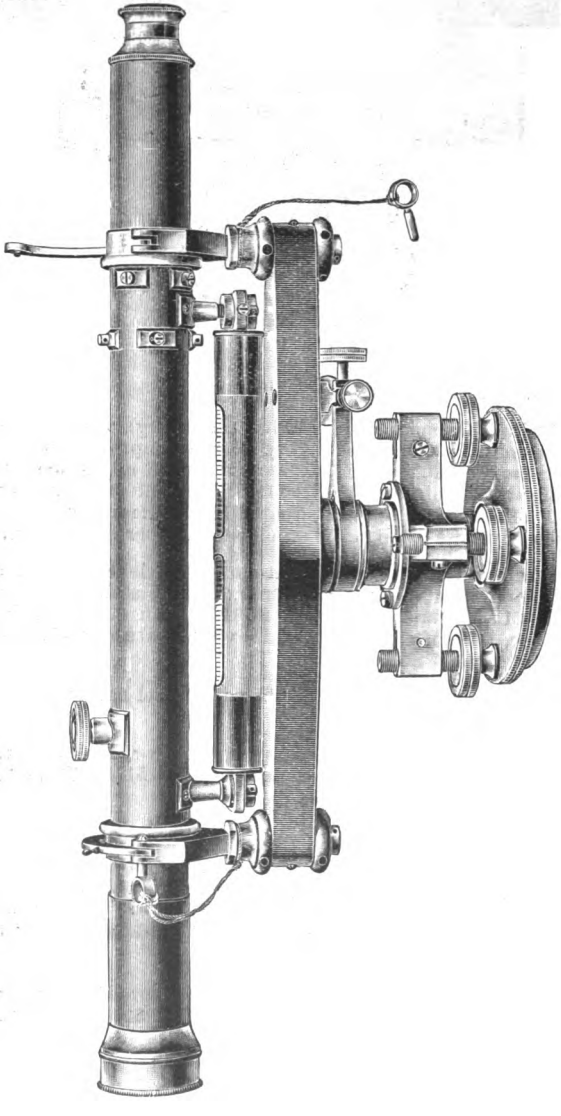
Weight of instrument with Tripod about 15 lbs.

For other Dumpy Levels see pages 335, 374.

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ENGINEER'S

RAILROAD Y LEVEL.



No. 5120.

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ENGINEER'S

RAILROAD Y LEVELS.

5118. Engineer's Railroad Y Level.

Telescope 15 in. achromatic terrestrial with dust cap and sun shade. OBJECT GLASS $1\frac{5}{16}$ in., with improved rack and pinion movement. EYEPIECE with sliding adjustment for focusing cross hairs. MAGNIFYING POWER 24 diameters. Fine SPIRIT LEVEL to telescope, graduated on the glass and ground to a sensitiveness of about 25 seconds of arc per graduation.

Level Bar of gun-metal, shaped to combine lightness and strength. Strong Y's fitted with pin bolts, with stop to insure true horizontal and vertical position of cross hairs.

Centre, anti-friction composition, carefully fitted. Improved CLAMP and TANGENT SCREW with counterspring. FOUR LEVELING SCREWS.

Instrument complete, with adjusting pins, waterproof cover, etc., packed in polished mahogany Box and with No. 5177 Split Tripod . . . . . $ 95 00

Weight of instrument with Tripod about 20 lbs.

5120. Engineer's Railroad Y Level, as described under No. 5118, but **Telescope 18 in., Object Glass $1\frac{3}{8}$ in.** MAGNIFYING POWER 28 diameters. Complete, with No. 5178 Split Tripod, etc. . . 105 00

Weight of instrument with Tripod about 23 lbs.

5122. Engineer's Railroad Y Level, as described under No. 5118, but **Telescope 20 in , Object Glass $1\frac{3}{8}$ in.** MAGNIFYING POWER 32 diameters. Complete, with No. 5178 Split Tripod, etc. . . . 110 00

Weight of instrument with Tripod about $23\frac{1}{2}$ lbs.

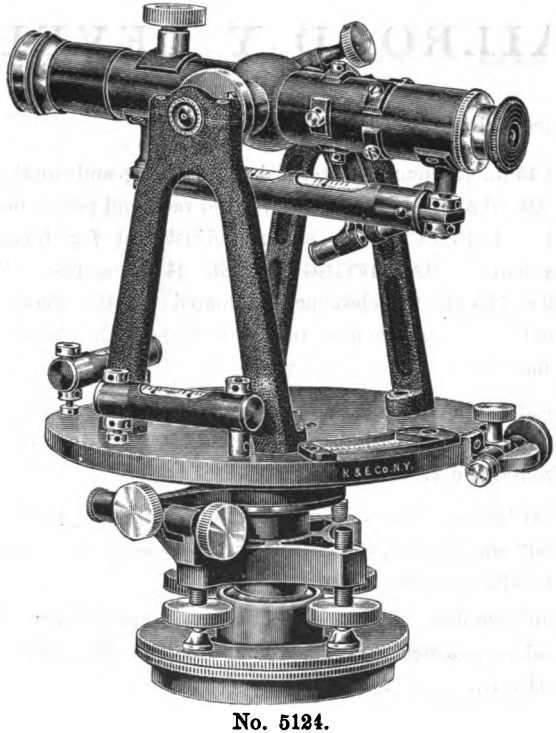
5123. Engineer's Railroad Y Level, as described under No. 5118, but **Telescope 22 in., Object Glass $1\frac{1}{2}$ in.,** MAGNIFYING POWER 37 diameters. Complete, with No. 5178 Split Tripod, etc. . . . 115 00

Weight of instrument with Tripod about 24 lbs.

For Engineers Extra Fine Y Levels, see page 337 etc.

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BUILDER'S TRANSITS.



No. 5124.

5124. Builder's Transit.

Telescope 8 in., achromatic terrestrial, with dust cap and sun-shade. OBJECT GLASS 1 in, with improved rack and pinion movement. EYEPIECE with sliding adjustment, for focusing cross hairs. MAGNIFYING POWER 15 diameters. Fine SPIRIT LEVEL graduated on the glass and ground to a sensitiveness of about 60 seconds of arc per graduation. CLAMP and TANGENT SCREW with counter-spring.

Horizontal Limb 5 in., graduated to half degrees, with vernier reading to single minutes. CLAMP and TANGENT SCREW. Two fine SPIRIT LEVELS graduated on the glass, and ground to a sensitiveness of about 100 seconds of arc per graduation.

Centres, anti-friction, carefully fitted. FOUR LEVELING SCREWS. CLAMP and TANGENT SCREW with counterspring.

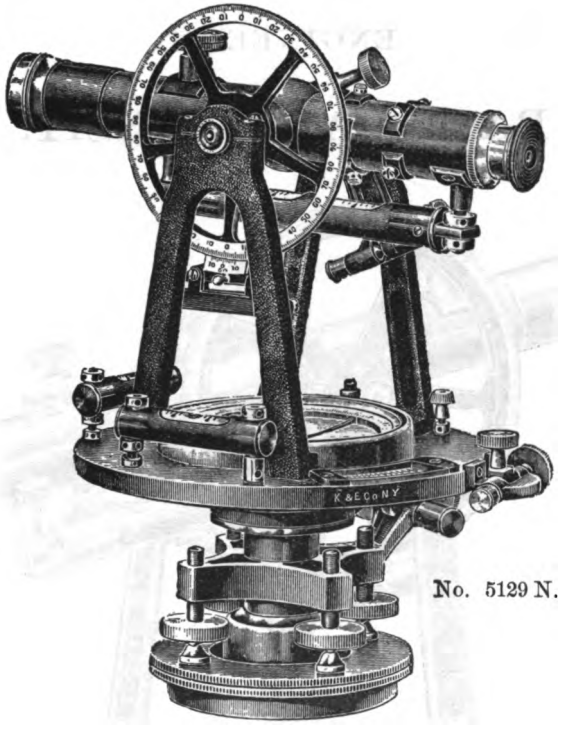
Instrument complete, with plumb bob, reading glass, adjusting pins, waterproof cover, etc., in polished mahogany Box and with No. 5175-1 Tripod . . . . . $ 85 00

5126. Builder's Transit as described under No. 5124, but with **full Vertical Circle 3½ in. diameter,** graduated to degrees reading by VERNIER to five minutes. Instrument complete, with No. 5175-1 Tripod, etc. 95 00

Vertical circle reading to one minute . . . . . **extra** 5 00

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PRELIMINARY SURVEY TRANSITS.



No. 5129 N.

5127 N. Preliminary Survey Transit.

Telescope 8 in., achromatic terrestrial, with dust cap and sunshade. OBJECT GLASS 1 in. with improved rack and pinion movement. EYEPIECE with sliding adjustment for focusing cross hairs. MAGNIFYING POWER 15 diameters. STADIA HAIRS fixed, ratio 1:100. Fine SPIRIT LEVEL graduated on the glass and ground to a sensitiveness of about 60 seconds of arc per graduation. CLAMP and TANGENT SCREW with counterspring.

Horizontal Limb 5 in., graduated on solid silver to half-degrees, with VERNIER reading to single minutes. CLAMP and TANGENT SCREW. Two fine SPIRIT LEVELS graduated on the glass and ground to a sensitiveness of about 100 seconds of arc per graduation.

Compass. NEEDLE about 3½ in. Compass graduated on silvered ring to one degree. VARIATION PLATE.

Centres, anti-friction, carefully fitted. FOUR LEVELING SCREWS. CLAMP and TANGENT SCREW with counterspring.

Instrument complete, with accessories and Tripod No. 5175-1 . . $ 100 00

5129 N. Preliminary Survey Transit as described under No. 5127 N, but with **Compass** and **full Vertical Circle 3½ in. diameter,** graduated to degrees, reading by VERNIER to 5 minutes. 110 00

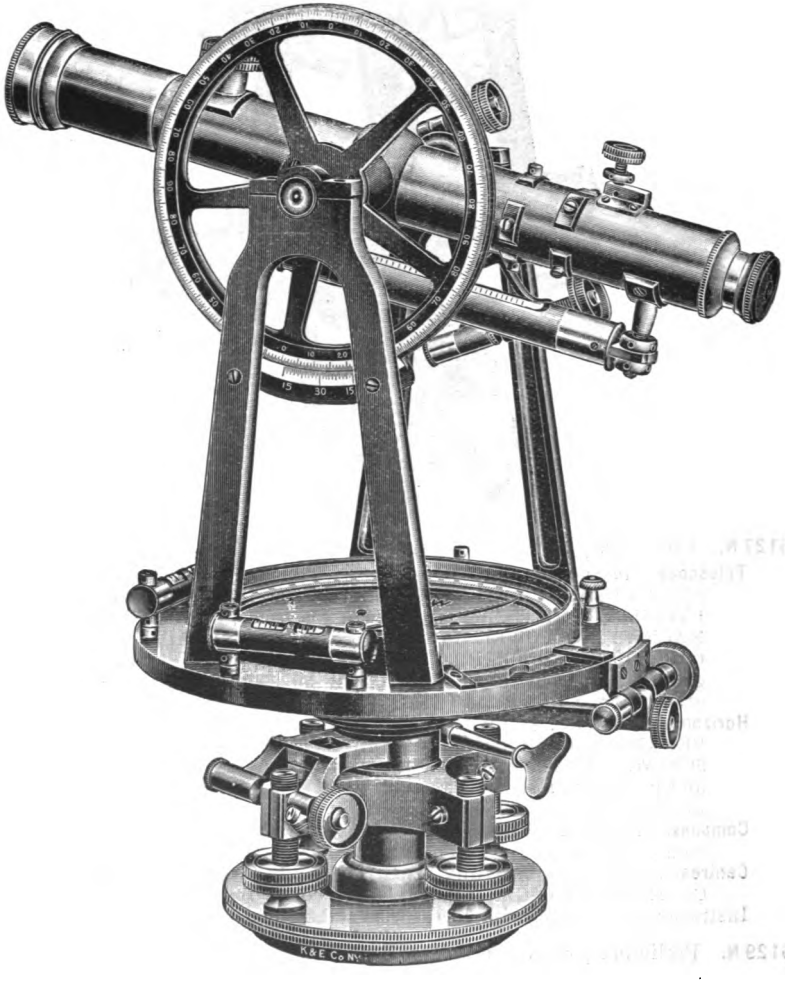
Vertical circle reading to one minute . . . . . extra 5 00

Patent Extension Tripod No. 5181 in place of regular Tripod, " 5 00

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ENGINEER'S

RAILROAD TRANSIT.



No. 5160.

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ENGINEER'S
RAILROAD TRANSITS.

(For Synopsis of Transits see page 390.)

5130. Engineer's Railroad Transit.

Telescope 11¼ in. achromatic terrestrial, with dust cap and sun-shade. OBJECT GLASS 1¼ in. with improved rack and pinion movement. EYEPIECE with patent micrometer focusing arrangement. MAGNIFYING POWER 24 diameters. STADIA HAIRS fixed, ratio 1:100. Improved CLAMP and TANGENT SCREW with counterspring.

Horizontal Limb 6½ in. diameter. Graduated on solid silver to half degrees and numbered like Fig. IV, page 326. Opposite VERNIERS placed at about 30 degrees with telescope, reading to one minute. Two fine SPIRIT LEVELS graduated on the glass and ground to a sensitiveness of about 80 seconds of arc per graduation.

Compass. NEEDLE about 5 in. COMPASS graduated on silvered ring to half degrees VARIATION PLATE.

Centres, anti-friction composition, carefully fitted. FOUR LEVELING SCREWS. SHIFTING CENTRE. Improved CLAMP and TANGENT SCREW with counterspring.

Instrument complete, with plumb bob, reading glass, adjusting pins, water-proof cover, etc., packed in polished mahogany Box and with No. 5178 Split Tripod. . . . . $ 155 00

Weight of Instrument with Tripod about 23 lbs.

5140. Engineer's Railroad Transit, as described under No. 5130, but with **Spirit Level** to telescope, graduated on the glass and ground to a sensitiveness of about 40 seconds of arc per graduation.

Instrument complete, with No. 5178 Split Tripod, etc. 165 00

Weight of Instrument with Tripod about 23½ lbs.

5150. Engineer's Railroad Transit, as described under No. 5140, but with **Vertical Arc 5 in.** diameter graduated on solid silver to half degrees, VERNIER reading to one minute.

Instrument complete, with No. 5178 Split Tripod, etc. 175 00

Weight of Instrument with Tripod about 24 lbs.

5160. Engineer's Railroad Transit, as described under No. 5140, but **full Vertical Circle 5 in.** diameter, graduated on solid silver to half-degrees with VERNIER reading to one minute.

Instrument complete, with No. 5178 Split Tripod, etc. 180 00

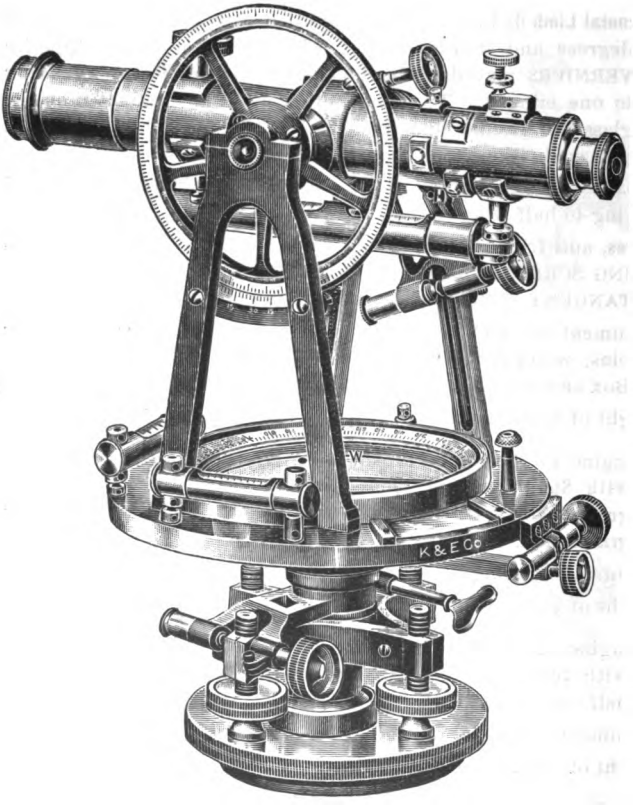
Weight of Instrument with Tripod 24 lbs.

For furnishing these instruments with other graduations see page 395.

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ENGINEER'S

LOCATING TRANSIT.



No. 5165.

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ENGINEER'S

LOCATING TRANSIT.

(For Synopsis of Transits see page 390.)

5165. Engineer's Locating or Mountain and Mining Transit.

Telescope 9 in., achromatic terrestrial, with dust cap and sun-shade. OBJECT GLASS $1\frac{1}{8}$ in. diameter with improved rack and pinion movement. EYEPIECE with patent micrometer focusing arrangement. MAGNIFYING POWER 17 diameters. STADIA HAIRS fixed, ratio 1:100. Fine SPIRIT LEVEL to telescope graduated on the glass and ground to a sensitiveness of about 40 seconds of arc per graduation. Improved CLAMP and TANGENT SCREW with counterspring.

Horizontal Limb $5\frac{1}{2}$ in. diameter, graduated on solid silver to half degrees and numbered like Fig. IV., page 326. Opposite VERNIERS set at about 30 degrees with telescope, reading to one minute. Two fine SPIRIT LEVELS graduated on the glass and ground to a sensitiveness of about 80 seconds of arc per graduation.

Compass. Needle about $3\frac{3}{4}$ in. COMPASS graduated on silvered ring to half degrees. VARIATION PLATE.

Vertical Circle 4 in. diameter. Graduated on solid silver to half degrees. VERNIER reading to one minute.

Centres, anti-friction composition, carefully fitted. FOUR LEVELING SCREWS, SHIFTING CENTRE. Improved CLAMP and TANGENT SCREW with counterspring.

Instrument complete, with plumb bob, reading glass, adjusting pins, waterproof cover, etc., packed in polished mahogany Box, and with No. 5177 Split Tripod . . . . . $ 175 00

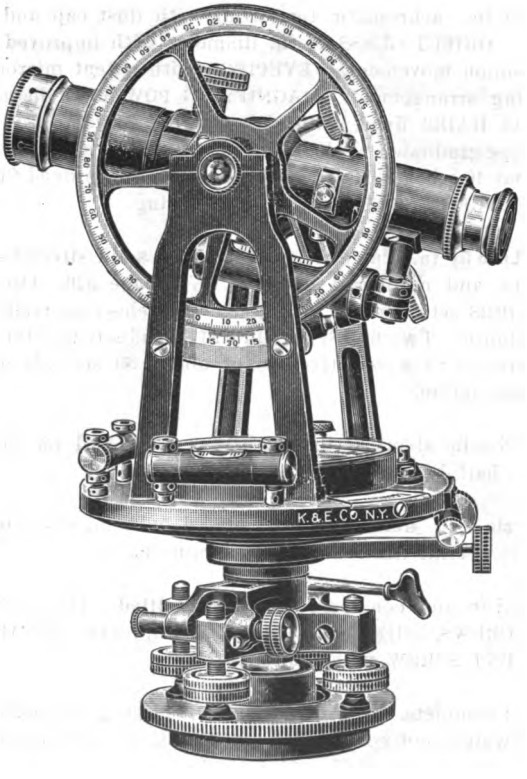
Weight of Instrument with Tripod about 19 lbs.

For furnishing this instrument with other graduations see page 395.

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ENGINEER'S

EXTRA LIGHT LOCATING TRANSIT.



No. 5165½.

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ENGINEER'S
EXTRA LIGHT LOCATING TRANSIT.

5165½. Engineer's Extra Light Locating Transit.

Telescope 6½ in., achromatic terrestrial, with dust cap and sun-shade. OBJECT GLASS ⅞ in. with improved rack and pinion movement. EYEPIECE with sliding adjustment for focusing cross hairs. MAGNIFYING POWER 18 diameters. STADIA HAIRS fixed, ratio 1:100. Fine SPIRIT LEVEL to telescope, graduated on the glass and ground to a sensitiveness of about 40 seconds of arc per graduation. Improved CLAMP and TANGENT SCREW with counterspring.

Horizontal Limb 4 in. diameter graduated on solid silver to half degrees and numbered like Fig. IV, page 326. Opposite VERNIERS set at about 30° with telescope, reading to one minute. Two fine SPIRIT LEVELS graduated on the glass and ground to a sensitiveness of about 100 seconds of arc per graduation.

Compass. NEEDLE about 2¾ in. COMPASS graduated on silvered ring to half degrees. VARIATION PLATE.

Vertical Circle 4 in. diameter, graduated on solid silver to half degrees. VERNIER reading to one minute.

Centres, anti-friction composition, carefully fitted. FOUR LEVELING SCREWS. SHIFTING CENTRE. Improved CLAMP and TANGENT SCREW with counterspring.

Instrument complete with plumb bob, magnifying glass, waterproof cover, adjusting pins, packed in fine **leather covered** mahogany Box with shoulder carrying strap and with Extension Tripod . . . . . $ 165 00

Weight of instrument with Tripod about 14 lbs.

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SYNOPSIS OF TRANSITS.

All the transits have spirit level to telescope, except Nos. 5030 and 5130, and all have 4 leveling screws, except Nos. 5069, 5081, 5088, which have 3.

The Triangulation Theodolites Nos. **5087** and **5087B** are omitted in this Synopsis.

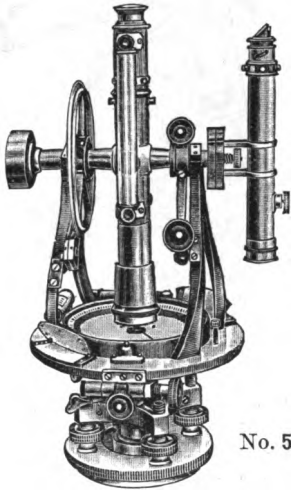
Page	No.	Telescope, inch.	Object glass, inch.	Eyepiece.	Comp. needle, inch.	Horiz. Limb		Vert. arc, inch.	Vert. circle, inch.	Weight about, pounds
						Inch	Reads to			
345	**5030**	11⅛	1 5/16	erect'g	4½	6¼	1 min.	. .	. .	13
345	**5040**	11½	1 6/16	"	4½	6¼	1 "	. .	. .	13½
346	**5050**	11½	1 5/16	"	4½	6¼	1 "	5	. .	13½
347	**5060**	11½	1 5/16	"	4½	6¼	1 "	. .	5	13½
351	**5069**	11	1⅜	invert'g	3½	5	1 "	. .	5	13¼
353	***5072**	9	1⅛	erect'g	4	5½	1 "	. .	. .	10
353	***5074**	9	1⅛	"	4	5½	1 "	4½	. .	10½
353	**5076**	9	1⅛	"	4	5½	1 "	. .	4½	11
355	**5077**	8	1⅛	"	3¼	4¾	1 "	. .	4	9
357	**5078**	9	1⅛	"	3¾	5½	1 "	special	. .	13½
359	**5079**	6½	⅞	invert'g	2¾	4	1 "	. .	3½	4½
361	**5081**	14	1½	"	. .	8	10 sec.	. .	5½	21½
363	**5082**	11½	1 5/16	erect'g	. .	6¼	1 min.	. .	. .	15
363	**5084**	11½	1 5/16	"	. .	6¼	1 "	5	. .	15½
363	**5085**	11½	1 5/16	"	. .	6¼	1 "	. .	5	15½
365	**5082C**	11½	1 5/16	"	3	6¼	1 "	. .	. .	15
365	**5084C**	11½	1 5/16	"	3	6¼	1 "	5	. .	15½
365	**5085C**	11½	1 5/16	"	3	6¼	1 "	. .	5	15½
367	***5082MC**	8	1⅛	"	2½	4¾	1 "	. .	. .	9½
367	***5084MC**	8	1⅛	"	2½	4¾	1 "	4	. .	9½
367	**5085MC**	8	1⅛	"	2½	4¾	1 "	. .	4	10
371	**5088**	12	1⅜	invert'g	. .	6⅓	20 sec.	. .	. .	16
382	**5124**	8	1	erect'g	. .	5	1 min	. .	. .	7½
382	**5126**	8	1	"	. .	5	1 "	. .	3½	7½
383	**5127N**	8	1	"	3½	5	1 "	. .	. .	7½
383	**5129N**	8	1	"	3½	5	1 "	. .	3⅓	8
385	**5130**	11½	1¼	"	5	6½	1 "	. .	. .	14
385	**5140**	11½	1¼	"	5	6½	1 "	. .	. .	14½
385	**5150**	11½	1¼	"	5	6½	1 "	5	. .	14½
385	**5160**	11½	1¼	"	5	6½	1 "	. .	5	14½
387	**5165**	9	1⅛	"	3¾	5⅓	1 "	. .	4	11
389	**5165½**	6½	⅞	"	2¾	4	1 "	. .	4	7

***Made to order only.**

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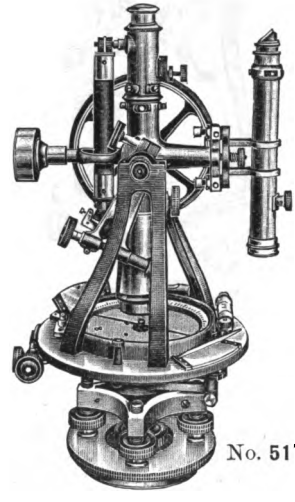
ATTACHMENTS AND SPECIAL INSTRUMENTS

FURNISHED TO ORDER.



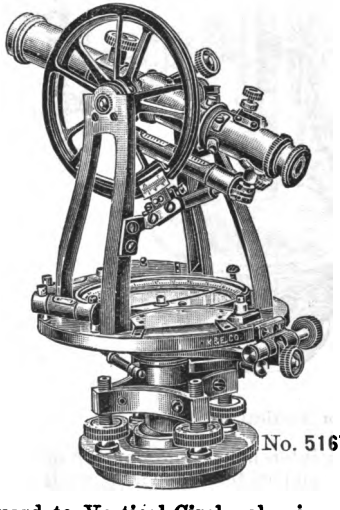
No. 5170-11

Auxiliary Telescope for Vertical Sighting, attachable on end of axis of main telescope. Detachable counter-weight . . extra $ 40 00



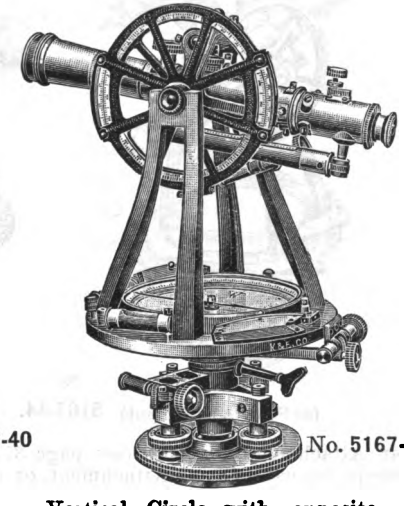
No. 5170-13

Auxiliary Telescope for Vertical Sighting, attachable on top of main telescope. Detachable counterweight. . . . . extra $ 40 00



No. 5167-40

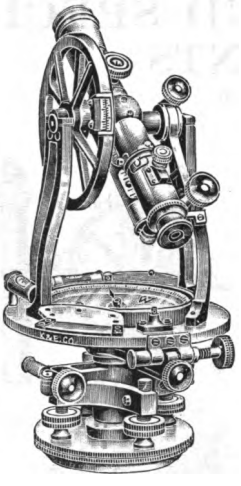
Guard to Vertical Circle, aluminum, cloth finished . . . extra $ 5 00



No. 5167-41

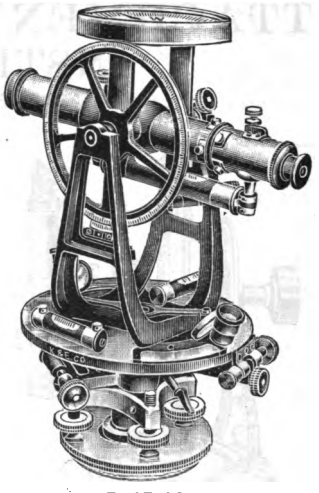
Vertical Circle with opposite Verniers and Guard, in place of regular vertical circle, . extra $ 20 00

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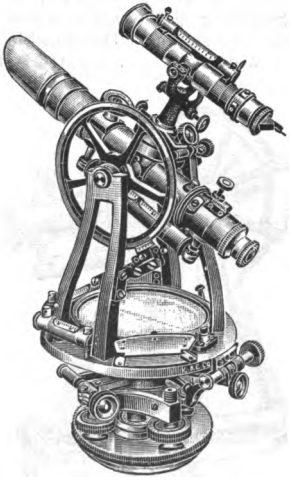
No. **5167-42**

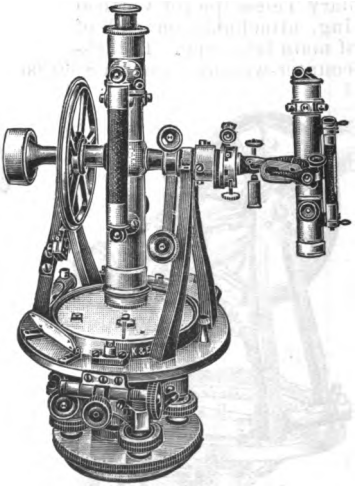
Vertical Circle and Vernier graduated on the periphery, with Guard, in place of regular vertical circle . . . . . extra $ 15 00



5167-63

Striding Compass, 4 in. needle, graduated to half-degrees, for transits with U-shaped standards . . . . . each $ 15 00





No.

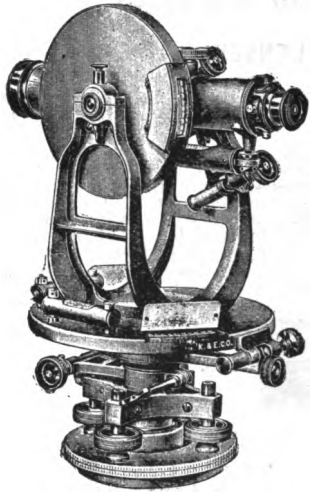
(as Solar Attachment) **5167-44.** (for Vertical Sighting.)

Solar Attachment No. 5090 (see page 372), interchangeable: on top of telescope for use as Solar Attachment, or on end of telescope axis, with detachable counter-weight for vertical sighting. . . . . extra $ 70 00

This attachment admits of quick changing of the Solar from one position to the other and has the advantage over other devices that it affords at the same time an excellent Solar and a side telescope for vertical sighting

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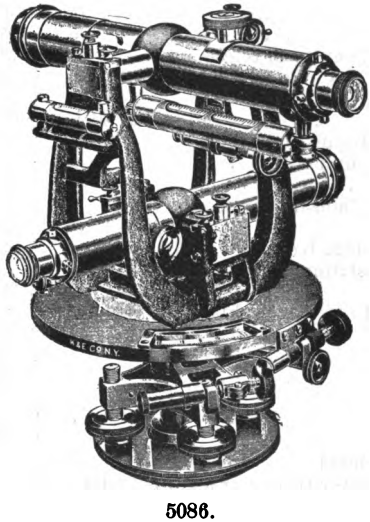
ENGINEER'S WET MINE TRANSIT.



5085 W. M.

5085 W. M. Engineer's Wet Mine Transit. **Telescope** 9 in., achromatic astronomical (inverting). **Object Glass** 1¼ in. **Eyepiece** with spiral focusing arrangement. **Stadia Hairs** fixed, ratio 1:100. **Horizontal Limb** 5½ in., graduated to half-degrees. Opposite verniers reading to one minute. **Vertical Circle** fully encased, graduated on periphery to half-degrees with vernier reading to one minute. Entire instrument finished in **hard smooth enamel.** Instrument complete with Tripod, etc. $ 275 00

ENGINEER'S CITY TRANSIT.



5086.

5086. Engineer's City Transit. **Upper Telescope** 11¼ in., achromatic astronomical (inverting). **Object Glass** 1 5/16 in. **Stadia Hairs** fixed, ratio 1:100. **Lower telescope** 9 in., achromatic astronomical (inverting), reversible on axis. **Object Glass** 1¼ in. **Stadia Hairs** fixed, ratio 1:100. **Horizontal Limb** 6½ in. graduated to twenty minutes, opposite verniers reading to thirty seconds. Standards cloth finished. Instrument adapted for City Surveys requiring a high degree of accuracy. Instrument complete with Tripod, etc. . . . . $ 325 00

For Holden's Line Clinometer (and Tape Stretcher), see page 514.

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ATTACHMENTS AND PARTS

FOR TRANSITS, LEVELS AND COMPASSES.

FOCUS REDUCING LENSES.

5166-1. Focus Reducing Lens for sighting near objects . . . . each $ 7 50
5166-2. do. do. do. do. set of two lenses . . . set 15 00

The range of adjustment for focus of the telescopes of our transits and levels permits sighting objects as near as 8 to 10 times the focal length of the object glass. To sight nearer objects we furnish focus reducing lenses which are slipped over the object glass like a cap. Lens No. 5166-1 shortens the range to about 6 to 7 times the focal length of the objective and when used with the additional lens (the combination constituting No. 5166-2) the range is shortened to about 4 to 5 times the focal length of the objective.

In ordering these lenses, give exact size of mount of object glass of telescope, or send cap or shade, state whether the telescope, is erecting or inverting and focal length of objective. If possible give the serial number of the instrument.



No. 5167-1

5167- 1. Improved Sunshade with Reflector for illuminating cross and stadia hairs . . . . . each $ 4 00

The reflecting mirror is rigidly mounted on a short tube, placed within the tube forming the sunshade, and held in position by a stop. To use the sunshade without the reflector, the mirror with its separate tube is taken out and the sunshade turned to bring the opening in its side away from the sun.

5167- 2. Sunshade, plain . . . . . each $ 75
5167- 3. Object-glass. . . . . each $ 6 00 to 10 00
5167- 4. Colored Glass, dark, to eyepiece . . . . . each 2 00
5167- 5. do. do. light, " " (ray filter) . . . . . " 2 00
5167- 6. Cap for object-glass . . . . . " 50
5167- 7. do. " eyepiece . . . . . " 75
5167- 8. Clamp Screw for horizontal limb, centre or telescope . . . " 75
5167- 9. Tangent Screw for " " " " " . . . " 1 50
5167-10. Leveling Screws . . . . . " 1 50
5167-11. Compass Needle and Centre Pin . . . . . 2 50 to 5 00
5167-12. Cover Glass for compass, with ground edge . . . . . 50 to 1 00
5167-13. Cover Glass for vernier, with ground edge . . . . . each 75
5167-14. Steel adjusting Pins . . . . . " 05
5167-15. Phosphor-bronze adjusting Pins (non-magnetic, for variation plate) " 05
5167-16. Combination Screwdriver and Centre Key . . . . . " 25
5167-17. Tripod Head with Bolts for instruments with 4 leveling screws " 5 00
5167-18. do. do. do. do. for architect's levels " 3 00
5167-19. Leg for tripod No. 5175 . . . . . " 2 00
5167-20. do. " " No. 5176 . . . . . " 1 25
5167-21. do. " " No. 5177 . . . . . " 2 25
5167-22. do. " " No. 5178 . . . . . " 2 25
5167-23. do. " " No. 5180 . . . . . " 3 50
5167-24. do. " " No. 5181 . . . . . " 3 50
5167-25. Waterproof Cover for transit or level . . . . . " 75
5167-26. Leather Case with shoulder strap for transit or level $ 12 00 to 15 00
5167-27. do. do. " " " for architect's level or surveyor's compass 5 00 " 10 00
5167-28. Fine Oil for surveying instruments . . . . . per bottle 25
5167-29. Pocket Oil Cans . . . . . each 25

When ordering Attachments and Parts, please give the serial number of the instrument.

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CROSS AND STADIA HAIRS

supplied separately from instrument.

5167-31.	Plain Cross Hairs and Diaphragm	$ 2 00
5167-32.	Replacing Cross Hairs on Diaphragm	1 75
5167-33.	Fixed Stadia and Cross Hairs and Diaphragm	3 00
5167-34.	Replacing Stadia and Cross Hairs on Diaphragm	2 75
5167-35.	Disappearing Stadia Hairs and Diaphragm	5 00

When instrument is sent to our Factory, there is an additional charge of $3.00 for inserting and adjusting cross or stadia hairs.

The following approximate prices represent the increase in cost of an instrument when it is made to order with the attachments or modifications here listed. Applying these extras to a finished instrument if they can be applied at all, may involve more work and consequent additional expense.

5167-40.	Guard to vertical circle (see page 391)	extra $ 5 00
5167-41.	Vertical Circle with opposite Verniers and Guard, in place of regular vertical circle (see page 391)	" 20 00
5167-42.	Vertical Circle and Vernier graduated on the periphery, with Guard, in place of regular vertical circle (see page 3 2)	" 15 00
5167-42D.	Vertical Circle and Opposite Verniers graduated on the periphery, with guard, in place of regular vertical Circle.	" 35 00
5167-43.	Vertical Circle with fully encasing Metal Covering, with glass covered Vernier and ground glass Reflector, in place of regular vertical circle	" 18 00
5167-44.	Solar Attachment (No. 5090, page 372) interchangeable to either top or end of axis of telescope, with detachable counter weight (see page 392)	" 70 00
5167-46.	Prism, with Colored Glass, to eyepiece of transit	" 7 50
5167-49.	Fixed Stadia Hairs and Diaphragm, if not regularly furnished with new instrument.	" 3 00
5167-53.	Disappearing Stadia Hairs and Diaphragm	" 5 00
5167-55.	Improved Tangent screw with Gradienter	10 00
5167-57.	do. do. do. " " " in place of plain tangent screw	extra 5 00
5167-60.	Folding Sights to telescope	8 00
5167-61.	Folding Sights to standards (at right angle to telescope)	10 00
5167-62.	Mounted Microscopes to verniers	each 8 00
5167-63.	Striding Compass, 4 in. needle, for transits with U-shaped standards (see page 392)	15 00
5167-70.	Graduating horizontal limb to read to 30 seconds	10 00
5167-71.	" " " " " " 20 "	15 00
5167-72.	" " " " " " 10 "	20 00
5167-73.	Graduating vertical circle " " " 30 "	10 00
5167-74.	" " " " " " 20 "	15 00
5167-75.	" " " " " " 10 "	20 00

Graduations to read to 10 or 20 seconds should be applied only to the Extra-fine Transits.

We have the best facilities for repairing Surveying Instruments of any make promptly and satisfactorily.

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FINE SPIRIT LEVELS,

VERY SENSITIVE, GRADUATED ON THE GLASS.

Price includes mounting in tube, if tube is returned to us.

5173 A.	Fine Spirit Levels for Telescope of 15 in. Levels . . .					each	$ 4 00
5173 B.	"	do.	"	"	" 18, 20 or 22 in. Levels	"	4 50
5173 C.	"	do.	"	"	" Transits	"	3 50
5173 D.N.	"	do.	"	"	" Builders Transits and Levels	"	3 00
5173 E.	"	do.	"	Plates of transits		"	1 25
5173 F.	Fine Reversible Spirit Level attached to Transit Telescope in place of regular level					extra	15 00

Price of Chambered Spirit Levels (for regulating the size of the bubble) quoted on application.

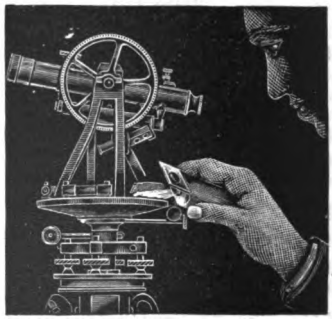


5168 N. Aladdin Pocket Reading Lens, (Patent pending) with electric lamp, fine reading glass mounted in nickel plated hinged reflector, with Tungsten 3-cell battery, in nickelplated Case fitted in neat leather Pouch . . . . . each $ 6 00

5168 B.N. Renewal Battery (American Ever Ready Co., No. 751) in pasteboard box, for No. 5168 N, ... " 50

The Battery being of Standard type and make can be obtained without difficulty at any store carrying such supplies.

The Aladdin Reading Lens is intended for the use of engineers or surveyors working in dark or badly lighted places, like mines, tunnels, forests, or at night, (polar observations, etc.). It combines a small powerful electric lamp with a reflector and a reading glass, all so constructed that the fine readings of verniers of surveying instruments, graduations of tapes, etc., can be very conveniently and accurately observed in dark places. Its light is at the same time free from the danger of igniting gases, which makes it extra valuable in coal mines, etc.



SURVEYOR'S UMBRELLA.



No. 5169.

5169. Surveyor's Umbrella. . . each $ 6 00

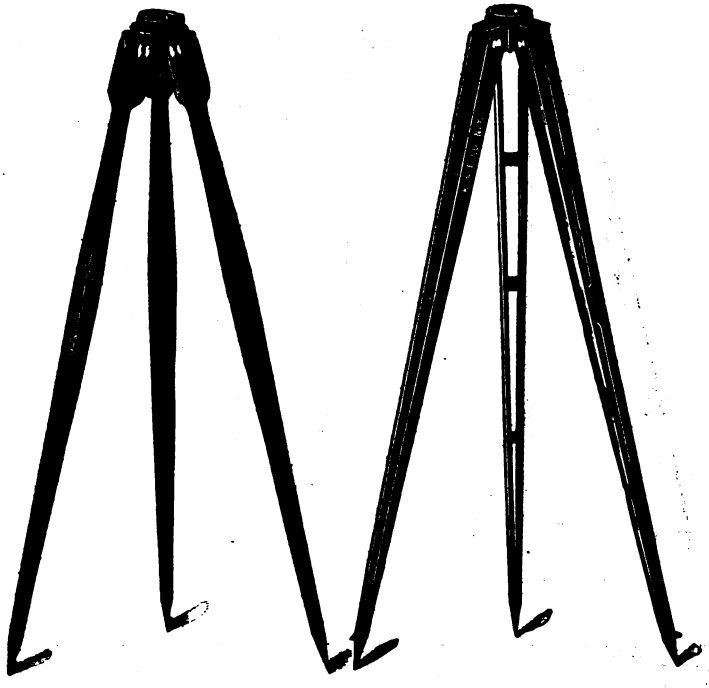
A substantially built umbrella about 5 feet in diameter with 6-ft. slip jointed staff. The staff is provided with one straight and one oblique socket for holding the umbrella in the required position It is also provided with pointed wrought iron shoe. Metal rings to umbrella ribs, for attaching brace cords.

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TRIPODS

FOR

LEVELS AND TRANSITS.



No. 5175. 5178.

5175.	Hardwood Tripod for levels and transits. Weight about 8 lbs.	each	$ 10 00
5175-1.	Hardwood Tripod similar to No. 5175, for Builder's Transits. Weight about 10 lbs.	"	6 00
5176.	Hardwood Tripod, similar to No. 5175, for Architect's Levels, etc. Weight about 7 lbs.	"	6 00
5177.	Split Tripod of hardwood, for light levels and transits, latest construction, very strong and rigid. Weight about 8½ lbs.	"	10 00
5178.	Split Tripod of hardwood, for levels and transits, like No. 5177, but heavier. Weight about 9½ lbs.	"	10 00
5179.	Split Tripod for Transits No. 5077 and 5082 M. C., like No. 5177 but lighter. Weight about 7 lbs.	"	10 00

Split Tripods No. 5177 to 5179 are furnished with Spurs, as illustrated.

For Patent Extension Tripods, see next page.

For Repair Parts for tripods, see page 394.

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K & E PATENT EXTENSION TRIPODS.



No. 5180.

This Patent Extension Tripod combines rigidity with lightness; its manipulation is easy and its construction such that the sliding leg can neither wear loose nor bind, but will always move smoothly. The special clamps render it as steady as any solid-leg tripod, even when the legs are fully extended. The head is very firm. It is adjustable to any height between 30 and 57 inches.

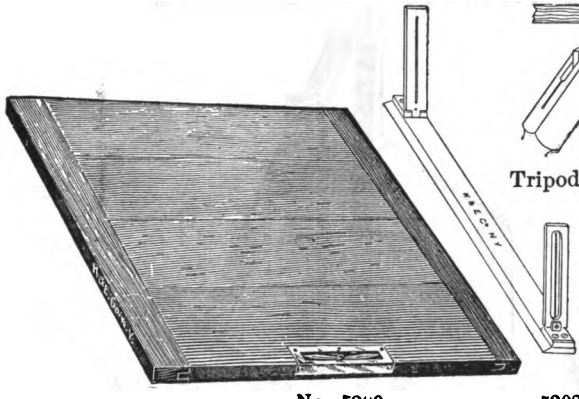
5180.	Patent Extension Tripod, for levels and transits. Weight about 10 lbs.	each	$ 15 00
	if with instrument in place of regular tripod, extra . . .	"	5 00
5181.	Patent Extension Tripod, like No. 5180, but lighter, for Builder's Transits and for Transit No. 5077. Weight about 7 lbs.	"	12 00
	if with instrument in place of regular tripod, extra . . .	"	6 00
5182.	Patent Extension Tripod, like No. 5180, but lighter, for Architect's Levels, etc. Weight about 4 lbs.	"	12 00
	if with instrument in place of regular tripod, extra . . .	"	6 00
5183.	Patent Extension Tripod, for Transit No. 5079, like No. 5182, but very light. Weight about 3½ lbs.	"	12 00
	For Tripods with one extension leg and two split legs, deduct from price of extension tripod	"	3 00

Tripods with one extension leg offer nearly all the advantages of a tripod with three extension legs, in using them on uneven ground, but they can not be put up as compactly for carrying.

For other Tripods, see preceding page.
For Repair Parts for tripods, see page 394.

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TRAVERSE TABLES.



Tripod head of No. 5200.

No. 5200. 5202

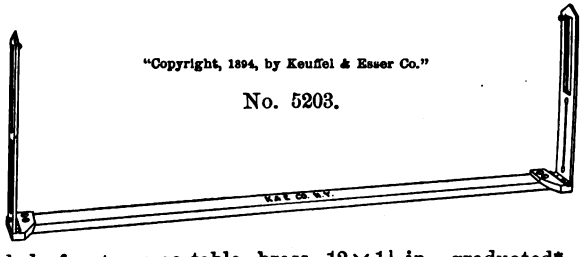
5200. Traverse Table, simple construction, best quality, pine-wood DRAWING BOARD, 15×15 in., with improved metal swiveling attachment for tripod. Fine TROUGH COMPASS set flush with board, NEEDLE about 3 in., jeweled centre, with stop. Graduated* BRASS ALIDADE 10½ in., beveled edge (No. 5202), FOLDING SIGHTS (alidade in sewed leather sheath). Tripod like No. 5176, stout swiveling discs, detachable clamp screw . . . . each $ 25 00

5201. Traverse Table, like No. 5200, but with Patent Extension Tripod similar to No. 5182, page 398 . . . . . " 31 00

5202. Alidade for traverse table, brass, 10½ in., graduated,* FOLDING SIGHTS, in sewed leather Sheath . . . . . " 8 00

"Copyright, 1894, by Keuffel & Esser Co."

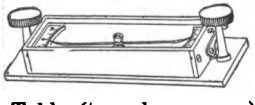
No. 5203.



5203. Alidade for traverse table, brass, 12×1½ in., graduated* BEVELED EDGE in line of sight folding fore and back SIGHTS 3 in. high, in sewed leather Sheath . . . . . each $ 15 00

*Unless another graduation is ordered, we graduate these alidades 40 parts to the inch.

No. 5204.

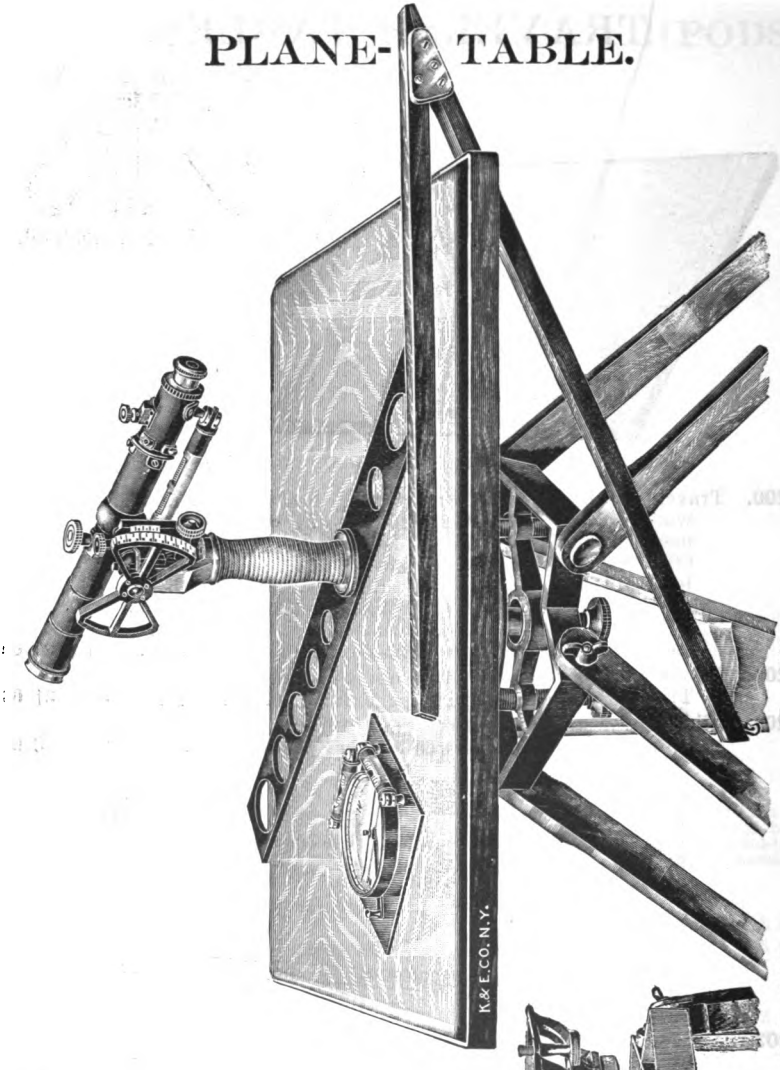


Copyright, 1894, by Keuffel & Esser Co."

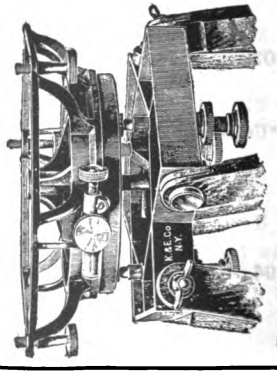
5204. Compass for Plane Table (trough compass), with milled head screws to fasten to board, improved NEEDLE about 3½ in., graduations on raised limb to half-degrees, covering 10 degrees each way . . . . . each $ 7 00

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PLANE-TABLE.



No. 5205.



Leveling arrangement of No. 5205.

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K & E
PLANE-TABLE.

5205. K & E Plane-Table.

Alidade: TELESCOPE 11½ in., achromatic terrestrial with dust cap and sunshade. OBJECT GLASS 1¼ in., with improved rack and pinion movement. EYEPIECE with patent micrometer focusing arrangement. MAGNIFYING POWER 23 diameters. STADIA HAIRS fixed, ratio 1:100. Fine SPIRIT LEVEL to telescope graduated on the glass and ground to a sensitiveness of about 45 seconds of arc per graduation. Improved CLAMP and TANGENT SCREW with counterspring. Opposite VERTICAL ARCS, 4 in. diameter, graduated 30° each way to half-degrees with hinged vernier reading to one minute. Arc and vernier graduated on periphery. Brass ALIDADE BLADE 20 × 3 in., beveled fiducial edge.

Compass, brass, 5×5 in. Compass graduated on raised ring to one degree. NEEDLE about 3 in., with stop. Two fine SPIRIT LEVELS graduated on the glass.

Drawing Board, white pine, thoroughly seasoned, 24×30 in., of substantial construction to prevent warping.

Leveling Arrangement, 3 screws, improved pattern, combining lightness, strength and ease of manipulation. The part supporting the board revolves in a metal socket on a large bearing surface, is provided with improved Clamp and Tangent Screw with counterspring, and holds board perfectly rigid in all positions.

Tripod, hardwood, split, very substantial and rigid.

Instrument complete with plumbing arm, plumb bob, spring clips for holding paper, in strong hardwood box, separate wooden box for board, firm hardwood Split Tripod etc. . . . . $ 175 00

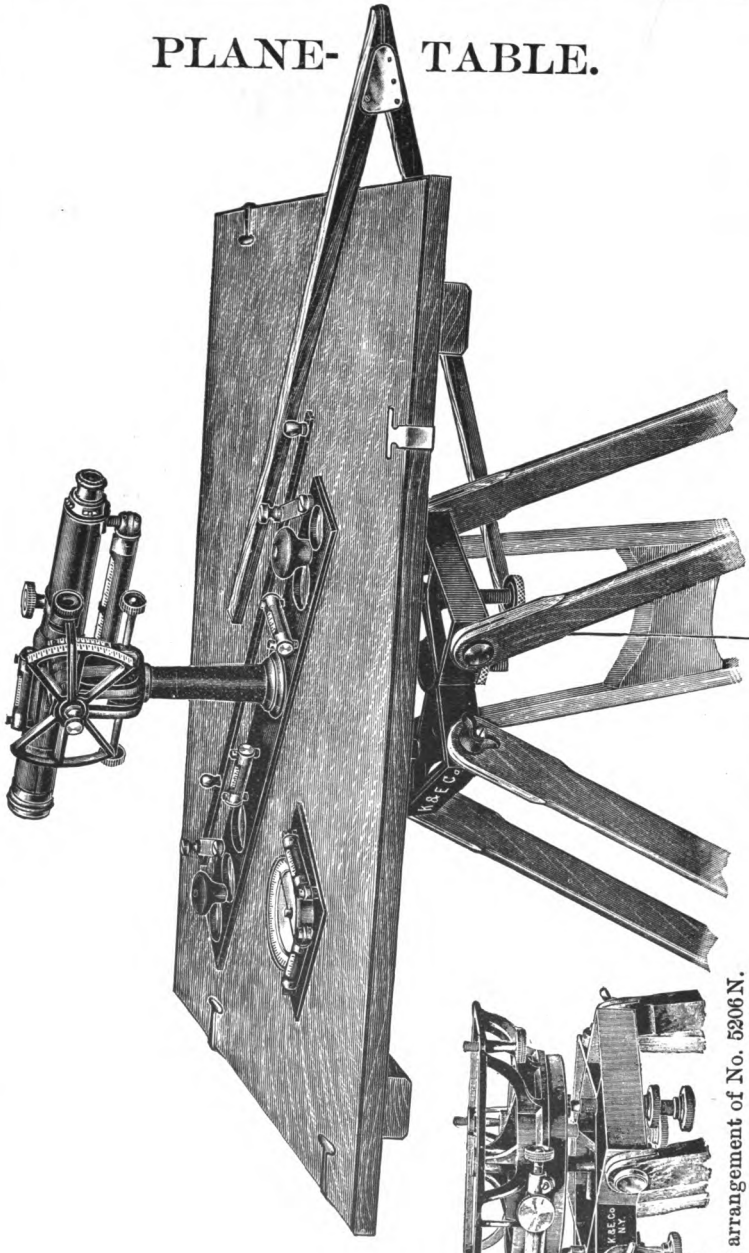
5205A. Alidade only, as described above 95 00

5205J. Plane-Table as described under No. 5205, but with leveling arrangement No. 5210 (after Johnson, see page 408), in place of above leveling arrangement 155 00

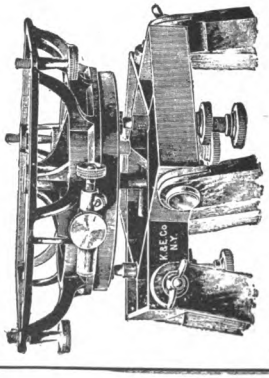
5209. Rollers for mounting continuous paper on plane-table (see cut page 406). . . . . extra 10 00

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PLANE-TABLE.



No. 5206 N.



Leveling arrangement of No. 5206 N.

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PLANE-TABLE.

5206 N. Plane Table.

Alidade. TELESCOPE 14 in., achromatic astronomical (inverting), with dust cap and sunshade OBJECT GLASS 1⅝ in., with improved rack and pinion movement. EYEPIECE with spiral focusing arrangement. MAGNIFYING POWER 28 diameters. STADIA HAIRS fixed, ratio 1:100. Fine SPIRIT LEVEL to telescope graduated on the glass and ground to a sensitiveness of about 40 seconds of arc per graduation. Improved CLAMP and TANGENT SCREW with counterspring. Opposite VERTICAL ARCS, 5 in. diameter graduated 30° each way to half-degrees with hinged vernier reading to one minute. Arc and vernier graduated on periphery. Fine Spirit Level to vernier, graduated on the glass and ground to a sensitiveness of about 60 seconds of arc per graduation. MOUNTED MICROSCOPE to vernier. Brass ALIDADE BLADE 20×2¾ in., beveled fiducial edge and parallel motion. Two fine SPIRIT LEVELS graduated on glass.

Compass, brass base 5 × 5 in. Compass graduated on raised ring to one degree. NEEDLE about 3 in. with stop. Two fine SPIRIT LEVELS graduated on the glass.

Drawing Board, white pine, throroughly seasoned, 24 × 30 in., of substantial construction to prevent warping.

Leveling Arrangement, 3 screws, improved pattern, combining lightness, strength and ease of manipulation. The part supporting the board revolves in a metal socket on a large bearing surface, is provided with improved Clamp and Tangent Screw with counterspring, and holds board perfectly rigid in all positions.

Tripod, hardwood, split, very substantial and rigid.

Instrument complete with plumbing arm, plumb bob, spring clips for holding paper, in strong hardwood box, separate wooden box for board, firm hardwood Split Tripod, etc . . . . . $ 260 00

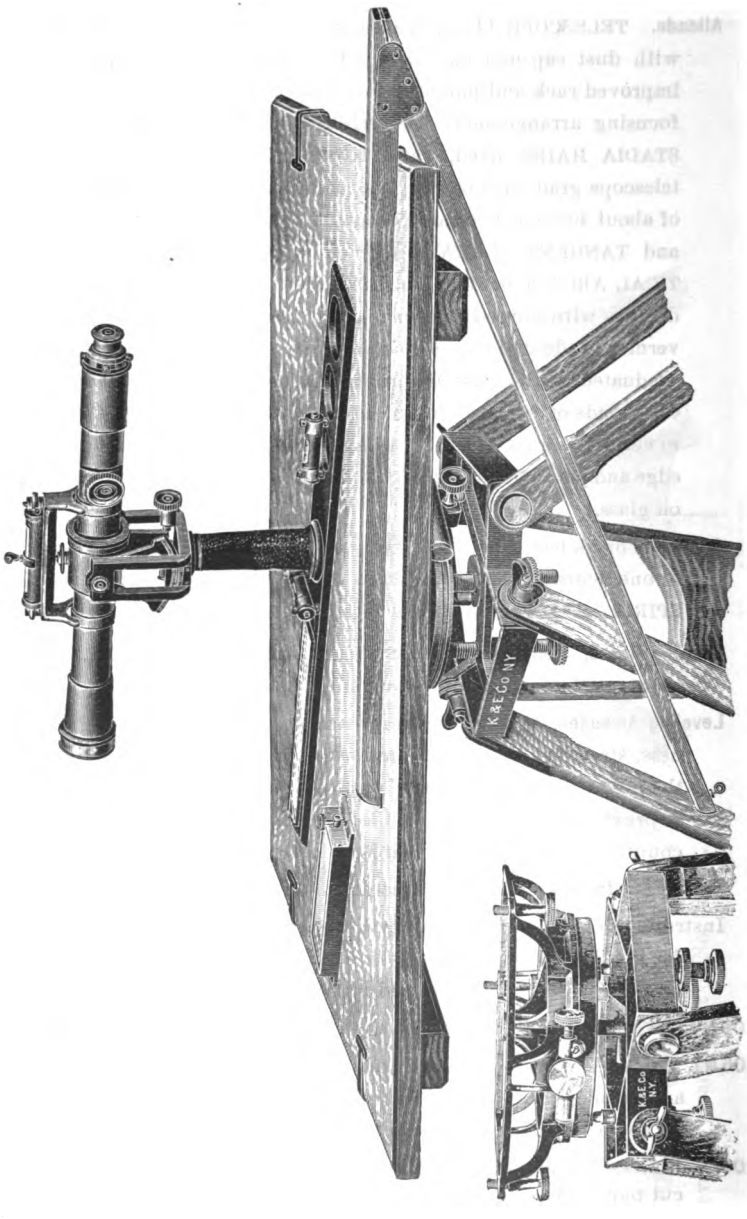
5206 N A. Alidade only, as described above 180 00

5206 N J. Plane-Table as described under No. 5206, but with leveling arrangement No. 5210 (after Johnson, see page 408), in place of above leveling arrangement 240 00

5209. Rollers for mounting continuous paper on plane-table (see cut page 406). . . . . extra 10 00

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PLANE-TABLE



No. 5207.

Leveling arrangement of No. 5207.

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PLANE-TABLE.

5207. Plane-Table.

Alidade, TELESCOPE 15½ in., achromatic astronomical (inverting), with dust cap and sunshade. OBJECT GLASS 1½ in. with improved rack and pinion movement. EYEPIECE with spiral focusing arrangement. MAGNIFYING POWER 35 diameters. STADIA HAIRS fixed, ratio 1:100. To facilitate adjustment of cross hairs, telescope can be revolved on longitudinal axis. Fine SPIRIT LEVEL to telescope graduated on the glass and ground to a sensitiveness of about 30 seconds of arc per graduation. Improved CLAMP and TANGENT SCREW with counter spring. VERTICAL ARC 5 in. diameter, graduated on solid silver 30° each way to half degrees, with vernier reading to one minute. Brass ALIDADE BLADE, 3½ × 22 in. beveled fiducial edge, two fine SPIRIT LEVELS graduated on the glass. DIAGONAL SCALE on blade.

Compass. Trough pattern, covering 20°, graduated on raised arc to half-degrees. NEEDLE about 5 in., with stop. Base about 1¾×7¼ in.

Drawing Board, white pine, thoroughly seasoned 24 × 30 in. of substantial construction to prevent warping.

Leveling Arrangement, 3 screws, improved pattern, combining lightness, strength and ease of manipulation. The part supporting the board revolves in a metal socket on a large bearing surface, is provided with improved Clamp and Tangent Screw with counterspring, and holds board perfectly rigid in all positions.

Tripod, hardwood, split, very substantial and rigid.

Instrument complete with plumbing arm, plumb bob, spring clips for holding paper, in strong hardwood box, separate wooden box for board, firm hardwood Split Tripod, etc . . . . . $ 260 00

5207A. Alidade only, as described above 180 00

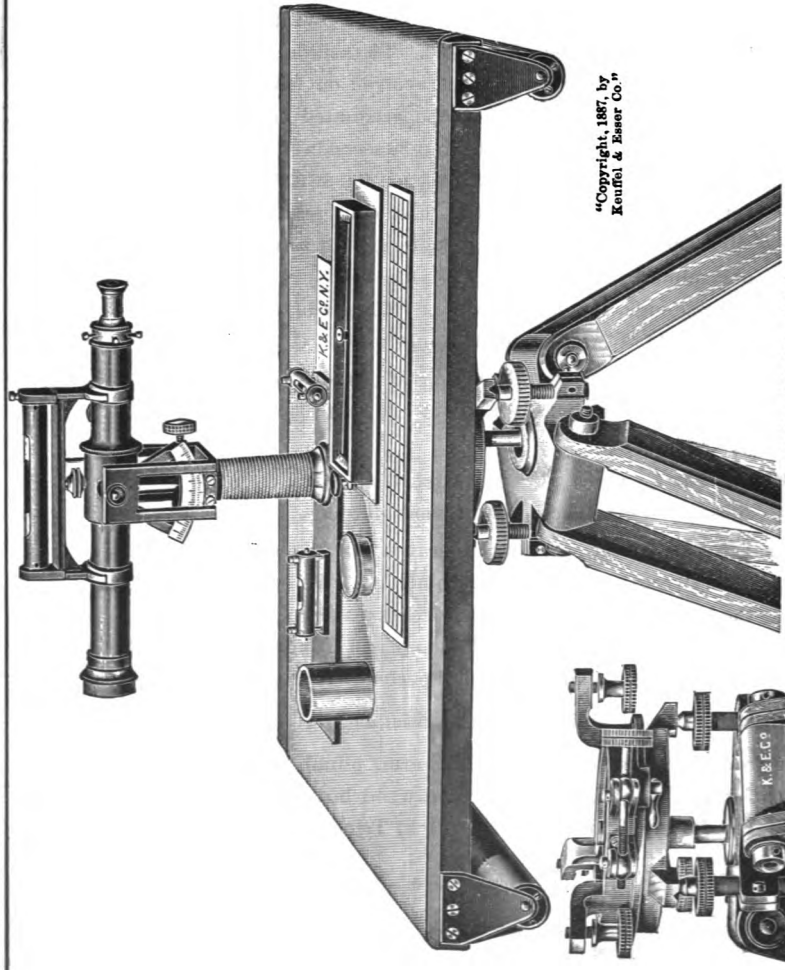
5207J. Plane-Table as described under No. 5207, but with Leveling Arrangement No. 5210 (after Johnson, see page 408) in place of above Leveling Arrangement 240 00

5209. Rollers for mounting continuous paper on plane-table (see cut page 406). . . . . extra 10 00

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PLANE-TABLES.

U. S. Coast and Geodetic Survey Pattern.



No. 5208 with No. 5209.

Leveling arrangement of No. 5208.

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PLANE-TABLE.

U. S. Coast and Geodetic Survey Pattern.

5208. Plane Table.

Alidade: TELESCOPE 10½ in., achromatic astronomical (inverting), with dust cap and sunshade. OBJECT GLASS 1 in., with improved rack and pinion movement. EYEPIECE with spiral focusing arrangement. MAGNIFYING POWER 25 diameters. STADIA HAIRS fixed, ratio 1:100. To facilitate adjustment of cross hairs, telescope can be revolved on longitudinal axis. Fine Striding SPIRIT LEVEL to telescope graduated on the glass and ground to a sensitiveness of about 45 seconds of arc per graduation. Improved CLAMP and TANGENT SCREW with counterspring. VERTICAL ARC, 4 in. diameter graduated 30° each way to half-degrees with vernier reading to one minute. Brass ALIDADE BLADE 12 × 2½ in., beveled fiducial edge, two fine spirit levels graduated on the glass. DIAGONAL SCALE graduated one side 1:10,000 other side 1:20,000.

Compass, Trough pattern, covering 20° each way, graduated on raised arc to half-degrees. NEEDLE about 5½ in. with stop. Base about 1¾ × 7¼ in.

Drawing Board, white pine, thoroughly seasoned, 16×20 in., of substantial construction to prevent warping.

Leveling Arrangement, 3 screws, improved pattern, combining lightness, strength and ease of manipulation. The part supporting the board revolves in a metal socket on a large bearing surface, is provided with improved Clamp and Tangent Screw and holds board perfectly rigid in all positions.

Tripod, hardwood, split, very substantial and rigid.

Instrument complete with plumbing arm, plumb bob, spring clips for holding paper, in strong hardwood box, separate wooden box for board, firm hardwood split Tripod, etc. . . . . $ 175 00

5208A. Alidade only, as described above. 95 00

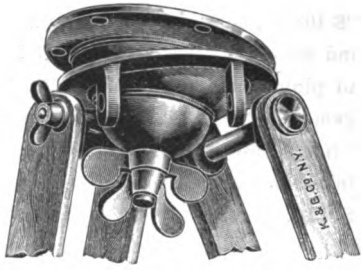
5208J. Plane-Table as described under No. 5208, but with Leveling Arrangement No. 5210 (after Johnson, see page 408), in place of above leveling arrangement 160 00

5209. Rollers for mounting continuous paper on plane-table (see cut) . . . . . extra 10 00

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PLANE-TABLE LEVELING ARRANGEMENT

(after Johnson)



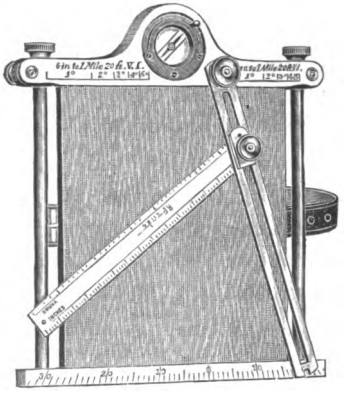
No. 5210.

(The cut shows one leg of the tripod removed, to afford a better view of the construction).

5210. Leveling arrangement (after Johnson) very simple and efficient, consists of two sphere-segments movable within one another and two wing nuts, one to keep the segments in apposition, the other to clamp them. With **stout split hardwood Tripod** . . . . . **$ 35 00**

This leveling arrangement is furnished with Plane-Tables Nos. 5205 J, 5206 N J, 5207 J and 5208 J.

CAVALRY SKETCHING CASE.



No. 5212

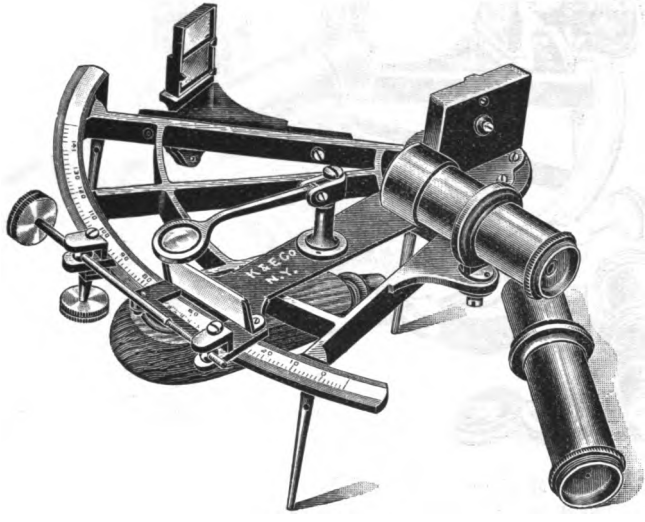
5212. Cavalry Sketching Case, as made by us for the U. S. Army. Board surface 6¾x7½ in., rollers for paper with set screws, brass arm and scale, compass with scores, swiveling Handle Strap . . . . . each **$ 15 00**

5212 P. Sketching Paper for No. 5212, in rolls of 6½ yards 7 in. wide. . . . . per roll **15**

The compass is set flush, numbered at every 5° up to 180°, compass cover with scores, stop to needle. Brass Scale Arm and Scale connected by sliding block with clamp screw. Scale 7 in., graduated 3 inches to the mile and inches in 10ths. Clinometer Scale graduated to one degree. Scales of Vertical Intervals on upper cross piece, 2, 3, 4, 6 inches to the mile. Two wooden tubes, with retaining springs for 4 pencils, on back of board.

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SEXTANTS AND OCTANTS.



No. 5223B.

5223. Sextant for Land Surveying, gun-metal, measuring angles up to 130 degrees. **Radius** 6 in., graduated on solid silver to 20 minutes, **vernier** reading to 30 seconds, Clamp and Tangent Screw to vernier. Mounted reading lens. Plain sighting tube.

Instrument complete, with adjusting key and screw-driver, in polished mahogany Case with Lock . . . . . each $42 50

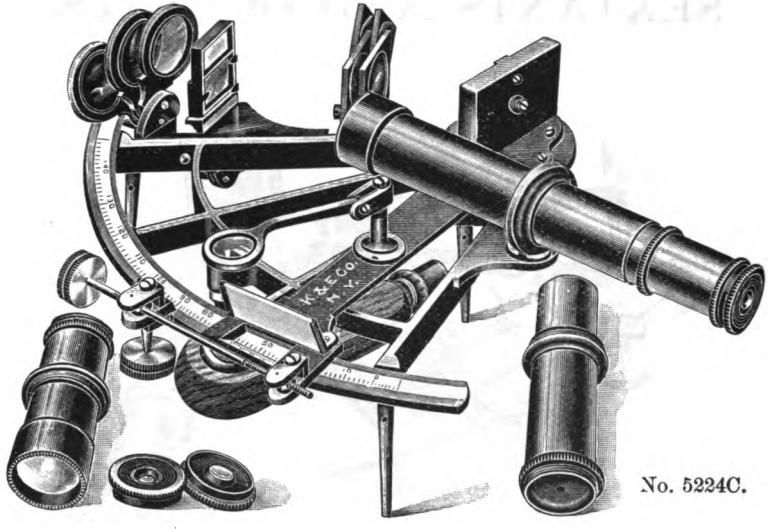
5223 B. Sextant for Land Surveying, like No. 5223, with **plain sighting tube** and **star telescope.**

Instrument complete, with adjusting key and screw-driver, in polished mahogany Case with lock . . . . . " 52 50

We have special apparatus for testing sextants of any make for eccentricity and errors of graduation, and as large manufacturers of sextants, have the best facilities for repairing these instruments.

For Octants, see page 412.

Digitized by Google



No. 5224C.

5224. Sextant, Mariner's, gun-metal, measuring angles up to 130 degrees. **Radius 6 in.**, graduated on solid silver to 20 minutes, **vernier** reading to 30 seconds, Clamp and Tangent Screw to vernier. Mounted reading lens. 1 plain **sighting tube, 1 inverting telescope** (power about 6 diam.), 2 neutral glasses for telescope, 7 neutral glasses to sextant.

Instrument complete, with adjusting key and screw-driver, in polished mahogany Case with Lock . . . . each $ 65 00

5224 B. Sextant, Mariner's, as described under No. 5224, but with **adjustable telescope holder.** Instrument complete, as above " 70 00

5224 C. Sextant, Mariner's, gun-metal, measuring angles up to 130 degrees. **Radius 6 in.**, graduated on solid silver to 20 minutes, vernier reading to 30 seconds, Clamp and Tangent screw to vernier. Mounted reading lens. 1 plain **sighting tube, 1 inverting telescope** (power about 6 diam.), 1 **star telescope**; 2 neutral glasses for telescope, 7 neutral glasses to sextant.

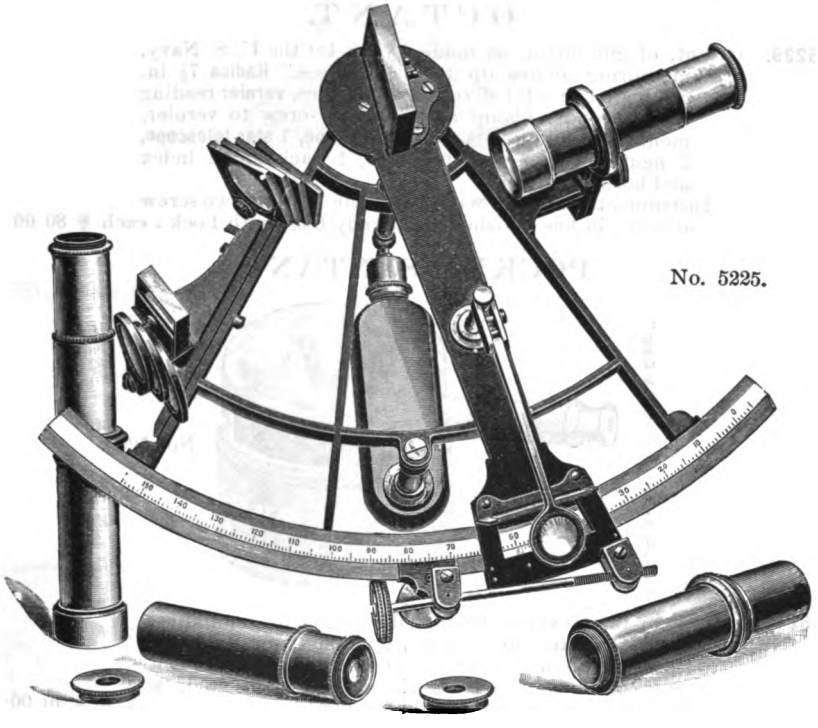
Instrument complete, with adjusting key and screw-driver, in polished mahogany Case with Lock . . . . . " 75 00

5224 D. Sextant Mariner's, as described under No 5224C, but with **adjustable telescope holder** Instrument complete, as above " 80 00

We have special apparatus for testing sextants of any make for eccentricity and errors of graduation, and as large manufacturers of sextants, have the best facilities for repairing these instruments.

For Octants, see page 412.

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No. 5225.

5225. Sextant, **high grade,** gun-metal, **as made by us for the U. S.** Navy; measuring angles up to 130 degrees. **Radius 7½** in. Graduated on solid silver to 10 minutes, **vernier** reading to 10 seconds; mounted reading lens, Clamp and Tangent Screw to vernier. **1 sighting tube, 1 star telescope, 1 inverting telescope** with two eyepieces, magnifying powers 6 and 12 diam.; 7 neutral glasses to sextant, 2 neutral glasses for telescopes, 1 each spare index and horizon mirror.

Instrument complete, with adjusting key and two screw drivers, in fine polished mahogany Case with Lock . . each **$120 00**

5227. Sextant, Surveying, of gun-metal, as made by us for the U. S. Navy, measuring angles up to 145 degrees. **Radius 6** in. Graduated on solid silver to 20 minutes, **vernier** reading to 30 seconds; mounted reading lens, Clamp and Tangent Screw to vernier. **1 sighting tube, 1 star telescope, 1 inverting telescope,** magnifying power 6 diam., 7 neutral glasses to sextant, 2 neutral glasses for telescope 1 each spare index and horizon mirror.

Instrument complete, with adjusting key and two screw drivers, in polished mahogany Case with Lock . . . . " **90 00**

We have special apparatus, for testing sextants of any make for eccentricity and errors of graduation, and as large manufacturers of sextants, have the best facilities for repairing these instruments.

For Octants, see page 412.

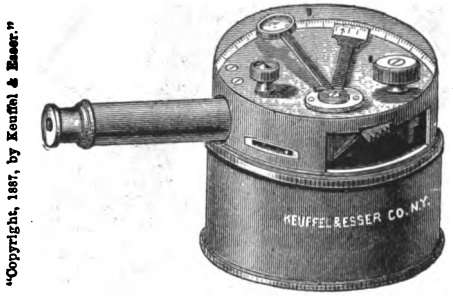
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OCTANT.

5229. Octant, of gun-metal, as made by us for the U. S. Navy, measuring angles up to 100 degrees. **Radius** $7\frac{1}{2}$ in. graduated on solid silver to 20 minutes, **vernier** reading to 30 seconds; clamp and tangent screw to vernier, mounted reading lens, 1 **sighting tube, 1 star telescope,** 2 neutral glasses for telescope, 1 each spare index and horizon mirror.

Instrument complete, with adjusting key and two screw drivers, in fine polished mahogany Case with Lock . each $ 80 00

POCKET SEXTANT.

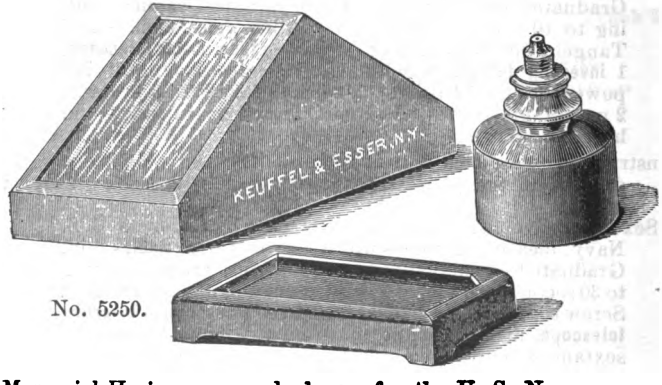


"Copyright, 1887, by Keuffel & Esser."

No. 5240.

5240. Pocket or Box Sextant, graduated on silver to 30 minutes, vernier reading to 1 minute, good telescope, 2 neutral glasses, mounted reading lens, micrometer tangent screw. Metal box 3 in. diameter × $1\frac{1}{2}$ in. high, a very reliable instrument, in leather Sling Case . . . each $ 40 00

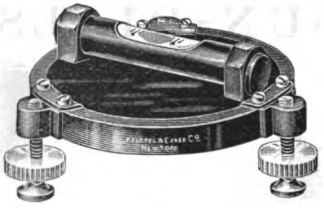
ARTIFICIAL HORIZONS



No. 5250.

5250. Mercurial Horizon, as made by us for the U. S. Navy. Bronzed brass roof $3\frac{3}{4} \times 7\frac{3}{8} \times 4\frac{1}{2}$ in. high, fine plane glasses $2\frac{3}{4} \times 4\frac{1}{8}$ in., iron mercury bottle with threaded stopper and funnel top. Iron mercury trough with thread for funnel, and lip. Polished mahogany Case, with carrying strap. Complete, with Mercury . . . . . each $ 35 00

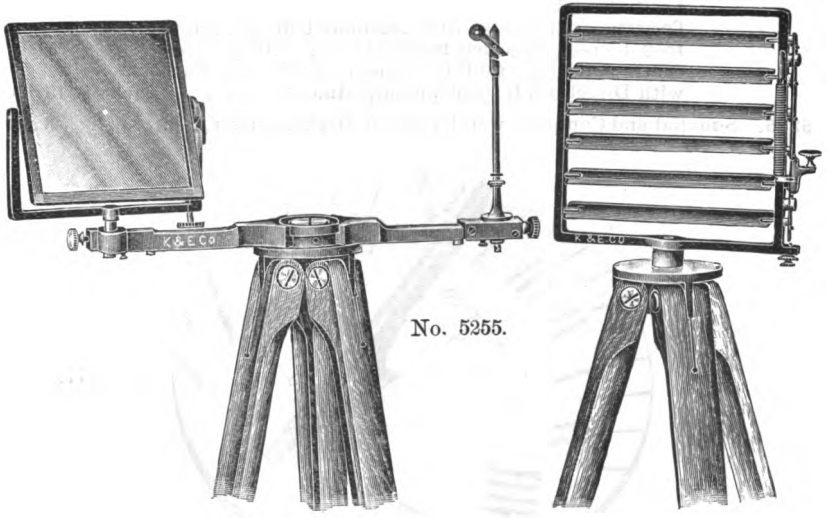
Digitized by Google



No. 5251.

5251. Reflecting Horizon, black glass, accurately ground plane surface 3⅜ in. diameter, mounted in bronzed brass frame, with three leveling screws, fine graduated **adjustable** spirit level in bronzed metal mounting, polished mahogany Case . . . . . each $ 16 00

HELIOGRAPHS



No. 5255.

5255. Heliograph, as made by us for the U. S. Signal Corps; outfit complete for one station . . . . . $ 80 00

The Heliograph is made according to the specifications of the U. S. Signal Office and consists of 1 Sun Mirror 4½×4⅘ in. and 1 Station Mirror 4⅕×4½ in., adjustable vertically and horizontally by micrometer movements, 1 sighting rod, 1 segmental Screen 6×6 in., actuated by a key, 1 Screw Driver. Mirrors in mahogany Box. All in Sole-leather Pouch. Two hardwood Tripods standing about 40 in. high in skeleton leather Case with shoulder strap.

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SUN-DIALS.



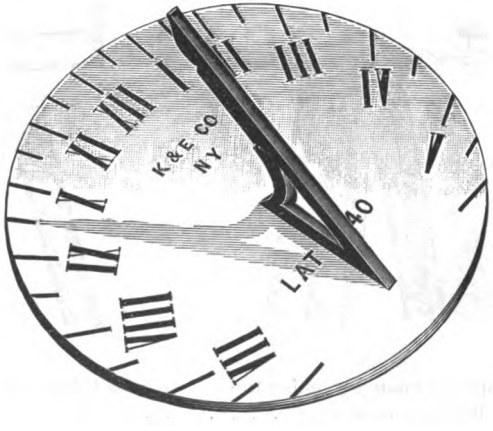
No. 5270.



No. 5275.

5270. Universal Sun-dial and Compass for both North and South Latitudes. **Time Circle** graduated to read to 10 minutes of time, numbered for North and South Latitudes. **Latitude Arc** graduated to single degrees. **Compass** with metal dial graduated in quadrants to 2 degrees, edge bar needle 1½ in., with jeweled centre and stop, folding gnomon, in Morocco Case with Directions for use and adjustment . . . . . each $ 15 00

5275. Sun-dial and Compass, watch pattern, German silver, 2 in. " 3 50



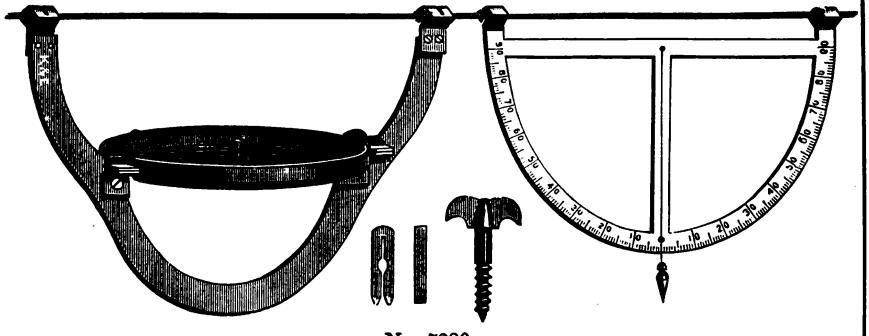
No. 5277.

5277. Sun-dial, brass white enamel, 12 in. diameter, graduated to read to 30 minutes of time, black graduations, heavy black gnomon. These Sun-dials are substantially built. They form a very attractive as well as useful ornament for parks, gardens, etc. . . . . each $ 6 00

In ordering, please state latitude of place where sun-dial is to be used.

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MINING COMPASS
AND CLINOMETER.

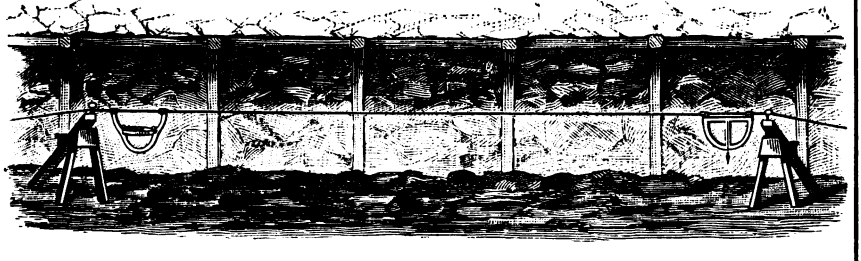


No. 5280.

5280. Mining Compass and Clinometer, Compass graduated to half degrees, suspended in a frame with hooks, by a universal joint (gimbal), needle about 3 in., with stop. Clinometer, aluminum, 7 in. diameter, graduated to half-degrees, with hooks and plumb bob, screws for cord, brass stop, in chamois lined leather Sling Case . . . each $ 50 00

5280B. Station bucks . . . . . per pair 4 00

5280C. Water-proof cord, 80 feet, on reel 3 00



Mining Compass and Clinometer in use.

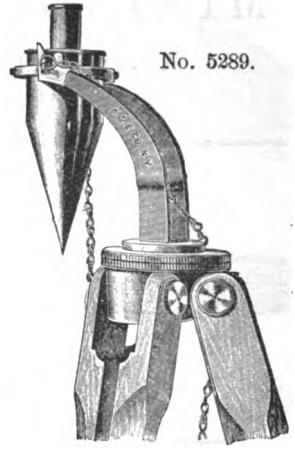
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MINING LAMP AND PLUMMET.



No. 5285.

"Copyright, 1894, by Keuffel & Esser Co."



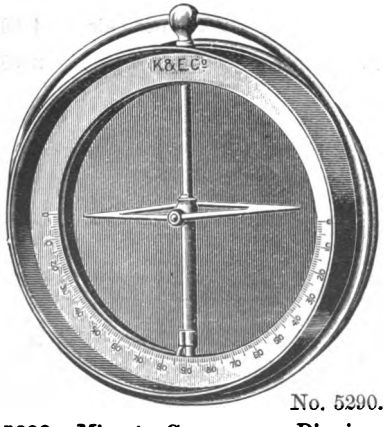
No. 5289.

5285. One Plummet, about 6½ in., in mahogany Box with strap, each $ 10 00
5286. Two do. in one mahogany Box with strap . . . . . pair 18 00

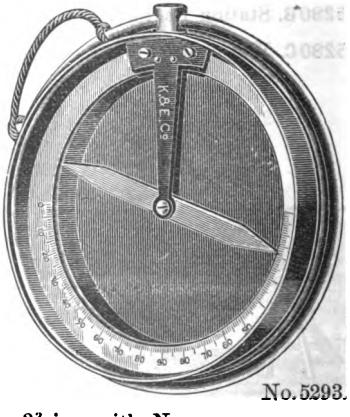
This is a large brass Plummet 2 in. diameter, 6½ in. long, with steel point, weight about 20 oz., mounted in gimbal with chains for suspending. The upper part is hollow, for oil, and provided with a burner, forming a lamp. The sight is taken to centre of flame.

5288. Standard for suspending Plummet, on plain tripod like No. 5176, (page 397) . . . . . each $ 15 00
5289. Standard No. 5288 but on Extension Tripod like No. 5182, (page 398) . . . . . " 21 00

MINER'S COMPASSES.



No. 5290.



No. 5293.

5290. Miner's Compass or Dipping Needle, 3¾ in., with Norwegian needle about 3 in., with stop; glass and brass covers on both sides, ... each $ 14 00
5293. Miner's Compass or Dipping Needle, 3¼ in., needle about 3 in., with stop, glass and brass covers on both sides, " 12 00

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SURVEYING COMPASSES.

In Surveying Compasses the **East** and **West** lettering is **reversed** from its position on the map. This is because the needle is the fixed point while the compass-box is revolved in directing the sights to the object observed. For instance, in sighting a point situated N. W. the needle will point N. E., but it will correctly read N. W. in accordance with the line actually sighted, because the East quadrant is marked West.



No. 5306, but with Out-keeper No. 5312.

5300. Large Surveying Compass, bronzed, graduated to half-degrees, numbered in quadrants, needle about 4 in., plate 12 in., graduated sights, 2 spirit levels, Ball joint and Socket (No. 5348-4, page 420.) for Jacob staff mounting, in polished mahogany Box with handle . . each $ 25 00

5302. do. do. needle about 5 in., plate 14 in., " 30 00

5304. do. do. " " 6 " " 16 " " 35 00

5306. Large Surveying Compass, like No. 5300, but with **variation plate** reading to minutes . . . . . each $ 30 00

5308. do. do. like No. 5302, but with variation plate, " 35 00

5310. do. do. " " 5304, " " " " " 40 00

The Surveying Compasses No. 5300 to 5310 represent the latest construction of these instruments, which we have improved in many features.

The compass box is sunk flush with the plate instead of projecting above it. The graduations, to half-degrees, are on a raised ring and the needle is of our improved pattern, as described on page 327. One of the detachable sights is graduated and provided with a sliding cross-piece for measuring vertical angles.

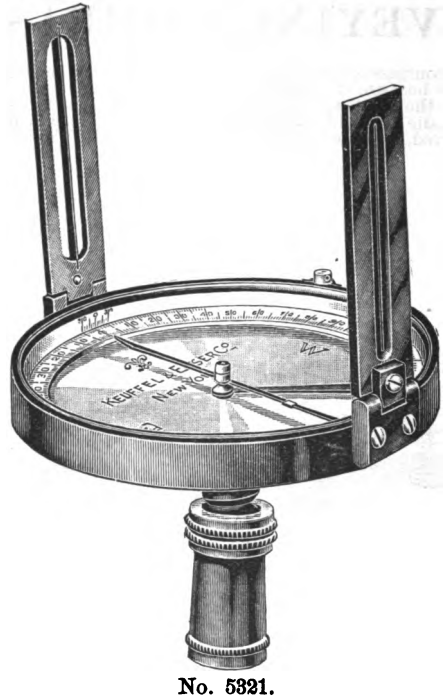
The variation of the needle is set off by a capstan-head pinion. The vernier of the variation arc reads to minutes. With these compasses we furnish adjusting pins of phosphor bronze, which do not disturb the needle.

5312. Out-keeper (tally register) . . . . . extra $ 1 50

The Out-keeper shown in above cut, is not included in the listed price of the Compasses.

For Tripods for above, see page 421.

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No. 5321.

5320. Surveying Compass, with folding sights, graduated on raised ring to degrees, variation plate, two spirit levels, Ball joint and Socket (No. 5348-2, page 420.) for Jacob staff mounting, needle about 3½ in., in polished mahogany Case . . . . . each $ 16 00

5320 A. do. do. like No. 5320, but with fore and back sights " 17 00

5321. do. do. like No. 5320, but needle about 4 in. Ball joint and Socket (No. 5348-3, see page 420.) in polished mahogany Case . . . . . " 18 00

5322. do. do. like No. 5320, but needle about 4½ in. Ball joint and Socket (No. 5348-3, see page 420.) in polished mahogany Case . . . . . " 20 00

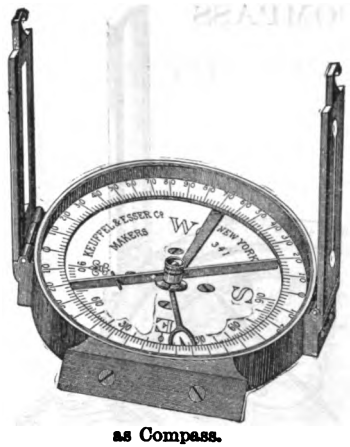
Compasses No. 5320 to 5322 are of the most practical construction and very carefully and substantially made. The variation of the needle is set off by a capstan-head pinion. The vernier of the variation arc reads 5 minutes. With these compasses we furnish adjusting pins of phosphor bronze, which do not disturb the needle.

Sewed leather Sling Case **in place of mahogany case.**

for Compasses	2	2½	3	3½	4	4½ in.
extra each	$ 2 00	2 00	2 25	2 50	3 00	3 25

For Jacob Staffs and Tripods, see page 421.

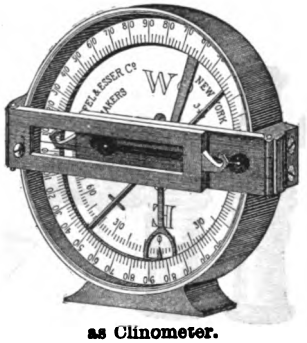
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as Compass.



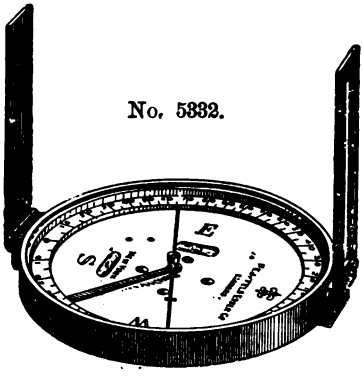
No. 5330.



as Clinometer.

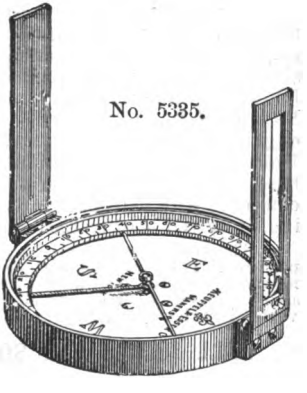
5330. Surveying Compass and Clinometer, bronzed, graduated to degrees, with folding sights ending in hooks, fiducial edge for clinometer, with Ball joint and Socket (No 5348-2 F, page 420) for Jacob staff mounting, needle about 2 in., in polished mahogany Case, each $12 50

5331. do. do. " " 2½ " " " " " " 14 50



No. 5332.





No. 5335.

5332. Surveying Compass, graduated on raised ring to degrees, with folding sights, 2 spirit levels, Ball joint and Socket (No. 5348-2, page 420) for Jacob staff mounting.

needle about 3 in., in mahogany Case, each $ 10 50

5333. do. do. " " 3½ " " " " " 11 50

5334. do. do. " " 4 " Ball joint and socket (No. 5348-3, page 420) in mahogany Case . . . . . " 13 00

5335. Surveying Compass, like No. 5332, but without spirit levels, needle about 2½ in., Ball joint and socket (No. 5348-2, page 420) in mahogany Case " 8 00

5336. do. do. needle about 3 in., " " " " 9 00

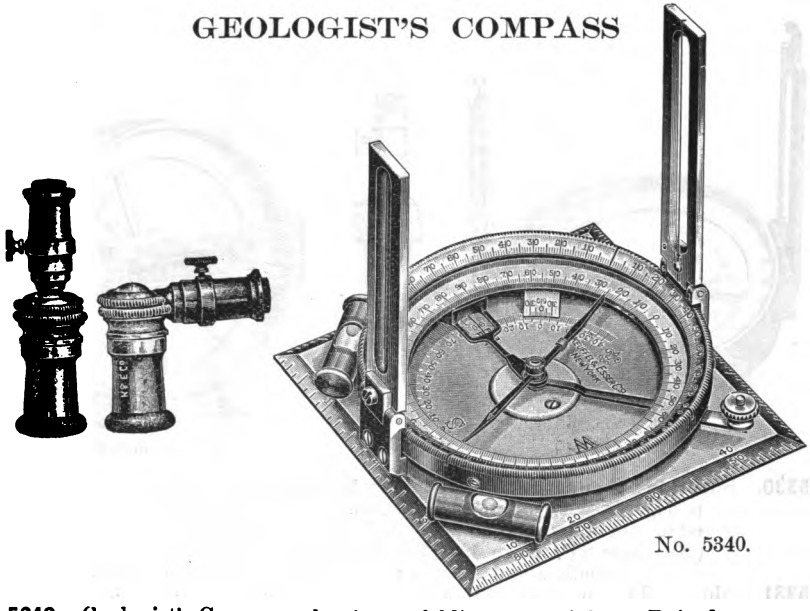
5337. do. do. " " 3½ " " " " " 11 00

5338. do. do. " " 4 " Ball joint and socket (No. 5348-3, page 420) in mahogany Case . . . " 11 50

For Leather Cases in place of mahogany, see page 418.

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GEOLOGIST'S COMPASS



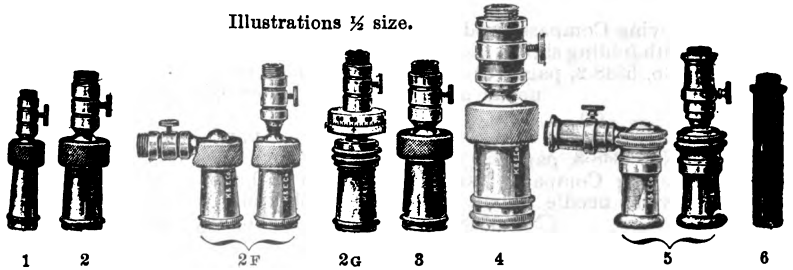
No. 5340.

5340. Geologist's Compass, aluminum, folding brass sights. Raised compass ring graduated to degrees, variation plate reading by vernier to 5 minutes. Improved needle about 2⅝ in. with stop, jeweled centre. Beveled ring on compass box, graduated to degrees and numbered in quadrants, with sighting mark at each quadrant, and knurled edge for revolving in azimuth. Pendulum clinometer graduatedt to degrees for 90 degrees in each direction. Base 4 x 4 in., all four edges beveled; two edges graduated as a protractor, one edge graduated to inches and eighths, representing chains on scale of 1 inch to 1 mile, the other edge graduated to inches and tenths. Two spirit levels on the base. A diagram of township numbering on under side of base. Instrument complete with ball joint and socket No. 5348-5 for Jacob Staff mounting, in sewed leather Case with Shoulder Strap . . . . . each **$ 25 00**

The Geologist's Compass is used largely in topographical work. It is light and portable. The variation of the needle is set off by revolving the raised compass ring by means of a slotted screw projecting through the side of the compass box, which serves also as set-screw. The beveled ring can be used for turning right angles or for sighting vertical angles by placing the edge of the base on a level surface.

BALL JOINTS AND SOCKETS FOR JACOB STAFF MOUNTING.

Illustrations ½ size.

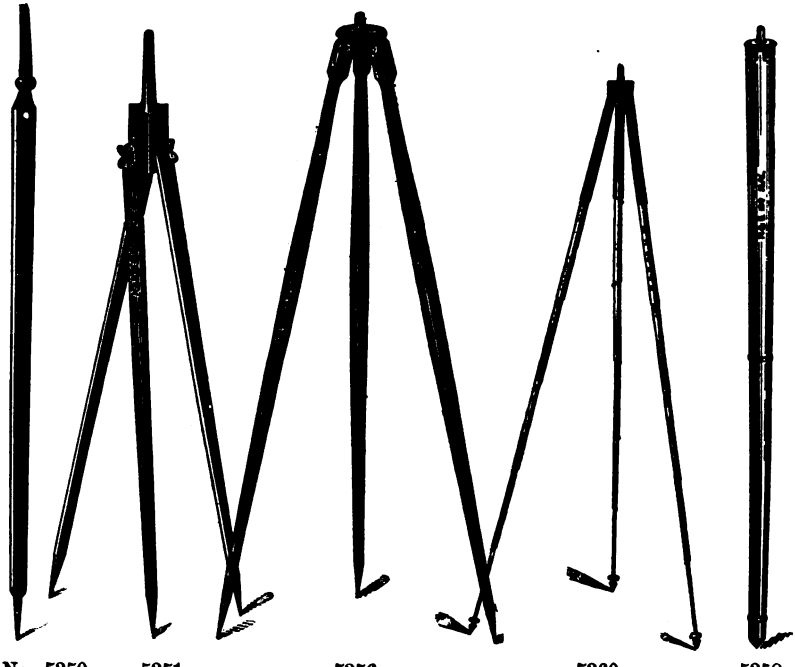


1	2		2F	2G	3	4		5	6
5348		**-1**	**-2**	**-2F**	**-2G**	**-3**	**-4**	**-5**	**-6**
	each	**$ 2 50**	**3 00**	**3 50**	**4 50**	**3 50**	**4 50**	**3 50**	**70**

For Jacob Staffs and Tripods, see page 421.

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JACOB STAFF AND TRIPODS.

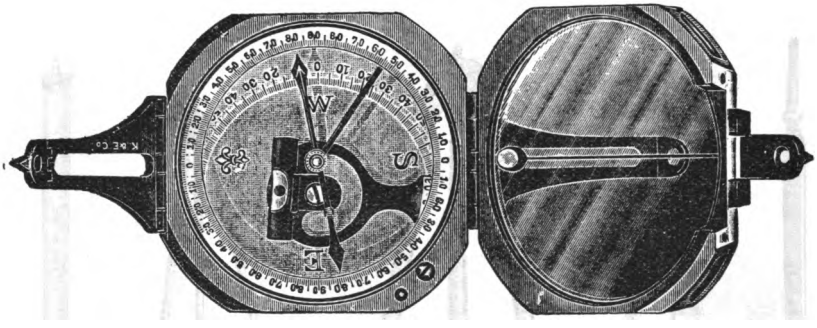


No. 5350 5351 5356 5360 5358

5350.	Jacob Staff, 54 in., hardwood, iron shoe	each	$ 1 00
5351.	Tripod, hardwood, with Jacob staff head, light, for compasses No. 5300 to 5340	"	3 00
5356.	do. hardwood, with brass staff-head for compasses, No. 5300 to 5340	"	5 00
5358.	do polished mahogany, round, cane pattern, with brass Jacob staff head, metal screw cap, for Nos. 5330, 5331, and instruments 5368, 5370, 5375, 5400, etc., .	"	10 00
5360.	Telescoping Metal Tripod, brass, black enamel finish, head and points nickelplated, brass Jacob staff head, for compasses, clinometers, hand levels, etc. Length closed 16½ in., extended 60 in.	"	6 50

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POCKET TRANSIT (after BRUNTON).

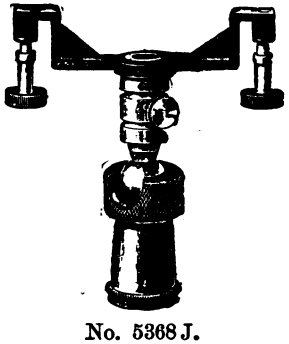


No. 5368.

5368. Pocket Transit (after Brunton), aluminum. Cover with fine mirror and centre line, hinged brass peep sight and sighting point. Raised compass ring and variation plate graduated to degrees. Variation set by pinion with slotted head. Improved needle about $2\frac{1}{8}$ in. with jeweled centre and automatic stop. Clinometer arc graduated to degrees, reading by vernier on clinometer arm to 5 minutes. Sensitive spirit level to clinometer arm. Instrument Case, made of solid aluminum casting, measures $2\frac{3}{4} \times 2\frac{3}{4} \times 1$ in. and weighs about 8 oz. . . . . each $ 22 50

5368S. Sewed Leather Sling Case for No. 5368 . . . . . " 2 25

5368J. Special ball joint and socket for mounting pocket transit No. 5368 on tripod . . . . . " 5 00



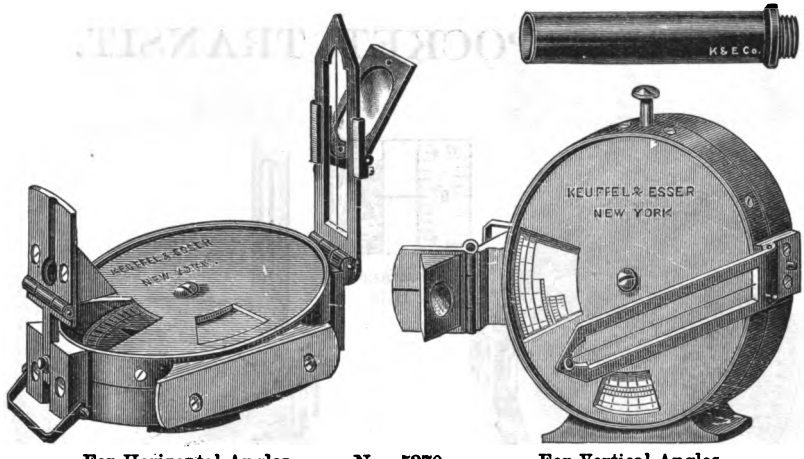
No. 5368J.

The Pocket Transit (after Brunton) combines the principal features of a sighting compass, prismatic compass, hand level and clinometer. It is an accurate and convenient instrument for topographic and preliminary surveys of all kinds. The variation is set off by revolving the raised compass ring by means of a slotted pinion projecting through a corner of the compass box.

For Tripod for Pocket Transit, see No. 5360, page 421.

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K & E HAND TRANSIT.



For Horizontal Angles No. 5370. For Vertical Angles

5370. K & E Hand Transit, Prismatic Compass, Clinometer and Altimeter, **aluminum case.** Compass dial 2¾ in. diameter graduated to half-degrees, jeweled centre, automatic stop, spring check. Hinged sight-vane with vertical wire and sliding reversible folding mirror. Clinometer and Altimeter formed by accurately balanced, sensitive, weighted disc, 2¾ in. diameter, with stop and spring check, giving angles of elevation or depression in half-degrees, and slopes in feet per 100 ft. horizontal, or centimeters per meter. Fiducial edge for clinometer. With tubular handle (No. 5348-6). With Directions . . each $ 25 00

5370S. Sewed leather Sling Case for No. 5370 . . . . . " 3 00

Folding Ball Joint and socket No. 5348-2F in place of tubular handle No. 5348-6. . . . . extra 2 80

To take the **horizontal** bearing of an object much above or below the plane of the observer the sight vane is provided with a folding adjustable mirror which can be placed with its face up or down. It slides on the sight vane with sufficient friction to remain stationary where placed.

The prism and the sight vane fold down, to store the instrument in its case.

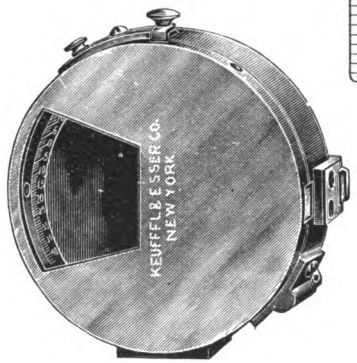
As the K & E Hand Transit reads angles in the **horizontal and in the vertical** plane and gives magnetic bearings, it is a useful instrument for rapid approximate work (preliminary surveying) or for filling in the details of larger surveys made with a transit.

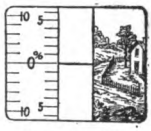
It is also used like a hand compass for rapid work (like in military surveying). By placing the instrument on a Tripod or Jacob staff its accuracy is increased. For very close work, the mean of repeated observations is taken.

For K & E Pocket Transit, see next page.
For Jacob Staffs and Tripods, see page 421.

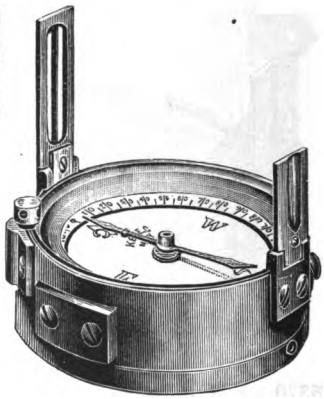
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K & E POCKET TRANSIT.





Appearance of field.



Clinometer side — No. 5373. — Compass.

5373. K & E Pocket Transit, combined sight compass and sight clinometer arranged on opposite sides of case. Aluminum case 2¾ in., Compass graduated on raised ring to single degrees, needle of improved shape with jeweled centre, automatic stop to needle, variation plate set by capstan-head pinion. Folding sights. Clinometer formed by a sensitive weighted ring with automatic stop, graduated for 45° in both directions to single degrees, and for slopes in feet per 100 ft. horizontal, or centimeters per meter. The scale readings and the sighted object are seen simultaneously (see cut). Fiducial edge (foot) for using instrument as contact clinometer. Adjusting pin of phosphor bronze (which will not disturb the needle) for setting the variation plate. Instrument in sewed leather Sling Case . . . . . .each $ 22 50

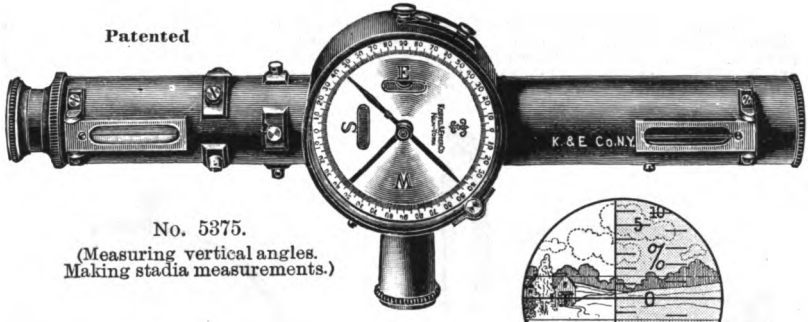
This is the most practical instrument for quickly determining vertical and horizontal angles and compass bearings. Vertical angles and slopes are read on the scale of a sensitive accurate pendulum disc. The results obtained are amply accurate for preliminary work, and as close as accurate graduations, careful centering and a perfect magnetic needle can make them in an instrument of this size.

The instrument is very substantially constructed, and will stand the rough usage incidental to the purposes for which it is intended.

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STADIA HAND TRANSIT.

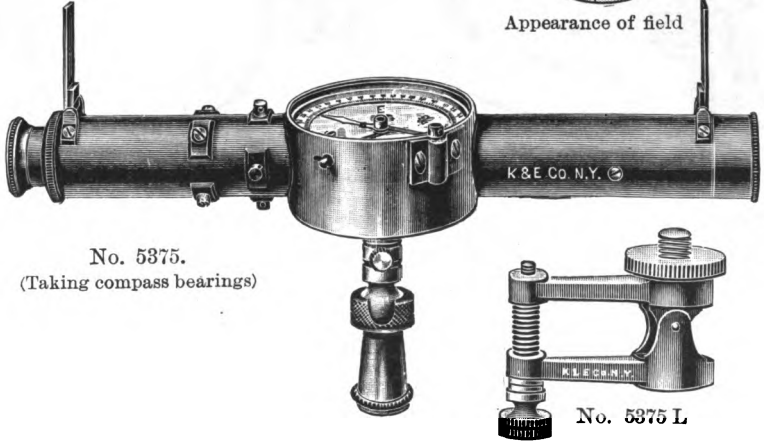
Patented



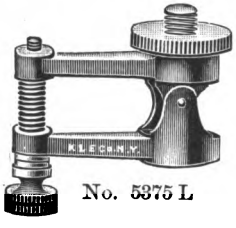
No. 5375.
(Measuring vertical angles.
Making stadia measurements.)



Appearance of field



No. 5375.
(Taking compass bearings)



No. 5375 L

5375. Stadia Hand Transit, achromatic terrestrial telescope 10 in., object glass 1 in., with cross hairs, and fixed stadia hairs ratio 1:100, folding sights. Clinometer and Altimeter formed by accurately balanced sensitive weighted ring with automatic stop, gives vertical angles to single degrees, and slopes in feet per 100 feet horizontal, or centimeters per meter, Compass $2\frac{3}{4}$ in., graduated on silvered raised ring to single degrees, variation plate set by capstan-head pinion, improved needle with jeweled centre, 2 spirit levels. Folding Ball joint and socket (No. 5348-2 F, page 420). Adjusting pin of phosphor bronze (which will not disturb the needle) for setting variation plate.
In velvet lined sewed leather Case with shoulder strap . . . . each $ 36 00

5375 L. Micrometer Leveling Attachment . . . . . » 3 50

The Stadia Hand Transit gives more accurate results than any similar portable instrument, and gives them in less time. In measuring vertical angles, the sighted object and the two scale readings (slopes and degrees) appear together in the field of view (see cut). Compass bearings can be sighted by the telescope on level ground or by the folding sights on sloping ground.

The Stadia Hand Transit is thoroughly well made and will meet the requirements of engineers and others who are engaged in preliminary work or in the subdivision of larger surveys made with a regular transit.

The Leveling attachment adds considerably to the accuracy of the Stadia Hand Transit, especially when sighting at long range.

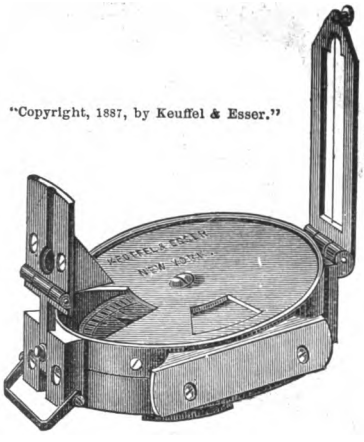
For Flexible (Pocket) Leveling Rods, see page 471.
For Jacob Staff and Tripods, see page 421.

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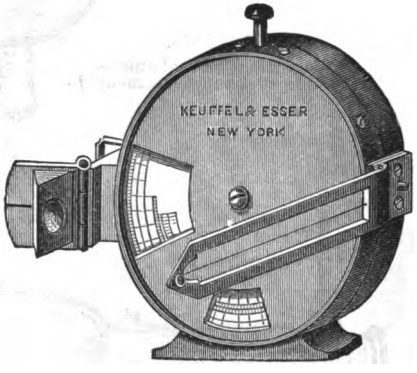
PRISMATIC COMPASSES.

Prismatic Compasses permit of observing the magnetic azimuth of objects not in the plane of the observer. The object, by means of the wire of the sight-vane is vertically projected to the plane of observation, so that angles are observed in one plane, like they are laid down on a map. Their accuracy can be increased by repeating the observations and taking their mean, or by backsighting.

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as Compass.



No. 5400. as Clinometer.

5400. Prismatic Compass, Clinometer and Altimeter, bronzed case. Compass dial 2¾ in. diameter, graduated to half-degrees, jeweled centre, automatic stop and spring check. Hinged sight vane with vertical wire. Gravity Clinometer and Altimeter formed by accurately balanced, sensitive, weighted disc 2¾ in. diameter, with stop and spring check, giving angles of elevation or depression in half-degrees and slopes in inches per yard. The inclination is read under the hair line on the cover glass. The compass is read by the lens-front prism which is adjustable for focus. Fiducial edge for clinometer. Plain tubular handle (No. 5348-6, page 420) for mounting on staff. With Directions . . . . . each $ 23 00

5400 M. Prismatic Compass, Clinometer and Altimeter, like No. 5400, but clinometer giving slopes in centimeters per meter . . . . . " 23 00

5405. Prismatic Compass, Clinometer and Altimeter, like No. 5400. The openings in the cover are much larger than in No. 5400, and the (lower) compass card is white to make the divisions better legible in dim light. With Directions . . . . . " 23 00

For Folding Ball joint and socket No. 5348-2F in place of tubular handle No. 5348-6 . . . . . add 2 80

5405 S. Sewed Leather Sling Case for Nos. 5400, 5400M or 5405 . . extra 3 00

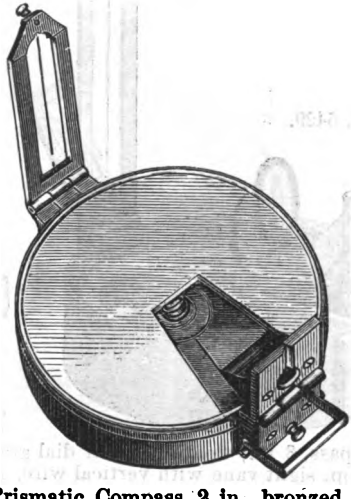
For Jacob Staff and Tripods, see page 421.

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No. 5408.

5408. Prismatic Compass, Clinometer and Altimeter, bronzed hunting case. Compass dial 2½ in. diameter graduated to half-degrees, jeweled centre, automatic stop, spring check. In the hinged cover is a circular glass with sighting line. Clinometer and Altimeter formed by accurately balanced weighted disc 2½ in. diameter, graduated to degrees and for slopes in inches per yard. In leather Sling Case . . . . . each $ 30 00



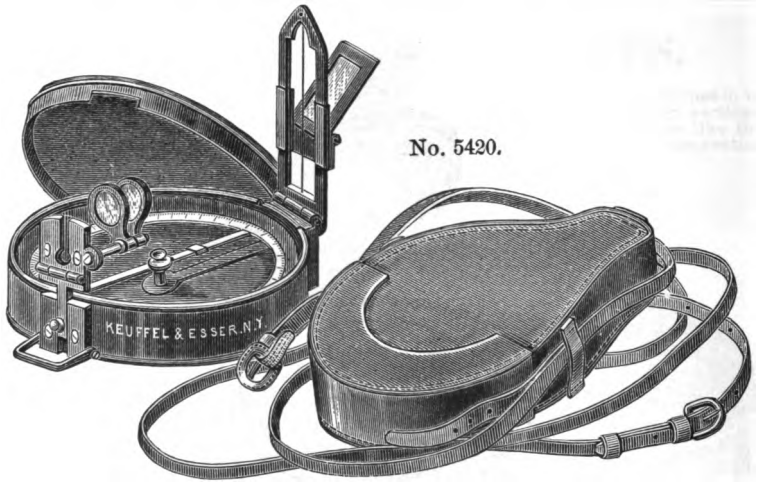
No. 5410.

5410. Hutchinson's Prismatic Compass, 2 in., bronzed, of improved pattern, nearly enclosed top, floating card dial graduated to degrees, jeweled centre, automatic stop and spring check, sight vane with vertical wire, in sewed leather Pouch, with Directions . . . . . each $ 11 00

5411. do. do. do. 3 in., in leather Sling Case. . " 16 00

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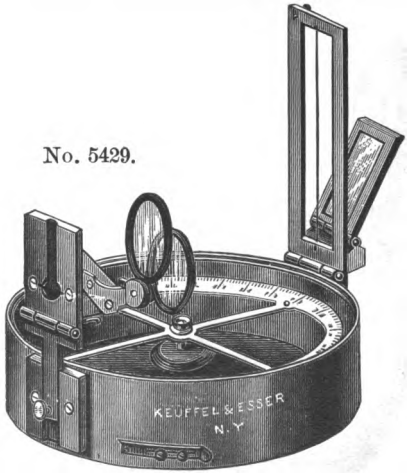


No. 5420.

5420. Prismatic Compass, 2⅝ in., floating aluminum ring, graduated to half-degrees, jeweled centre, automatic stop and spring check, hinged sight vane with vertical wire and sliding mirror, which can be reversed to face upwards or downwards when sighting objects much above or below the horizontal plane, dark glasses for observing the sun's magnetic azimuth, with tubular handle (No. 5348-6, page 420) in leather Sling Case, with Directions . . . . . each $ 25 00

5422. do. with Ball joint and Socket (No. 5348-2, page 420) and polished mahogany Tripod, cane pattern, No. 5358, (page 421) each 37 50

No. 5429.





5428. Prismatic Compass, 3 in., floating metal dial graduated to degrees, with stop, sight vane with vertical wire, Ball joint and Socket (No. 5348-2, page 420) for Jacob staff mounting, in mahogany Case, with Directions . . . . . each $ 12 85

5429. do. do. 3¾ in., floating metal dial graduated to half-degrees, neutral glasses for observing the sun, sight vane with vertical wire and attached hinged mirror, Ball joint and Socket for Jacob staff mounting in mahogany Case, with Directions . . . . each 21 50

5429S. Sewed Leather Sling Case in place of mahogany case . . extra 3 00

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SIGHT-COMPASSES.



No. 5441.



No. 5445.

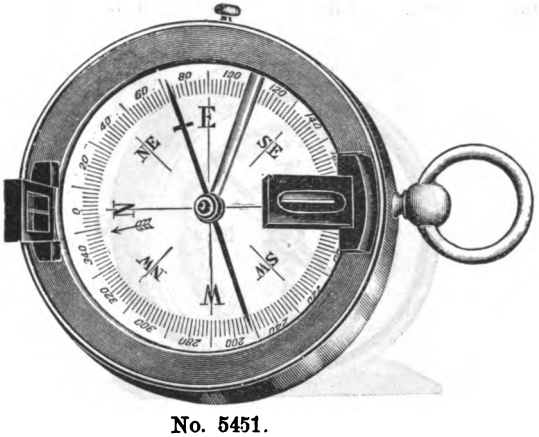
5440. Bronzed Pocket Compass, $2\frac{1}{2}$ in, pull-off cover, metal dial graduated to degrees, folding sights, edge-bar needle with jeweled centre and stop . . . . . each $ 5 25

5441. do. do. do. 3 in. . . . . " 6 25

5445. Bronzed Pocket Compass, $1\frac{3}{4}$ in., watch pattern, folding sights, graduated to 2 degrees on raised ring, needle with jeweled centre and stop . . . . . " 4 25

5446. do do. do. 2 in . . . . . " 4 75

5447. do. do. do. $2\frac{3}{8}$ in. . . . . " 5 25



No. 5451.

5451. Pocket Compass, 2 in., brass case, pull-off cover, folding sights, metal dial graduated to 2 degrees, edge bar needle with jeweled centre and stop . . . . . each $ 3 25

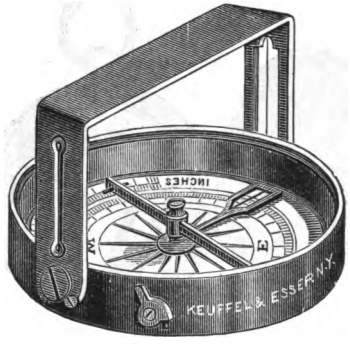
5452. do. do. do. $2\frac{3}{8}$ in. . . . . " 3 75

5453. do. do. do. $2\frac{3}{4}$ in. . . . . " 4 25

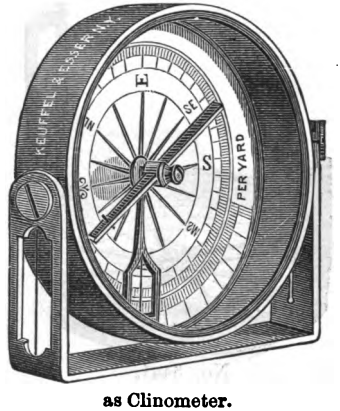
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COMPASSES WITH CLINOMETER.

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as Sight Compass.



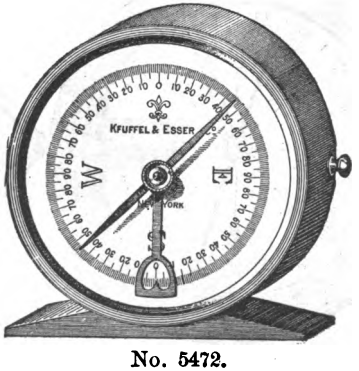
No. 5460.

as Clinometer.

5460. Bronzed Sight Compass and Clinometer, 2½ in. diameter, graduated to degrees, numbered in quadrants, bar-needle with stop. The sights are connected by a bar across the top, which when turned down serves as fiducial edge for the clinometer. The clinometer is graduated to give slopes in inches per yard and in degrees. This is a very practical instrument for taking angles, bearings, slopes, altitudes, etc. Its lightness and small size add to its usefulness. In polished mahogany Case . . . . . each $ 7 25

5461. do. do. do. do. 3 in. diameter " 8 75

5462. do. do. do. do. 4 " " " 10 50



No. 5472.

5472. Harvard Geological Compass and Clinometer . . . . . each $ 4 00

5472S. Leather Case for No. 5472 . . . . . " 75

This Geological Compass was devised by the Harvard Geological Department and has given excellent satisfaction. Bronzed brass, 2 in. diameter by ⅛ in. thick, silvered dial graduated to degrees, numbered in quadrants, needle of approved pattern with jeweled centre and stop. Pendulum Clinometer.

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BOAT COMPASSES.



No. 5490 N.

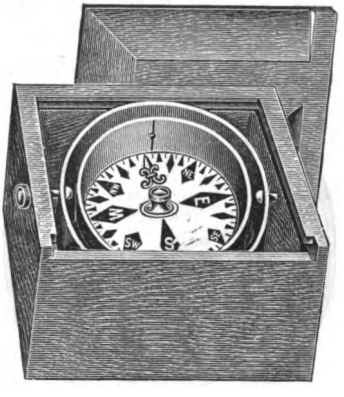


5493 N.

5490 N. Mariner's Pocket Compass, 2 in., bronzed brass, watch pattern, floating pearl dial, with stop, with **luminous** North and South points, compass suspended in nickel-plated gimbals in **telescoping** frame . . . . . each $ 8 50

5491 N.	Boat Compass, all metal, dial 1⅝ in.	"	4 50
5492 N.	" " " " " 2 "	"	5 50
5493 N.	" " " " " 2½ "	"	7 00
5494 N.	" " " " " 3¼ "	"	9 00

Compasses No. 5491 N to 5494 N have flat card dial, jeweled centre, cover glass with quadrant lines, brass bowl hung in gimbals, brass base, all metal nickelplated, with screw holes. Compass can be attached to horizontal or vertical surface. A neat, well made compass for use on small boats.



No. 5495.

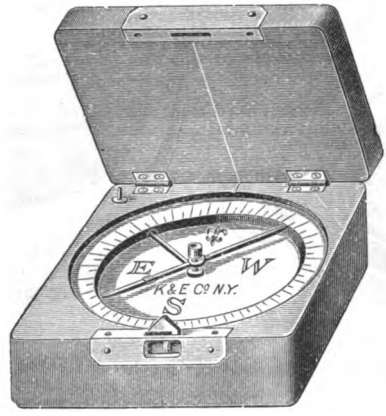
K & E Dry Compasses, flat card dial, jeweled centre, brass bowl hung in gimbals, in mahogany slide-lid box.

5495.	Boat Compass, dial 2 in., box 3⅞ × 3⅞ in.	each	$ 3 50
5496.	" " " 3 " " 4⅛ × 4⅛ "	"	4 00
5497.	" " " 4 " " 6⅛ × 6⅛ "	"	4 75
5498.	" " " 5 " " 7⅛ × 7⅛ "	"	5 50
5499.	" " " 6 " " 8¼ × 8¼ "	"	6 50

For Liquid Compasses, Binnacles, Peloruses, &c. see our Catalogue of Nautical Instruments.

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SPECIAL POCKET COMPASSES.



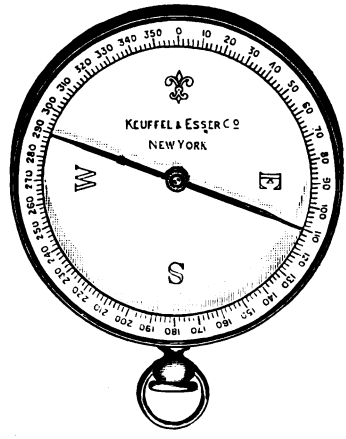
No. 5602.

5602. Military Compass, 3×3 in., needle 2 in. with jeweled centre and automatic stop, graduated on raised metal ring to degrees, numbered 0—360. Polished mahogany box with sighting line on lid . . . . . each $ 3 50

5602 X. Military Compass, like No. 5602, but numbered in quadrants. . . . . " 3 50

5602½. Military Compass, like No 5602, but 3¾×3¾ in., needle 2½ in., numbered 0—360 . . . . . " 4 50

5602½ X. Military Compass, like No. 5602½, but numbered in quadrants. . . . . " 4 50



No. 5603.

5603. Forester's Compass, 3 in., nickelplated, graduated on raised ring to 2 degrees, fine bar-needle about 2⅜ in., with jeweled centre, stop to needle (from pendant). each $ 4 50

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POCKET COMPASSES,

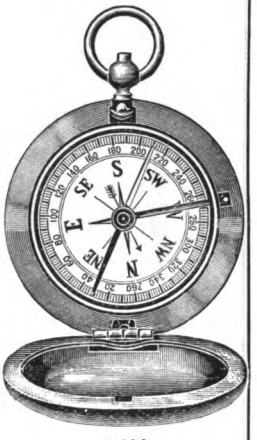
Watch Pattern, Hunting Case.



No. 5610.



5614.



5620.

5610. Pocket Compass, $1\frac{3}{4}$ in., watch-pattern hunting case, nickel-plated, Singer Pearl Dial, edge bar needle with jeweled centre and stop. . . . . each $ 4 40

5614. Pocket Compass, watch-pattern hunting case, nickel-plated, silvered metal dial graduated to 2 degrees, numbered in quadrants every 10 degrees, edge bar needle with jeweled centre and stop.

Size	$1\frac{3}{8}$	$1\frac{3}{4}$	2 in.
Price	$ 2 60	2 90	3 05

5616. Pocket Compass, watch-pattern hunting case, nickel-plated, paper dial graduated to 2 degrees, numbered every 20 degrees, from 0 to 360°, edge bar needle with jeweled centre and stop.

Size	$1\frac{3}{8}$	$1\frac{3}{4}$	2 in.
Price	$ 1 90	2 30	2 65

5618. Pocket Compass, watch-pattern hunting case, nickel-plated, metal dial graduated every 2 degrees, numbered every 20 degrees from 0 to 360°, needle with jeweled centre and stop.

Size	$1\frac{3}{8}$	$1\frac{3}{4}$	2 in.
each	$ 1 80	2 20	2 40

5620. Pocket Compass, plain hunting case, nickel-plated, metal dial graduated every 2 degrees, numbered every 20 degrees from 0 to 360°, needle with jeweled centre and stop.

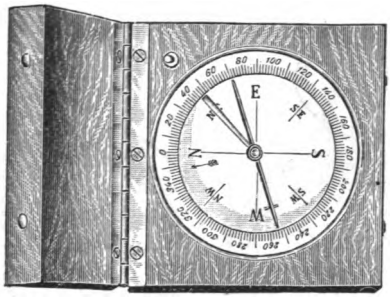
Size	$1\frac{3}{8}$	$1\frac{3}{4}$ in.
each	$ 1 20	1 30

5622. Pocket Compass, plain hunting case, nickel-plated, with paper dial, plain needle, no stop.

Size	$1\frac{1}{4}$	$1\frac{3}{8}$	$1\frac{3}{4}$ in.
each	$ 40	45	55

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POCKET COMPASSES.



No. 5630.



5636.

5630. Pocket Compass, 3 in. square mahogany case with hinged cover, metal dial, graduated on raised ring to 2 degrees from 0 to 360°, edge bar needle with jeweled centre and automatic stop . . . . . each $ 2 00

5632. Pocket Compass, like No. 5630, but graduated on metal dial, numbered in quadrants every 10 degrees . . . . . each 1 75

Pull-off cover.

5636. Pocket Compass, heavy brass case, pull-off cover, metal dial, graduated on raised ring to 2 degrees, numbered every 20° from 0 to 360, edge bar needle with jeweled centre and stop.

Size	2	2⅜ in.
each	$ 2 25	2 50



No. 5638.



5640.

5638. Pocket Compass, heavy bronzed brass case, pull-off cover, silvered metal dial, graduated to 2 degrees, numbered every 20° from 0 to 360, edge bar needle with jeweled centre and stop.

Size	2	2⅜ in.
each	$ 1 35	1 60

5640. Pocket Compass, heavy bronzed brass case, pull-off cover, enameled card dial, graduated to 2° and numbered every 10° in quadrants, with jeweled center and stop.

Size	2	2⅜ in.
each	$ 1 15	1 40

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POCKET COMPASSES,

PULL-OFF COVER.



No. 5642.



5648.

5642. Pocket Compass, brass, pull-off cover, metal dial graduated to 2 degrees, numbered every 20 degrees from 0 to 360°. Needle with jeweled centre and stop.

	Size	1⅜	1½	2 in.
	each $	80	90	95

5644. Pocket Compass, brass, pull-off cover, metal dial. Needle with stop.

	Size	1¼	1⅜	1¾ in.
	each $	50	55	70

5646. Pocket Compass, brass. pull-off cover, plain paper dial graduated to 2° and numbered every 10°. Needle without stop.

	Size	1¼	1⅜	1¾ in.
	each $	30	35	40

5648. Pocket Compass, brass, pull-off cover, paper dial numbered every 10°. Needle without stop.

	Size	1¼	1½	1¾ in.
	each $	20	25	30

WATCH PATTERN.



No. 5660.



5662.



5664.

5660. Pocket Compass, open face gun-metal finish, silvered metal dial graduated every 2°, numbered in quadrants every 10 degrees. Needle with jeweled centre and stop.

	Size	1¼	1⅜	1½ in.
	each $	1 40	1 45	1 50

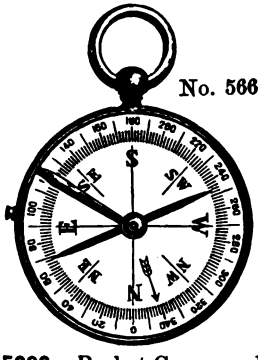
5662. Explorer's Pocket Compass, 1¾ in. open face, brass finish, metal dial graduated every 2° and numbered every 20° from 0 to 360°. Needle with jeweled centre and stop, direction pointer, adjusted by turning milled edge . . . . . each $ 1 60

5664. Pocket Compass, brass, metal dial graduated on raised ring every 2°, numbered every 20° from 0 to 360°. Needle with jeweled centre and stop.

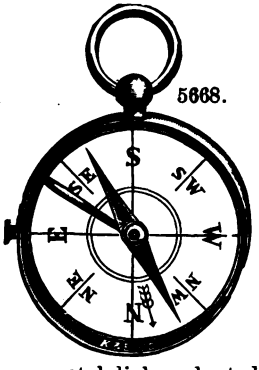
	Size	1⅜	1½	2 in.
	each $	1 10	1 20	1 25

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POCKET COMPASSES. (Watch Pattern.)



No. 5666.



5668.



5672.

5666. Pocket Compass, brass, metal dial graduated every 2 degrees and numbered every 20 degrees from 0 to 360°. Needle with jeweled centre and stop.

Size	1⅜	1¾	2 in.
each $	90	1 00	1 05

5668. Pocket Compass, brass, metal dial, cardinal points, needle with stop.

Size	1¼	1⅜	1¾ in.
each $	50	55	65

5670. Pocket Compass, like No. 5668, but without stop to needle

Size	1¼	1⅜	1¾ in.
each $	35	40	50

5672. Pocket Compass, brass, paper dial numbered every 10°, needle without stop.

Size	1¼	1⅜	1¾ in.
each $	20	25	35



No. 5680.



5682.



5684.

5680. Pocket Compass, 1⅝ in. gun-metal finish, fancy metal dial, graduated every 6° on brass ring, needle without stop. . . . each $ 40

5682. Pocket Compass, nickel-plated, metal dial, graduated to 2° and numbered every 20° from 0 to 360°, needle with jeweled centre and stop.

Size	1⅜	1¾	2 in.
each $	75	90	1 00

5684. Pocket Compass, nickel-plated, metal dial, graduated to 2° and numbered every 20° from 0 to 360°, needle without stop.

Size	1¼	1⅜	1¾ in.
each $	35	40	50

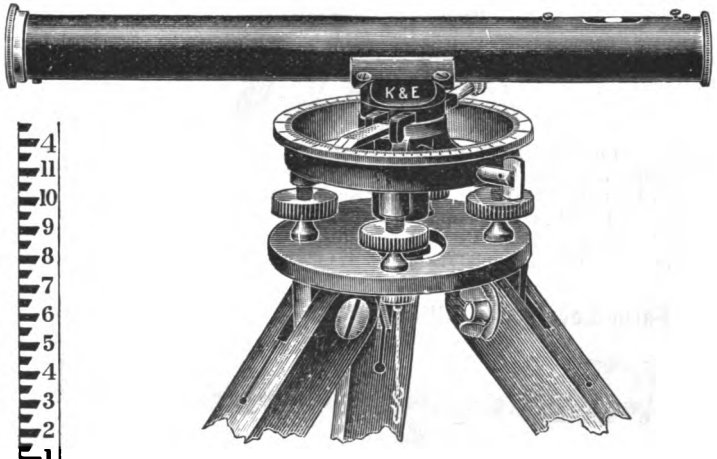
5686. Pocket Compass, nickel-plated, likeNo. 5684, but with paper dial.

Size	1¼	1⅜	1¾ in.
each $	25	30	40

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FARM LEVELS.

K & E Farm Levels have been designed especially for draining, ditching and road-making and for laying out parks, gardens, agricultural plots, etc. They are strongly and accurately built and for the purposes of the Landscape Gardener, Road Builder and Farmer, give very good results. Full description and plain directions, free from technical terms, written expressly for those who are not surveyors, are furnished with each level.



No. 5690.



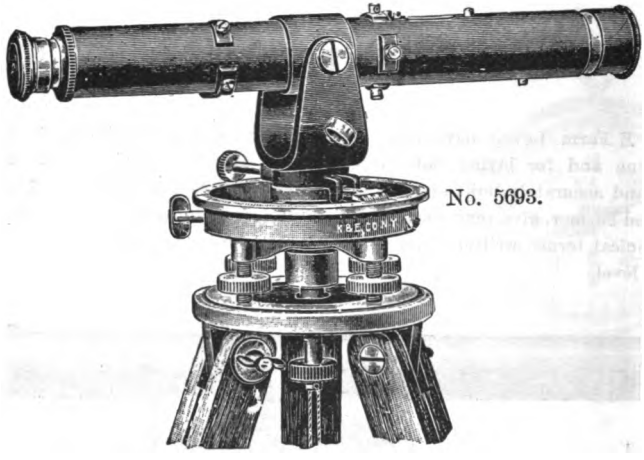
A section of the flexible rod.

5690. **Farm Level,** Sighting Tube 10 in., pinhole eyepiece, plain glass front, with spirit level and cross-hairs, 4 in. horizontal circle graduated to degrees. Instrument complete, in wooden Box with lock-hooks and metal handle, Plumb bob, 6-foot flexible Leveling Rod No. 6335 S, (page 471,) plain Tripod, with Directions . . . . . each $ 16 00

5692. **Farm Level,** like No. 5690, but with **Telescope,** 10 in., with good lenses, object glass 1 in., shows objects erect. Complete with Plumb bob, 6-foot flexible Leveling Rod No. 6335 S, (page 471,) plain Tripod, with Directions . . . . . each 25 00

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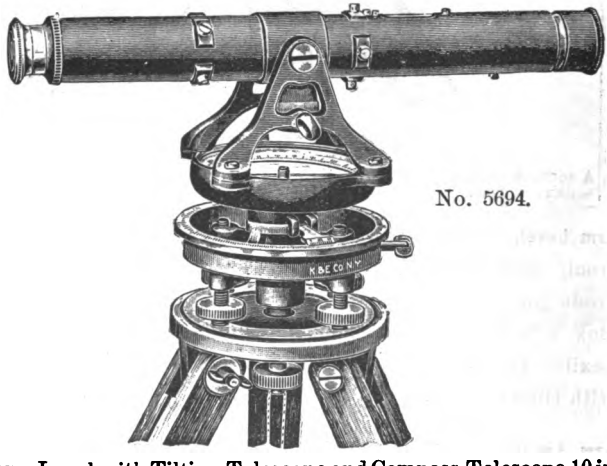
Farm Level with Tilting Telescope.



No. 5693.

5693. Farm Level with Tilting Telescope, Telescope 10 in., with good lenses, object glass 1 in., shows objects erect. Horizontal circle graduated to degrees. Vernier reading to 10 minutes. Sensitive Spirit Level in telescope. Instrument complete in wooden Box with lock-hooks and metal handle, Plumb Bob, 6 foot flexible Leveling Rod No. 6335 S (page 471) and plain Tripod . . each $ 30 00

Farm Level with Tilting Telescope and with Compass.



No. 5694.

5694. Farm Level with Tilting Telescope and Compass, Telescope 10 in., with good lenses, object glass 1 in., shows objects erect. Horizontal circle graduated to degrees. Vernier reading to 10 minutes. Compass Needle 2½ in., compass circle graduated to degrees. Sensitive Spirit Level in telescope. Instrument complete in wooden Box with lock-hooks and metal handle, Plumb Bob, 6 foot flexible Leveling Rod No. 6635 S. (page 471) and plain Tripod. . . each $ 38 00

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HAND LEVELS.



No. 5700.

5700. Locke's Hand Level, German silver, with draw to eyepiece 5 in., in leather pouch . . . . . each $ 7 00

5701. Locke's Hand Level, bronzed Brass with draw to eyepiece, 5 in., in leather pouch . . . . . " 5 50

5702. Locke's Hand Level, Brass, plain, 5 in., in leather pouch . " 4 50

Nos. 5700-5701 havem agnifying lens for the bubble at the end of the draw.



Diagram, showing bubble in field of view



Patented "Copyright, 1894, by Keuffel & Esser Co." No. 5703.

5703. K & E Patent Hand Level, square tube, bronzed, 5 in., in Case, each $ 4 00

5704. do. do. " " nickelplated, " " 4 00

In Nos. 5703 and 5704 the reflector is a narrow prismoid, crossing the middle of the field of view, so that the field appears on both sides of the reflected bubble, as shown in above diagram. As the lower surface of the tube is flat and parallel with the bubble, these hand levels can be used also as contact levels.

The Hand Level is a great help in chaining accurately and quickly.

STADIA HAND LEVEL (Telescopic).



No. 5706.







No. 5375 L. (⅓ size)

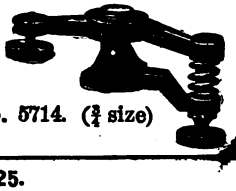
5706. Stadia Hand Level, telescope 10 in., stadia hairs fixed, ratio 1:100, object-glass 1 in., with Ball joint and Socket, (No. 5348-2, page 420) in Leather Sling Case . . . . each $ 18 00

5375 L. Micrometer Leveling Attachment as used with Stadia Hand Level . . . . . " 8 50

The Stadia Hand Level has an achromatic erecting 10-inch telescope with 1-inch objective. The objective is drawn out for focusing and the eyepiece is adjustable for defining the stadia hairs. This instrument will be found very useful for preliminary surveys, cross-sectioning, railroad construction work, exploration of streams for water power, etc. When set on a staff or tripod, a fairly accurate line of levels can be run. It is easily carried, as it weighs scant 1½ pounds. In connection with a flexible leveling rod it constitutes a good outfit for preliminary work, on account of its light weight and ease of manipulation

MICROMETER LEVELING ATTACHMENT.

5714. Micrometer Leveling Attachment (for Abney Levels, etc.) bronzed brass, in leather Case . . . each $ 8 00



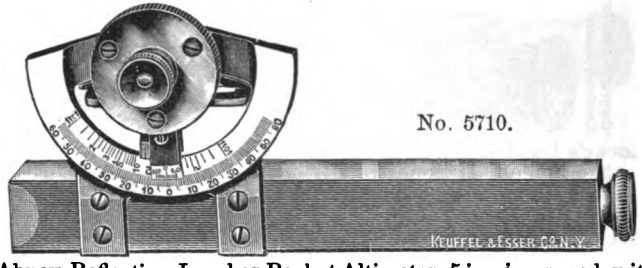
No. 5714. (¾ size)

For Stadia Hand Transit, see page 425.
For Flexible Leveling Rods, see page 471.

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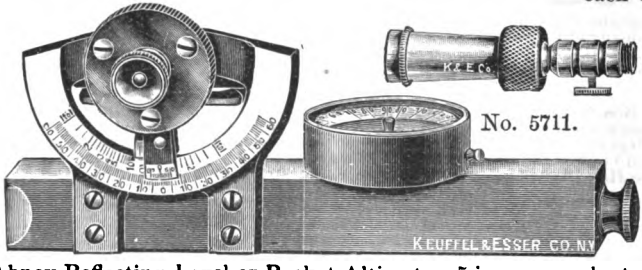
ABNEY LEVELS.

"Copyright, 1890, by Keuffel & Esser Co."



5710. Abney Reflecting Level or Pocket Altimeter, 5 in., improved, with arc graduated to degrees for 60°, vernier reading to 10 minutes, gradients 1:1 to 1·10 in both directions, in mahogany Case each $ 13 50

5710S. Abney Reflecting Level No. 5710, but in sewed leather Sling Case each $ 14 50

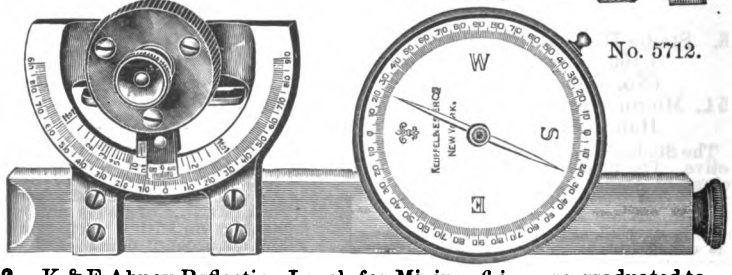


5711. Abney Reflecting Level or Pocket Altimeter. 5 in., arc graduated like in No 5710, bar-needle Compass 1⅜ in., Ball joint and Socket (No. 5348-1, page 420) for Jacob Staff mounting, in mahogany Case. . . . . each $ 18 00

5711S. Abney Reflecting Level No. 5711 but in sewed leather Sling Case each $ 19 00

MINER'S ABNEY LEVEL.



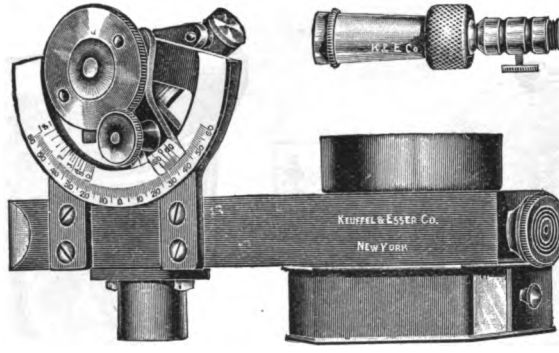


5712. K & E Abney Reflecting Level, for Mining, 6 in., arc graduated to degrees for 90°, vernier reading to 10 minutes; gradients from 1:1 to 1:10 in both directions. Base of tube is finished so that the instrument can be used also as contact level. Compass 2 in., silvered dial graduated to degrees, needle about 1⅜ in., jeweled centre, and stop. Two screw threads, so that level can be mounted on the socket either with the arc vertical or with the compass horizontal. Instrument complete with Ball joint and Socket, (No. 5348-1, page 420) in stout velvet lined sewed Leather Sling Case . each $ 20 00

For Leveling Attachment, see page 439.

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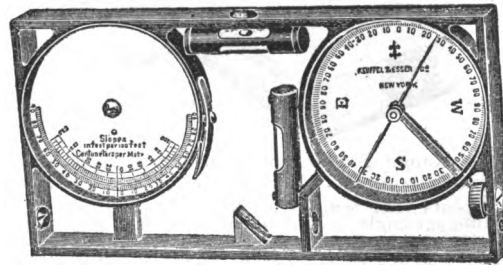
RECONNOISSANCE LEVEL.



No. 5715.

5715. Reconnoissance Level, 5 in. This is an Abney level with 1⅜-in. compass, similar to No. 5711, in combination with Penta-Prism Range Finder No. 5745. (see page 443). As it is a Universal Instrument giving bearing, grade and distance, it is very useful for reconnoissance and preliminary surveying. It is recommended also for use by military officers. Instrument with Ball joint and Socket (No. 5348-1, page 420) for Jacob staff mounting, in sewed velvet-lined leather Sling Case, with Directions for the range finder . each $ 34 00

K & E POCKET OMNIMETERS.



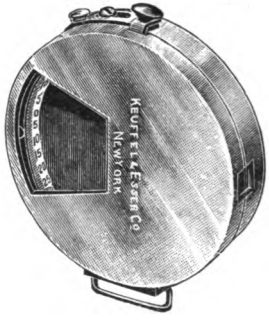
No. 5718.

5718. K & E Pocket Omnimeter, in sewed leather Case . . . . . each $15 00
5719. " " " like No. 5718, but with folding Sights, in sewed leather Case . . . . . " 18 00

The K & E Pocket Omnimeter combines compass, clinometer, hand level, plumb, alidade, and contact level; it will indicate magnetic bearings, azimuth angles, altitudes, levels and slopes. The Omnimeter No. 5719 with folding sights indicates also azimuth angles of objects not in the horizontal plane. The rectangular frame of aluminum, 5¼x2⅝x½ in., serves as fiducial edge. Compass 2 in. diameter, graduated to 2 degrees, numbered at every 10 degrees, in quadrants, needle with jeweled centre and stop. Gravity Clinometer 2 in. diameter, graduated to 2 degrees and to slopes in feet per 100 feet horizontal or centimeters per meter. The prism of the hand level is attached to one of the long sides and its spirit level is on the opposite side of the frame. The spirit level is as sensitive as is admissible in a hand level. Weight about 5 ounces.

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MILITARY CLINOMETER.





Appearance of field.

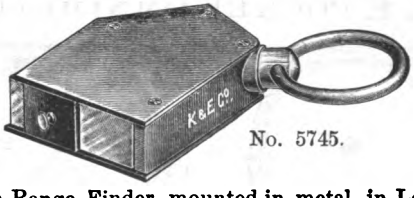


No. 5721.

5721. Military Clinometer as made by us for the U. S. Army, bronzed case 2¾ in. diam., sensitive weighted ring clinometer graduated 45° in both directions to single degrees, numbered at every 5 degrees, with automatic stop. In sewed leather Case with belt loop. . . . . each $ 17 50

The scale reading and the sighted object are seen simultaneously (see cut). The instrument has a fiducial edge (feet) for using it as contact clinometer and a wire loop for attaching a carrying strap.

PENTA-PRISM RANGE FINDER.



No. 5745.

5745. Penta-Prism Range Finder, mounted in metal, in Leather Case, with Directions . . . . . each $ 10 00

No. 5745 is a pentagonal prism, (like No. 5765, page 445,) but the ocular side has two faces, of different angle, one of which is alternately exposed by shifting the sliding shutter. Distances up to over two miles can be determined from the point of observation with sufficient accuracy for many of the requirements of the surveyor or military officer. The method of using it is extremely simple and very easily acquired with but little practice. Complete directions are furnished with the instrument. To obtain the distance sought, the base line, as determined by the prism, is measured and multiplied by 50 (½°). The angles of the prism are ground so accurately that no tables are required. Right angles are determined with this prism with great accuracy in the usual way

TAPE FOR MEASURING THE BASE LINE.

7482Y. K & E Metallic Tape, length 20 yards, graduated to read 1000 yards by single yards . . . . . each $ 4 00

This is a **K & E** Metallic Tape, 3/8 in. wide, stout bent leather case, **large centre, folding handle**, all mountings nickelplated, line interwoven with metal, end re-enforced with leather. The line is 20 yards long and graduated on a scale of 1 : 50 to read direct up to 1000 yards by single yards.

The tape in its case measures about 3-5/8 x 5/8 in. and weighs about 9 oz. Its compactness and light weight make it convenient for carrying in the pocket.

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ANGLE MIRRORS.

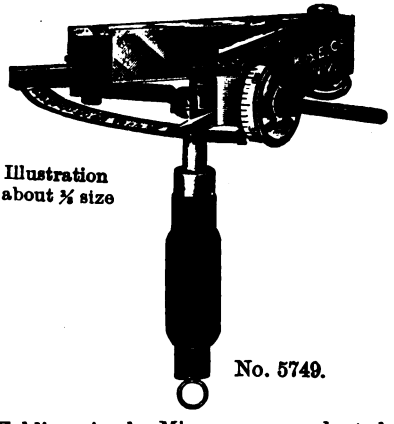


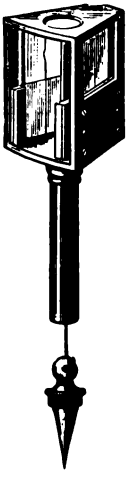
Illustration about ⅓ size

No. 5749.

5749. Adjustable Folding Angle Mirror, arc graduated to degrees with Micrometer screw reading to minutes, folding ebony Handle, in velvet lined morocco Case, with Directions . . . . . each $ 15 00

This Angle Mirror has the advantage that the angle of the mirrors is not fixed, but adjustable. It is determined by an arc graduated from zero to 100 degrees, figured in accordance with the angle of the sighted point, being consequently double the angle of the mirrors. With this instrument offsets may be laid down at any angle up to 100 degrees from a given base, and distances to inaccessible points may be determined by measuring base and angle, when distance = base × tangent of angle. This computation for distance can also be worked out in a very simple manner by means of the slide rule.

This Angle Mirror will be found very useful, not only for the Surveyor and Civil Engineer, but also for the Military Officer, Traveler, etc.



No. 5750.

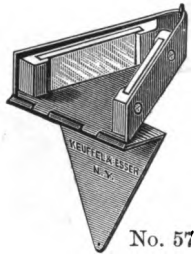


5751.

5750. Angle Mirror, for angles of 90 degrees, with small plumb bob, which is threaded to stow it in the handle. The handle can be unscrewed and stowed in frame of instrument, in morocco Case . . . . . each $ 7 50

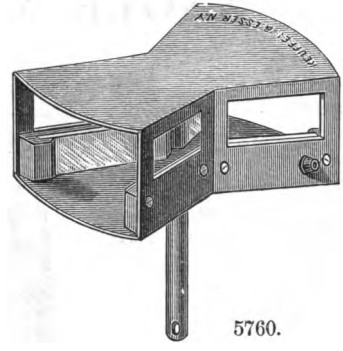
5751. Angle Mirror, plain, for angles of 90 degrees, in morocco Case " 5 00

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No. 5752.

"Copyright, 1887, by Keuffel & Esser."



5760.

Illustration about ½ size.

5752. Angle Mirror, for angles of 90 degrees, in brass casing, cover folding back to serve as handle. . . . . each $ 6 00

5760. Double Angle Mirror, one side for angles of 90 degrees, the other for angles of 45 degrees, in mahogany Case . . " 10 00

5761. Double Angle Mirror, like No. 5760, but for angles of 90 and 60 degrees . . . . . " 10 00

ANGLE PRISMS.

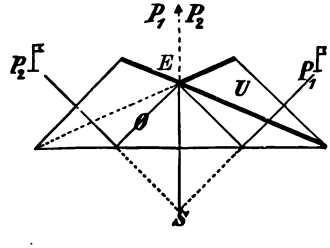
Illustration about ½ size.





No. 5762.

5763.



5762. Rectangular Prism, for angles of 90 degrees, in morocco Case . . . . . each $ 5 00

5763. Double Prism, for angles of 90° and 45°, in morocco Case " 10 00

This neat and simple instrument consists of two prisms of 22½ × 45×112½°, placed one above the other in brass mounting, to the handle of which a plumb line can be attached. The longer sides of the prisms are placed in one plane, facing the observer, and the reflecting surfaces cross each other at E. When one prism is used alone, an angle of 45° can be set off. By using both prisms, the observer will see the object P_2 in the upper prism to the right and object P_1 in the lower prism to the left. When the position is shifted, so that the two objects are seen one vertically above the other, the observer is in the apex of the right angle, between the two objects.

This instrument is very useful in cross-sectioning and dividing up land, also for laying out building-grounds, etc.

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5765. Pentagonal Prism, for angles of 90 degrees, with detachable Handle, in morocco Case . . each $ 8 50

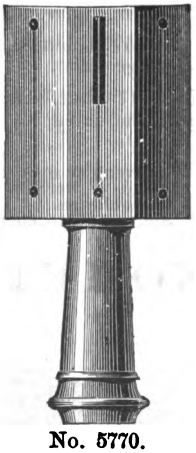
Of the five faces of the prism two are polished and open. The longer two of the other faces are polished and silvered and covered by the casing. The fifth (short) face has no optical function. By this novel optical construction the reflected immovable image is much more distinct and much better illuminated than in triangular prisms, while its size is about twice that produced by the latter. These pentagonal prisms are therefore far superior to triangular prisms of similar size and give more accurate results, with easier manipulation.



Illustration ⅞ size.

No. 5765.

STAFF HEADS.



No. 5770.

5770. Cross Staff Head, octagonal, 2½ in., Socket for Jacob staff, in Case. . . . . each $ 2 75

5772. Cross Staff Head, 3 in., with magnetic Compass, graduated on raised ring to 2 degrees, needle about 1¾ in., in Case " 4 75

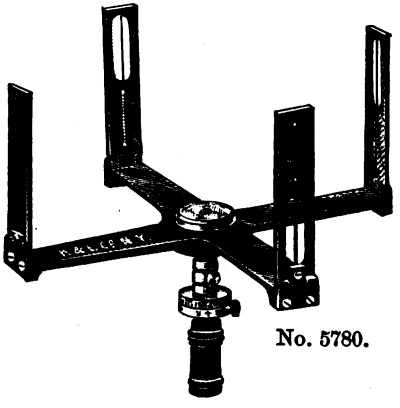
5775. Cross Staff Head, revolving, with rack-movement, German silver rim graduated to degrees, with vernier reading to 2 minutes, Compass graduated to 2 degrees, needle about 2⅛ in. with jeweled centre and stop, in Case . . " 11 50

For Jacob Staff and Tripods, see page 421.

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SURVEYOR'S CROSSES

(STAFF HEADS.)



No. 5780.

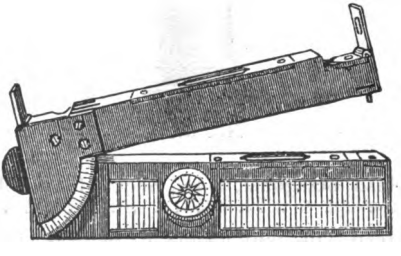
5778. Surveyor's Cross, bronzed brass, 8 in., strong ribbed arms, folding fore and back-sights, circular spirit level 1¼ in., Ball Joint and Socket (No. 5348-2, page 420) for Jacob Staff mounting, in wooden Box . . . . . each $ 6 50

5779. Surveyor's Cross, like No. 5778, but with Ball joint and Socket (No. 5348-2, page 420) . . . . . " 9 50

5780. Surveyor's Cross, like No. 5779, but Ball Joint and socket with silvered ring graduated to 5 degrees (No. 5348-2 G, page 420) . . . . . " 11 00

The Surveyor's Cross is an improvement over the staff head, as its greater size makes it more accurate. For some kinds of work it is preferable to more elaborate instruments on account of ease of manipulation.
It is used chiefly by Builders, Landscape Gardeners, Farmers, etc.

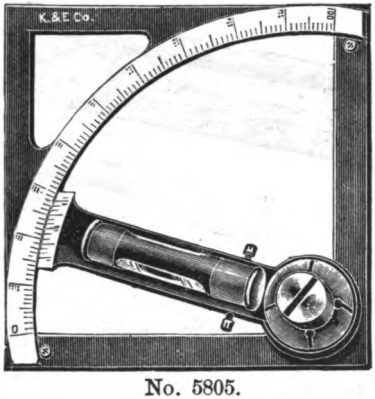
CLINOMETERS.



5800. Boxwood Clinometer, 12 in., folding to 6 in., brass mountings, with 2 spirit levels, compass, brass arc graduated to degrees also giving gradients from 1 to 6, tables giving slopes 1 to 100 and inches per yard, in leather Pocket Case . . . . . each $ 9 20

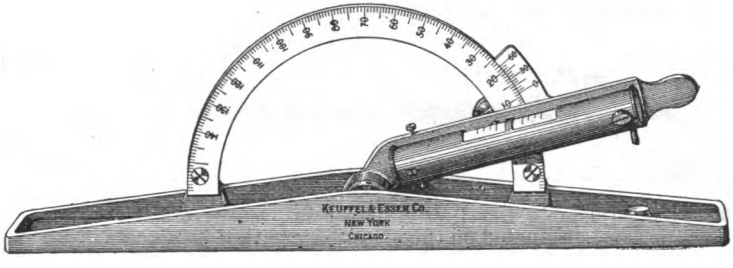
5801. do. do. do. with folding sights, in leather Pocket Case " 12 40

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No. 5805.

5805. Clinometer or Slope Level, bronzed, square frame 4 in., with silvered arc graduated to degrees, vernier reading to 5 minutes, fine adjustable spirit level graduated on the glass, in mahogany Case . . . . . each $ 10 00



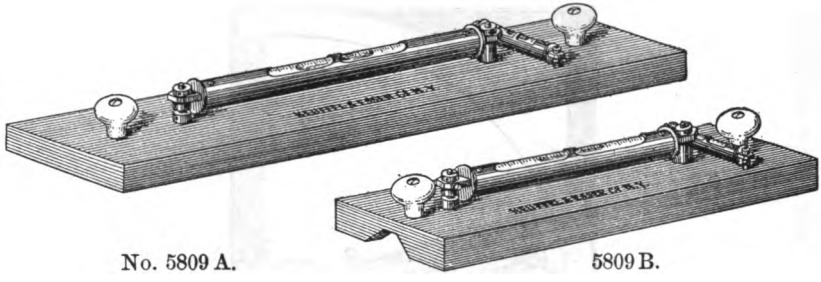
No. 5808.

5808. Combined Level and Clinometer, bronzed, base 9 in., silvered arc 4½ in. diameter, graduated to degrees, vernier reading to 5 minutes, fine adjustable spirit level graduated on the glass, arm with clamp-screw, in mahogany Case . . . . . each $ 12 00

This is a very practical level for Civil Engineers, Architects, Machinists, Builders and others. It can be applied direct in mounting machinery, construction material etc. or it can be used on a straightedge to determine the slope of ground, embankments or excavations, in laying rails and for other similar purposes.

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LEVELS.



No. 5809 A. 5809 B.

5809 A. Extra Fine Adjustable Level, iron base 18×4×1 in., spirit level 9 in., graduated on the glass and ground to a sensitiveness of about 20 sec. of arc per graduation, weight about 13 lb., in hardwood case, each $ 20 00

5809 B. do. do. iron base 12×3×1 in., spirit level 6 in., graduated on the glass and ground to a sensitiveness of about 25 sec. of arc per graduation, weight about 5 lb., grooved base . . . . . " 16 00

5809 C. do. do. iron base 12×3×1 in., very sensitive spirit level 6 in., graduated on the glass and ground to a sensitiveness of about 25 sec. of arc per graduation, weight about 6 lb., flat base. . . . " 12 00

The levels No. 5809 are of the finest workmanship and of the greatest precision and very sensitive. The spirit levels are graduated on the glass and are adjustable. Each level is provided with a cross level for accurate adjustment. No. 5809 B has a grooved (V-shape) base for use on round surfaces, such as shafting. We recommend these levels for the most particular and delicate work.

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No. 5810.



5810. Fine adjustable Level, iron base 8 in., sensitive spirit level graduated on the glass, base with side braces to make it more rigid, level vial 3½ in., . . in Case, each $ 6 50

5811. do. do. do. base 12 in., level vial 6 in., " " 8 00

5812. do. do. do. " 16 " " " 7 " " " 10 00

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No. 5816



5815. Adjustable Level, brass, spirit level graduated on the glass, base 6 in., spirit level tube 4 in., in Case . . each $ 2 00

5816. do. do. 8 " " " " 6 " " " 3 00

5817. do. do. 10 " " " " 8 " " " 3 50

5818. do. do. 12 " " " " 10 " " " 3 75

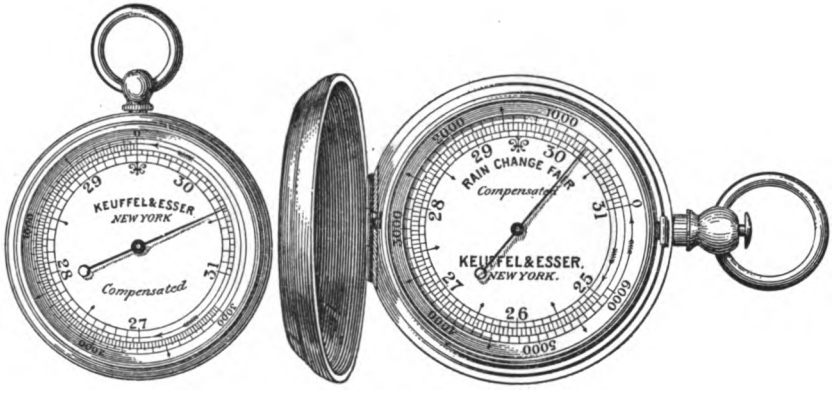
5819. do. do. 14 " " " " 12 " " " 4 25

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ANEROID BAROMETERS

FOR MEASURING ALTITUDE AND ATMOSPHERIC PRESSURE.

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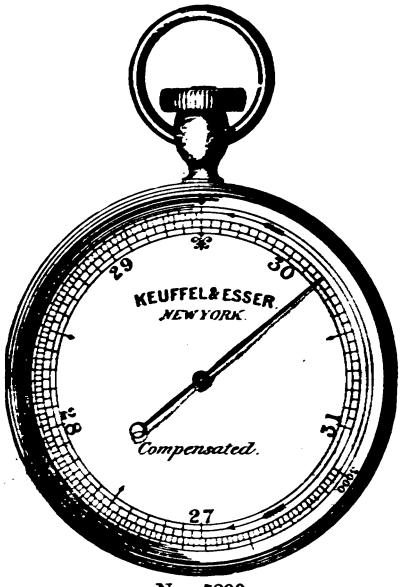


No. 5855. 5871.

5850.	Watch pattern, gilt case 1¾ in. diameter, silvered dial, revolving altitude scale 8000 feet, in morocco Case, each	$	13 50
5855.	Watch pattern, gilt case 1¾ in. diameter, silvered dial, revolving scale 3000 feet, compensated for temperature, in morocco Case	"	19 75
5856.	Like No. 5855, but altitude scale 6000 feet	"	19 00
5857.	" " 5855, " " " 12000 "	"	19 75
5858.	" " 5855, " " " 18000 "	"	21 00
5860.	Pocket pattern, gilt case 1¾ in. diameter, silvered dial, revolving altitude scale 8000 feet, compensated for temperature, detachable bar-needle compass on reverse side, in morocco Case	"	29 00
5861.	Like No. 5860, but altitude scale 18000 feet	"	31 00
5870.	Watch pattern, nickel hunting case 2 in. diameter, silvered dial, revolving altitude scale 3000 feet, compensated for temperature	"	22 50
5871.	Like No. 5870, but altitude scale 6000 feet	"	21 75
5872.	" " 5870, " " " 12000 "	"	23 50
5873.	" " 5870, " " " 18000 "	"	23 75

PLAIN DIRECTIONS FOR MEASURING HEIGHTS FURNISHED WITH EACH INSTRUMENT.

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No. 5890

5880. Pocket pattern, brass case 2¾ in. diameter, silvered dial, revolving altitude scale 3000 feet, compensated for temperature, in morocco Case . . . . . each $ 21 25

5881. Like No. 5880, but altitude scale 6000 feet . . . . . " 20 50

5882. " " 5880, " " " 12000 " . . . . . " 21 25

5883. " " 5880, " " " 18000 " . . . . . " 22 50

5890. Pocket pattern, bronzed case 2¾ in. diameter, silvered dial, revolving altitude scale 3000 feet, operated by rack and pinion, revolving pointer (index) operated separately by milled ring, compensated for temperature, in sewed leather Sling Case . . . . . each $ 33 25

5891. Like No. 5890 but altitude scale 6000 feet . . . . . " 31 50

5892. " " 5890, " " " 12000 " . . . . . " 33 25

5893. " " 5890, " " " 18000 " . . . . . " 33 50

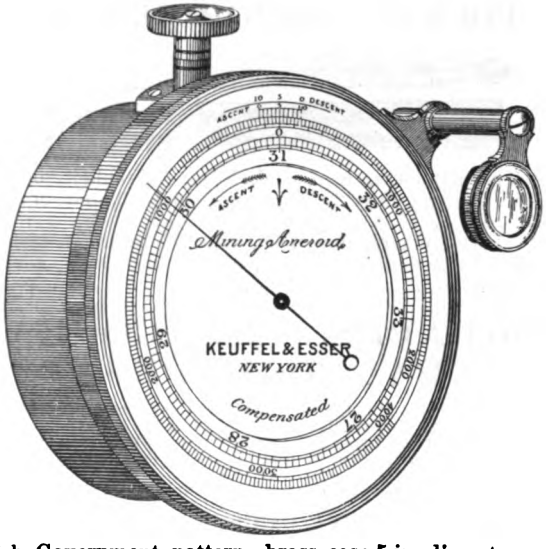
As the altitude scale and the pointer of Nos. 5890 to 5893 have separate actions, these instruments can also be used as with fixed altitude scale.

5895. Mining Barometer, like No. 5890, but reading 2000 feet below and 6000 feet above sea level . . . . . each $ 33 50

Sewed leather Sling Case for Barometers Nos. 5890, 5891, 5892, 5893, 5895 and 5910 (on next page) . . . . . " 2 50

PLAIN DIRECTIONS FOR MEASURING HEIGHTS FURNISHED WITH EACH INSTRUMENT.

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No. 5920.

5900.	English Government pattern, brass case 5 in. diameter, silvered dial, graduations on raised ring, fixed altitude scale 6000 feet, revolving pointer, compensated for temperature, curved thermometer, in morocco Case.	each	$ 33 25
5902.	Like No. 5900, but altitude scale 12000 feet	"	35 25
5904.	" 5900, " " " 18000 "	"	38 25
5910.	Surveying Barometer bronzed case 3 in. diameter, silvered dial, graduations on raised ring, fixed altitude scale 14800 feet, vernier scale operated by rack and pinion, reading to 5 feet, compensated for temperature, adjustable reading lens, in leather Sling Case . . .	"	50 00
5915.	Surveying Barometer, bronzed case 5 in. diameter, silvered dial, graduations on raised ring, fixed altitude scale 5000 feet, vernier scale operated by rack and pinion, reading to 1 feet, compensated for temperature, adjustable reading lens, in leather Sling Case . . .	"	60 00
5916.	Like No. 5915, but altitude scale 14900 feet, reading to 2 feet,	"	75 00
5920.	Mining Barometer, bronzed case 5 in. diameter, silvered dial, graduations on raised ring, fixed altitude scale 2000 feet below and 4000 feet above sea level, vernier scale operated by rack and pinion, reading to 1 foot, compensated for temperature, adjustable reading lens, in leather Sling Case	"	60 00
	Sewed leather Sling Cases for Nos. 5915, 5916 and 5920,	"	5 00

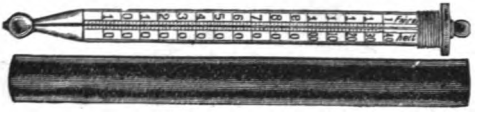
The instruments Nos. 5910 to 5920 are constructed especially for ascertaining slight variations in gradients, levels etc Their extreme sensitiveness is of great value in mining and surveying work generally. A valuable improvement in these instruments is an arrangement of the scale of altitude permitting the reading by vernier, formerly impracticable owing to the usual altitude scale being a gradually diminishing one, to which a vernier could not be applied. In the above instruments the action has been adjusted to give accurate readings upon a uniform scale of altitudes the barometrical scale of inches having been made progressive so as to afford the correct relative readings with the scale of altitudes

These instruments are also constructed for measuring greater altitudes, i. e., up to 20,000 feet, but with these higher scales the measurements cannot be made quite so minute as with the more open scales.

PLAIN DIRECTIONS FOR MEASURING HEIGHTS FURNISHED WITH EACH INSTRUMENT.

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POCKET THERMOMETERS.



No. 5930.

5930. Pocket Thermometers, mercurial, 5 in., Fahrenheit, opal glass scale reading to 2 degrees, nickelplated brass Case . . . . . each $ 85

5931. Pocket Thermometers, mercurial, 4 in., Fahrenheit, scale reading to 2 degrees, nickelplated brass Case with ring pendant . . . . . " 50

BAROGRAPHS, THERMOGRAPHS, HYGROGRAPHS.

These Self-recording instruments are for many purposes preferable to reading instruments. They have been perfected, so that they now are reliable and correct.

The sensitive member of these instruments expands or contracts under varying conditions of pressure, temperature, or humidity of the atmosphere and imparts its motion to a multiplying lever. To one end of this a pen is attached which automatically records on a graduated chart which travels by clockwork.

POCKET BAROGRAPHS.



No. 5895.

5935. Pocket Barograph, compensated for temperature, reading to 4000 feet, in morocco covered metal Case Barograph, bottle of Ink and 50 graduated Charts, in polished mahogany Box . . . . . each $ 66 00

5936. Like No. 5935, but reading to 7800 feet . . . . . " 60 00

5937. " " " " " 15000 " . . . . . " 60 00

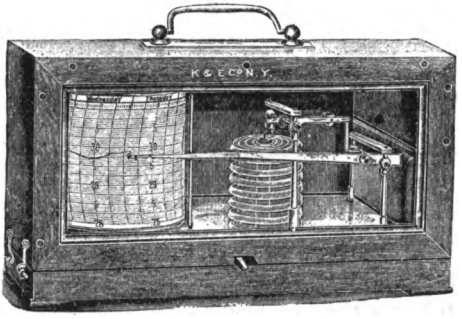
These self-recording aneroid barometers are of great advantage in many cases where the bulk and weight of the usual barographs forbid their use.

The Pocket Barograph measures 4¾ x 3¾ x 1¾ in. and weighs about one pound. The metal, morocco covered case has a glass inserted in the cover over the chart, for taking readings without opening the case.

The chart is so ruled that it represents the time by half-hours, for 24 hours and the pressure in feet of altitude. The pen makes contact every two minutes

Notwithstanding its small size the Pocket Barograph is a relatively reliable instrument. It also indicates atmospheric changes, like other aneroids.

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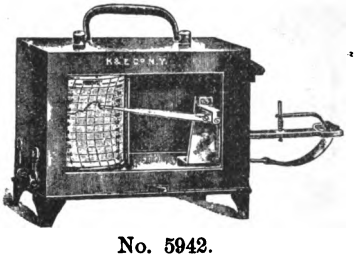


No. 5941.

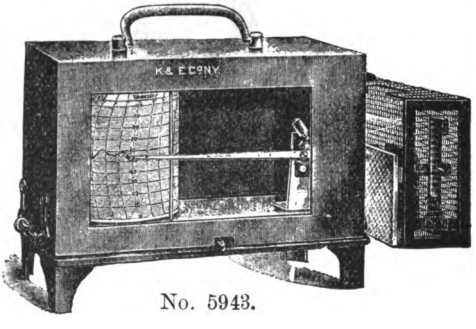
5940. Barograph, small size; registering one week; from 28 in. to 30.5 in. atmospheric pressure, by twentieths inches. Series of 5 vacuum boxes cylinder 2⅝ in. diameter ×2¾ in. high. In polished mahogany Case with handle, hinged cover with glass-paneled front. With Charts for one year and bottle of Ink . . . . . each $ 40 00

5941. do. do. but large size; series of 8 vacuum boxes, cylinder 3⅝ in. diameter × 3⅝ in. high . . . . . " 55 00

5941 H. Gimbal Hook for suspending Barograph from ceiling on shipboard . . . . . " 6 00



No. 5942.



No. 5943.

5942. Thermograph, registering one week; from 0 to 100 degrees Fahrenheit by 2 degrees; cylinder 2⅝ in. diameter × 2¾ in. high. In weatherproof metal case with handle and glass-paneled front. With Charts for one year and bottle of Ink. . . . . each $ 40 00

The curved tube outside of the case contains alcohol and is hermetically sealed. The alcohol expands and contracts under changes of temperature, thereby changing the curve of the tube, thus imparting motion to the recording lever.

5943. Hygrograph, registering one week; from 0 to 100 per cent, of moisture by single per cent. Cylinder 3⅝ in diameter × 3⅝ in high. The sensitive hairs are protected by a wire cage. Instrument in weatherproof metal case with glass-paneled front and handle. With Charts for one year and bottle of Ink . . . . . each $ 60 00

The sensitive member of this instrument consists of a bundle of fine hair, which expands and contracts under variations of humidity, which motion is imparted to the recording mechanism.

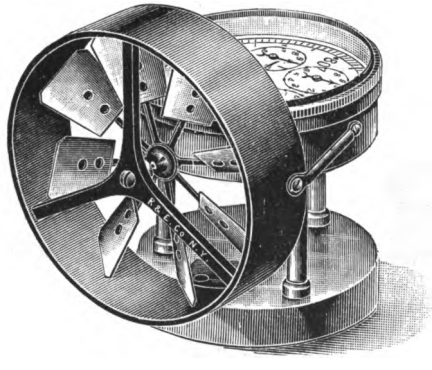
Extra charts for period of one year for Nos. 5935, 5936, 5937, 5942, per set $ 2 00

do. do. do. for Nos. 5940, 5941, 5943 . . " "

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ANEMOMETERS.

Anemometers are used for the measurement of the velocity of air currents in mines, tunnels, sewers, public buildings, hospitals etc. As now constructed by us, these instruments embody a number of important mechanical improvements among which may be mentioned the **zero setting arrangement.** Setting the instrument to zero before each reading does away with the necessity of taking a previous reading into consideration and lessens the liability of error. Each instrument is carefully calibrated and provided with a correction table. Our instruments are constructed to **measure air velocities up to 2000 feet per minute** and should not be used in temperatures exceeding 300° F.



No. 5952.

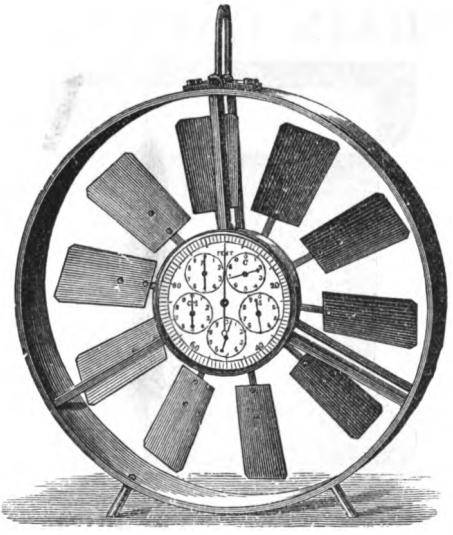
5950. Improved Portable Air Meter, with disconnector, vane 2½ in. diam., registering to 1000 feet, in polished mahogany Case . . . . . each $ 19 00

5950Z. do. do. do. but with Zero Setting arrangement . . . . . " 21 00

5952. Improved Portable Air meter, like No. 5950, but registering to 10,000,000 feet . . . . . " 21 00

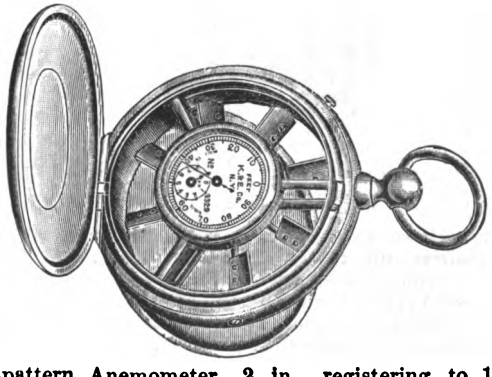
5952Z. do. do. do. but with Zero Setting arrangement . . . . . " 25 00

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No. 5965.

5953. Biram Anemometer, 3 in. diam., reading to 1000 feet, with disconnector, in polished mahogany Case . . . . . each $ 17 50
5953Z. do. do. but with Zero Setting arrangement. . . " 19 50
5957. Biram Anemometer, like No. 5953, but 4 in. diam., reading to 1000 feet, in polished mahogany Case. . . . . " 18 00
5957Z. Like No. 5957, but with Zero Setting arrangement. . . . " 20 00
5958. Biram Anemometer,, like No. 5953, but 4 in. diam. reading to 100,000 feet, in polished mahogany Case . . . . . " 20 00
5958Z. Like. No. 5958, but with Zero Setting arrangement . . . " 23 00
5963. Biram Anemometer, like No. 5953, but 6 in. diam. reading to 1000 feet, in polished mahogany Case . . . . . " 20 00
5963Z. Like No. 5963, but with Zero Setting arrangement. . . . " 22 00
5965. Biram Anemometer, like No. 5953, but 6 in. diam. reading to 10,000,000 feet, in polished mahogany Case . . . " 28 00
5965Z. Like No. 5965, but with Zero Setting arrangement . . . " 32 00

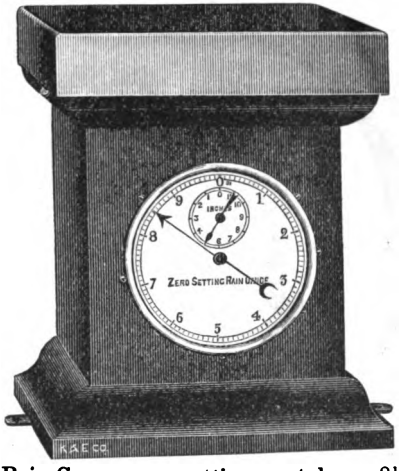


No. 5968.

5968. Watch-pattern Anemometer, 2 in., registering to 1000 feet; hunting case, with disconnector. The two covers, when open form a base for the instrument . . . . . each $ 30 00

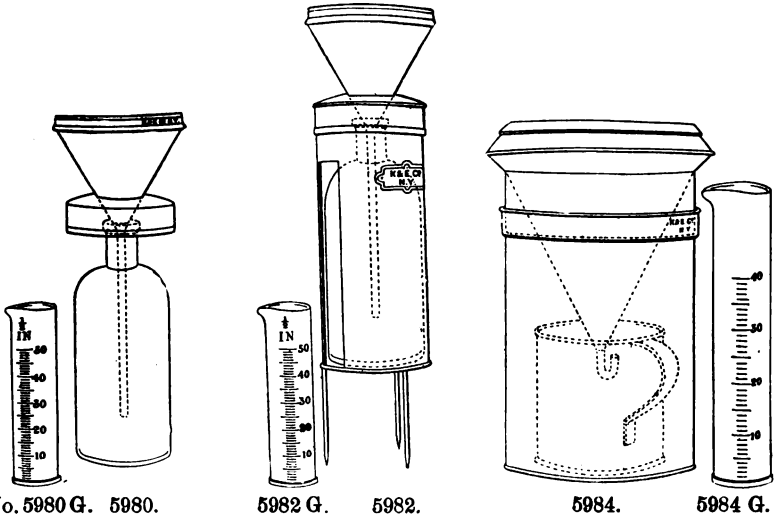
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RAIN GAUGES.



No. 5971.

5971. Registering Rain Gauge, zero-setting, metal case 8⅓ × 8½ in. × 10½ in. high, records up to 12 inches of rainfall by 100ths inches. The copper receiver is of improved design . . . each $27 00



No. 5980 G. 5980. 5982 G. 5982. 5984. 5984 G.

5980. Rain Gauge, Howard's model, simple construction, with graduate reading to $\frac{1}{100}$ in., ... each $ 4 00

5982. do. Symon's model, with prongs to prevent tipping, with graduate reading to $\frac{1}{100}$ in., ... " 5 00

5984. do. Glaisher's model, a very reliable instrument, with graduate reading to $\frac{1}{100}$ in., ... " 7 00

Extra Graduates	No. 5980 G.	5982 G.	5984 G.
each	$ .90	.90	1 00

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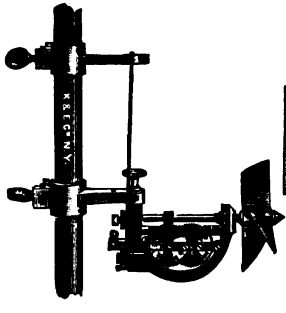
K & E CURRENT METERS.

The current meters illustrated and described in the following pages represent the most improved instruments of this type, and in selecting them all the requirements of the Engineer and Hydrographer have been taken into careful consideration. With this type of instrument, only the velocity of the water parallel to the horizontal axis of the instrument is measured, thereby reducing to a minimum the disturbing influences of whirls and cross currents and making it possible to measure any desired component of the water's velocity, a feature that is of obvious importance.

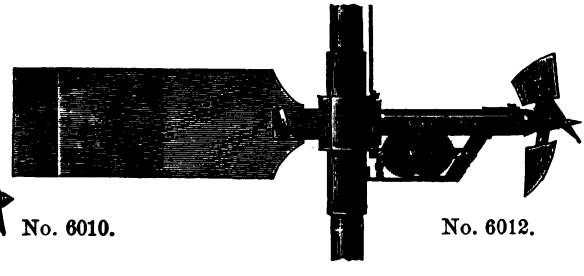
Special attention is called to instruments No. 6019 and 6025, which are provided with watertight contact chambers to avoid the liability of error due to short circuiting in salt water or water polluted with sewage.

Marked improvements have been introduced in the various constructive details. Wherever possible ball and agate bearings are used and protected by the most approved means against the entrance of silt and other injurious substances. All parts subject to wear or liable to injury, are substantially constructed. Instruments are calibrated under actual conditions of use and furnished with constants for the calculation of results.

CURRENT METERS WITH REGISTERING WHEELS.



No. 6010.



No. 6012.

6010. Current Meter, pocket size; propeller 8 in. dia., two graduated wheels registering to 1000 revolutions. The registering wheels can be thrown into and held in gear by a string attached to a lever, or they can be released and stopped by means of a cam operated by two strings and attached to the frame. The instrument fits on a pole of ¾ in. diameter. It can be taken apart and stored compactly in a morocco Case 9x4x1½ in. Weight 1½ lb. . each $45 00

6010P. Pole for No. 6010, 9-foot steel tube, graduated to feet and tenths, in 3 sections, with steel point and detachable baseplate . . . . . " 17 00

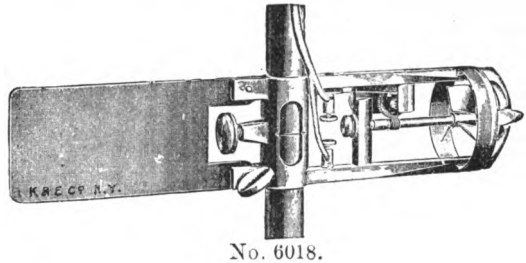
6012. Current Meter, medium size; propeller 5 in. dia., propeller axis in ball and agate bearings encased in torpedo-shaped housing; two graduated wheels registering to 1000 revolutions; improved arrangement for engaging and disengaging registering wheels; detachable metal rudder 3½ x 7 in.; fits on a pole of 1 in. diameter. Instrument in polished hardwood Case, ... " 77 00

6012P. Pole for No. 6012, 12-foot plain tube graduated to feet and tenths, in 2 sections, with steel point and detachable baseplate . . . . . " 10 7[illegible]

For Accessories, see page 461.

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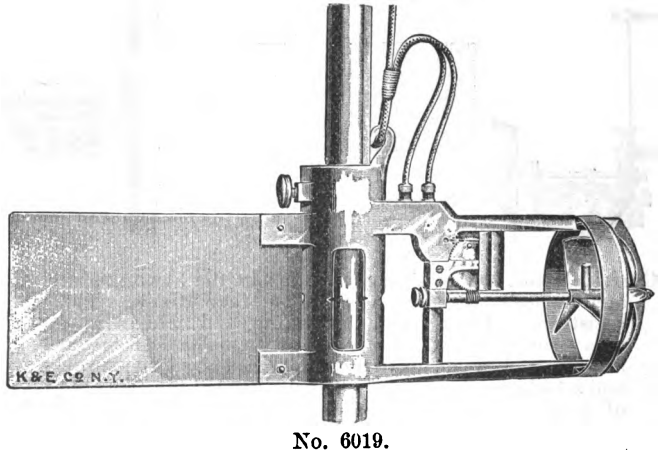
CURRENT METERS WITH ELECTRICAL RECORDING APPARATUS.



No. 6018.

6018. Electrical Current Meter, small size, designed especially for measuring currents in shallow waters. Minimum depth of measurable water 3½ in. Propeller 2½ in. dia., propeller axis in agate bearings. Electrical contact for every 50 revolutions. Metal rudder about 3 × 5 in. Instrument fits on pole ¾ in. diameter. In polished hardwood box with Pointer . . each $ 38 50

6018 P. Pole for No. 6018, 9 foot steel tube, in 3 sections, graduated to feet and tenths, with steel point and detachable baseplate . . . . . " 17 00



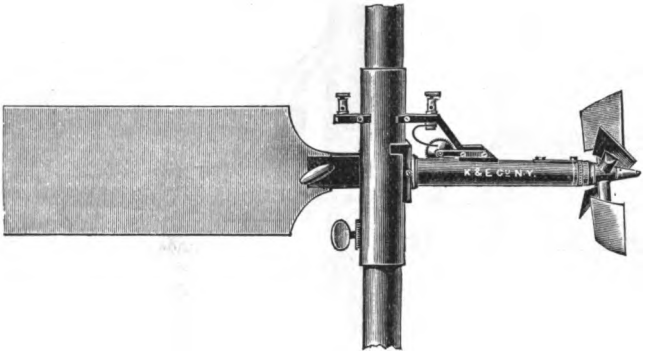
No. 6019.

6019. Electrical Current Meter with waterproof contact chamber. For use in salt or impure water where conductivity would produce short circuiting and consequent errors in observations. Propeller 3½ in. diam., axis in agate bearings. Adjustable pins allow of setting meter to give signal every 25, 50 or 100 revolutions. Instrument fits on pole 1 in. diameter. Instrument complete in hardwood Box, with 40 ft. reinforced electric cable, pulley and clamp with Pointer . . . . . each $ 100 00

6019 P. Pole for No. 6019, 16 foot steel tube, in 2 sections, graduated to feet and tenths, with guide bar, steel point and detachable baseplate . . . . . " 24 00

For accessories, see page 461.

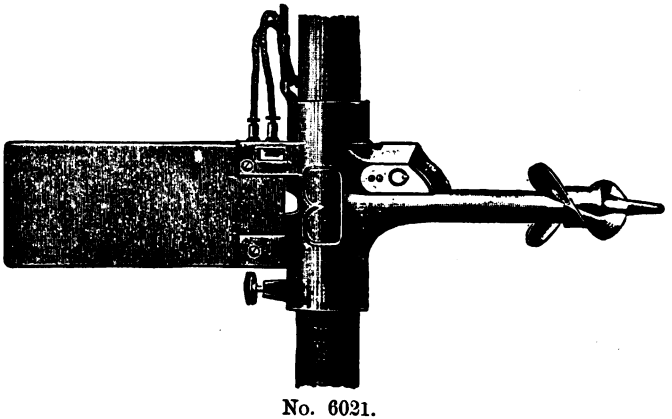
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No. 6020.

6020. Electrical Current Meter, small size, propeller 5 in. diam., propeller axis in ball and agate bearings in torpedo-shaped metal housing. Contact for every 25 revolutions. Metal rudder 3¼ × 7 in. Instrument fits on a pole of 1 in. diameter. In polished hardwood Box with Pointer. . . . . each $ 64 00

6020 P. Pole for No. 6020, 12 foot plain tube in 2 sections graduated to feet and tenths, steel point and detachable baseplate . . . . . " 9 75

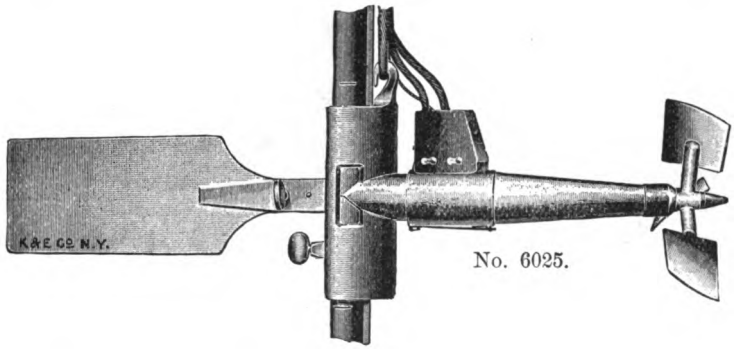


No. 6021.

6021. Electrical Current Meter designed especially for use in water carrying silt, grass or leaves, Shape of propeller blades offers minimum resistance to the flow of water. Propeller 4¾ in diam., axis with ball and agate bearings. Meter fits on pole 1 in. diam. Instrument complete in hardwood Box, with 40 ft. reinforced electric cable, pulley, clamp and Pointer, each $ 98 00

6021 P. Pole for No. 6021, 16 foot steel tube in 2 sections, graduated to feet and tenths, with guide bar, steel point and detachable baseplate . . . . . " 24 00

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No. 6025.

6025. Electrical Current Meter with magnetic contact device. All contact points enclosed in hermetically sealed case and actuated from without by powerful permanent magnet mounted on end of propeller axis. Contact every 25th revolution or every single revolution as desired. Propeller 7⅛ in. diameter, axis mounted in ball and agate bearings. Instrument fits on rod 1¼ in. diameter. The body of this instrument carrying the propeller axis and contact chamber can be unscrewed and attached to a hollow metal rudder to form a Floating Current Meter (see No. 6026).

Instrument complete in hardwood Box, with 40 feet of re-inforced electrical cable, pulley clamp and Pointer . . . . . each $ 145 00

6025 P Pole for No. 6025, 20-foot steel tube graduated to feet and tenths, in 2 sections, with guide bar, steel point and detachable baseplate . . . . . each $ 32 50

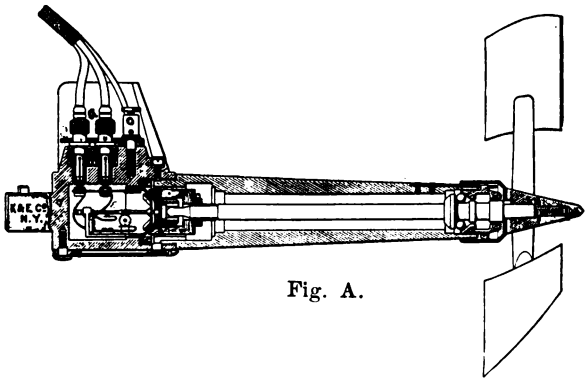
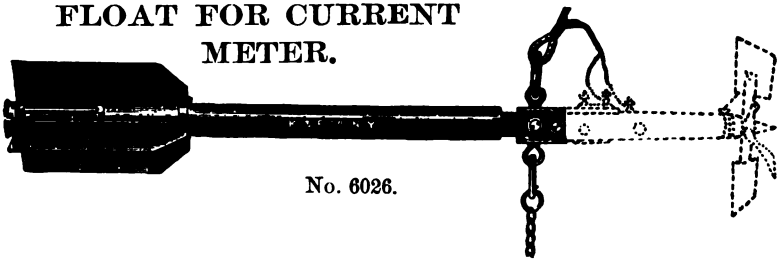


Fig. A.

Figure A illustrates a cross section of No. 6025 showing the arrangement of shaft bearings, mounted bell shaped magnet and water tight contact chamber. With this construction there is no possibility of short circuiting or disarrangement of the recording mechanism, which makes this meter especially valuable for taking observations in harbors and tide waters. When used with Float No. 6026, observations can be taken at any depth with a high degree of accuracy.

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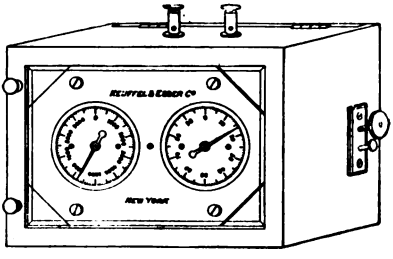
FLOAT FOR CURRENT METER.



No. 6026.

6026. Brass Float with movable Rudder with Hooks for suspending and anchoring, for Meter No. 6025, in hardwood Case . . . . . each $ 51 00

ACCESSORIES FOR CURRENT METERS.



No. 6028 L.

6028 L. Electric Register, 2 dials registering up to 10000 revolutions in polished mahogany Case 4½ x 6¼ x 3¼ in, with Switch, each $54 00
6028 N. Electric Bell. . . . . " [redacted] .65
6028 O. Dry Cells . . . . . " [redacted] .30
6028 P. Electric Register, Bell and 4 Dry Cells in hardwood Case " 62 00
6028 S. Insulated Copper Wire . . . . . per foot 03
6028 T. Lead weight, about 75 lbs., with chain for anchoring float No. 6026. . . . . each 10 00
6028 W. Canvas bags, for No. 6010 P. to 6021 P. . . . . " 2 50

BOYDEN'S HOOK GAUGE

Improved Pattern.



No. 6050.

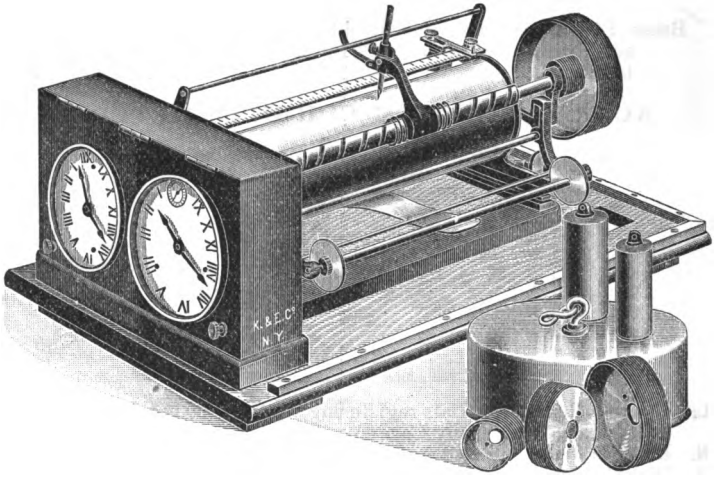
6050. Boyden's Hook Gauge, latest improved pattern, mahogany frame, slide faced with German silver, graduated to 100ths ft., adjustable vernier reading 1000ths ft., with clamp, slow motion screw of German silver, hook and all mountings of brass. . . . . each $ 24 00

Boyden's Hook Gauge for ascertaining the depth of water flowing over a weir or dam, consists of a scale 2 ft. long, graduated to 100ths ft. and sliding in the groove of a frame which also carries an adjustable vernier reading 1000ths ft. By means of this adjustable vernier the scale can be set to read exactly zero when the tip of the hook is level with the crest of the weir and all readings can be taken directly without the necessity of making a correction for initial reading. The lower end of slide is fitted with movable brass hook, upper end with micrometer screw.

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SELF-REGISTERING TIDE GAUGE.

(C. & G. SURVEY MODEL.)



No. 6061.

6061. Self-registering Tide Gauge, as made by us for the U. S. Coast & Geodetic Survey, brass cylinder 13¼ in., 2 rollers for record paper, adjustable metal scale, 4 interchangeable brass pulleys, float with counterweight, 2 independent clocks, instrument complete in strong hardwood Box $250 00

This is a very correct and reliable instrument. The registering pencil derives its motion from one of the clocks and records the tide as well as the time, the latter by an interruption in its mark at every hour. The travel of the periphery of the cylinder is 1 inch per hour. The 4 pulleys of different diameter (in the ratio 1:2:3:4) can be interchangeably attached to the end of the shaft carrying the pencil, so that the travel of the mechanism can be adapted to the extent of travel of the float.

6061 T. Record Paper for Self-Registering Tide Gauge (blank), per roll of 22 yards . . . . . $ 50

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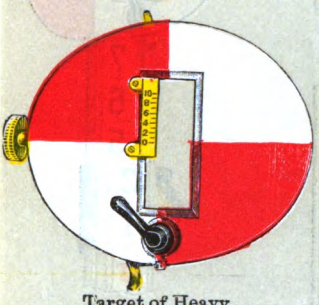


LEVELING RODS.



Our leveling rods are made with the same painstaking regard for precision and high quality which we bestow on our other surveying tools.

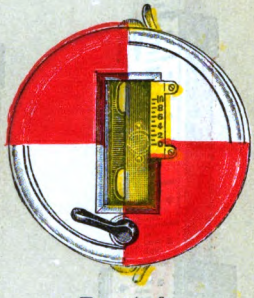
The clamps on all our rods, except the Frisco and the Architects' are of the improved design shown in the illustrations.



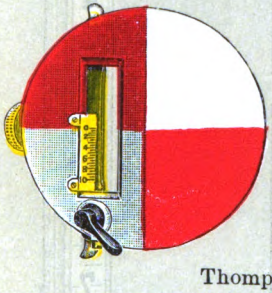
Target of Heavy Philadelphia Rods.

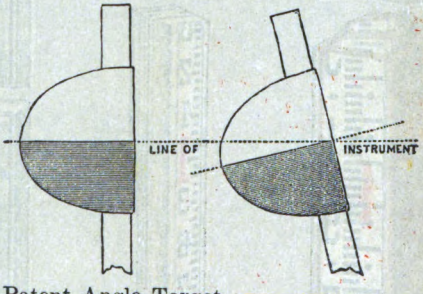


Target of Light Philadelphia Rods.



Target of New York Rods.





Thompson's Patent Angle Target.

This Leveling Rod Target is devised to insure the rod being held perpendicular to the observer's line of sight by giving him full control of its position and an efficient check upon the rodman. The horizontal dividing line of the target is carried over two surfaces placed at right angles to each other, thus **showing a continuous and unbroken line only when the rod is held vertical.**

All targets on our rods, except the Boston and the Architect's, are provided with our patented MICROMETER ARRANGEMENT for setting the target. This consists of an eccentric controlled by a handle placed at the lower edge of the target, which slides the target on an inner metal sleeve and permits of rapid and accurate setting of the target. The brass mountings are very durable and of best design and workmanship.

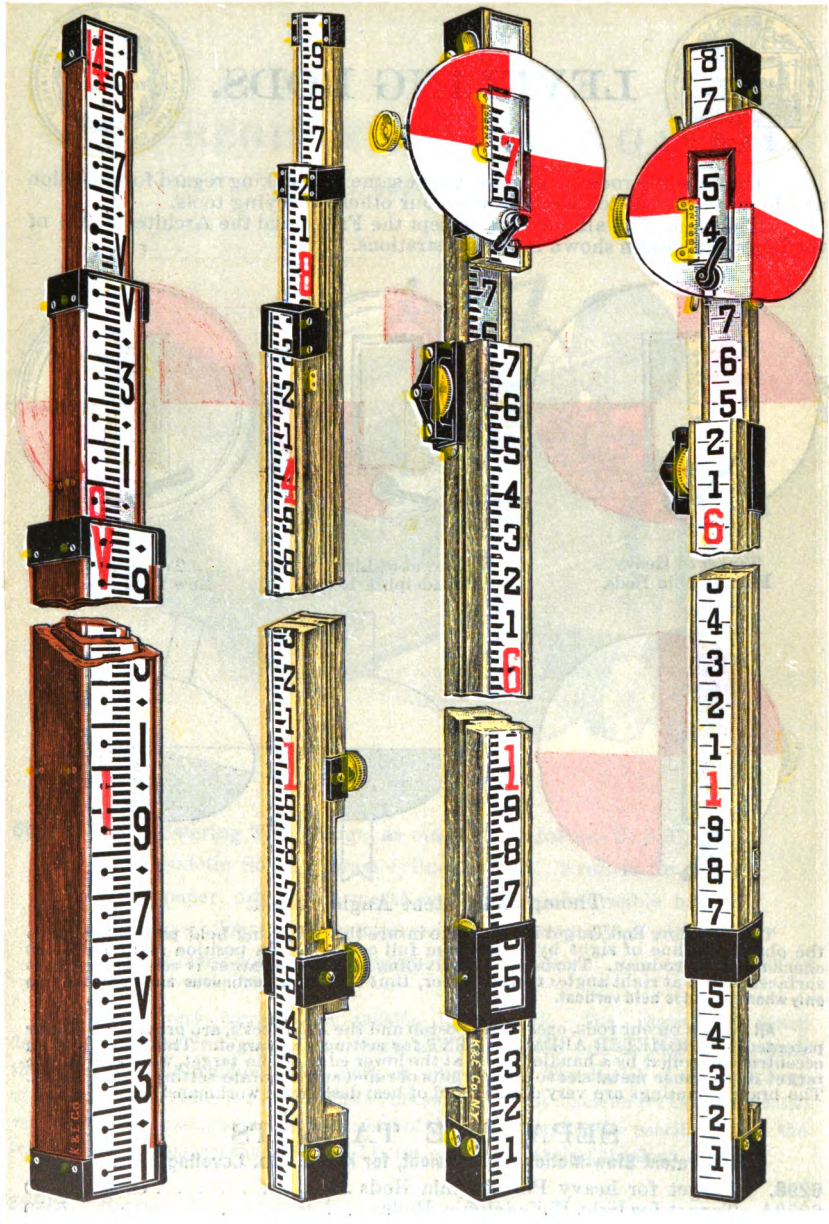
SEPARATE TARGETS

with Patent Slow-Motion Arrangement, for K. & E. Co. Leveling Rods.

6298.	Target for heavy Philadelphia Rods	each	$ 5 50
6298A.	Target for light Philadelphia Rods	"	5 50
6298B.	Target for New York Rods	"	5 50
6298C.	Angle Target, Thompson's Patent, for Philadelphia Rods	"	6 50
6298D.	do. do. do. do. for New York Rods	"	6 50

In ordering extra Targets, for our rods please give exact cross section of the rod for which they are intended, and **state how rod is graduated, or give its catalogue number.**

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No. 6250.
English.

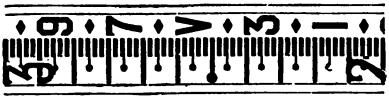
6252.
Frisco.

6256.
Philadelphia (Heavy).

6261.
Light Philadelphia.

Digitized by Google

LEVELING RODS.



For pattern of rod see No. 6250 on opp. page.

6250. **English Self-reading Rod,** telescoping, mahogany, graduated on the enameled wood, strong brass mountings, 5 feet, extending to 14 feet . . . . . each $ 20 00



For pattern of rod see No. 6250 on opp page.

6251. **English Self-reading Rod,** like No. 6250, but metric, 1.5 meter, extending to 4 meters . . . . . each 20 00



For pattern of rod see No. 6252 on opp. page.

6252. **Frisco Rod,** Patented, white maple, self-reading, stout brass mountings, 3 ply, 4.4 feet, extending to 12 feet . . . each 12 00

6253. **Frisco Rod,** like No. 6252, but 5.4 feet, extending to 15 feet " 14 00

The Frisco Rods are very light and compact and can therefore be conveniently carried in railroad or trolley cars, in a buggy, etc., where rods of the usual pattern would be inconvenient to carry. Portability and light weight, compactness and short length when closed, make them desirable also for use in mines, in the woods or underbrush, or on obstructed ground.

Target scale reads to $\frac{1}{100}$ths foot.



For pattern of rod see No. 6256 on opp. page.

6254. **Philadelphia Rod,** white maple, with Micrometer Target, Clamp and Vernier, 7 feet extending to 13 feet . . . each 15 00

6255. **Philadelphia Rod,** like No. 6254, but with Micrometer **Angle** Target . . . . . " 16 00

Vernier reads to $\frac{1}{1000}$ths foot.

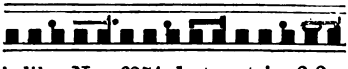


For pattern of rod see No. 6256 on opp. page.

6256. **Philadelphia Rod,** like No. 6254, but feet div. 10ths and 100ths, each 15 00

6257. **Philadelphia Rod,** " " 6255, " " " 10ths " 100ths, " 16 00

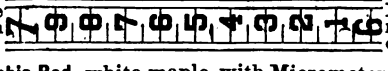
Target scale reads to 1 mm.



For pattern of rod see No. 6256 on opp. page.

6258. **Philadelphia Rod,** like No. 6254, but metric, 2.2 meters, extending to 4 meters . . . . . each 15 00

Target scale reads to $\frac{1}{200}$th foot.



For pattern of rod see No. 6261 on opp. page.

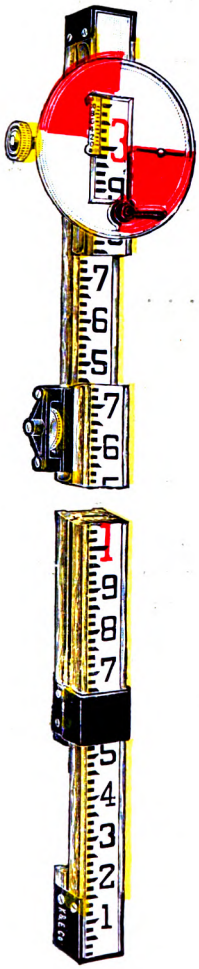
6260. **Light Philadelphia Rod,** white maple, with Micrometer Target, Clamp and Vernier, 6.5 feet, extending to 12 feet . . each 13 00

6261. **Light Philadelphia Rod,** like No. 6260, but with Micrometer **Angle** Target . . . . . " 14 00

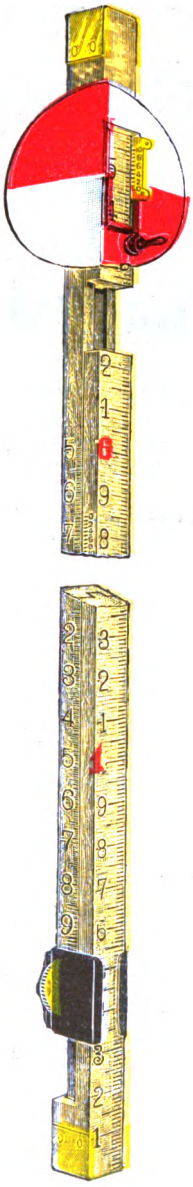
For extra **Targets,** see page 463.
For **Rod Levels** and **Canvas Covers** for rods see page 472.

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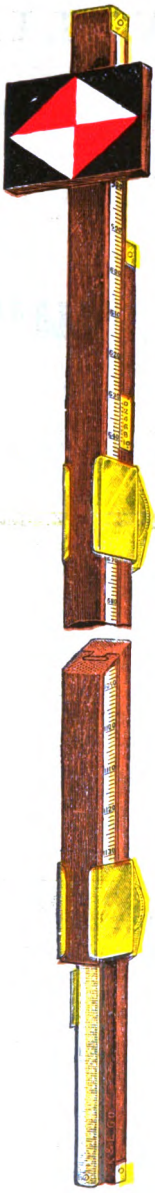
KEUFFEL & ESSER CO. NEW YORK.



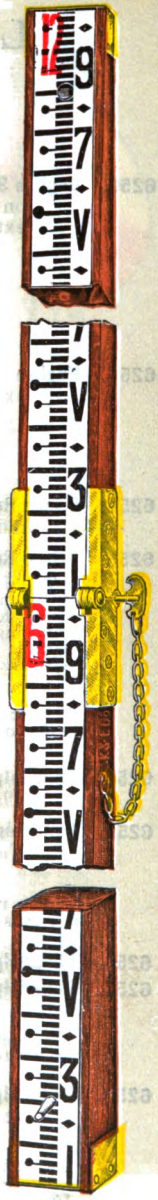
No. 6267½
Mining.



6271.
New York.



6274.
Boston.



6276.
Telemeter.

Digitized by Google

Vernier reads to 1/300th foot.  For pattern of rod see No. 6261 on page 464.

6262. Light Philadelphia Rod, like No. 6260, but feet div. 10ths and 100ths . . . . . each $ 13 00

6262 S. Light Philadelphia Rod, like No. 6262, but 5.8 feet, extending to 10.6 feet . . . . . " 13 00

This rod is made 6 feet long over all, to comply with the law of a number of States prohibiting the carrying of any article over 6 feet long on trolley cars.

6263. Light Philadelphia Rod, like No. 6261, but feet div. 10ths and 100ths . . . . . each 14 00

Target Scale reads to 1 mm  For pattern of rod see No 6261 on page 464.

6264. Light Philadelphia Rod, like No. 6260, but metric, 2 meters, extending to 3.7 meters . . . . . each 13 00

Target scale reads to 1/200th foot.  For pattern of rod see No. 6267½ on opp. page.

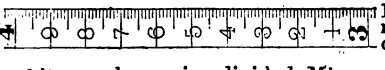
6267. Mining Rod, white maple, with Micrometer Target, Clamp and Vernier, 3 feet, extending to 5 feet, target with slit . each 12 00

6268. Mining Rod, like No. 6267, but 5 feet, extending to 9 feet . . " 12 75

Vernier reads to 1/1000th foot.  For pattern of rod see No. 6267½ on opp. page.

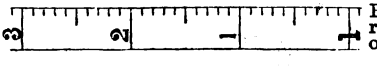
6267½. Mining Rod, like No. 6267, but feet div. 10ths and 100ths . each 12 00

6268½. Mining Rod, like No. 6268, but feet div. 10ths and 100ths . " 12 75

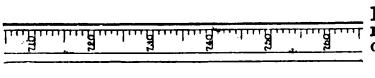
Vernier reads to 1/1000th foot.  For pattern of rod see No 6271 on opp. page.

6270. New York Rod, white maple, engine divided, Micrometer Target, Clamp and Vernier, 6.5 feet extending to 12 feet . . . each 14 00

6271. New York Rod, like No. 6270, but with Micrometer Angle Target " 15 00

Target scale reads to 1 mm.  For pattern of rod see No 6271 on opp. page.

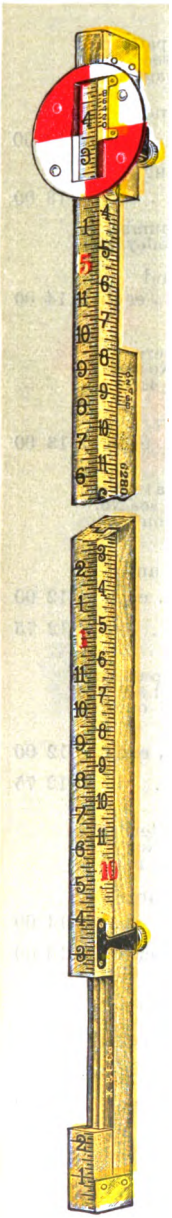
6272. New York Rod, like No. 6270, but metric, 2 meters, extending to 3.7 meters . . . . . each 14 00

Vernier reads to 1/1000th foot.  For pattern of rod see No. 6274 on opp. page.

6274. Boston Rod, mahogany, engine divided on inlaid boxwood, with Target, Clamp and 2 Verniers, 6.5 feet, extending to 11 feet . . . . . each 14 00

For extra **Targets,** see page 463.
For **Rod Levels** and **Canvas Covers** for rods see page 472.

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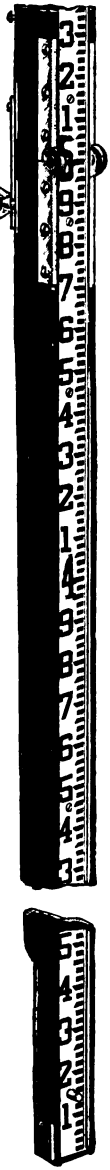
No. 6280.
Architect's.



6284.
Florida.



6286 A.
Plain Stadia.



6287 A.
Stadia, Folding.

Digitized by Google



For pattern of rod see No. 6276 on page 466.

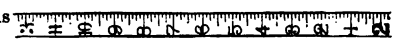
6276. Telemeter Rod, pinewood, self-reading, folding, with strong, nickelplated bronze hinge, 12 ft., 2 fold, folding to 6 ft. each $ 12 00

6276½. Telemeter Rod, like No. 6276, but 12 " 3 " " " 4 " " 15 00

6277. " " " " " " 14 " 2 " " " 7 " " 13 50

6277½. " " " " " " 14 " 4 " " " 3½ " " 19 50

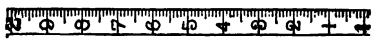
Vernier reads to ¼th inch.



For pattern of rod see No 6280 on opp. page.

6280. Architect's Rod, white maple, brass mounted, with Target, Clamp and Vernier, engine divided, feet to inches and ⅛ in., 5½ feet, extending to 10 feet . . . . . each 6 00

Vernier reads to 1/1000th foot



For pattern of rod see No. 6280 on opp. page.

6281. Architect's Rod, like No. 6280, but feet div. 10ths and 100ths each 6 00



For pattern of rod see No. 6284 on opp. page.

6284. Florida Rod, pinewood (in one piece), stout tapering rib with opening for the hand, 10 feet . . . . . each 8 00

6285. Florida Rod, like No. 6284, but 12 feet . . . . . " 10 00



For pattern of rod see No. 6286A. on opp. page.

6286A. Plain Stadia Rod, pinewood (in one piece), tapering rib, 10 feet . . . . . each 6 00

6286B. Plain Stadia Rod, like No. 6286 A. but 12 feet . . . . . " 7 00

6286C. " " " " " " 14 " . . . . . " 8 00

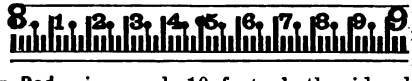


For pattern of rod see No. 6287A. on opp. page.

6287A. Plain Stadia Rod, Folding, pinewood, strong brass hinge with brace, 10 feet, folding to 5 feet . . . . . each 8 00

6287B. Plain Stadia Rod, like No. 6287A. but 12 feet folding to 6 feet " 9 00

6287C. " " " " " " 14 " " " 7 " " 10 00



For pattern of rod see No. 6288 on page 470.

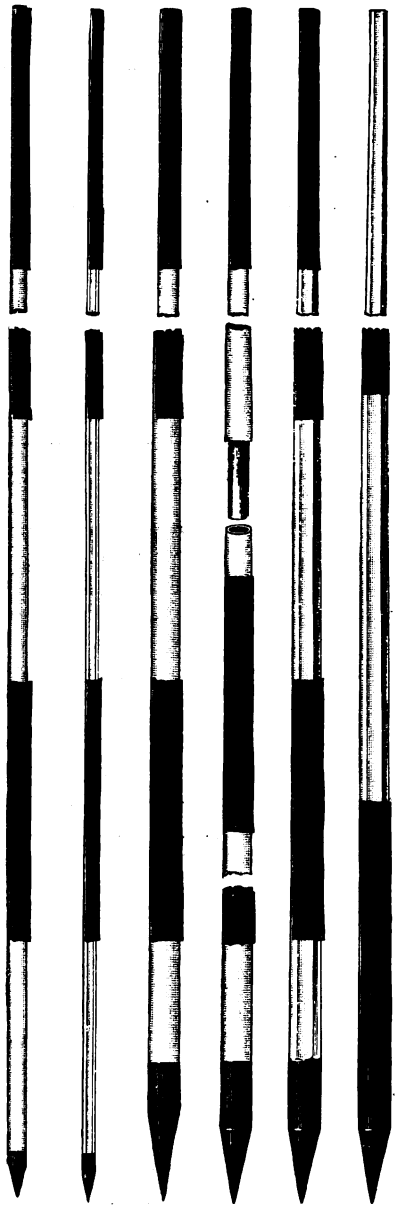
6288. Cross Section Rod, pinewood, 10 feet, both sides divided, spirit level at each end, opening for the hand . . . . each 10 00

For extra **Targets,** see page 463.
For **Rod Levels** and **Canvas Covers** for rods see page 472.

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KEUFFEL & ESSER CO. NEW YORK.





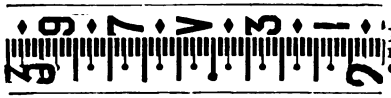
No. 6288.
Cross Section.

6330.
Flexible.

6290. 6291. 6292. 6292 S. 6293. 6295.

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FLEXIBLE OR POCKET LEVELING RODS.



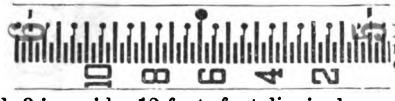
For pattern of rod see No. 6330 on opp. page.

6330. Flexible Rod, 3 in. wide, 8 feet, div. 10ths and 100ths feet, each $ 3 00
6331. do. 3 " " 10 " " " " " " " " 3 25
6332. do. 3 " " 12 " " " " " " " " 4 00



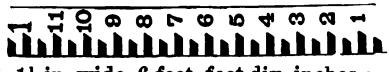
For pattern of rod see No. 6330 on opp. page.

6333. Flexible Rod, 1½ in. wide, 10 feet, div. 10ths and 100ths feet, each 2 50
6334. do. 1½ " " 12 " " " " " " " " 3 00



For pattern of rod see No. 6330 on opp. page.

6335. Flexible Rod, 3 in. wide, 12 feet, feet div. inches and ⅛ in . each 4 00



For pattern of rod see No. 6330 on opp. page.

6335 S. Flexible Rod, 1½ in. wide, 6 feet, feet div. inches and ¼ in. . each 1 50



For pattern of rod see No. 6330 on opp. page.

6340. Flexible Rod, 3 in. wide, metric, 3.5 meters, div. to centimeters . . . . . each 4 00

These Rods are strips of prepared canvas, graduated like self-reading rods. For use they are fastened to a straight board with thumb tacks. When rolled up they are easily carried in the pocket. They are put up in neat tin boxes.

RANGING POLES.

See illustrations on opp. page.

METAL

6290. Iron Tubular Ranging Poles, round ⅞ in. diameter, painted red and white alternately every foot, 6 8 10 feet
each $ 2 75 3 00 3 50

6291. Steel Ranging Poles, hexagonal (solid), ½ in. diameter, painted red and white alternately every foot, 6 8 feet
each $ 2 75 3 00

WOOD (white pine)

6292. Ranging Poles of best seasoned wood, **round**, tapered, painted red and white alternately every foot, 6 8 10 feet
each $ 2 00 2 25 2 50

6292 S. Ranging Poles, **sectional**, of best seasoned wood, round, in two sections, painted red and white alternately every foot, 8 10 feet
each $ 3 00 3 50

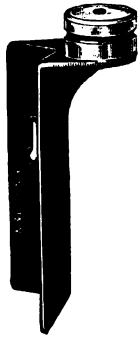
6293. Ranging Poles of best seasoned wood, **octagonal**, tapered, painted red and white alternately every foot, 6 8 10 feet
each $ 2 00 2 25 2 50

6295. Ranging Poles, **metric**, of best seasoned wood, octagonal, tapered, painted red and white alternately every half-meter, 2 2½ 3 meters
each $ 2 50 3 00 3 75

For Canvas Covers for Poles see page 472.

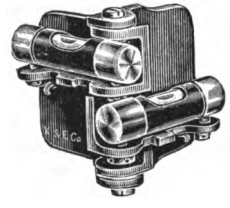
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ROD LEVELS.



No. 6299.

Illustration about ⅓ size.



6300.

6299. Rod Level, brass, circular spirit level 1 in. diam. . . . . each $ 3 00
6300. Rod Level, brass, folding, 2 spirit levels. . . . . " 3 00

Rod Levels are used for determining whether the rod is held perpendicular.

In No. 6299 the long angle plate insures proper contact when holding it to the rod, it may also be attached to the rod by means of a round-head screw for which there is a keyhole slot in the plate.

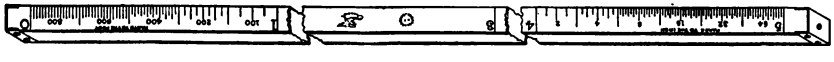
No. 6300 may be attached to the rod by means of a rubber band, for which purpose it is provided with two folding hooks.

CANVAS COVERS
FOR RODS AND POLES.

6302. Canvas Covers for rods No. 6250 to 6264, and 6270 to 6272. . . . . each $ 2 00
6303. Canvas Covers for poles No. 6290 to 6295. . . . . " 1 00

These covers are of heavy canvas, well made, to protect the rod or pole. In ordering these covers, please state for which catalogue number of rod or pole, and give length of pole.

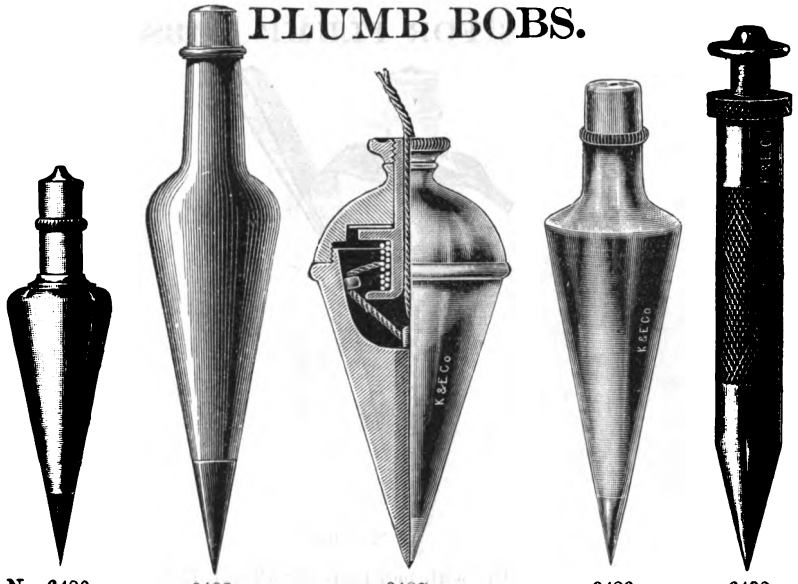
STANDARD MEASURES.



We make to order Standard Measures of wood, iron, brass or German silver, graduated in U. S. or any foreign measure. Prices according to specifications.

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PLUMB BOBS.



No. 6480 to 6482. | 6483 to 6486. | 6487. | 6489, 6490. | 6492, 6493.

6480. Fine Brass Plumb Bob, with hardened steel point, screw cap, about 6 oz. . . . . each $ 1 50
6481. do. do. " 8 " . . . . . " 1 75
6482. do. do. " 12 " . . . . . " 2 00
6483. Fine Brass Plumb Bob, with hardened steel point, screw cap, long neck, about 14 oz. . . . " 2 25
6483-1. do. do. do. " 18 " . . . " 2 75
6484. do. do. do. " 24 " . . . " 3 25
6485. do. do. do. " 32 " . . . " 3 75
6486. do. do. do. " 48 " . . . " 5 00
6487. Fine Brass Plumb Bob, with reel inside, on which the line is wound and held by friction at any point of its length, about 10 oz. . . . . " 2 50
6488. Plain Iron Plumb Bob, about 7 oz. . . . . " 75
6489. Plain Brass Plumb Bob, steel point, screw cap, about 8 oz. . . " 1 00
6490. do. do. " " " " 12 " . . " 1 40

6491. Sheaths for Plumb bobs, see next page.

STEEL AND MERCURY PLUMB BOBS.

6492 A. Fine Solid Steel Plumb Bob, nickelplated, with screw cap, about 3 oz., 4 in. long, $\frac{9}{16}$ in. diam., each $ 75
6492 B. do. do. " 6 " 5 " " $\frac{11}{16}$ " " " 1 00
6492 C. do. do. " 10 " $5\frac{1}{2}$ " " $\frac{7}{8}$ " " " 1 50
6492 D. do. do. " 14 " 6 " " 1 " " " 2 00
6493 A. Fine Steel Plumb Bob, nickelplated, with screw cap, loaded with mercury about 4 oz., 4 in. long, $\frac{9}{16}$ in. diam., each $ 1 00
6493 B. do. do. " 8 " 5 " " $\frac{11}{16}$ " " " 1 50
6493 C. do. do. " 12 " $5\frac{1}{2}$ " " $\frac{7}{8}$ " " " 2 00
6493 D. do. do. " 16 " 6 " " 1 " " " 2 50

Plumb Bobs No. 6492 and 6493 are made of steel rod. Their small diameter permits of using them close to walls or other surfaces and prevents their being readily swayed by the wind. The No. 6493 are hollow and filled with mercury, which makes them very heavy for their size, and brings the centre of gravity nearer to the point of the bob.

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SHEATHS FOR PLUMB BOBS.



No. 6491.

6491 A.	Sewed Leather Sheath, with belt loop, for Plumb Bobs,	6 to 8 oz.	each	$ 35
6491 B.	do.	12 to 14 oz.	"	45
6491 C.	do.	18 to 24 oz.	"	55
6491 D.	do.	32 to 48 oz.	"	75

PLUMB BOB CORD.

6496.	Plumb Bob Cord, best linen, thin, medium or thick. .		per yard	$ 02
6497.	do.	best braided silk	" "	06

STAKE TACKS.



No. 6494.

SPADS.



No. 6498.

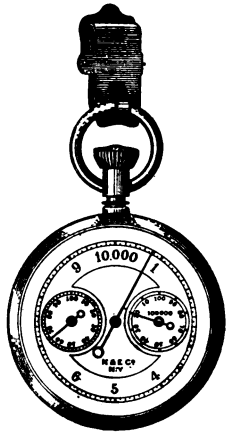
6494.	Stake Tacks, galvanized, tin box of 50			$ 10
6495.	do. do.	" " " 100		15
6495 B.	do. do.	" in bulk (5 lb. or over).	per lb.	30

These tacks have an indentation in the surface of the head, to guide the point of the plumb bob in exactly indicating location.

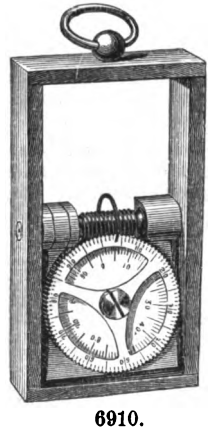
6498.	Surveying Spads, Montgomery's, steel, for suspending plumb bob from timbers in mines, tin box of 50.			75
6498 M.	do. do. do.	in bulk, per lot of 1000.		11 00

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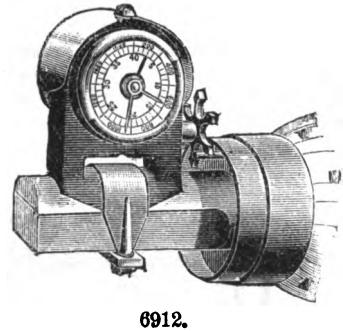
PEDOMETERS. ODOMETERS.



No. 6905.



6910.



6912.

6900. Pedometer, watch pattern, nickel case, 1¾ in., registering 12 miles by ¼ miles . . . . . each $ 4 50

6901. do. do. registering 50 miles by 80 yards " 5 25

Pedometers No. 6900 and 6901 register the **distance** walked. The hand advances in proportion to the length of stride, and the instrument is adjustable for length of stride by an easily accessible screw.

6905. Passometer, watch pattern, nickel case, 1¾ in., registering to 100,000 steps . . . . . each $ 6 50

Passometer No. 6905 registers the **number of steps** walked and is not adjustable to length of stride. The distance walked can be computed from the number of steps registered.

6910. Odometer of Brass, with silvered dials, in dustproof leather Case with Straps . . . . . each $ 15 00

The Odometer is attached to the spokes of a wheel, near the hub. It registers the number of revolutions of the wheel up to 10,000, and the distance traveled is determined by multiplying the circumference of the wheel by the number of revolutions which the dial indicates.

6912. Bell Odometer, for wheels of 44, 44½, 46 or 48 in. diameter, complete with attachments, record cards and directions . . . . . each $ 5 00

The Bell Odometer registers the distance traveled by vehicles of any description, and rings a small bell as each mile is passed. It keeps a record for 1600 miles and repeats. It is fastened to the axle and is operated by a steel pin driven into the end of the hub, or by special attachments furnished for wire wheels. These attachments propel the mechanism of the Odometer with each revolution of the vehicle wheel.

There are 3 hands (indexes) on the dial: The red hand registers 1 mile by 40th of a mile the yellow hand registers 40 miles by single miles, the blue hand registers 1600 miles by spaces of 40 miles. The completion of each mile is distinctly announced by one sharp stroke of a small bell in the instrument. The bell is a valuable feature, as the driver is enabled without even looking at the Odometer to tell how far or how fast he is traveling.

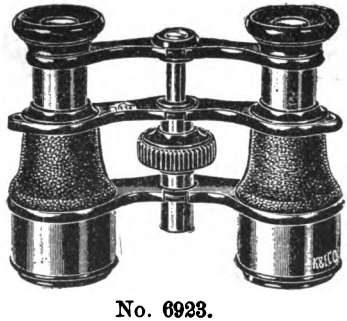
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EXTRA FINE

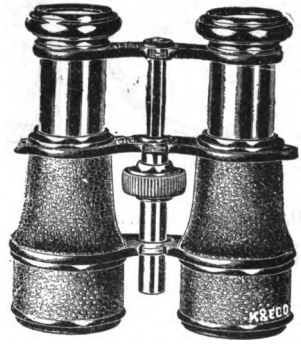
FIELD AND MARINE GLASSES.

The Field and Marine Glasses and Prism Binoculars here listed are of the finest quality and finish. They have been selected to meet the exacting requirements of the Engineer, Tourist, Sportsman and Naturalist and may be depended upon to be of the highest optical efficiency and satisfactory in every respect.

All of these glasses can be adapted to the distance between the eyes of the observer, as the bars connecting the two bodies are hinged. A short graduated arc and index facilitate setting the interpupillary distance when this is once determined. The focusing is by means of a central thumbscrew.



No. 6923.



6925½.

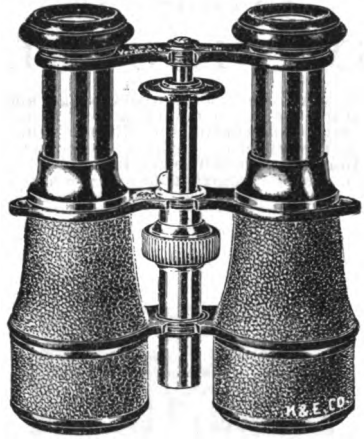
6923. Field and Marine Glass, Object Glass 1⅜ in., magnifying power 3½ diameters, field of view 115 yards at 1000 yards. Body finished in black lacquer and black grained leather. Weight 15 oz. In stiff leather Sling Case, with shoulder strap and cord . . . . . each $ 13 50

6924. Field and Marine Glass, similar to No. 6923, but with sunshades, magnifying power 4 diameters, field of view 100 yards at 1000 yards. Weight 16 oz . . . . . " 14 00

6925½. Field and Marine Glass, Object Glass 1⅞ in., magnifying power 3½ diameters, field of view 120 yards at 1000 yards. Body finished in black lacquer and black grained leather, sunshade leather covered. Weight 22 oz. In stiff leather Sling Case, with shoulder strap and cord . . . . . " 17 00

6927 N. Field and Marine Glass similar to No. 6925½, Object Glass 2⅛ in., magnifying power 4 diameters, field of view 105 yards at 1000 yards. Weight 30 oz. . . . . " 17 50

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No. 6929.

***6929.** Field and Marine Glass, Object Glass 1¾ in., magnifying power 6 diameters, field of view 60 yds. at 1000 yds. Body finished in black lacquer and black grained leather, sunshades leather covered, weight 21 oz. In stiff leather Sling Case, with shoulder strap and cord, each $ 21 50

***6931.** Field and Marine Glass, similar to No. 6929 but Object Glass 1¾ in., magnifying power 8 diameters, field of view 50 yds. at 1000 yds. Weight 21 oz. . . . . " 22 00

***6932.** Field and Marine Glass, similar to No. 6929 but Object Glass 1⅞ in., magnifying power 9 diameters, field of view 45 yds. at 1000 yds. Weight 24 oz. . . . . " 24 50

***6933.** Field and Marine Glass, like No. 6931, but of aluminum. Weight 14 oz. . . . . " 25 00

***6934.** Field and Marine Glass, like No. 6932, but of aluminum. Weight 15 oz. . . . . " 27 50

*In the glasses No. 6929 to 6934, the focusing screw is independent of the telescoping arrangement, so that closing the glass and drawing the tubes out will not disturb the focus to which they have been adjusted by the focusing screw.

6936. Field and Marine Glass, Object Glass 1⅞ in., two magnifying powers, 4½ and 6½ diameters, field of view 70 and 50 yds. at 1000 yds. Body finished in black lacquer and black grained leather, sunshades leather covered. Weight 24 oz. In stiff leather Sling Case with shoulder strap and cord . . . . . each $ 24 00

The two powers of this glass are produced by a movable auxilliary lens in the eyepiece, which drops into the field or out of it according to the position in which the glass is held. The upper cross-bar is marked to show which power is employed.

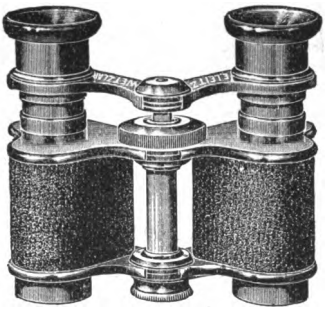
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EXTRA-FINE

PRISM BINOCULARS.

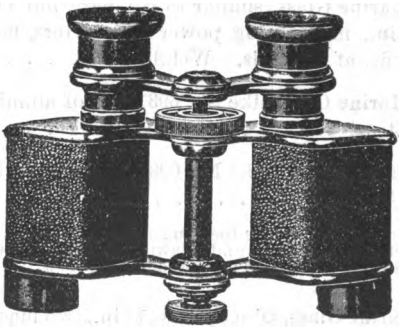
These Prism Binoculars are of latest improved design and of the finest quality in regard to their optical features and to the mountings and casings. They will withstand considerable rough usage without disturbing the adjustment of the prisms and the casings are so accurately made that the reflecting surfaces are protected against dust and moisture under extreme variations of temperature and humidity.

They are focused by means of a central thumb screw and one of the eyepieces can be adjusted to compensate for any difference of refraction in the eyes.



No. 6940.

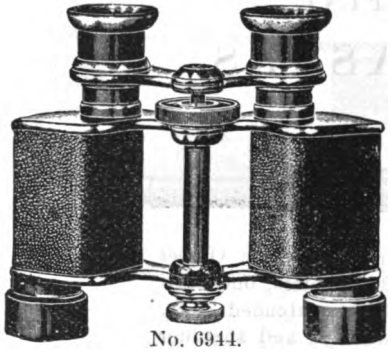
6940. Prism Field Glass, Object Glass $\frac{5}{8}$ in. effective diameter, magnifying power 4 diameters. Relative luminosity 16. Field of view 193 yards at 1000 yds. Body finished in black lacquer and heavy grained leather. Weight 8 oz. Stiff leather Sling Case with shoulder strap. . . . . each $ 36 00



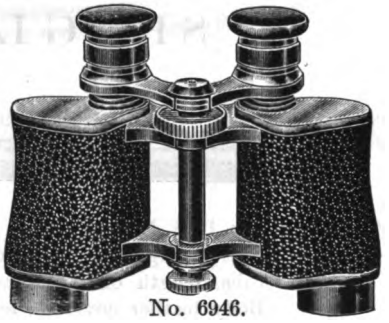
No. 6942.

6942. Prism Field Glass, Object Glass $\frac{7}{8}$ in. effective diameter, magnifying power 6 diameters. Relative luminosity 12.2. Field of view 124 yards at 1000 yards. Body finished in black lacquer and heavy grained leather. Weight 15½ oz. Stiff leather Sling Case with shoulder strap. . . . . each $ 45 00

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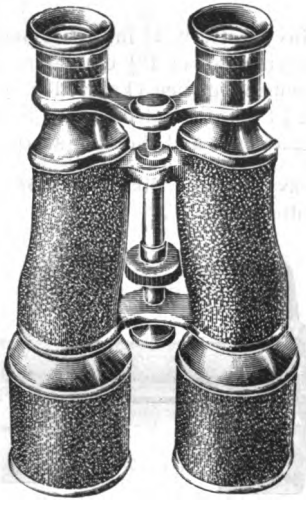
No. 6944.



No. 6946.

6944. Prism Field Glass, Object Glass $1\frac{5}{16}$ in. effective diameter, magnifying power 8 diameters. Relative luminosity 9. Field of view 115 yards at 1000 yds. Body finished in black lacquer and heavy grained leather. Weight 18 oz. Stiff leather Sling Case with shoulder strap . . . . . each $ 50 00

6946. Prism Field Glass, Object Glass $1\frac{5}{16}$ in. effective diameter, magnifying power 8 diameters. Relative luminosity 13.7. Field of view 120 yds. at 1000 yds. Body finished in black lacquer and heavy grained leather. Weight 23 oz. Stiff leather Sling Case with shoulder strap . . . . . " $ 62 00



No. 6948.

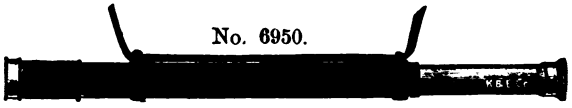
***6948.** Prism Field Glass, Object Glass $1\frac{11}{16}$ in. effective diameter, magnifying power 10 diameters, relative luminosity 16.7. Field of view 88 yds. at 1000 yds. Body finished in black lacquer and heavy grained leather. Weight 32 oz. Stiff leather Sling Case with shoulder strap . . . . . each $ 78 00

*NOTE. On account of its high magnifying power, this glass should be firmly supported during observations. When holding it in the hand, the arm should rest upon some rigid object, to obtain the full benefit of the high power.

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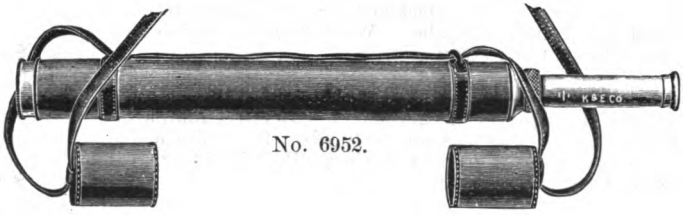
EXTRA-FINE

SPYGLASSES.



No. 6950.

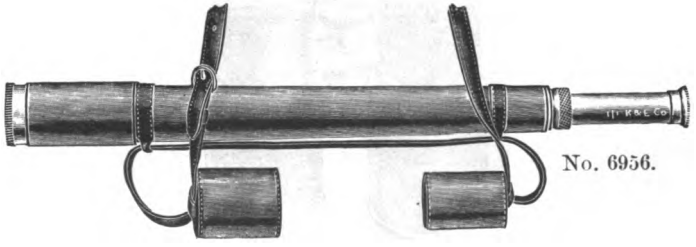
6950. Spyglass, U. S. Navy Pattern, 1 in. achromatic Object Glass, magnifying power 12 diameters, one draw tube, length closed about 16 in., extended 21 in. Body leather covered; leather caps and shoulder strap . . . . . each $ 16 00



No. 6952.

6952. Spyglass, U. S. Navy Pattern, $1\frac{7}{8}$ in. achromatic Object Glass, magnifying power $13\frac{1}{2}$ diameters, one draw tube with focusing device (knurled ring), length closed about 21 in., extended 26 in. Body leather covered; leather caps and shoulder strap . . . . . each $ 27 50

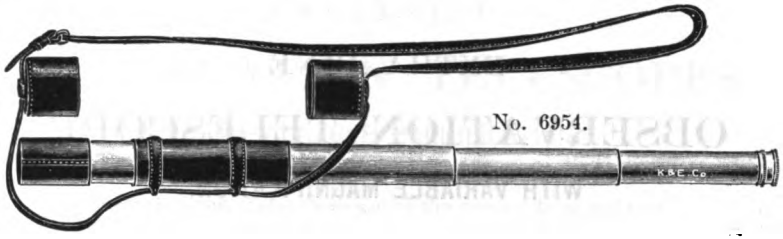
6953. Spyglass, U. S. Navy Pattern, like No. 6952, but with power of 20 diameters . . . . . " 27 50



No. 6956.

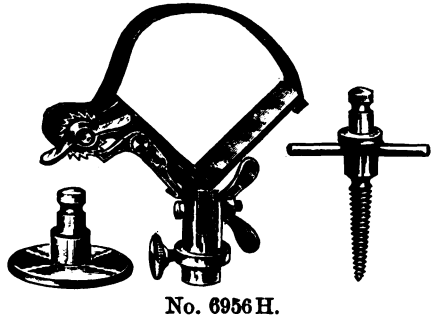
6954. Spyglass, U. S. Navy Pattern, $2\frac{1}{8}$ in., achromatic Object Glass, magnifying power 30 diameters, one draw tube with focusing device (knurled ring). Length closed about 24 in., extended 28 in. Tapered body, leather covered; leather caps and shoulder strap, each $ 80 00

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No. 6954.

6956. Spyglass, after Lord Bury, 1½ in. achromatic Object Glass, adjustable for magnifying powers of 25, 30 and 35 diameters, three draw tubes and eyepiece draw for setting magnification, length, closed 11 in., extended 30 in. Body leather covered, leather caps and shoulder strap . . . . . each $ 30 00



No. 6956 H.

6956 H. Spyglass holder, (tripod head) nickelplated, base plate tapped for standard photographic tripod screw, separate screw support with long gimlet screw for attaching to a tree or post, can be used for all customary sizes of spyglasses . . . . . each $ 5 00

This is a very substantial and practical holder. The glass rests firmly in the broad arms of the metal angle and is held by a stout woven strap which is tightened by a ratchet wheel and released by throwing back the spring check. The holder swivels on its base plate or on the screw support and has an additional joint for pointing the glass up or down.



No. 6957.

6957. Target or Sharpshooter's Spotting Telescope, 2½ in., achromatic Object Glass, magnifying power 60 diameters, two draw tubes, focusing device by knurled ring. Length closed 15½ in., extended 35 in. Body morocco finished, with leather cap. In fine polished mahogany Box . . . . . each $ 60 00

Tripod and Holder, suitable for No. 6957, furnished to order to meet requirements.

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EXTRA-FINE

OBSERVATION TELESCOPE.

WITH VARIABLE MAGNIFICATION.



No. 6960.

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EXTRA-FINE

OBSERVATION TELESCOPES

WITH VARIABLE MAGNIFICATION.

These Observation Telescopes are of the newest type and embody a number of novel optical and mechanical features. They are of the same high grade as the telescopes furnished by us to the U. S. Army and Navy and are far superior to the instruments usually offered as Observation or Porch Telescopes.

The **variable magnification** is a feature deserving of special attention. By means of a new system of lenses, **an object, after being focused, can be magnified to any size within the limits of the telescope without disturbing the focus.** This optical arrangement permits of the use of a low power and large field or of a high power and correspondingly smaller field to suit atmospheric conditions. Changing to a different power is accomplished by turning a knurled sleeve near the eyepiece, the focus remaining equally sharp and clear throughout the range of magnification. The eyepiece is provided with a "Ray Filter" (a colored glass shutter) which can be used to eliminate the blue haze which often obscures details when observing over distant mountains or over water.

For **astronomical observations** the variable eyepiece is removed and an adapter attached for holding one of the three astronomical eyepieces furnished with each telescope. To facilitate locating a celestial body, a finder telescope (not shown on the cut) having a large field of view is attached to the telescope.

The telescope can be easily pointed in any direction and is fitted with an improved arrangement for raising and lowering. The metal tripod shown in the illustration is of a type furnished by us to the U. S. Navy. It is extremely strong and rigid. We are prepared to furnish other tripods for these telescopes to meet the wishes of the purchaser and shall be glad to submit sketches and prices.

6960. Extra-Fine Observation Telescope.

Telescope 50 in., achromatic, terrestrial, with sunshade. Object Glass 4 in. Magnification **variable** from 20 to 40 diameters. Three extra eyepieces for astronomical observations. Magnification of astronomical eyepieces, 50, 120 and 170 diameters. **Finder telescope** 12 in. effective aperture 1 in., magnification 6 diameters.

Telescope packed in strong polished mahogany Box, extra strong and rigid metal Tripod and waterproof cover . . . . . $ 500 00

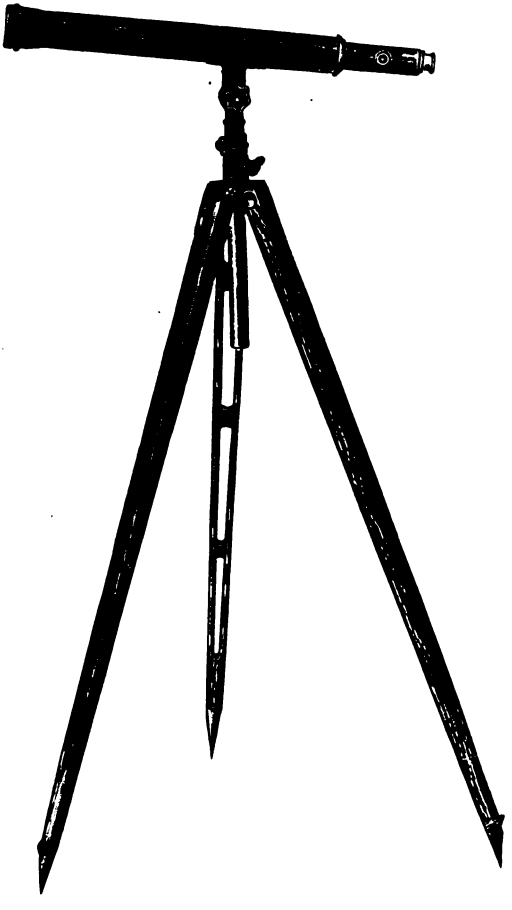
6961. Extra-Fine Observation Telescope.

Telescope 42 in., achromatic, terrestrial, with sunshade. Object Glass 3 in. Magnification **variable** from 15 to 30 diameters. Three extra eyepieces for astronomical

(continued on page 485).

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PORCH TELESCOPE.



No. 6964.

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(continued from page 483).

observations. Magnification of astronomical eyepieces 40, 100 and 140 diameters. **Finder telescope** 12 in., effective aperture 1 in., magnification 6 diameters.

Telescope packed in strong polished mahogany Box, extra strong and rigid metal Tripod and waterproof cover . . . . . $ 375 00

6962. Extra-Fine Observation Telescope.

Telescope 35 in., achromatic, terrestrial, with improved sunshade. Object Glass 2½ in. Magnification **variable** from 12 to 24 diameters. Three extra eyepieces for astronomical observations. Magnification of astronomical eyepieces, 30, 80 and 110 diameters. **Finder telescope** 12 in., effective aperture 1 in., magnification 6 diameters.

Telescope packed in strong polished mahogany Box, extra strong and rigid metal Tripod and waterproof cover 250 00

PORCH TELESCOPES.

The Porch Telescopes differ from the Observation Telescopes in that they are somewhat smaller and lighter, having an erecting eyepiece with **fixed** magnification. The optical parts are of the same fine quality as those of the Observation Telescopes, giving a large clear field and good definition.

The Telescope is mounted so that it can be easily pointed in any direction and will hold its position with great steadiness. It is arranged for raising and lowering to suit the height of the observer. The strong split-leg tripod is similar to that used for heavy Surveying Instruments and makes a very rigid support for the telescope.

6964. Fine Porch Telescope.

Telescope 48 in., achromatic terrestrial, with improved sunshade and rack and pinion focusing arrangement. Object Glass 3 in. Magnification 36 diameters. Eyepiece with ray filter. Telescope in wooden box, strong split-leg tripod and waterproof cover. . . . . $ 100 00

Astronomical eyepiece, magnification 100 diameters . . . extra 10 00

Table Stand . . . . . " 5 00

6965. Fine Porch Telescope.

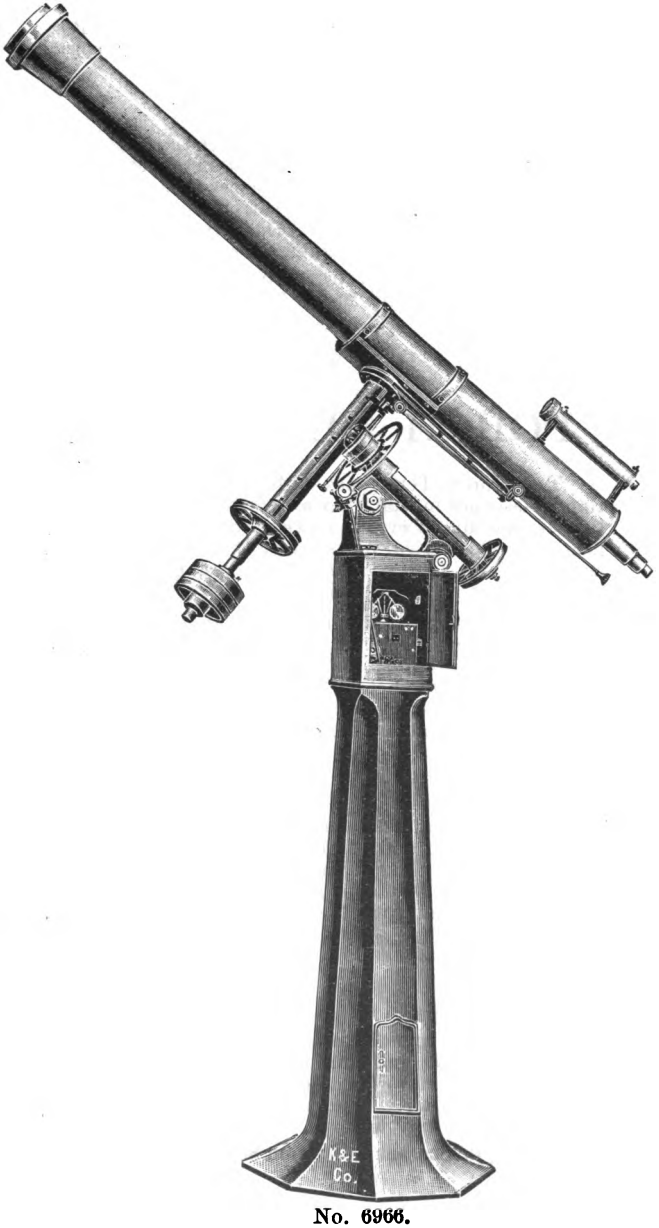
Telescope 42 in., achromatic terrestrial, with improved sunshade and rack and pinion focusing arrangement. Object Glass 2½ in. Magnification 30 diameters. Eyepiece with ray filter. Telescope in wooden box, strong split-leg tripod and waterproof cover. 75 00

Astronomical eyepiece, magnification 80 diameters. . . . extra 10 00

Table Stand . . . . . " 5 00

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EQUATORIAL TELESCOPE.



No. 6966.

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FIXED EQUATORIAL TELESCOPE.

6966. Fixed Equatorial Telescope.

Length of Telescope about 8 feet. Object Glass 6 in. clear aperture. Five astronomical eyepieces giving powers of 50, 120, 180, 250 and 380 diameters. Color shades for solar observations.

Mounting equatorial, adjustable for latitude. Clamps and slow motion both in Declination and Right Ascension.

Circle in Right Ascension, (Hour Circle), with coarse graduations on bronze ring to 10 minutes, fine graduations on silvered ring to 1 minute, reading by vernier to 1 second of time.

Circle in Declination, graduated on solid silver to 10 minutes, reading by vernier to 10 seconds.

Finder to Telescope. Length 18 in., objective 2 in. clear aperture. Magnifying Power 12 diameters.

Driving Clock inside of Stand, can be regulated from outside.

Equatorial Telescope complete as described above. . . . . $ 2000 00

6967. Equatorial Telescope as described under No, 6966, but Object Glass 5 in. clear aperture, five astronomical eyepieces giving powers of 40, 100, 150, 210 and 315 diameters 1500 00

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The Optical Department of our works has at its disposal a staff of scientific experts and skilled mechanics and is equipped with the latest and best appliances and precision tools.

We are prepared to design and manufacture any kind of instrument similar in type to those listed in this catalogue, either with straight line or with prism telescope.

Our facilities enable us also to make repairs on such instruments in the very best manner.

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MAGNIFYING GLASSES.



No. 6970.

6970. Reading Glasses, **German Silver** Rim, Black Handle, **Best Quality.**

	1½	2	2½	3	3½	4	4½	5 in.
each $	60	75	95	1 30	1 75	2 35	3 00	3 75

POCKET MAGNIFYING GLASSES

MOUNTED IN METAL.



No. 6980.

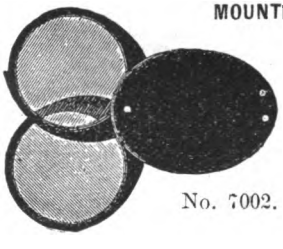


6986.

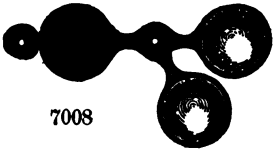
6980.	Round, bronzed frame,	1	lens,	1	in.	each	$ 40
6981.	do. " "	2	"	1	"	"	65
6982.	do. " "	3	"	1	"	"	1 00
6985.	do. German silver frame,	1	lens,	1	in.	"	75
6986.	do. " " "	2	"	1	"	"	1 00
6987.	do. " " "	3	"	1	"	"	1 30

These glasses have a large, flat field and good magnifying power and are well adapted for reading graduations on Surveying Instruments. As they are mounted in metal they are more durable than those mounted in hard rubber. The mountings are non-magnetic.

MOUNTED IN RUBBER.



No. 7002.

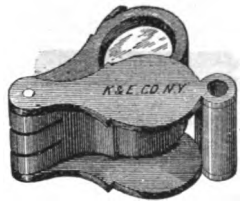


7008

7000.	Oval Pattern,	1	lens,	1	in. diameter	each	$ 35
7001.	do.	1	"	1½	" "	"	60
7002.	do.	2	lenses,	1	" "	"	60
7003.	do.	2	"	1½	" "	"	85
7007.	Round Pattern,	1	lens,	1	" "	each	$ 35
7010.	do.	2	lenses,	1	" "	"	60
7013.	do.	3	"	1	" "	"	85

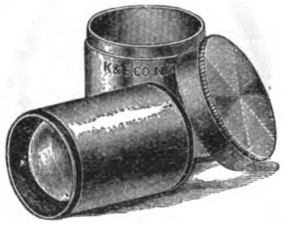
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ACHROMATIC POCKET MAGNIFIERS



No. 7021.

"Copyright, 1890, by Keuffel & Esser Co."



7022.

7021. Pocket Magnifier, **achromatic**, nickel plated brass frame, lens ¾ in., magnifying power about 5 diameters, a very fine glass with good definition, for examining ore, etc, each $ 5 75

7022. do. do. do. but in brass cylinder Case " 7 25



No. 7023.

"Copyright, 1890, by Keuffel & Esser Co."



7024.

7023. Pocket Magnifier, extra powerful, **achromatic**, in bronzed brass frame, lens ¼ in., magnifying power about 12 diameters . . . . . each $ 5 00

7024. Pocket Magnifier, **achromatic**, like No. 7023, but lens ⅜ in. power about 5 diameters . . . . . " 5 00



No. 7026.



7035.

7025. Coddington Lens, brass frame and handle, nickel plated, ⅝ in., each $ 1 10

7026. do. " " " " " 1 3/16 " " 1 30

7027. do. " " wooden handle " 1¼ " " 1 65

THREAD COUNTERS.

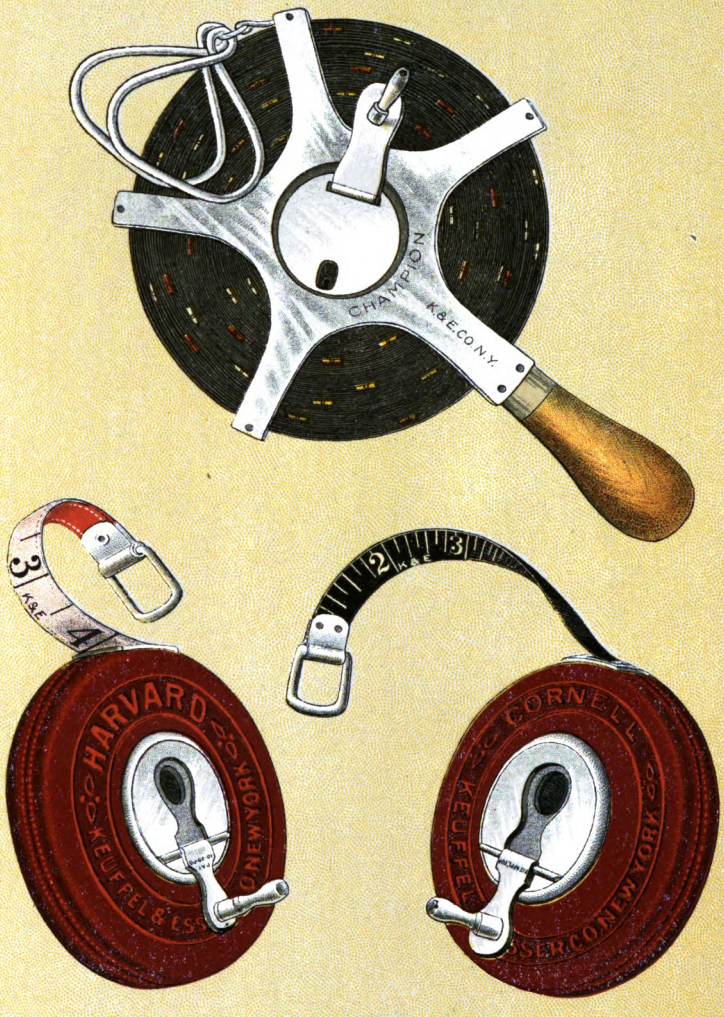
(LINEN PROVERS.)

7035. Thread Counter, folding brass frame, ¼ in. field . . . . each $ 30

7036. do. " " " ½ " " . . . . " 50

7037. do. " " " 1 " " . . . . " 2 00

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PART III
MEASURING TAPES

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K & E MEASURING TAPES.

Patented.

Manufactured by

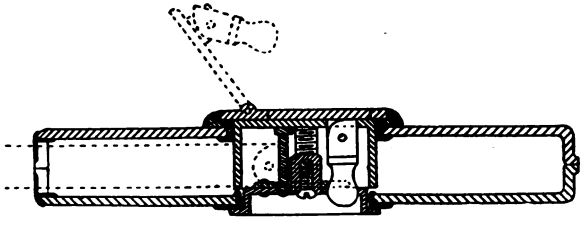
KEUFFEL & ESSER CO.

These **American-made** tapes are recommended for their superiority in *design*, *material*, *workmanship*, and *accuracy*. They are graduated according to the U. S. Standard of the National Bureau of Standards at Washington, D. C.

Our Steel Tapes in feet are standard at 62°F, those in metric measure at 20°C.

K & E IMPROVED CENTRE.

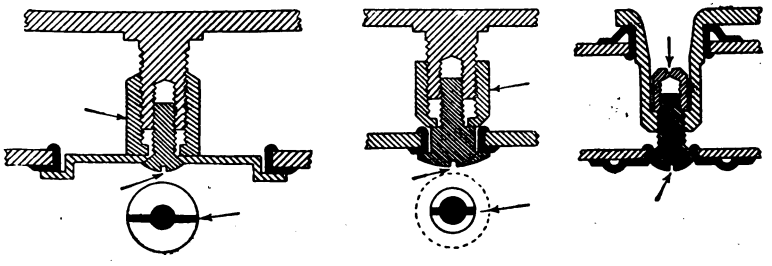
Patented.



The **K & E Patent Centre** with flush holding handle, as shown in cut, has a large drum with long handle crank, which winds the tape quickly and easily and avoids the close coiling which injures the steel line. The long, jointed swiveling handle pin, when closed, protrudes beyond the surface of the reverse side of the tape case, so that the handle crank can be thrown open by pressing the protruding end of the handle pin.

ADJUSTABLE CENTRES.

Patented.



Owing to wear, the nice adjustment of the usual style of tape centre suffers in time, resulting in difficulties when winding or unwinding the tape. The cases of all **K & E** Measuring Tapes have our Patent Adjustable Centre, allowing readjustment for wear at the centre, to maintain just the friction desired.

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KECO FINISH.

By this name we designate the superior finish which we put on all our steel tape lines. It produces a dense, even black line with brilliant bright-steel graduations and figures. The KECO finish wears well, guards against rusting, obviates the necessity of greasing the line to protect it, and tends to preserve the appearance of the line.

NUMBERING



We make the foot numbering on our Steel Tapes in much larger and heavier figures than the numbering of the sub-divisions, making it almost impossible to confuse the two. The foot figures on tapes are readily recognized as such, even in poor light or when the line is partly worn. Our tapes are **easy reading** and unencumbered by confusing and superfluous figures.

K & E STEEL TAPES WITH THERMOMETER SCALE.



Ending of 100 foot tape with Thermometer Scale. Actual size.

F.S. Patent Thermometer Scale on 50 or 100 foot tape, ... extra $ 1 00

As a means of obtaining additional accuracy and uniformity in measuring, we recommend **steel tapes with thermometer scale.** This scale is graduated to correspond to the contraction and expansion of the tape, according to the Fahrenheit thermometer for tapes graduated in feet, or the Centigrade thermometer for tapes in metric measure. It takes the place of the terminal mark of the tape and the terminal point lies at that mark of the thermometer scale, which corresponds to the thermometer reading at the time of taking the measurement: For instance, at 80° the terminal point will be at the graduation numbered 80 on the thermometer scale, at 20° it will be at the graduation numbered 20, etc., etc. The above cut, which is actual size, will show how important it is for exact measuring to make this correction for temperature, as the variation in 100 feet between 90°+ and 20°—is nearly .07 feet. (The fig. "9" in the cut is the 9th tenth of the last foot of a 100 foot tape).

This scale can not be applied to Liliput, Midget, Dwarf, Unique, Home or Armor Tapes nor to tapes less than one-quarter inch wide, nor to Bandchains.

For Pocket Thermometers see page 452.

K & E STEEL TAPES WITH STATED TENSION.

T.E. Determining the tension and etching it on the line, for tapes up to 100 ft. . . . . extra $ 1 00

To secure uniformity in measurements we etch on any of our steel tapes (except Liliput, Midget, Dwarf, Unique, Home and Armor) the tension (in pounds, to the nearest half-pound) at which the tape is standard at 62° F. when supported for its entire length, and also when supported at its ends only.

For determining the tension of longer lines and etching it on the line, prices which will be according to conditions, will be quoted on application.

EXTRA-LONG TAPES.

We list our tapes in lengths up to 100 feet. If they are wanted of greater length, we make them to order in any of our styles with suitable cases or reels. For lengths beyond 100 feet the Flat Wire Tapes and the Band Chains (page 519 &c.) are generally preferred.

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SUBDIVISIONS.

U. S. STANDARD.

Steel Tapes in **12ths** have the foot graduated to inches ($\frac{1}{12}$ foot) and each inch to eighths, making the ultimate graduation $\frac{1}{8}$ inch, except the Liliput, Midget, Dwarf and Mechanic's which are graduated to $\frac{1}{12}$ inch.

Steel Tapes in **10ths** have the foot graduated into 10 parts and each $\frac{1}{10}$ again into 10 parts, making the ultimate graduation $\frac{1}{100}$ foot.

Woven Tapes in **12ths** have the foot graduated to inches ($\frac{1}{12}$ foot) and the inches to halves, making the ultimate graduation half-inch, except the Piccolo which is graduated to $\frac{1}{8}$ inch.

Woven Tapes in **10ths** have the foot graduated into 10 parts and each $\frac{1}{10}$ into halves, making the ultimate graduation half-tenths of a foot, except the Piccolo, which is graduated to $\frac{1}{10}$ and $\frac{1}{100}$ foot.

Spring Winding Pocket Tapes in **12ths: Excelsior,** up to 6 feet long are graduated to inches in 16ths, those over 6 feet long to feet, inches and 16ths. **Tip Top Tapes** are graduated to inches in 16ths, except No. 7713 TF and 7723 TF, to feet, inches and 16ths.

Spring Winding Pocket Tapes in **10ths** have the foot graduated into 10 parts and each $\frac{1}{10}$ again into 10 parts, making the ultimate graduation $\frac{1}{100}$ foot.

Steel Tapes on which the measurement begins "on the line" have the zero mark $\frac{1}{8}$ or $\frac{1}{4}$ foot respectively from the end of the line.

METRIC.

Steel Tapes in **Metric** measure are graduated to half-centimeters, the first decimeter to millimeters.

Woven Tapes in **Metric** measure are graduated to half-centimeters throughout.

Spring Winding Pocket Tapes in **Metric** Measure are graduated to millimeters throughout.

On all Tapes in **Metric** measure except Paine's pattern tapes, the measurement begins "on the line."

OFFICIAL CERTIFICATE OF COMPARISON.

We can furnish any of the **K & E** Steel Tapes the graduations of which BEGIN ON THE LINE, with Certificate of Comparison of the National Bureau of Standards at Washington. The following prices for comparing consist of the Bureau's fee and the transportation charges to and from Washington.

Ca.	For total length not greater than 100 feet or 50 meters **either** supported throughout **or** at intervals	$ 1 25
	do. do. for each additional 100-foot or 50-meter interval .	50
Cd.	For comparing total length **both** supported throughout **and** at intervals, for lengths of 100 feet or 50 meters	1 75
	do. do. for each additional 100 or 50 meters.	1 00
Cf.	For each sub-division compared	10
Cg.	For determining length at an additional tension, for each 100 foot or 50 meter interval	25
Ch.	For determining the tension to the nearest 0.5 pounds or 0.25 kilogram at which the tape is most nearly correct at the standard temperature, for each 100 foot or 50 meter interval	1 00

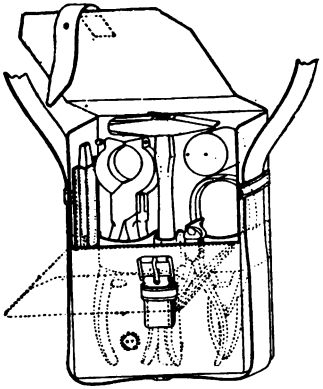
For comparing tapes not wound on a reel, for each 100 feet or 50 meters or fraction thereof, there is an extra charge of 25

The certificate of the Bureau of Standards states among other data, the temperature at which comparison was made, the method of support the tension at which tape was compared, and the length corrected for the temperature of 62° F for tapes graduated into feet, or 20° centigrade for metric tapes.

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K & E MENDING OUTFIT

for mending tapes in the field.



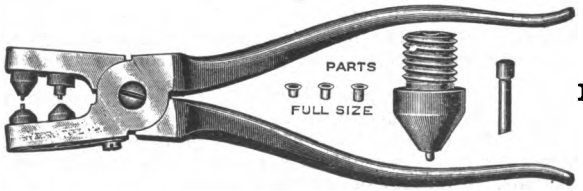
No. 7096.

7096. K & E Tape Mending Kit, in sewed Leather Sling Case, with rivets and metal sleeves . . . . . each $ 9 75

This outfit consists of one rivet set, one punching pliers, one riveting hammer, one end-nippers, one pair shears, one anvil, one three-square file, one centre punch (for heavy band chains, to be used before applying the punching pliers.) It is put up in a sewed leather case 5 x 7¼ in., with shoulder strap, and weighs about 30 ounces. In the case is a separate pouch with rivets and sleeves for flat wire tapes.

With this outfit all kinds of measuring tapes can be quickly and durably repaired in the field. The Flat Wire Tapes, for which we furnish clamping sleeves, are first notched by the three-square file and the sleeves are pressed into the notches by the end-nippers. This makes a strong joint.

TAPE MENDING TOOL.



No. 7098.

7098. Tape Mending Tool, combined cutter and riveter, 8 in., a light and convenient tool for quickly repairing tapes in the field.

Tool, with 1000 eyelets (500 each of two sizes) . . . . . each $ 4 00
Extra eyelets (500 in a package) . . . . . per mille 1 25

REPAIRING TAPES.

We promptly attend to any repairs on steel or woven tapes and execute them in the most approved manner at moderate charge.

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K & E
STEEL MEASURING TAPES.



Stevens **K & E** Steel Tapes, **1/2 in. wide,** patent brass frame, paten. centre, long swiveling flush folding handle opened by pushing handle pin from opposite side of frame. Frame and all mountings nickelplated. Graduations begin **on the line.**

Length in feet,	50	100
12ths of feet	No. 7102T	7105T
10ths " "	7102D	7105D
	each $ 7 15	12 85
12ths of feet and Links	No. 7102TL	7105TL
10ths " " " "	7102DL	7105DL
	each $ 7 35	13 15

Length in Meters,	15	30
Metric (one side only)	No. 7102M	7105M
	each $ 7 15	12 85
Metric, other side 12ths of feet	No. 7102TM	7105TM
	each $ 8 40	15 30

Madison **K & E** Steel Tapes, **5/16 in. wide, Paine's pattern,** patent brass frame, large centre, long swiveling flush folding handle opened by pushing handle pin from opposite side of frame. Frame and all mountings nickelplated. Two handles for tape line. Graduations begin **at end of line.**

Length in feet,	50	100
12ths of feet	No. 7122T	7125T
10ths " "	7122D	7125D
	each $ 7 15	12 85

Length in Meters,	15	30
Metric (one side only)	No. 7122M	7125M
	each $ 7 15	12 85
Metric, other side 12ths of feet	No. 7122TM	7125TM
	each $ 8 40	15 30

For Patent Thermometer Scale, see page 492.
Etching Tension on Line, see page 492.
Nickelplating Tape Lines, see page 510.

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KEUFFEL & ESSER CO. NEW YORK.

K & E STEEL TAPES.

KECO Finish.
(see page 492)



Please order by number.

Ohio K & E Steel Tapes, 1/2 **in. wide,** on patent brass frame, large centre with long folding handle, frame and all mountings nickel-plated. Graduations begin **on the line.**

Length in feet,	50	100
12ths of feet	No. 7152T	7155T
10ths " "	7152D	7155D
	each $ 5 10	8 75
Length in Meters,	**15**	**30**
Metric (one side only)	No. 7152M	7155M
	each $ 5 10	8 75
Metric, other side 12ths of feet	No. 7152TM	7155TM
	each $ 6 30	11 20

Texas K & E Steel Tapes 3/8 **in. wide,** on patent brass frame, large centre with long folding handle, frame and all mountings nickelplated. Graduations begin **on the line.**

Length in feet,	50	100	150*	200*
12ths of feet	No. 7162T	7165T	7166T	7167T
10ths " "	7162D	7165D	7166D	7167D
	each $ 4 40	7 55	12 20	15 10
Length in Meters,			**15**	**30**
Metric (one side only)			No. 7162M	7165M
			each $ 4 40	7 55
Metric, other side 12ths of feet			No. 7162TM	7165TM
			each $ 5 60	10 00

*The reels of the 150 and 200-foot Texas Tapes are like those of the shorter lengths, but have cross-arms (four-arm reels).

Maine K & E Steel Tapes, 5/16 **in. wide, Paine's Pattern,** on patent brass frame, large centre with long folding handle, frame and all mountings nickelplated, two handles for tape line. Graduations begin **at end of line.**

Length in feet,	50	100
12ths of feet	No. 7172T	7175T
10ths " "	No. 7172D	7175D
	each $ 5 10	8 75
Length in Meters,	**15**	**30**
Metric (one side only)	No. 7172M	7175M
	each $ 5 10	8 75
Metric, other side 12ths of feet	No. 7172TM	7175TM
	each $ 6 30	11 20

7182. Berkeley Tape, see page 498.

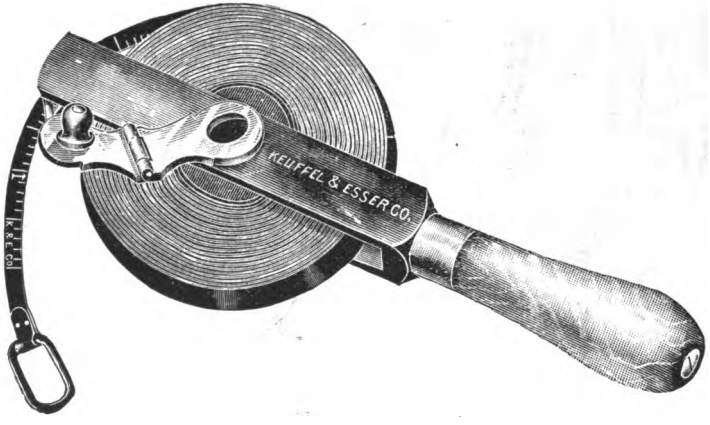
For Patent Thermometer scale, see page 492.
Etching Tension on Line, see page 492.
Nickelplating Tape Lines, see page 510.

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K & E BRONZE TAPES.

(Special Bronze Alloy)

RUST PROOF.



Please order by number.

K & E BRONZE TAPE 1/2 in. wide, on patent brass frame, large centre with long folding handle, frame and all mountings nickelplated. Graduations begin **on the line.**

Length in feet.	50	100
12ths of feet. . . . . No.	7387 T	7389 T
10ths of feet.	7387 D	7389 D
each	$ 7 75	13 25

The Bronze Tapes are intended for use in salt or fresh water, mine waters, on board ship, &c. The lines are heavy bronze ribbon and the etched graduations are sharp and easily read.

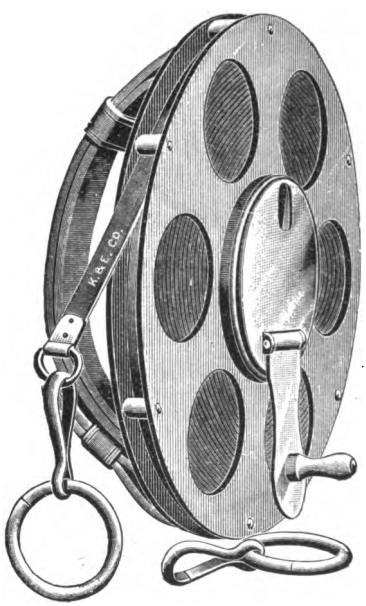
Bronze Tapes in other measures or of other lengths made to order.

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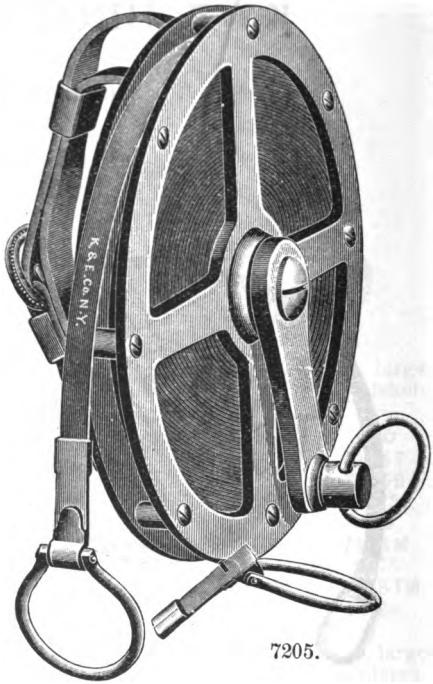
K & E STEEL TAPES.

KECO Finish.

(see page 492.)



No. 7185.



7205.

Berkeley **K & E** Steel Tapes, **1/4 in. wide,** metal reel with leather strap handle, large centre with long folding handle. Two handles for tape line. Reel and all mountings nickelplated. Graduations begin **on the line.**

Please order by number.

Length in feet,	50	100
10ths of feet	No. 7182 D	7185 D
	each $ 7 00	12 00
Length in Meters,	**15**	**30**
Metric (one side only)	No. 7182 M	7185 M
	each $ 7 00	12 00

Purdue **K & E** Steel Tapes, **1/4 in. wide,** Paine's pattern, heavy brass reel with leather strap handle, large centre with long crank and swiveling ring handle. Two handles for tape line. Reel and all mountings nickelplated. Graduations begin **at end of line.**

Length in feet,	50	100
10ths of feet	No. 7202 D	7205 D
	each $ 11 00	17 00
Length in Meters,	**15**	**30**
Metric (one side only)	No. 7202 M	7205 M
	each $ 11 00	17 00

The Purdue is an extra-heavy tape, intended for rough accurate work

For Patent Thermometer Scale, see page 492.
Etching Tension on Line, see page 492.
Nickelplating Tape Lines, see page 510.

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K & E STEEL TAPES.

KECO Finish.
(see page 492.)



Columbia **K & E** Steel Tapes, 1/2 in. wide, stout bent leather case, patent centre, long swiveling flush folding handle, opened by pushing handle pin from opposite side of case. Centre adjustable for wear. Nickelplated mountings. Graduations begin **at end of line.**

Please order by number.

Length in feet,	33	50	66	75	100
12ths of feet. . . . . No.	7231 T	7232 T	7233 T	7234 T	7235 T
10ths "	7231 D	7232 D	7233 D	7234 D	7235 D
each $	5 35	7 50	9 55	10 80	13 40
12ths of feet and Links. . . No.	7231 TL	7232 TL	7233 TL	7234 TL	7235 TL
10ths " " . . .	7231 DL	7232 DL	7233 DL	7234 DL	7235 DL
each $	5 55	7 70	9 85	11 10	13 70

Length in Meters,	10	15	20	25	30
Metric (one side only) . . . No.	7231 M	7232 M	7233 M	7234 M	7235 M
each $	5 35	7 50	9 55	11 80	13 40
Metric, other side 12ths of feet No.	7231 TM	7232 TM	7233 TM	7234 TM	7235 TM
each $	6 15	8 75	11 15	13 80	15 85

For Patent Thermometer Scale, see page 492.
Etching Tension on Line, see page 492.
Nickelplating Tape Lines, see page 501.

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K & E STEEL TAPES.

KECO Finish.

(See page 492.)



Please order by number.

Cornell **K & E** Steel Tapes, **3/8 in. wide,** stout bent leather case, patent centre, long swiveling flush folding handle, opened by pushing handle pin from opposite side of case. Centre adjustable for wear. Nickel-plated mountings. Graduations begin **at outside end of ring.**

Length in feet,	25	33	50	66	75	100
12ths of feet . . . . . No.	7250T	7251T	7252T	7253T	7254T	7255T
10ths " "	7250D	7251D	7252D	7253D	7254D	7255D
each	$ 4 15	4 75	6 65	8 45	9 60	11 85
12ths of feet and links No.	7250TL	7251TL	7252TL	7253TL	7254TL	7255TL
10ths " " " "	7250DL	7251DL	7252DL	7253DL	7254DL	7255DL
each	$ 4 30	4 95	6 85	8 75	9 90	12 15

Graduating Cornell Steel Tapes to **16ths inches throughout,** add per foot $ 01

Length in Meters,	10	15	20	25	30
Metric (one side only) . . . . No.	7251M	7252M	7253M	7254M	7255M
each	$ 4 75	6 65	8 45	10 50	11 85
Metric, other side 12ths of feet No.	7251TM	7252TM	7253TM	7254TM	7255TM
each	$ 5 55	7 90	10 05	12 50	14 30

TREE TAPE

(FORESTER'S TAPE).



No. 7262DP.

7262DP. *Cornell* **K & E** Steel Tree Tape, **3/8 in. wide,** 50 ft., one side 10ths and 100ths feet, other side in the proportion of circumference to diameter to feet, 10ths and 100ths, stout bent leather case, patent centre, long swiveling flush folding handle opened by pushing handle pin from opposite side of case. Nickel plated mountings. Jointed anchor peg for fastening to tree. Graduations begin **at end of line** each $ 9 65

As the two sides of this tape are graduated in the ratio of diameter to circumference (=3.1416), either dimension can be read off opposite the other.

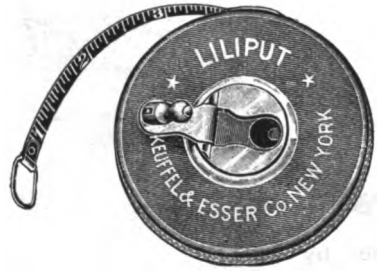
For Patent Thermometer Scale, see page 492.
Etching Tension on Line, see page 492.
Nickelplating Tape Lines, see page 510.

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K & E STEEL TAPES.

KECO Finish.

(see page 492.)



Please order by number.

Liliput **K & E** Steel Tapes, 1/4 **in. wide,** stout bent leather case patent centre, long swiveling flush folding handle, opened by pushing handle pin from opposite side of case. Centre adjustable for wear. Nickelplated mountings. Graduations begin **at outside end of ring.**

Length in feet,	25	50	75	100
Dimensions,	2¼×½ in.	2¾×½ in.	3¼×½ in.	3¾×½ in.
Weight,	3½ oz.	5 oz.	8½ oz.	10½ oz.
12ths of feet (inches in 16ths) No.	7270T	7272T	7274T	7275T
10ths " " (to 100ths feet)	7270D	7272D	7274D	7275D
each	$ 3 65	4 45	5 60	6 80

Length in Meters,	10	15
Metric (one side only) . . . No.	7271M	7272M
each	$ 4 15	4 45
Metric, other side 12ths of feet	7271TM	7272TM
each	$ 4 95	5 70

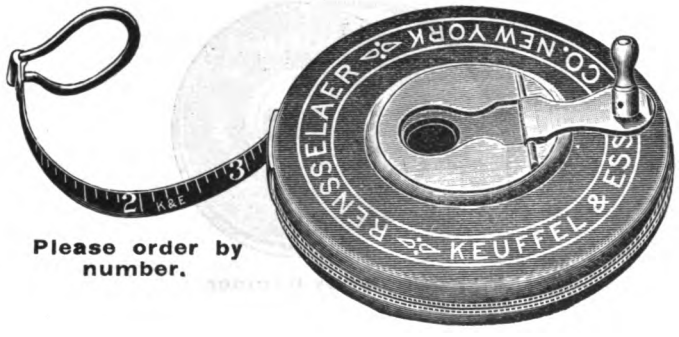
The Liliput Steel Tape is warranted to be of the same grade, workmanship and accuracy as the other **K & E** Steel Tapes. It is made very compact and light and is therefore suitable and convenient for the pocket. It is a durable tape and will wear well.

Nickelplating Tape Lines, see page 510.

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K & E STEEL TAPES.

KECO Finish.
(see page 492.)



Please order by number.

Rensselaer **K & E** Steel Tapes, 5/16 in. wide, Paine's pattern, stout bent leather case, patent centre, long swiveling flush folding handle opened by pushing handle pin from opposite side of case. Centre adjustable for wear. Two handles for tape line. Nickelplated mountings. Graduations begin at end of line.

Length in feet,	50	66	75	100
12ths of feet . . . . . No.	7292T	7293T	7294T	7295T
10ths " "	7292D	7293D	7294D	7295D
each	$ 7 50	9 55	10 80	13 40

Length in Meters,	15	20	25	30
Metric (one side only) . . . . No.	7292M	7293M	7294M	7295M
each	$ 7 50	9 55	11 80	13 40

The Rensselaer is an extra-fine stout heavy tape.

For Patent Thermometer Scale, see page 492.
Etching Tension on Line, see page 492.
Nickelplating Tape Lines, see page 510.

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K & E STEEL TAPES.

KECO Finish. (See page 492.)



Illinois **K & E** Steel Tapes, **5/16 in. wide,** Paine's pattern, stout bent leather case, large centre with long folding handle. Centre adjustable for wear. Two handles for tape line. Nickelplated mountings. Graduations begin **at end of line.**

Length in feet,	50	66	75	100
12ths of feet	No. 7302T	7303T	7304T	7305T
10ths " "	7302D	7303D	7304D	7305D
each	$ 5 80	7 75	9 25	11 65
Length in Meters,	**15**	**20**	**25**	**30**
Metric (one side only)	No. 7302M	7303M	7304M	7305M
each	$ 5 80	7 75	10 00	11 65



Princeton **K & E** Steel Tapes, **5/16 in. wide,** Paine's pattern, strong steel case, large centre with long folding handle. Centre adjustable for wear. Two handles for tape line. Case and mountings nickelplated. Graduations begin **at end of line.**

Length in feet,	25	33	50	66	75	100
12ths of feet	No. 7310T	7311T	7312T	7313T	7314T	7315T
10ths " "	7310D	7311D	7312D	7313D	7314D	7315D
each	$ 3 00	3 85	5 15	6 85	8 55	10 25
Length in Meters,		**10**	**15**	**20**	**25**	**30**
Metric (one side only)	No.	7311M	7312M	7313M	7314M	7315M
each	$	3 85	5 15	6 85	9 35	10 25

For Patent Thermometer Scale, see page 492.
Etching Tension on Line, see page 492.
Nickelplating Tape Lines, see page 510.

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K & E STEEL TAPES.

KECO Finish.
(See page 492.)



Please order by number.

New York **K & E** Steel Tapes, **3/16 in. wide,** Paine's pattern, strong steel case, large centre with long folding handle. Centre adjustable for wear. Two handles for tape line. Case and mountings nickelplated. Graduations begin **at end of line.**

	Length in feet,	50	100
10ths of feet.		No. 7322 D	7325 D
		each $ 6 50	11 70

	Length in Meters,	15	30
Metric (one side only) . . .		No. 7322 M	7325 M
		each $ 6 50	11 70

The New York Tape is an extra-narrow full divided tape, and is of heavy tough steel ribbon, so that it has good wearing qualities. It is intended specially for the use of Surveyors who require a strong tape which offers the least resistance to the wind.

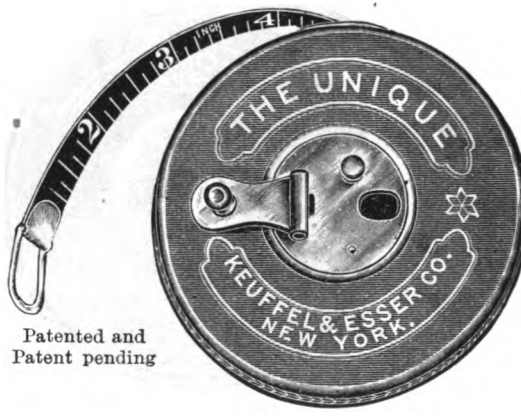
For Nickleplating Tape Lines see page 510.

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K & E STEEL TAPES.

KECO Finish.
(see page 492.)

with PRESTO SELF-OPENING HANDLE.



Patented and
Patent pending

The Unique Tapes have the standard K & E Patent Adjustable Centre, improved by the addition of the PRESTO SELF-OPENING HANDLE.

Pressing the small button next to the handle releases a catch, and a spring throws the handle into position for winding the tape.

UNIQUE K & E Steel Tapes, **3/8 in. wide,** stout bent leather case, large centre, adjustable for wear. Presto self-opening handle. Nickelplated mountings. Graduations begin **at outside end of ring.**

Please order by number.

Length in feet,	25	50	75	100
12ths of feet	No. 7340T	7342T	7344T	7345T
10ths " "	7340D	7342D	7344D	7345D
each	$ 3 70	4 40	5 60	7 10

Length in Meters,	15	30
Metric (one side only).	No. 7342M	7345M
each	$ 4 40	7 10
Metric, other side 12ths of feet.	No. 7342TM	7345TM
each	$ 5 35	9 00

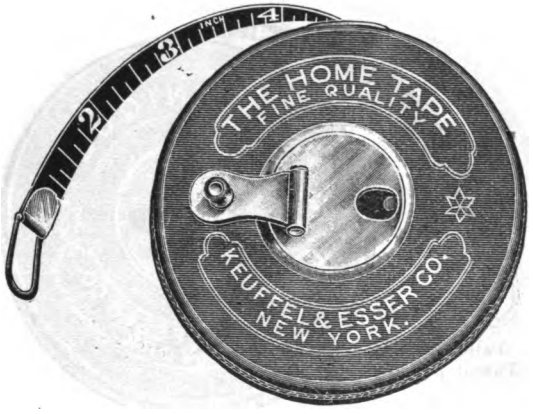
For Nickelplating Tape Lines, see page 510.

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K & E STEEL TAPES.

KECO Finish.

(See page 492.)



HOME K & E Steel Tapes, 3/8 **in. wide,** stout bent leather case, large centre, long folding handle. Centre adjustable for wear. Nickelplated mountings. Graduations begin **at outside end of ring.**

Please order by number.

Length in feet,	25	33	50	66	75	100
12ths of feet . . . No.	7350 T	7351 T	7352 T	7353 T	7354 T	7355 T
10ths " " . . .	7350 D	7351 D	7352 D	7353 D	7354 D	7355 D
each	$ 3 20	3 40	3 90	4 85	5 10	6 60

Length in Meters,	10	15	20	25	30
Metric (one side only) . . . No.	7351 M	7352 M	7353 M	7354 M	7355 M
each	$ 3 40	3 90	4 85	5 85	6 60
Metric, other side 12ths of feet No.	7351 TM	7352 TM	7353 TM	7354 TM	7355 TM
each	$ 4 05	4 85	6 15	7 30	8 50

The Home and Armour **K & E** Steel Tapes are intended to supersede the woven tapes which on account of their low price are often used where a more reliable tape ought to be employed. They are of best quality steel and accurately graduated. The neat sewed leather case of the Home Tape is convenient to use and to carry in the pocket.

For Nickelplating Tape Lines, see page 510.

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K & E STEEL TAPES.

KECO Finish.
(See page 492.)



ARMOR K & E Steel Tapes, 3/8 **in. wide,** strong steel case, large centre with long folding handle. Centre adjustable for wear. Case and mountings nickelplated. Graduations begin **at outside end of ring.**

Please order by number.

Length in feet	25	33	50	66	75	100
12ths of feet . . . No.	7370 T	7371 T	7372 T	7373 T	7374 T	7375 T
10ths " " . . .	7370 D	7371 D	7372 D	7373 D	7374 D	7375 D
each	$ 2 70	2 30	3 30	4 15	4 35	5 60

Length in Meters,	10	15	20	25	30
Metric (one side only). . . . No.	7371 M	7372 M	7373 M	7374 M	7375 M
each	$ 2 90	3 30	4 15	5 00	5 60
Metric, other side 12ths of feet No.	7371 TM	7372 TM	7373 TM	7374 TM	7375 TM
each	$ 3 55	4 30	5 40	6 45	7 55

The strong steel case of the Armor tape, a steel tape intended chiefly for Mechanic's use, will wear well even if knocked about or otherwise roughly used. (See also note on opposite page).

For Nickelplating Tape Lines, see page 510.

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K & E STEEL TAPES.

KECO Finish.

(see page 492.)



Please order by number.

MIDGET K & E Steel Tapes, **1/4 in. wide,** stout bent leather case, large centre, long folding handle. Centre adjustable for wear. Nickelplated mountings. Graduations begin **at outside end of ring.**

Length in feet.	25	50	75	100
Dimensions	$2\frac{3}{8}\times\frac{3}{4}$ in.	$2\frac{7}{8}\times\frac{3}{4}$ in.	$3\frac{1}{4}\times\frac{3}{4}$ in.	$3\frac{3}{4}\times\frac{3}{4}$ in.
Weight (abont)	$4\frac{1}{4}$ oz.	$6\frac{1}{2}$ oz.	$8\frac{1}{2}$ oz.	$10\frac{1}{2}$ oz.
12ths of feet (inches in 16ths) .	No. 7360T	7362T	7364T	7365T
10ths " " (to 100ths feet) .	7360D	7362D	7364D	7365D
each	$ 2 90	3 40	4 40	5 60

The Midget Steel Tape meets the increasing demand for an accurate and durable stsel tape of convenient size for the pocket, at a low price. It is similar to the Liliput tape (page 501) but has a plain centre, like the Home Tape.



Please order by number.

DWARF K & E Steel Tapes, **1/4 in. wide,** strong steel case, large centre, long folding handle. Centre adjustable for wear. Case and Mountings nickelplated. Graduations begin **at outside end of ring.**

Length in feet,	25	50
Dimensions	$2\frac{1}{4}\times\frac{1}{2}$ in.	$2\frac{3}{4}\times\frac{1}{2}$ in.
Weight (about)	$3\frac{1}{4}$ oz.	6 oz.
12ths of feet. (inches in 16ths)	No. 7380T	7382T
10ths " " (to 100ths feet)	7380D	7382D
each	$ 2 40	2 90

The Dwarf Steel Tape is an accurate and durable tape. The case is of steel and will stand much wear and rough usage. It is similar to the Armor tape (page 507), but of pocket size.

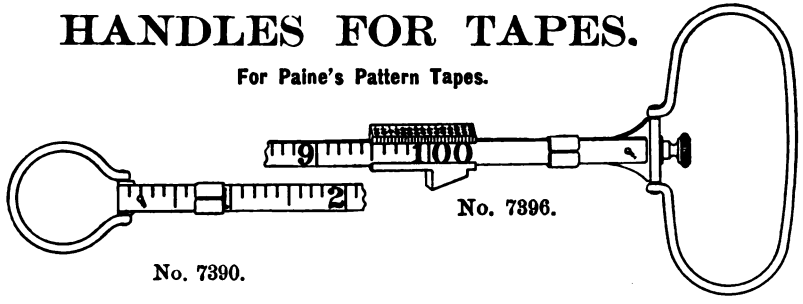
7387. Tape, see page 497.

For Nickelplating Tape Lines, see page 510.

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HANDLES FOR TAPES.

For Paine's Pattern Tapes.



No. 7396.

No. 7390.

7390.	Plain Brass Handles, Nickelplated.	each	$ 25
7392.	do. do. but large oval ring (as shown in cut of No. 7396)	"	50
7394.	Compensatory Handles for 50 foot tapes, Nickelplated	pair	2 00
7396.	do. do. " 100 " " " "	"	2 00

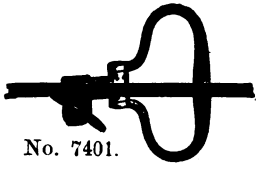
A pair of Compensatory Handles consists of one compensatory handle as illustrated under No. 7396 and one large plain handle, No. 7392.

These handles are furnished only for Paine's Pattern Tapes 3/16, or 5/16 in. wide. When ordering these handles, state for which width of tape.

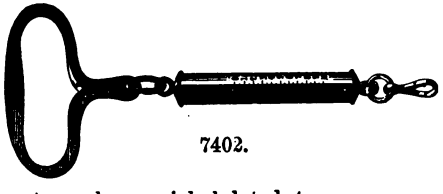
TENSION AND CLAMPING HANDLES.

For Engineer's Steel Tapes.

These tension handles form a very valuable addition to a tape, as they enable the user to apply exactly the tension at which the tape is standard. They are recommended also for use with the fine narrow tapes.

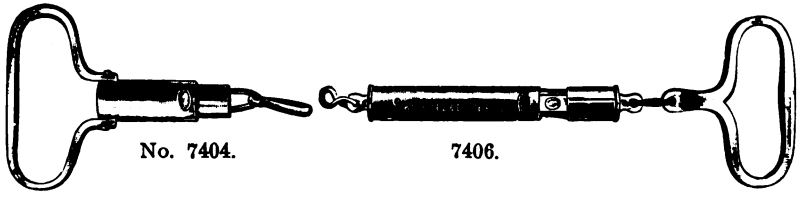


No. 7401.



7402.

7401.	Clamping Handles, for narrow tapes, brass, nickelplated, to attach to any part of tape	each	$ 75
7402.	Tension Handles, brass, nickelplated, indicating tension up to 20 lbs., reading by half-pounds	"	2 50



No. 7404.

7406.

7404.	Tension Handles, brass, nickelplated, for tapes up to 100 ft.,	each	$ 2 00
7406.	do. do. like No. 7404, but with spirit level . . .	"	4 00

Tension Handles No. 7404 and 7406 must be marked for the individual tape with which they are to be used. They must therefore be ORDERED WITH THE TAPE.

Tension Handles for tapes longer than 100 feet quoted on application.

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NICKELPLATING STEEL TAPE LINES.

We are prepared to furnish our steel tape lines nickelplated in the best and most durable manner (for protection against rust) at the following extra charge:

Length in feet,	25	33	50	66	75	100
extra each	$ 90	1 00	1 50	1 75	1 75	2 00

METALLIC (WOVEN) TAPES.

ALL AND ANY WOVEN TAPES OF ANY MAKE, ARE LIABLE TO STRETCH OR SHRINK. WOVEN TAPES SHOULD THEREFORE NOT BE USED WHEN EXACT MEASUREMENTS ARE REQUIRED, WITHOUT CONSTANT ATTENTION TO THEIR CONDITION BY COMPARISON WITH A STANDARD STEEL TAPE. ANY OF THE **K & E** STEEL TAPES WILL ANSWER THIS PURPOSE, AS THEY ARE MADE ACCORDING TO THE U. S. STANDARD OF THE NATIONAL BUREAU OF STANDARDS AT WASHINGTON.

EXCELSIOR MEASURING TAPES.

WARD'S PATENT ENGINEER'S TAPE.



7410. Excelsior Engineer's Tapes, Ward's Patent, 50 feet, of same quality as No. 7442, (page 512) in bent leather case, long folding handle. Centre adjustable for wear. Graduations begin **at outside end of ring.** All mountings nickelplated, graduated for single-track road-bed, with Directions . . . . . each $ 3 25

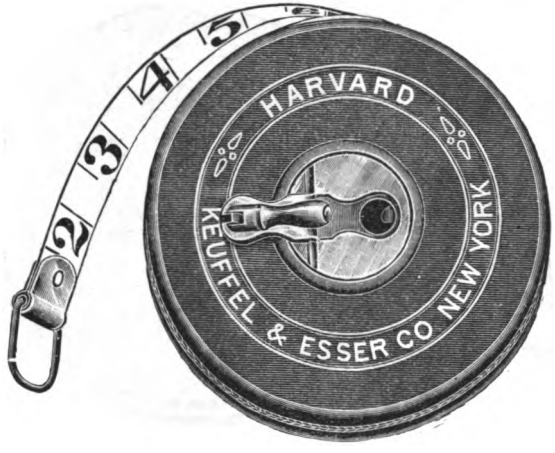
7411. Excelsior Engineer's Tapes, like No. 7410, but graduated for double-track road-bed. . . . . " 3 25

This is a metallic tape in best bent leather case. One side of the tape is marked in feet and tenths, as for ordinary measurements, while the other side is marked in a special manner for setting Slope Stakes, or for finding the centre from the Slope Stakes after the Centre Stake has been removed.

A pamphlet, **How to Set Slope Stakes,** giving full particulars of the method of using them is supplied with each one of these Tapes.

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K & E METALLIC TAPES.



Please order by number:

Harvard **K & E** Metallic Tapes, 5/8 **in. wide,** stout bent leather case, patent centre, long flush folding handle, opened by pushing handle pin from opposite side of case. Centre adjustable for wear. All mountings nickelplated. Line interwoven with metal, leather re-enforced end. Graduations begin **at outside end of ring.**

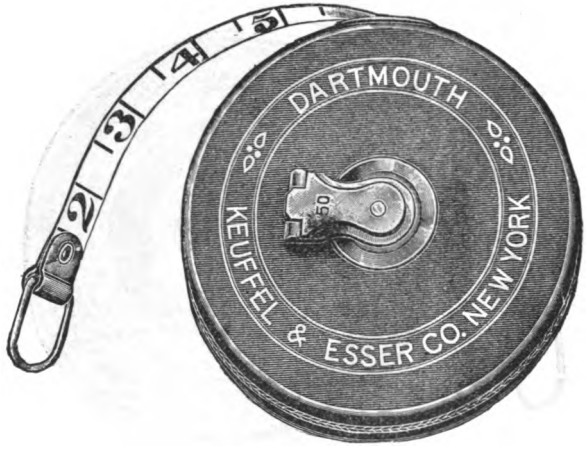
Length in feet,	25	33	50	66	75	100
12ths of feet . . . . . No.	7420T	7421T	7422T	7423T	7424T	7425T
10ths " "	7420D	7421D	7422D	7423D	7424D	7425D
each	$ 1 95	2 25	2 75	3 05	3 35	4 10
12ths of feet and Links, No.	7420TL	7421TL	7422TL	7423TL	7424TL	7425TL
10ths " " " "	7420DL	7421DL	7422DL	7423DL	7424DL	7425DL
each	$ 2 05	2 35	2 85	3 25	3 50	4 40

Length in Meters.	10	15	20	25	30
Metric (one side only) . . . . No.	7421M	7422M	7423M	7424M	7425M
each	$ 2 25	2 75	3 05	3 60	4 10
Metric, other side 12ths of feet	7421TM	7422TM	7423TM	7424TM	7425TM
each	$ 2 35	2 85	3 25	3 80	4 40

For lines without case (Re-fills) see page 513.

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K & E METALLIC TAPES.



Please order by number.

Dartmouth **K & E** Metallic Tapes, 5/8 **in. wide,** stout bent leather case, long folding handle. Centre adjustable for wear, all mountings nickelplated. Line interwoven with metal, leather re-enforced end. Graduations begin **at outside end of ring.**

Length in feet,		25	33	50	66	75	100
12ths of feet	No.	7440T	7441T	7442T	7443T	7444T	7445T
10ths " "		7440D	7441D	7442D	7443D	7444D	7445D
each	$	1 65	1 95	2 45	2 75	3 05	3 80
12ths of feet and Links,	No.	7440TL	7441TL	7442TL	7443TL	7444TL	7445TL
10ths " " " "		7440DL	7441DL	7442DL	7443DL	7444DL	7445DL
each	$	1 75	2 05	2 55	2 95	3 25	4 10

Length in Meters,		10	15	20	25	30
Metric (one side only)	No.	7441M	7442M	7443M	7444M	7445M
each	$	1 95	2 45	2 75	3 35	3 80
12ths of feet Metric, other side .	No.	7441TM	7442TM	7443TM	7444TM	7445TM
each	$	2 05	2 55	2 95	3 55	4 10

For Lines without cases (Re-fills) see opposite page.

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KEUFFEL & ESSER CO. NEW YORK.

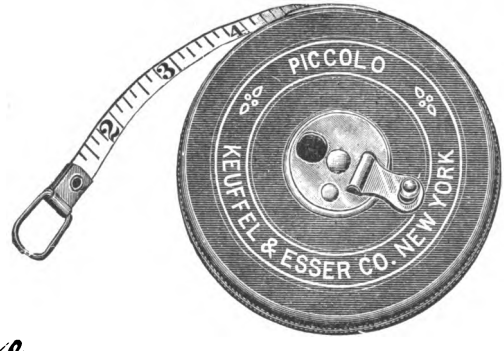
K & E METALLIC TAPES.

K & E METALLIC LINES (RE-FILLS.)

Please order by number.

Length in feet,	25	33	50	66	75	100
12ths of feet . . . . . No.	7460T	7461T	7462T	7463T	7464T	7465T
10ths " "	7460D	7641D	7462D	7463D	7464D	7465D
each $	80	1 00	1 35	1 55	1 75	2 55
12ths of feet and Links, No.	7460TL	7461TL	7462TL	7463TL	7464TL	7465TL
10ths " " " "	7460DL	7461DL	7462DL	7463DL	7464DL	7465DL
each $	90	1 10	1 50	1 75	1 95	2 85

Length in Meters,	10	15	20	25	30
Metric (one side only) . . . No.	7461M	7462M	7463M	7464M	7465M
each $	1 00	1 35	1 55	1 95	2 55
12ths of feet and Metric, . . No.	7461TM	7462TM	7463TM	7464TM	7465TM
each $	1 05	1 45	1 75	2 15	2 85



Please order by number.

Piccolo **K & E** Metallic Tapes, **3/8 in. wide**, stout bent leather case, large centre, long folding handle, centre adjustable for wear, all mountings nickelplated, line interwoven with metal, end re-enforced with leather. Graduations begin at **outside end of ring.**

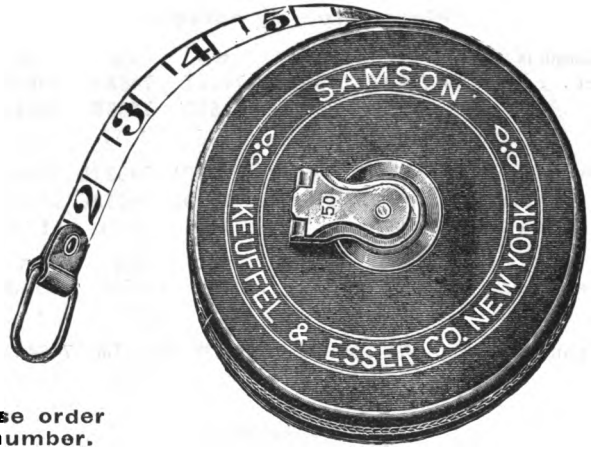
Length in feet,	25	50
Size and Weight,	$2\frac{3}{4} \times \frac{5}{8}$ in., $4\frac{1}{2}$ oz.	$3\frac{1}{8} \times \frac{5}{8}$ in., $8\frac{1}{2}$ oz.
12ths of feet (inches in eighths) . . No.	7480T	7482T
10ths " " (to 100ths feet)	7480D	7482D
each $	1 55	2 00

Length in Meters,	10	15
Metric (one side only) . . . . . No.	7481M	7482M
each $	1 70	2 00

The Piccolo Metallic Tape is warranted to be of the same grade and workmanship as the other **K & E** Metallic Tapes. It differs from them only in size and weight, being very compact and light and therefore suitable and convenient for the pocket. It is a strong tape and will wear well.

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K & E LINEN TAPES.



Please order by number.

Samson **K & E** Linen Tapes, 5/8 in. wide, stout bent leather case long folding handle. Centre adjustable for wear. All mountings nickelplated. **Extra-heavy** all-linen line, leather re-enforced end. Graduations begin **at outside end of ring.**

Length in feet,	50	100
12ths of feet	No. 7492T	7495T
10ths " "	7492D	7495D
each	$ 2 75	4 10

The Samson is a linen line which surpasses all others in durability and is made especially to withstand the severe conditions of railroad construction, lumbering, dock building, mining, etc. This tape will prove highly efficient where steel tapes and metallic lines do not give satisfaction owing to their being affected by dampness. The line is made of very heavy linen, closely woven and has a coating which protects it from moisture.

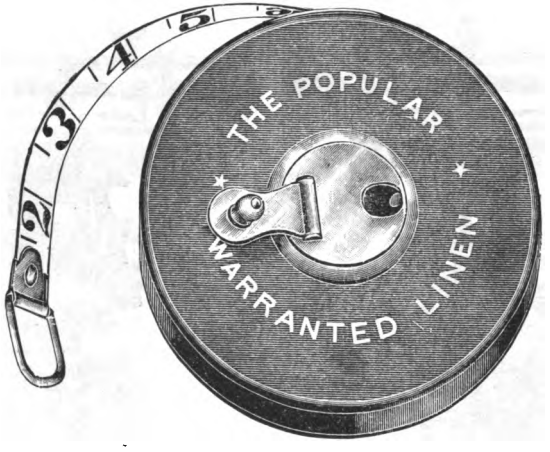
LINES WITHOUT CASES, FOR SAMSON TAPES.

(RE-FILLS.)

Length in Feet,	50	100
12ths of feet	No. 7502T	7505T
10ths " "	7502D	7505D
each	$ 1 50	2 90

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THE POPULAR LINEN TAPES.



Please order by number.

THE POPULAR Linen Tapes, 5/8 in. wide, substantial bent leather case, flat folding handle. Centre adjustable for wear, all mountings nickelplated. Stout linen line, end re-enforced with leather. Graduations begin at outside end of ring.

Length in feet,	25	50	75	100
12ths of feet	No. 7510T	7512T	7514T	7515T
10ths " "	7510D	7512D	7514D	7515D
each	$ 1 20	1 60	2 00	2 40

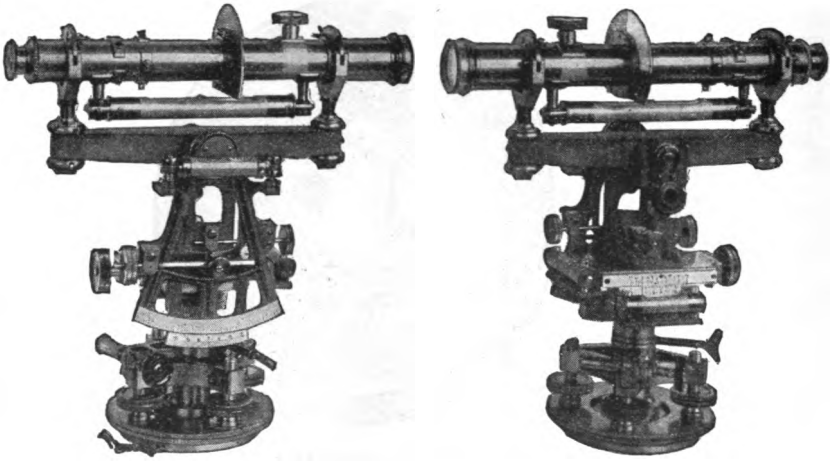
Length in Meters.	15	25	30
Metric (one side only)	No. 7512M	7514M	7515M
each	$ 1 60	2 20	2 40

The POPULAR is a low-priced well made linen tape in stout bent leather case with durable centre and handle. The line is of the width and finish of our metallic tapes, heavily coated, and has leather re-enforced end.

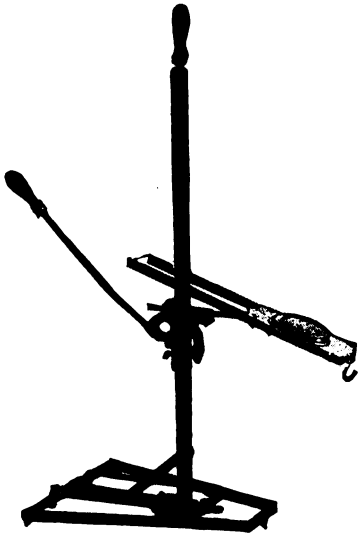
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LINE CLINOMETER

AND TAPE STRETCHER.



No. 7590.
(view of both sides)



No. 7593.
Front Stretcher.

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LINE CLINOMETER
AND TAPE STRETCHER

FOR PRECISION WORK WITH MEASURING TAPES.

Designed by Edw. H. Holden.

7590. Line Clinometer. Achromatic terrestrial **telescope** 11 in., with dust cap and sun shade, **object glass** 1⅛ in. with improved rack and pinion movement, eyepiece with sliding adjustment. **Magnifying Power** 18 diameters. **Spirit level** to telescope graduated on the glass and ground to a sensitiveness of about 60 seconds of arc per graduation. **Vertical arc** 9½ in. diam., graduated to 15 minutes for 15 degrees in each direction; **vernier** reading to 20 seconds, clamp and tangent screw. Fine ground spirit level to vertical arc. Two fine ground spirit levels to base. **Sliding block** with slow motion screw, **with scale** graduated to $\frac{1}{100}$ foot, reading by vernier to $\frac{1}{1000}$ foot. Four leveling screws, shifting center.

Instrument complete with plumb bob, magnifying glass, adjusting pins, waterproof cover, etc., packed in fine mahogany Box, Extension Tripod. . . . . per pair $ 500 00

These Line Clinometers, which are used in pairs, have the advantages, among others, that the lineal measurement is separate from the angular, resulting in economy of time and labor, that they are more easily adjusted than a transit for vertical angles and line of collimation, and that they afford a check on the gradients, the vertical angle being observed at each of the two instruments.

The telescope rests in Y's and the Y-bar is pivoted to the standard so that it is movable in altitude. The connecting piece between the level bar and the leveling head is U-shaped, with the "U" resting on one side, thereby permitting the tape to come directly in alignment at an index post set in the lower part of the "U" piece. The index post carries at its side an eccentric cylinder which forms the support for the tape, the eccentricity allowing varying thicknesses of tape to have the upper surface at the same level with the index mark. The U-shaped piece rests on a sliding head which, by a slow motion screw moves forward and backward in the direction of the line.

A scale reading by vernier to 0.0001 ft. measures the sliding motion. When the vernier is set at 50 (representing .05 ft.), marked by an arrow, the index mark is at the centre of the instrument, directly over the plumb-bob.

7593. Patent Tape Stretchers. A pair consists of one instrument with spring balance, as shown in cut, and another like it, but without spring balance . . . . . per pair $ 90 00

The **front stretcher** consists of an upright (a twin bar of iron) hinging sideways at its lower end on a foot base and terminating at the top in a handle. On this upright, traveling up and down, is a block which supports the spring balance. The tension is applied by a half-wheel, centered in the block and working by a lever attached to its diameter. A strap connects the wheel motion to a rod which carries the spring balance. By means of the vertical motion of the block, the balance and the front end of the tape is raised or lowered, while the hinge motion of the upright gives lateral motion for alignment. The **rear stretcher** is similar to the front stretcher, but has no spring balance. A clamp on the foot-base regulates the friction necessary for the upright to be self-supporting.

The advantages of the stretchers are:

1. Ease of manipulation.
2. Absolute control, the tension being maintained constant for a longer time than with other forms.
3. With the tension released it is self-supporting, allowing the operator to quickly ward off an approaching interference, thus protecting the tape from injury. Theses stretchers can be used in standardizing tapes and hold to a ten-thousandth of a foot.

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K & E FINE FLAT STEEL WIRE TAPES

FOR

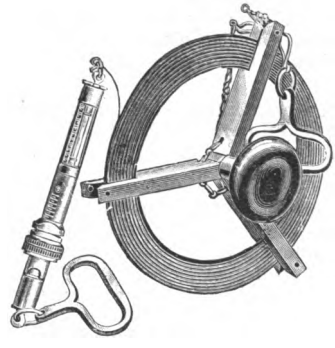
CITY, MINE, BRIDGE AND RAILROAD ENGINEERING.

KECO Finish.

(See page 492.)

CITY ENGINEER'S STANDARD TAPE.

(Not Sub-Divided.)



No. 7600.

7600. City Engineer's Standard Tape, $\frac{3}{8\frac{1}{2}}$ in. wide, 50 ft., with improved spring balance adjustable for temperature, with level and thermometer, two nickelplated handles on folding brass reel No. 7650 B . . . . . each $ 18 00

7601. City Engineer's Standard Tape, like No. 7600, but 100 ft. . " 21 60

7605. do. do. do. like No. 7600, but 25 meters " 21 00

The spring balance consists of two telescoping brass tubes connected by a strong spring; the inner tube carries the spirit level and tension mark, and the outer one carries the thermometer which is protected by a revolving semi-tubular cover. A knurled clamping ring encircles the outer tube; in it is cut a V-shape groove **representing the END MARK of the measure.** The spring balance up to the groove in the ring is **INCLUDED IN THE MEASURE.** On the outer tube is engraved the temperature scale, which compensates expansion and contraction and is marked with the corresponding degrees Fahrenheit. Correction for temperature, *i. e.* allowance for contraction and expansion is made by adjusting the clamping ring on the temperature scale to the degree indicated by the thermometer. The starting point is marked by another V-shape groove in a brass plate at the other end of the tape. **There are no intermediate graduations on this tape, and the** tension and temperature corrections apply to its entire length only.

DIRECTIONS.

To use this tape, adjust the clamping ring according to the temperature as read on the thermometer, then bring the V-shape zero groove in the brass lug at the other end of the line exactly over the starting point by means of a suspended plumb-bob; pull the telescoping handle until the tension marks coincide, and bring the tape into a horizontal plane by means of the spirit level. A second plumb-bob suspended from the V-shape groove on the spring balance will then indicate the terminal point on the ground.

For Tape Stretcher and Line Clinometer, see page 517.

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K & E FLAT WIRE TAPES, GRADUATED.

These tapes are made of the best and toughest flexible steel-ribbon, carefully tempered to prevent breaking or kinking. They are graduated according to the standard of the National Bureau of Standards and are correct at 62° Fahrenheit.

We furnish, if so ordered, a certificate giving the temperature and the tension at which the tape agrees with our standard (a fac-simile of that at the National Bureau of Standards) when the tape is supported over its entire length and when it is supported at stated intervals. The charge for a certificate of comparison will be according to the conditions of the test (See also page 493).

FLAT WIRE TAPES WITH ETCHED GRADUATIONS.

KECO FINISH.
(See page 492).



Etched graduations, (No. 7607).

Graduated to feet only.

7607.	Flat Wire Tapes, KECO finish, $\frac{1}{8}$ in. wide, graduated at every foot, end-feet to 10ths and 100ths. The graduations are **etched** in a new manner, which insures their durability in rough work. They can be furnished in any length up to 500 feet; 2 nickelplated detachable handles. 100 feet. . . .	$ 4 00
	Each additional 100 feet.	3 50



Etched graduations, (No. 7608).

Graduated, feet to 100ths throughout:

7608.	Flat Wire Tapes, KECO finish, $\frac{1}{8}$ in. wide, **etched** to 10ths and 100ths ft., black line, bright numbers and graduations. They can be furnished in any length up to 500 feet. 2 nickelplated detachable handles, 100 feet	$ 7 50
	Each additional 100 ft., same graduation.	6 50
7609.	Flat Wire Tapes, like No. 7608, but nickelplated	9 25
	Each additional 100 ft., same graduation.	8 25

Above tapes with one extra sub-divided foot BEFORE zero, furnished to order without extra charge.

Reels are listed separately (see page 522, &c.) and are not included in the price of these tapes.

Fine flat wire tapes graduated in links, Vara, or other measure furnished to order at short notice.

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FLAT WIRE TAPES, GRADUATED ON CLAMPED SLEEVES.

Graduations on clamped sleeves, (No. 7610).

Our Fine Flat Wire Steel Tapes with brass sleeves are of the most improved type. The sleeves are firmly clamped (or clamped and soldered) and are notched exactly opposite the graduation, for the exact locating of the plumb-bob line. The ends of the sleeves are beveled to prevent their catching on obstructions when measuring, or on each other when winding or unwinding the tape.
These Tapes can be made in any length up to 1000 feet, without joints.

7610	Flat Wire Tapes, KECO finish, ⅛ in. wide, black line, graduated on **clamped brass sleeves**, 2 nickelplated detachable handles, graduated every foot, end-feet to 10ths, 100 feet . .	$ 7 00
	Each additional 100 ft., same graduation	6 00
7510D	Flat Wire Tapes like No. 7610, but graduated every 5 feet, first and last five feet every foot, end-feet to 10ths, 100 feet,	5 00
	Each additional 100 feet, same graduation.	4 00
7610F	Flat Wire Tapes like No. 7610, but graduated every 10 feet, first and last five feet every foot, end-feet to 10ths, 100 feet,	3 50
	Each additional 100 feet, same graduation.	2 50
7610W	White plating, to resist rust, (see note page 521) per 100 feet .	1 50
7610Y	Nickelplating " " " " per 100 feet .	1 75

Above tapes with one extra sub-divided foot BEFORE zero, furnished to order without extra charge.

FLAT WIRE TAPES, METRIC; CLAMPED SLEEVES.

Graduations on clamped sleeves, (No. 7612).

7612	Flat Wire Tapes, (Metric) KECO finish, ⅛ in. wide, graduated on **clamped brass sleeves**, 2 nickelplated detachable handles, graduated every 20 cm., end-meters to decimeters, 25 meters,	$ 8 00
	Each additional 25 meters	7 00
7612C	Flat Wire Tapes like No. 7612, but graduated every half-meter, end-meters to decimeters, 5 meters	7 00
	Each additional 25 meters	6 00
7612E	Flat Wire Tapes like No. 7612, but graduated every meter, end-meters to decimeters, 25 meters	6 00
	Each additional 25 meters	5 00
7612W	White plating, to resist rust, (see note page 521) per 25 meters.	1 50
7612Y	Nickelplating, ... " " " per 25 meters.	1 75

Reels are listed separately (see page 522 &c.) and are not included in the price of these tapes.

Fine flat wire tapes graduated in Links, Vara, or other measure furnished to order at short notice.

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FLAT WIRE TAPES GRADUATED ON SOLDERED SLEEVES.

Graduations on soldered sleeves, (No. 7613).

7613	Flat Wire Tapes, $\frac{1}{8}$ in. wide, graduated on **tubular brass sleeves carefully soldered** to the tape, to prevent corrosion from moisture entering between sleeves and tape line, **heavily plated with white metal** (to resist rust), 2 nickel plated detachable handles, graduated every foot, end-feet to 10ths., 100 feet,	$ 10 50
	Each additional 100 ft., same graduation	9 00
7613D	Flat Wire Tapes like No. 7613, but graduated every 5 feet, first and last five feet every foot, end-feet to 10ths, 100 feet. . .	7 50
	Each additional 100 ft., same graduation	6 00
7613F	Flat Wire Tapes like No. 7613, but graduated every 10 feet, first and last five feet every foot, end-feet to 10ths., 100 feet,	5 50
	Each additional 100 ft., same graduation	4 00

Above tapes with one extra sub-divided foot BEFORE zero, furnished to order without extra charge.

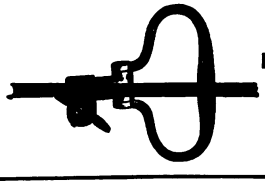
FLAT WIRE TAPES, METRIC, SOLDERED SLEEVES.

Graduations on soldered sleeves, (No. 7614).

7614	Flat Wire Tapes, (Metric) $\frac{1}{8}$ in. wide, graduated on **tubular brass sleeves carefully soldered** to the tape to prevent corrosion from moisture entering between sleeves and tape, **heavily plated with white metal** (to resist rust), 2 nickelplated detachable handles, graduated every 20 centimeters, end-meters to decimeters 25 meters.	$ 12 00
	Each additional 25 meters	10 50
7614C	Flate Wire Tapes like No. 7614, but graduated every half-meter, end-meters to decimeters, 25 meters.	10 50
	Each additional 25 meters	9 00
7614E	Flate Wire Tapes like No. 7614, but graduated every meter, end-meters to decimeters, 25 meters	9 00
	Each additional 25 meters	7 50

NOTE Etched tapes (or tapes with etched end-units) can be furnished nickelplated, but they cannot be furnished plated with white metal. Tapes plated with white metal cannot be furnished with end-units etched.

Reels are listed separately (see page 522 &c.) and are not included in the price of these tapes.



For Clamping Handle to attach at any part of tape line, and for Tension Handles, see page 509.

Fine flat wire tapes graduated in Links, Vara, or other measure furnished to order at short notice.

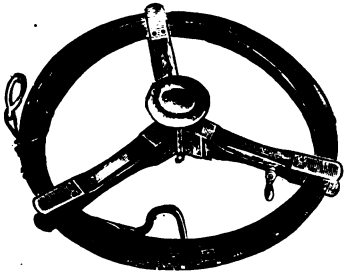
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REELS FOR FLAT WIRE TAPES.

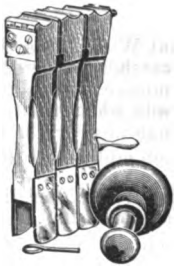
The reels here described embody all the latest improvements, the result of years of experience and study.

Any of the Steel Tapes listed under Nos. 7607 to 7614 can be furnished on the Reels here listed, with such limitations as to length as are stated in the descriptions of the reels.

The prices of Flat Wire Tapes are for the tape lines only; the price of the reel is extra.

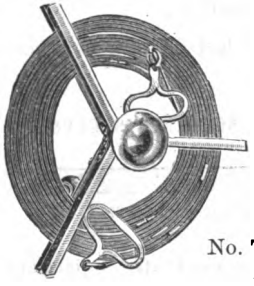


7650 A.

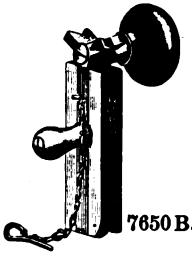


7650 A. folded.

7650A. Folding Reel, hardwood, plain, nickelplated brass trimmings, for tapes 100 to 500 ft. long . . . . . each $ 1 25

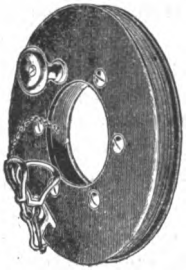


No. 7650 B.



7650 B. folded

7650B. Folding Reel, brass, nickelplated, hardwood knob, for tapes 100 to 200 ft. long . . . . . each $ 4 00



No. 7650 C.



7650 D.

7650C Reel of built-up hardwood, polished, very substantial, revolving on metal centre, nickelplated brass bolts and two hardwood knobs, for tapes from 100 to 500 ft., each $ 7 00

The opening in reel C enables the chainman to slip the reel over his arm, where it will not impede him when manipulating the tape.

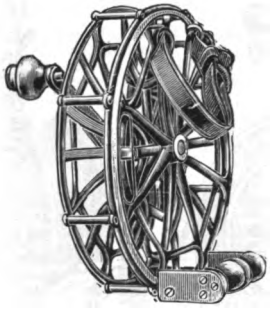
7650D. Reel of built-up hardwood, polished, revolving on long brass centre, large hardwood grip and knob, for tapes from 100 to 500 feet long. . . . . each $ 10 00

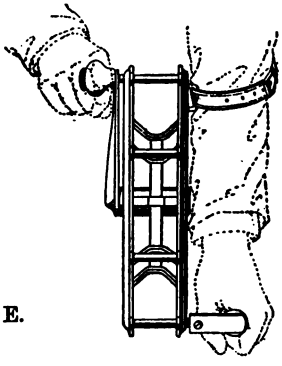
Reel D is very strong and substantial, of light weight and easily manipulated.

Please note that these prices are for REELS ONLY The lines shown on some of the cuts of the reels are for better illustration.

When ordering reels separately, please state for which length of line and kind of graduation.

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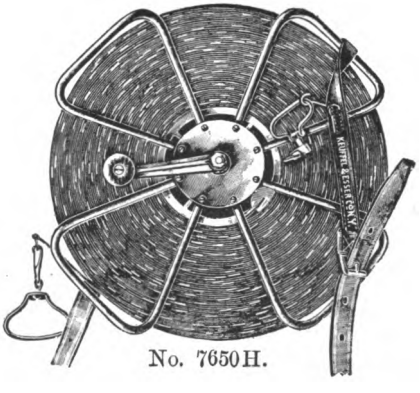




No. 7650E.

7650E. Skeleton Reel, gun metal, nickelplated, for tapes 300 to 500 ft. . . . . each $ 13 50

Reel E, being exceedingly strong, is especially adapted for railroad and bridge work, to withstand very rough usage. It has a strong grip handle and a leather strap fitting around the fore-arm of the chainman, thus distributing the weight over the whole arm and greatly reducing the strain on the wrist. When less than the full length of the tape on the reel is required, its unreeling can be arrested at any desired point by a brake in the wooden knob of the crank, applied by a half-turn of the milled head.



No. 7650H.

7650H. K & E Improved Metal Reel, with strong shoulder strap, for lines from 300 to 500 feet, for $\frac{1}{8}$" lines only . . . each $ 12 00

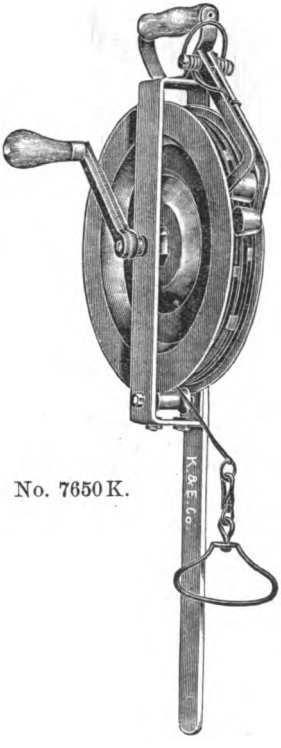
Reel H is a heavy metal skeleton reel with large centre and extra-long handle with large knob. It is very strongly and substantially built. The eight metal arms are so arranged that they preclude kinking of the line during winding and leave the wound line freely exposed to the air for rapid drying and cleaning.

Please note that these prices are for REELS ONLY. The Lines shown on some of the cuts of the reels are for better illustration.

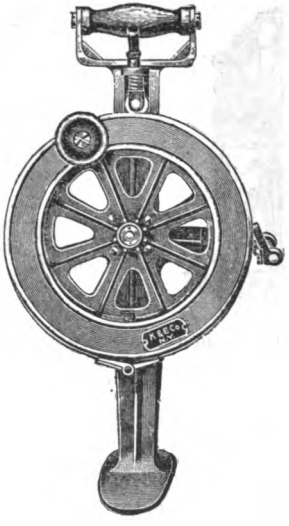
When ordering reels separately, please state for which length of line and kind of graduation.

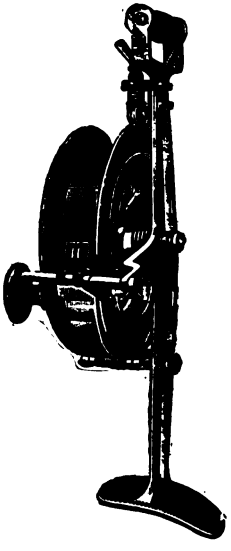
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MINE REELS.



No. 7650 K.





7650 M. PATENTED.

7650 K Mine Reel, steel, 10 in. diameter, 24 in. over all with arm extended. Spooling controller for distributing the line evenly on the reel when winding it. Large roller to mouth-piece. Long stout steel crank with hardwood handle. Weight about 5 pounds. For lines from 300 to 500 feet . . . . . each $ 20 00

This reel will be found very convenient for use in mines. It is of steel and very substantially built. The folding steel arm, when extended, supports the reel while winding the tape and is folded across the reel when not required.

7650 M K & E Mine Reel, aluminum, 19 in., brass centre, automatic mechanism for spooling the line evenly on the reel, weight of reel about 5½ lbs., for lines from 300 to 500 feet . . . . . each $ 25 00

The K & E Mine Reel, for long narrow tapes, is of aluminum, except the axis and wearing parts which are of hard brass. The frame is a stout ribbed T bar with breast plate, 19 in. over all.

When winding the line, the mouth-piece on the reel travels automatically from side to side across the groove on the reel, so that the line is evenly spooled and cannot tangle nor catch. A double spring-brake prevents the line springing out into loose loops while reeling it. A lever brake at the handle can be applied to act as a drag on the reel. The mouth-piece for the line is provided with rollers.

Please note that these prices are for REELS ONLY The lines shown on some of the cuts of the reels are for better illustration.

For Flat Wire Steel Tapes (lines), see page 519 &c.

WHEN ORDERING REELS SEPARATELY, PLEASE STATE FOR WHICH LENGTH OF LINE AND KIND OF GRADUATION.

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EXCELSIOR BAND CHAINS.

(Patented.)

KECO Finish.

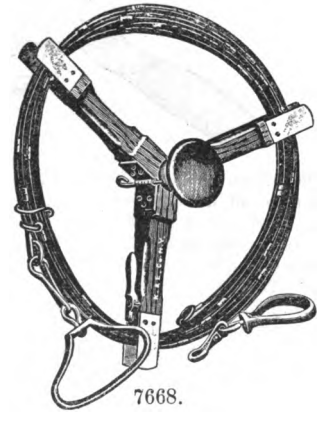
(See page 492.)

The Excelsior Band Chains are of heavy steel ribbon ¼ in. wide, except No. 7668. They are graduated and marked by rivets at every foot or link and numbered at every 5 feet or 5 links on brass plates riveted to the tape, with additional number marks at every 10 feet or links. The number plates have rounded edges so that they will not catch, and they are notched to insure correct locating of the plumbing cord. A wooden folding reel like No. 7650-A, page 522, and two detachable handles are furnished with the band chain and are included in the price.



No. 7660 C.

"Copyright, 1890, by Keuffel & Esser Co."



7668.



Graduations of Patent Excelsior Band Chains No. 7660 to 7663.

7660.	Excelsior Band Chains, ¼ in. wide, 50 feet, grad. every foot, end-feet to **10ths** each											$ 4 00
7660B	do.	do.	100	"	"	"	"	"	"	"	"	5 00
7660C	do.	do.	200	"	"	"	"	"	"	"	"	7 50
7660D	do.	do.	300	"	"	"	"	"	"	"	"	10 00
7661C	do.	do.	200	"	"	"	5 feet,	"	"	"	"	6 00
7661D	do.	do.	300	"	"	"	"	"	"	"	"	8 00
7662	do.	do.	50	"	"	"	foot, end-feet to **12ths**				"	4 00
7662B	do.	do.	100	"	"	"	"	"	"	"	"	5 00
7662C	do.	do.	200	"	"	"	"	"	"	"	"	7 50
7663C	do.	do.	200	"	"	"	5 feet,	"	"	"	"	6 00
7663L	do.	do.	66	"	"	"	link	(100 links)			"	5 00

For lines (without reels) see page 528.

EXCELSIOR RAILROAD BAND CHAIN.



Graduations of Excelsior Railroad Band Chains No. 7668.

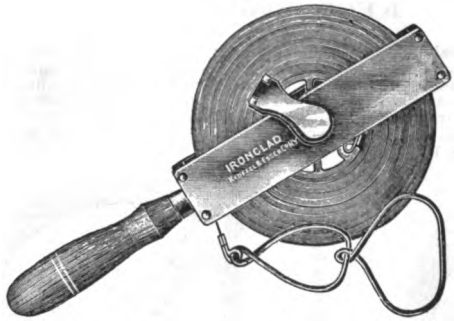
7668 Excelsior Band Chain, **EXTRA HEAVY**, for Railroad work, etc., ½ in. wide, 100 feet, graduated every foot **on brass sleeves**, end-feet to tenths, very thick steel band, two swiveling chain handles attached by strong spring hooks and solid rings; best quality and workmanship throughout; reel similar to Style 7650 A; (page 522) a correct and very substantial Band Chain for rough work . . . . . each $ 9 00

Any of the above band chains with one extra sub-divided foot BEFORE zero, furnished to order without extra charge.

For Nickelplating Lines see page 529.

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IRONCLAD BAND CHAINS.



No. 7664 C.

IRONCLAD BAND CHAINS are of most substantial construction and very accurate. The line is of heavy steel ribbon ¼ in. wide. The very practical reel consists of two strong steel plates, 1½ in. wide, carrying a large centre (for quick and easy winding) with extra-long heavy folding brass handle. The width of the side plates prevents tangling of the line in reeling or unreeling. All metal parts of the reel are heavily nickle-plated. The line, when reeled up, is exposed to the air, so that it will dry readily and free itself of adhering soil or dirt. Two large nickleplated handles for the line are furnished with each chain.

We recommend the **IRONCLAD BAND CHAINS** for their durability; they are practically indestructible.



Graduations of Ironclad Band Chains No, 7664.

IRONCLAD Band Chains, heavy black steel ribbon, ¼ inch wide, **KECO finish,** (see pape 492) **etched** graduations at every foot, end-feet to 10ths and 100ths. The graduations are etched in a manner which insures permanence in rough work. Reel and all mountings nickelplated, two large handles for the line.

7664B. **IRONCLAD** Band Chain, ¼ in. wide, etched graduations, 100 ft., each $ 5 75

7664C. do. do. do. ¼ " " do. 200 ft., " 8 75



Graduations of Ironclad Band Chains No. 7666.

IRONCLAD BAND CHAINS, heavy steel ribbon, ¼ in. wide, plated with white metal (to resist rust) and graduated and numbered at every foot on Babbitt metal, end-feet to 10ths. Reel and all mountings nickelplated, two large handles for the line.

7666B. **IRONCLAD** Band Chain, ¼ in. wide, graduated on Babbitt metal, 100 ft., each $ 5 75

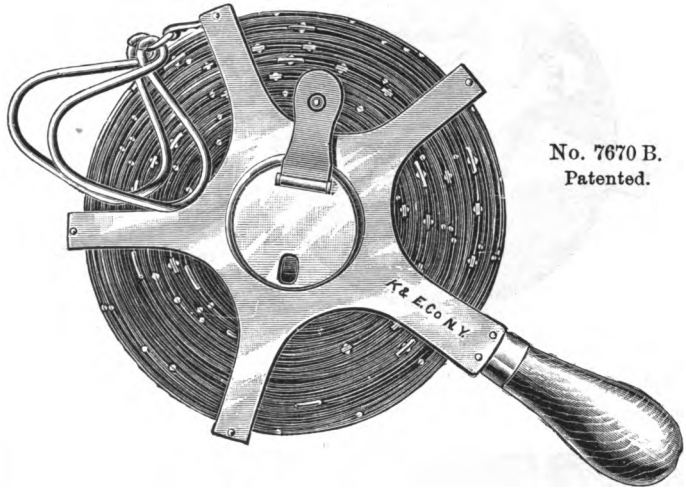
7666C. do. do. do. ¼ " " do. 200 ft., " 8 75

Above band chains with one extra sub-divided foot BEFORE zero, furnished to order without extra charge.

For Lines (without reels) see page 528.
For nickelplating lines see page 529.

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CHAMPION BAND CHAINS



No. 7670 B.
Patented.

Champion Band Chains are of superior quality heavy steel ribbon, ¼ in. wide. Nos. 7670 and 7671 are graduated and marked by rivets at every foot or link, the end-feet are subdivided to 10ths. They are numbered at every 5 feet, with additional number marks at every 10 feet. The number plates have rounded edges so that they will not catch, and they are notched to insure correct locating of the plumbing line. The reel is of stout metal, nickelplated, with polished wooden handle, two nickelplated handles for the line. The 100-foot band chain, complete, weighs about 2 pounds and measures about 6¼ inches across. The "Champion" is a substantial and reliable band chain of light weight, strong enough for rough work and easy to wind and unwind. As the whole tape is exposed to the air while on the reel, it is easily dried and kept clean.



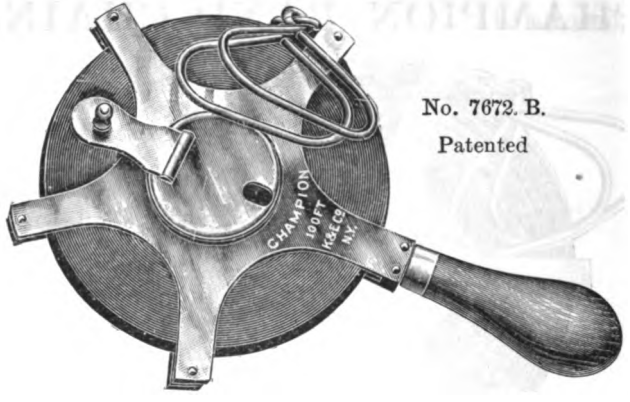
Graduations of Champion Band Chains Nos. 7670-7671.

7670 B	Champion Band Chain, ¼ in. wide, superior quality, **heavy blued steel ribbon,**				100 feet	. . .	each	$ 6 75
7670 C	do.	do.	do.	do.	200 "	. . .	"	10 25
7670 D	do.	do.	do.	do.	300 "	. . .	"	12 50
7670 L	do.	do.	do.	do.	66 "	(100 links)	"	6 00
7670 B M	Champion Band Chain, like No. 7670, but 25 Meters					. .	"	6 75
7670 C M	do.	do.	" "	7670, but 50	"	. .	"	10 25
7671 B	Champion Band Chain, like No. 7670, but **plated with white metal,** to resist rust,				100 feet	. . . .	each	$ 6 75
7671 C	do.	do.	do.	do.	200 "	. . . .	"	10 25
7671 D	do.	do.	do.	do.	300 "	. . . .	"	12 50
7671 L	do.	do.	do.	do.	66 "	(100 links)	"	6 00
7671 B M	Champion Band Chain, like No. 7671 but 25 Meters,						"	6 75
7671 C M	do.	do.	" "	7671 " 50	"		"	10 25

Above band chains with one extra sub-divided foot BEFORE zero, furnished to order without extra charge.

For lines (without reels) see page 528.
For nickelplating lines see page 529.

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No. 7672. B.
Patented

Champion Band Chains No. 7672 are like No. 7670 but with **etched** graduations at every foot or link, end-feet to $\frac{1}{10}$ths and $\frac{1}{100}$ths. The graduations are etched in a new manner, which insures their durability in rough work. They have the **KECO Finish.**



Graduations of No. 7672.

7672 B	Champion Band Chain, $\frac{1}{4}$ in. wide,		etched,	100 feet	. . each	$	6 75
7672 C	do.	do.	do.	do.	200 "	. . "	10 25
7672 D	do.	do.	do.	do.	300 "	. . "	12 50
7672 L	do.	do.	do.	do.	66 "(100 links)	"	6 00



Graduations of No. 7674.

Champion Band Chains, No. 7674, are **plated with white metal** (to resist rust) and are graduated and numbered at every foot on Babbitt Metal. They are well adapted for use in mines, as no water or moisture can enter between the Babbitt metal and the band to corrode the tape. On rough ground like stone or gravel, the graduations are less liable to injury than rivets or plates.

7674 B	Champion Band Chain, $\frac{1}{4}$ in. wide graduated on Babbitt metal,				100 feet	. . . each	$ 6 75
7674 C	do.	do.	do.	do.	200 "	. . . "	10 25
7674 D	do.	do.	do.	do.	300 "	. . . "	12 50
7674 B M	Champion Band Chain, like No. 7674B,				but 25 Meters,	"	6 75
7674 C M	do.	do.	do.	do.	" 50 "	"	10 25

LINES FOR BAND CHAIN

(Without Reels.)

Lines $\frac{1}{4}$ in. wide, for Champion or Ironclad Band Chains, graduated by rivets, or etched, or on Babbit metal.

66	**100**	**200**	**300 feet**	**25**	**50 meters**
each $ 3 90	3 90	6 25	8 25	each $ 3 90	6 25

In ordering lines only, please state for which catalogue number of Band Chain.

Above band chains with one extra sub-divided foot BEFORE zero, furnished to order without extra charge.

For nickelplating lines, see page 529.

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NICKELPLATING BAND CHAINS.

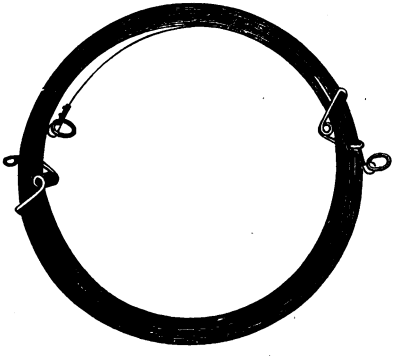
We are prepared to furnish our band chains nickelplated in the best and most durable manner (for protection against rust) at the following extra charge:

Length in feet.	50	66	100	200	300
extra, each	$ 1 50	1 50	2 00	3 00	4 00

DREADNAUGHT BAND CHAINS,

WITHOUT REELS.

STRONGER AND MORE ACCURATE THAN WIRE CHAINS; EASIER TO HANDLE; NEARLY INDESTRUCTIBLE.



No. 7669 B.

Dreadnaught Band Chains are plated with white metal, to resist rust, and are carefully graduated and plainly numbered on Babbitt metal. We furnish them with rawhide handles, but will furnish metal handles at the same price, if they are specified on the order.

Some engineers engaged on large construction work prefer to use band chains without reels, carrying them looped, either over the shoulder or in the hand in figure-eight form.



Graduations of Dreadnaught Band Chains.

7669 B	Dreadnaught Band Chains (no reel) ¼ in. wide, plated white, graduated and numbered on Babbitt metal at every foot, end-feet graduated to 10ths,	100 feet . . each	$ 3 90
7669 C	do. do. do. do.	200 " . . "	6 25
7669 D	do. do. do. do.	300 " . . "	8 25
7669 B M	Dreadnaught Band Chain (no reel) ¼ in. wide, plated white, graduated and numbered on Babbit metal at every half-meter, end-meters to decimeters, 25 meters,	each	$ 3 90
7669 C M	do. do. do. do.	50 " "	6 25

Above band chains with one extra sub-divided foot BEFORE zero, furnished to order without extra charge.

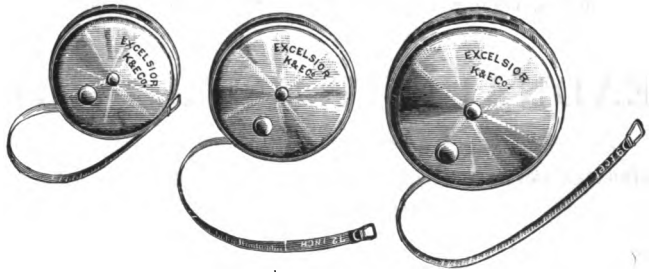
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EXCELSIOR STEEL POCKET TAPES.

Extra-Fine Quality. German Silver Cases

KECO Finish.

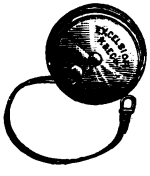
(See page 492.)



Excelsior Steel Pocket Tapes, 1/4 in. wide, German silver case, spring winding, with stop.

Length in feet,	3	5	6	9	12
Inches to 16ths (one side) . . . . No.	7690T	7691T	7692T	7693T	7694T
each	$ 1 00	1 25	1 40	1 90	2 50
Feet to 100ths (one side) . . . . . No.	7690D	7691D	7692D	7693D	7694D
each	$ 1 00	1 25	1 40	1 90	2 50
Inches to 16ths, other side millimeters, No.	7690TM	7691TM	7692TM	7693TM	7694TM
each	$ 1 10	1 40	1 60	2 20	2 80

7705. Excelsior Steel Pocket Tapes, 1/4 **in. wide, German silver case,** spring winding, with stop, feet divided to 100ths, other side links. **length 10 feet** . . . . . each $ 3 00



Excelsior Miniature Steel Pocket Tapes, 5/32 in. wide, German silver case, 1 in. diameter, spring winding, with stop, **length 36 inches.**

7707. Inches in 16ths . . . . . each $ 1 00
7708. " " " other side millimeters . . . . . " 1 10

Excelsior Pocket Tapes in 12ths up, to 6 feet long are numbered inches only, those over 6 feet long are numbered feet and inches, those in 10ths are numbered feet and 10ths, the Metric at every cm.
The length of these tapes is marked on the line, before the zero point.

NICKELPLATING POCKET TAPE LINES.

We are prepared to furnish our pocket tape lines nickelplated in the best and most substantial manner (for protection against rust) at the following extra charge:

Length in feet,	3	5	6	9	12
extra each	$ 25	30	35	40	45

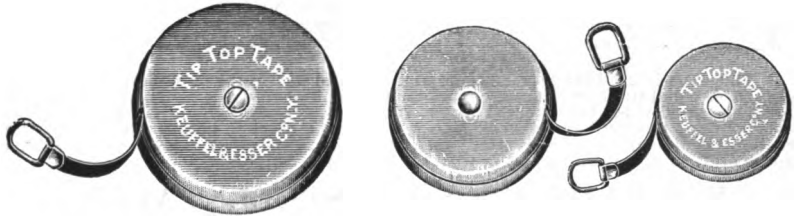
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TIP TOP TAPES.

POCKET TAPES, SPRING WINDING.

KECO Finish.
(see page 493)

Nickelplated Brass Cases.



No. 7713 (front) 7711 (back) 7720 (front)

We recommend the **Tip Top Tapes** as well made reliable tapes at a moderate price.

STEEL POCKET TAPES. SPRING WINDING.

TIP TOP Steel Pocket Tapes, ¼-in. wide, **nickelplated** brass case, spring winding, with stop at centre.

Length in inches,	36	60	72	96
Inches to 16ths (one side) . . . No.	7710T	7711T	7712T	7713T
each $	55	70	80	1 10

No. 7713TF Feet to inches in 16ths (one side) . . **Length 8 feet** each $ 1 10

Length in feet,	3	5	6	8
Feet to 100ths (one side). . . . No.	7710D	7711D	7712D	7713D
each $	55	70	80	1 10

Length in Meters,	1	1½	2	2½
Inches to 16ths, other side millimeters, No.	7710TM	7711TM	7712TM	7713TM
each $	65	80	1 00	1 30

Tip Top Steel Pocket Tapes **with scale. Length 60 inches.**

No. 7711-4 Inches to 16ths, other side **Scale ½ in. to the foot,** each $ 80
No. 7711-8 " " " other side **Scale ⅛ in. to the foot,** " 80

LINEN POCKET TAPES. SPRING WINDING.

TIP TOP Linen Pocket Tapes, ¼-in. wide, **nickelplated** brass cass, spring winding, with stop at centre.

Length in inches,	36	60	72	96
Inches to 16ths (one side) . . . No.	7720T	7721T	7722T	7723T
each $	30	35	40	60

No. 7723TF Feet to inches in 16ths (one side). **Length 8 feet** each $ 70

THE LENGTH OF THESE TAPES IS MARKED ON THE LINE, BEFORE THE ZERO POINT.

For nickelplating Lines see opposite page.

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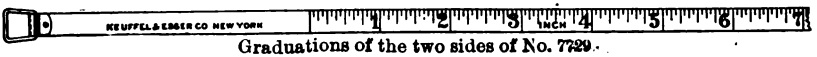
K & E STEEL TAPES

KECO Finish.

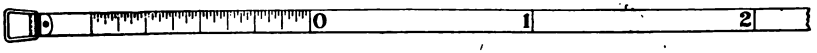
(See page 492)

For reading diameter opposite circumference (π Tapes.)

7729. **K & E** Steel Pocket Tape, 1/4 **in. wide,** K. & E. Co. patent German silver case, spring winding, with stop, **12 feet** each **$ 3 25**



Graduations of the two sides of No. 7729.



This tape is graduated on one side in inches and sixteenths of inches; on the other side spaces equal to 3.1416 inches are marked off and numbered 0, 1, 2, etc., the one before zero being subdivided into 64 equal parts. If the tape is passed around a circular object, say a column, the "circumference" side will read the correct number of inches and fraction (to 64ths in.) of the diameter. (see cut). There are many cases in which such a tape is useful and certainly handier than a pair of large calipers.

K & E MECHANIC'S STEEL TAPES.



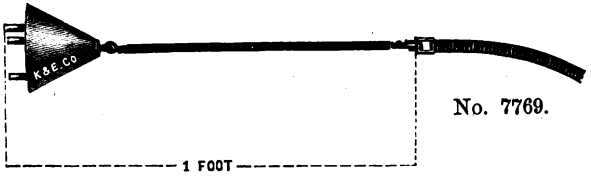
Please order by number.

K & E Mechanic's Steel Tapes, KECO finish, 3/8 **in. wide,** nickelplated metal case, large centre with long folding handle, graduations begin **on the line.**

Length in Feet,	**8**	**12**	**15**	**20**
Feet in inches, (to 16ths inches). . . . **No.**	**7760**	**7761**	**7761½**	**7762**
each	$ 1 20	1 45	1 70	1 95
Length in Meters,	**3**	**5**		
Metric (one side only) . . . . . **No.**	**7760M**	**7762M**		
each	$ 1 40	1 80		

The **K & E** Mechanic's Steel Tapes are of practical construction. As they are very accurate, finely subdivided and of moderate cost, they will often be preferred to the less reliable woven tapes or folding rules. They will stand rough handling and will not be injured by knocking about in a tool chest.

SOUNDING ATTACHMENT FOR TAPES.



No. 7769.

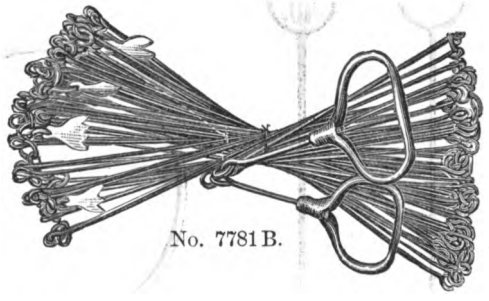
7769. Sounding Attachment for Tapes . . . . . each **$ 1 50**

This attachment for measuring the depth of oil in tanks, &c., consists of a heavy conical weight with 3 short feet, attached by a ring to a short piece of tape line which ends in a stout snap hook. It can be used with any tape with graduations beginning at end of ring, when it is only necessary to add 1 foot to the reading of the tape to obtain correct measurement, as the attachment is exactly one foot long.

If the Sounding Attachment and the tape are ordered together, we can furnish the tape to read actual measurement, if so desired.

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MEASURING CHAINS.



No. 7781 B.

STEEL, U. S. STANDARD.

7780 A.	**Steel,**	W. G.	12,	Brass Handles,	oval rings,	50 feet	. . . .	each	$	4	50
7780 B.	do.	"	"	12,	"	"	"	"	100	"	. . . .	"		8	00
7780 C.	do.	"	"	12,	"	"	"	"	33	"	(50 Links)	"		3	50
7780 D.	do.	"	"	12,	"	"	"	"	66	"	(100 Links)	"		6	50
7781 A.	do.	"	"	12,	"	"	brazed links and rings,		50 feet			"		6	00
7781 B.	do.	"	"	12,	"	"	"	"	"	"	100	"	"	11	00
7781 C.	do.	"	"	12,	"	"	"	"	"	"	33	"	(50 Links)	5	50
7781 D.	do.	"	"	12,	"	"	"	"	"	"	66	"	(100 Links)	10	00

Chain 7781 B has a spring-hook (snap) at 50 feet, so that it can be separated there and the handle attached for using it as a 50-foot chain.

STEEL, METER AND VARA.

7782 A.	Steel,	W. G	12,	Brass Handles,	oval rings,	10 meters	. .	each	$	3	50
7782 B.	do.	"	"	12,	"	"	"	"	15	"	. . .	"		5	00
7782 C.	do.	"	"	12,	"	"	"	"	20	"	. . .	"		6	20
7783 A.	do.	"	"	12,	"	"	brazed links and rings,		10 meters			"		5	50
7783 B.	do.	"	"	12,	"	"	"	"	"	"	15	"	"	7	50
7783 C.	do.	"	"	12,	"	"	"	"	"	"	20	"	"	10	00
7783 D.	do.	"	"	12,	"	"	"	"	"	"	25	"	"	12	50
7784 A.	do.	"	"	12,	"	"	oval rings,		10 Varas			. .	"	3	50
7784 B.	do.	"	"	12,	"	"	"	"	20	"		. .	"	6	50
7785 A.	do.	"	"	12,	"	"	brazed links and rings,		10 Varas				"	5	50
7785 B.	do.	"	"	12.	"	"	"	"	"	"	20	"	"	10	00

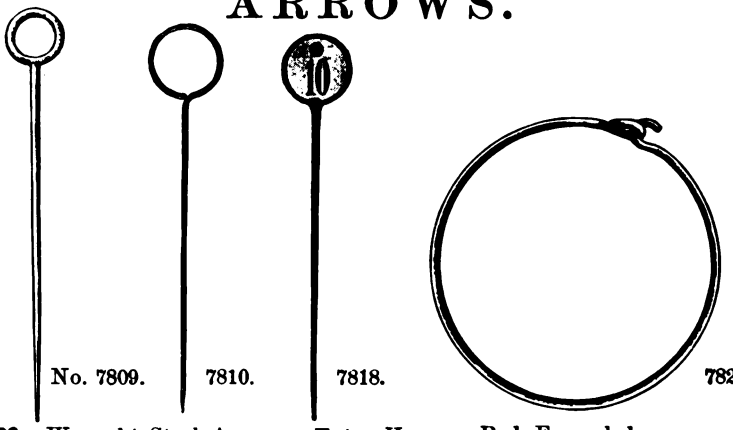
The Vara Chains are in Mexican Varas (838 m m.). Chains in Varas of other Standards furnished to order.

IRON, U. S. STANDARD.

7786 A.	**Iron,**	W. G.	8,	Brass Handles,	2	round	rings,	50 feet	. . .	each	$	2	50
7786 B.	do.	"	"	8,	"	"	2	"	"	100	"	. . .	"		3	50
7786 C.	do.	"	"	8,	"	"	2	"	"	33	"	(50 Links)	"		2	00
7786 D.	do.	"	"	8,	"	"	2	"	"	66	"	(100 Links)	"		3	20
7787 A.	do.	"	"	8,	"	"	3	sawed oval	"	50	"	. . .	"		3	50
7787 B.	do.	"	"	8,	"	"	3	"	"	100	"	. . .	"		5	50
7787 C.	do.	"	"	8,	"	"	3	"	"	33	"	(50 Links)	"		2	70
7787 D.	do.	"	"	8,	"	"	3	"	"	66	"	(100 Links)	"		4	25

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ARROWS.



No. 7809. 7810. 7818. 7825.

7809. Wrought Steel Arrows. Extra Heavy. Red Enameled. 15 in., set of 11 $ 2 00

Arrows No. 7809 are of tempered wrought steel and very useful on hard or stony ground. They can also be used like a scratch awl.

7810.	Steel Arrows, W. G.	6,	nickelplated	14 in.,	set of	11	$ 1 25
7811.	do. do.	" " 9,	do.	14 "	" "	11	1 00
7812.	do. do.	" " 9,	red enameled	12 "	" "	11	1 20
7813.	do. do.	" " 11,	nickelplated	12 "	" "	11	90
7815.	Iron do.	" " 9, ...		14 "	" "	11	60
7818.	Steel Arrows, W. G.	6, bright, 14 in., with white enameled disc 2½ in. diam , with red figures 1 to 11		"	"	11	5 00
7819.	Canvas Carrying Case for No. 7818, with shoulder strap . .					each	2 50
7820.	Leather Quiver with belt loop for set of 11 arrows.					"	1 00
7825.	Spring Steel Carrying Ring for arrows					"	15

When ordering Canvas Case or the Quiver, state for which catalogue number of arrows.

TALLYING MACHINES.



No. 7846. 7847. No. 7854.

7846. Tallying Machine, for keeping count by pressing on a knob, nickelplated watch case, porcelain dial, 3 numbered dials, registers to 1000, with lever for setting hands to zero. . each $ 4 00

7847. Tallying Machine, like No. 7846, but with 4 numbered dials, registers to 10,000. . . . . each 5 50

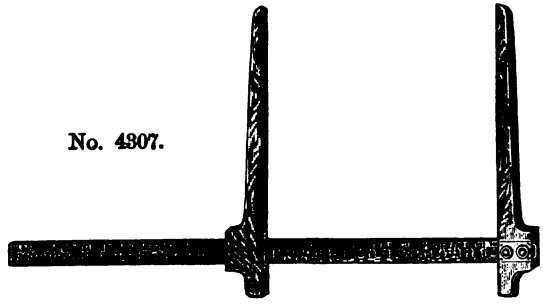
7854. Tallying Machine, for keeping count by pressing on a knob, nickelplated, registers to 999, arranged to set back to zero. each 2 50

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INSTRUMENTS FOR FOREST WORK.

TREE CALIPERS.

No. 4307.



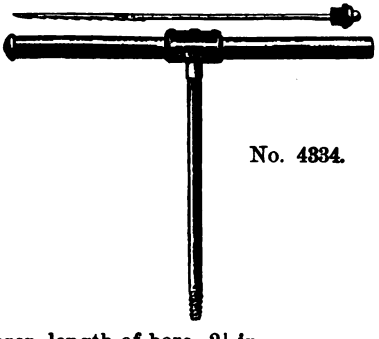
4305.	Tree Caliper, fine quality, hardwood, 18 inch, 1 clamp nut, each	$ 3 15
4307.	" " " " " 34 " 2 " " " "	4 50
4309.	" " " " " 50 " 2 " " " "	5 50

These calipers are of light-colored hardwood, best workmanship, finely finished, beam graduated to 10ths inches and plainly numbered. The arms are detachable for convenience in transportation. The stationary arm is held by brass clamp nuts with lock nut. The eye of the sliding arm is brass-lined all around.



Tree Tape No. 7262 P. reading circumference and diameter, with jointed anchor peg for attaching to tree,
see page 500.

SWEDISH INCREMENT BORERS.



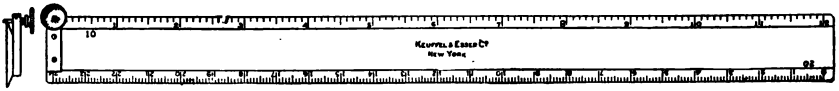
No. 4334.

4330.	Increment Borer, length of bore 2½ in. . . . . each	$ 5 25
4331.	do. do. " " " 4 " . . . . . "	8 00
4332.	do. do. " " " 6 " . . . . . "	10 50
4333.	do. do. " " " 8 " . . . . . "	14 50
4334.	do. do. " " " 10 " . . . . . "	20 50
4335.	do. do. " " " 11¾ " . . . . . "	25 00

These Swedish Increment Borers are the latest and most approved type and are of the finest quality. The steel borer proper and the steel plug-extractor can be stored in the tubular nickelplated metal handle. They work rapidly and surely in both soft and hard woods and make perfect cylinders.

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STEM ANALYSIS RULES.

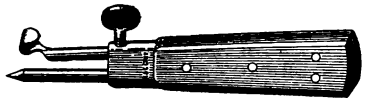


No. 4348.

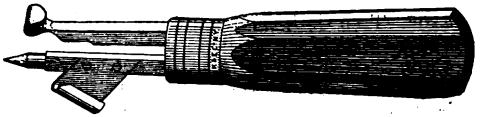
4347 Stem Analysis Rules, 12 in., brass, nickelplated, engine divided, one edge to 10ths inches, the other to 20ths inches . . . . . each $ 2 50

4348. Stem Analysis Rules, 12 in., like No. 4347 but with centering pin on the 10ths inches edge . . . . . " 3 50

TIMER SCRIBES.



No. 4350.

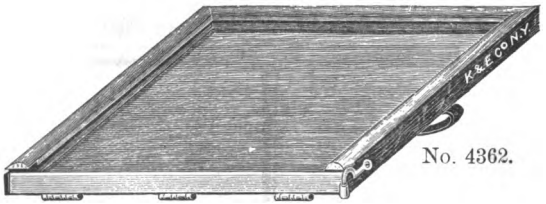


4352.

4350. Timber Scribe, wooden handle, small, (5 in.) . . . . . each $1 00

4352. " " " " large, (6½ ") . . . . . " 1 25

TALLY SHEET HOLDERS.



No. 4362.

Old No.

5723 **4360.** Tally Sheet Holder, for tally sheets 7×10 in . . . . . each $ 2 50

5724 **4362.** do. do. " " " 10×12 " . . . . . " 4 00

The frames are of hardwood and provided with strap handle. The hinged side is of brass and is held by a hook.

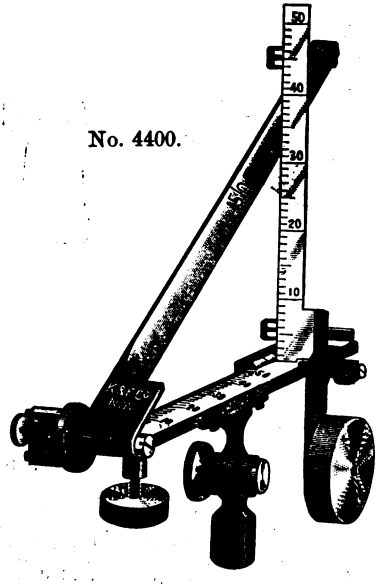


No. 7854, Tallying Machine, nickelplated, for keeping count by pressing on a knob, registers to 999, sets back to zero . . . . each $ 2 50

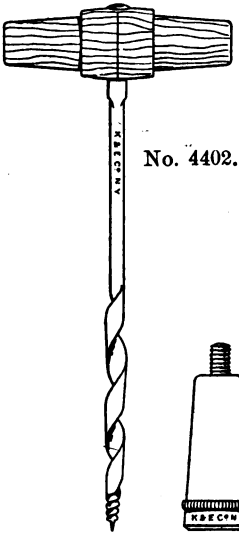
(Repeated from page 534.)

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HYPSOMETERS.



No. 4400.



No. 4402.



No. 4404.

4400. Hypsometer (after Klaussner). brass, graduated surfaces silvered, in wooden box 8 × $2\frac{3}{4}$ × $2\frac{3}{8}$ inches . . . . . each $26 00

4402. Gimlet Support, for attaching hypsometer to a tree or post, hard wood cross piece (handle) . . . . . " 1 00

4404. Brass Socket threaded to fit the jointed ferrule and fitting the handle of the gimlet support, or a staffhead . . . " 1 00

This Hypsometer offers the advantage over most others that the total height of the tree or other object can be read direct from one scale without requiring the adding of the readings above and below the observer's level. The weighted altitude scale is much steadier in the wind than a plumbbob.

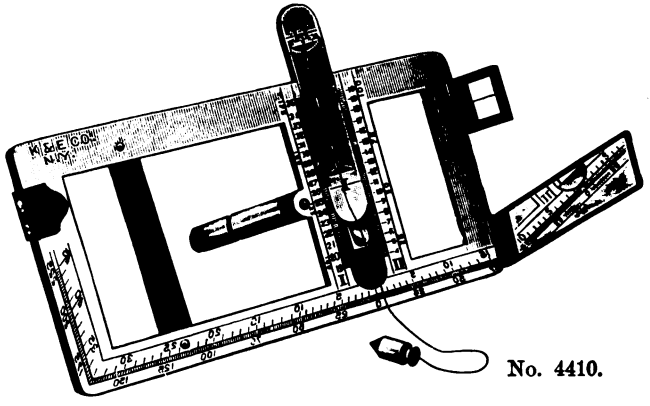
The instrument consists of a base rule 6 in. long, a hinged sighting rule and an altitude-scale held vertical by a weight. The base rule is graduated up to 60 equal parts, each part divided to halves, forming the distance scale. It carries a slide with index line, to which the weighted altitude-scale is attached. The altitude-scale is graduated to 50 equal parts, each part divided to halves. The graduations may be read as yards, meters, feet or in any other unit, depending on the unit adopted in measuring the base line (from observer to object). The sighting rule is hinged to the near end of the base rule, and like the base rule, has a hair-line sight at its further end. At the joint of these two rules is a revolvable peep-sight, which can be directed to either of the two hairlines by turning a milled disk. The instrument has a jointed ferrule with clamp screw which is threaded to fit the regular photographer's tripod screw.

The slide of the altitude-scale is set on the distance scale to correspond to the measured base line. After sighting the base of the object along the base rule, the sighting rule is raised by means of a high pitch thumbscrew, until its hairline cuts the top of the object, when the total height is read from the altitude scale.

It is particularly adapted to cases where necessity of haste or the roughness of country make the use of a tripod impracticable, although accurate results are obtained more easily when using a tripod than without one.

For Jacob staff and Tripods see page 421.

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No. 4410.



4411.

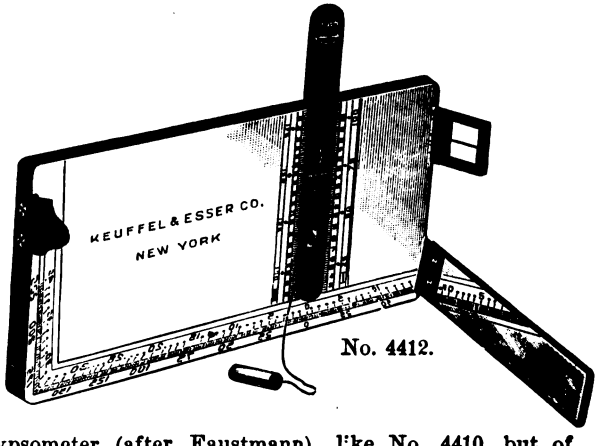
4410. Hypsometer 3¼ x 7 in., (after Faustmann), brass, graduated surface silvered, hinged mirror mounted in aluminum, folding sights, folding swiveling handle. In cloth covered pouch 3½ × 7½ × ⅝ in. with cover flap. With Directions . . . . . each $19 50

4410S. Sole Leather Pouch for No. 4410, ... extra " 2 00

This Hypsometer is provided with two scales: the scale of heights on the lower edge of the instrument and the scale of distances on the two edges of the groove in which the slide moves. The slide carries the plumbbob thread and has two reading lines marked I and II, corresponding to the two scales of distances also marked I and II. It is held in place by a spring. The plumbbob is stored in a small tube at the back of the frame. The peep-hole and hairline sights and mirror (5¾ x ¾ in.) are hinged to fold down.

4411. Brass Ferrule, to fit gimlet support, (No. 4402, p. 537). or a staffhead . . . . . each $ 1 00

For Jacob staff and Tripods see page 421.



No. 4412.

4412. Hypsometer (after Faustmann), like No. 4410, but of polished hardwood, graduations on white facing with protective coating, hinged mirror mounted in aluminum, folding sights. In cloth covered pouch 3½ × 7½ × ⅝ in. with cover flap. With Directions, ... each $ 6 50

See also Military Clinometer, page 442.

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HYPSOMETER AND GRADEMETER.



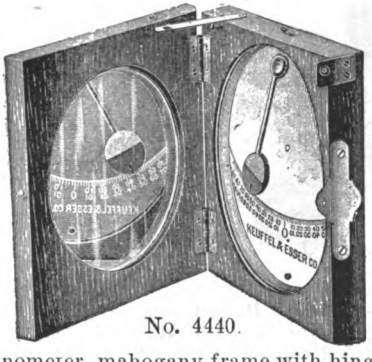
No. 4435.

4435. Hypsometer and Grademeter as manufactured by us for the U. S. Forest Service, bronzed brass case $3\frac{5}{8} \times \frac{3}{4}$ in., sensitive gravity (pendulum) clinometer graduated to percentage of angle, from 0 to 50% for depression and from 0 to 200% for elevation. The spring stop is released by pressing knob; sliding lock for spring stop. Leather strap handle . . . . . each $ 17 00

The line of sight passes through the diameter of the box, from a peep sight in one side to a small glazed window in the opposite side. A segment of the cover, closed by transparent celluloid, admits light to the graduations, which are seen simultaneously with the sighted object.

This instrument was designed and patented by Mr. G. G. Plummer of the U. S. Forest Service.

CLINOMETERS FOR MEASURING HEIGHTS.



No. 4440.

No. 4442.



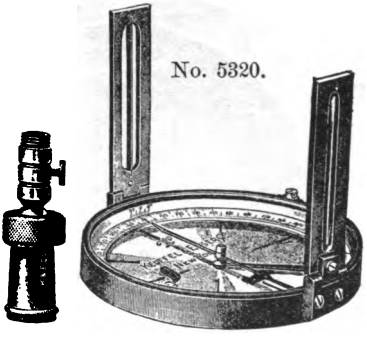
4440. Clinometer, mahogany frame with hinged cover, $4\frac{1}{2} \times 4\frac{1}{2} \times 1$ in., silvered metal dial with cover glass. Graduated to percentage of angle to 100% each way (by 2%), numbered at each 10%, with a second row of reversed numbers for reading in the mirror in the lid while sighting. The upper edge has a peep sight and sighting pin, the lower serves as fiducial edge. . . . . each $ 8 00

4442. Clinometer, mahogany frame $3 \times 3 \times \frac{1}{2}$ in., silvered metal dial with cover glass. Graduated to percentage of angle to 100% each way (by 2%), numbered at each 10%. The top or bottom of the frame serve as fiducial edge and for sighting. . . . . " 4 00

In Nos. 4440 and 4442 the pendulum is held by a spring, except when released by pressing a button on the reverse side of the frame, so that its observed position can be fixed and read on the scale after the sighting.

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TIMBER CRUISER COMPASS.

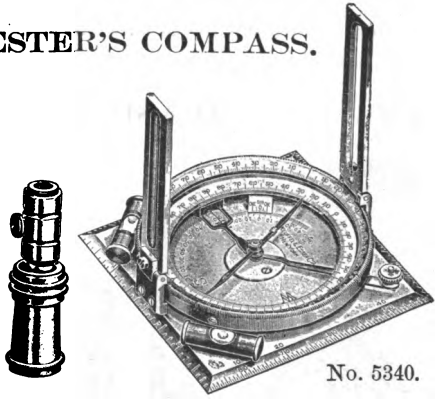


No. 5320.

5320. Timber Cruiser's Compass, with folding sights, graduated on raised ring to degrees, **RADIAL LINES AT HALF-QUADRANTS,** variation plate, two spirit levels, Ball joint and Socket (No. 5487-2 p. 420) for Jacob staff mounting, needle about 3½ in., in polished mahogany Case, each $ 16 00
Sewed leather Sling Case **in place of mahogany case** . . . extra " 2 50

(This item is repeated from page 418.)

FORESTER'S COMPASS.



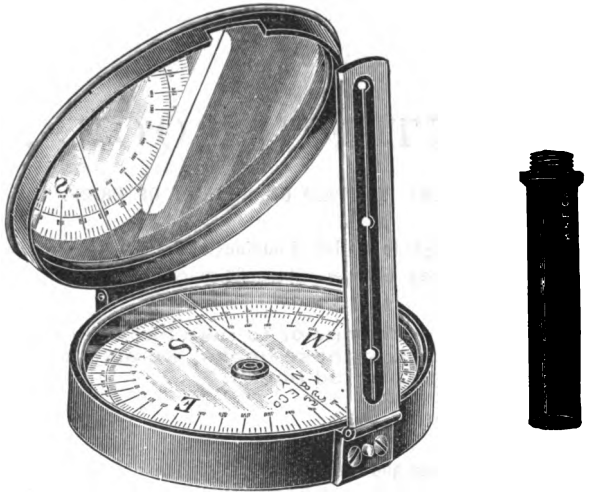
No. 5340.

5340. Forester's Compass, as made by us for the U. S. Forest Service, aluminum, folding brass sights. Raised compass ring graduated to degrees, variation plate reading by vernier to 5 minutes. Improved needle about 2⅝ inches, with stop, jeweled centre. Beveled ring on compass box, graduated to degrees, numbered in quadrants, sighting mark at each quadrant, with knurled edge for revolving in azimuth. Pendulum clinometer graduated to degrees for 90 degrees in each direction. Base 4x4 in., beveled edges; two edges graduated as a protractor, one edge graduated to 8ths inches representing chains on scale of 1 inch to one mile, the other edge graduated to 10ths inches. Two spirit levels on the base. A township diagram on under side of base. Instrument complete with ball joint and socket for Jacob Staff mounting, in sewed leather Case with shoulder strap . . . . . each $ 25 00

The Forester's Compass is light and portable. The variation of the needle is set off by revolving the raised compass ring by means of a slotted screw projecting through the side of the compass box, which serves also as set-screw. The beveled ring can be used for turning right angles or for sighting vertical angles by placing the edge of the base on a level surface.

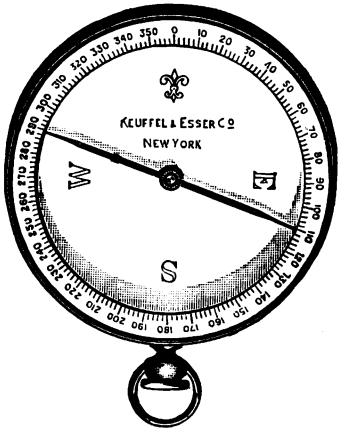
This style of Compass is also known as Geologist's Compass and is used largely also in topographical work. It is listed as such on page 420.

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No. 5455.

5455. Compass with Mirror in lid, floating card dial about 3½ in., jeweled centre, automatic stop, graduated to 2 degrees, numbered to 360. A second (inner) row of reversed figures, in quadrants, for reading in the mirror in the lid. One folding peep sight. The hair line on the cover glass of the compass is continued across an unsilvered strip of the mirror, where it forms the sighting vane. Socket for staff head, (No. 5487-6, page 420). . . . . **each $ 22 00**



No. 5603.

5603. Forester's Compass, 3 in., nickelplated, graduated on raised ring to 2 degrees, fine bar needle about 2⅞ in., jeweled centre, stop to needle (from pendant). . . . . **each $ 4 50**

(This item is repeated from page 432.)

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INDEX.

A.	PAGE
Abney Hand Levels	440, 441
Accessories for Current Meters	461
Adder (fractions)	308
Adhesive Binding Strips	6
Adhesives, Higgins	263
Adjustable Angle, Duplex	202
" Curve Rules	208
Air Meters	454, 455
Aladdin Reading Lens	396
Alba Rubber	284
Alba Tracing Paper	19
Alidades	399
Alphabet Books	291
Altimeters	423—425, 440—442, 539
American Drawing Tables	247
Amsler's Integrators	318, 319
" Pattern Planimeter	311
Anemometers	454, 455
Aneroid Barometers	449—451
Angle, Mirrors and Prisms	443, 444
" Targets	463
Anvil Drawing Paper	11, 14
Architect's Blanks	38
" Contracts	38
" Dumpy Level	374
" Level Rods	469
" Levels	374—378
" Specifications	38
" Transits	382, 383
Arkansas Oil Stones	260
Armor Tapes	507
Arrow Brand Ruling Pens	134
Arrows	534
Art Gum	285
Artificial Horizons	412, 413
Artist's Drawing Tables	242—244
" Gum	284, 285
" Pencils	281, 282
Astronomical Telescopes	487
Attachments, leveling	422, 425, 439
" solar	372, 373
" transits and levels	391, 392, 394—396
Automatic Print Hangers	27

B.	PAGE
Ball Joints and Sockets	420, 422
Band Chains	525—529
" " Champion	527, 528
" " Dreadnaught	529
" " Excelsior	525
" " Ironclad	526
" " Lines for	528
" " Nickelplating	529
" " Railroad	525
Banknote Tracing Paper	19
Barographs	452, 453
Barometers, Aneroid	449—451
Bars for Beam Compasses	214
Bath Trays	232
Beam Compasses	71—74, 115, 116, 160
" " Bars for	214
Beginners' Sets	147—149
Bell Odometers	475
Bench Levels	447, 448
Berkeley Tape	498
Binding Strips	6
Binoculars	476—479
Birams Anemometers	455
Black Process Papers	24, 25
Black Xylonite Splines	208
Blanca Drawing Paper	2
Blanks for Architects	38
Blue Process Cloth	24, 26
" " Frames	224—229
" " Hangers	27
" " Machines	228—231
" " Papers	22, 23
" " Trays for	232
Boards, Drawing	233, 234
Boat Compasses	431
Bond Paper	4
Books of Alphabets	291
" Cross Section	39, 42
" Earthworks	44
" Field	40—45
" Level	42
" Mining (transit)	40
" Profile	39
" Round Writing	288

Digitized by Google

PAGE

Books Scientific . . . . 542—553
" Topographical 44
" Transit 40
Border Pens 77, 120
Both's Section Liner 159
Bottle Holders (ink) 266
Bow Compasses 66
Bow Dividers 67—70, 112, 113, 145, 146
Bow Pencils 66—70, 112—114, 145, 146
Bow Pens 66—70, 112—114, 145, 146
Box Compass 399
Boxes for Sheet Papers 8
" Color 260, 262
" Colored Inks 266
" for Instruments . . 137, 138
Box Sextant 412
Boxwood Clinometers 446
" Pocket Rules 192
" Protractors . . 168, 172
" Scales . 180—184, 187, 188
" Sectors 308
Boyden's Hook Gauge 461
Bristol Board 4, 5
" " Patent Office . . . 4, 5
" " Protractors . . . 171
Bronze Tape 497
Brown Print Process 25
Brunton type Pocket Transit . 422
Brushes . . . . . 269—273
Brush Rests 275
Builder's Levels . . . . . 374—378
" Transits 382, 388
" Specifications 38

C.

Cabinet Saucers 274
Calculating Instruments . 292—308
Calculators, Pocket 296, 297
Calipers, tree 535
Cane Tripod 421
Canvas Covers (for rods) . . . 472
Cardboard 5
" Railroad Curves . . 213
Cards for Indicators 312
Carrying Case for Drawing Tools 138
Cases for Instruments . . . 137, 138
" of " 81, 82, 89—105, 122—133, 139—143, 147—149
" for Slide Rules 301
Casey's Section Liner 158
Castell Pencils, A. W F. . . 281, 282
Cavalry Sketching Case 408
Celluloid Drawing Tools, see Xylonite
Centrolineads 218
Chains, Measuring 533
Chalk, marking 283
Champion Band Chains . . 527, 528

PAGE

Charpentier Calculator 297
Chartometers 190
Chests of Drawers . . . . 253—256
China Ware 274, 275
Chinese Ink 267, 268
" White . . . . . 260—262
Circular Slide Rules 296, 297
Circumference Scale 178
" Tapes 500, 532
City Engineer's Tapes 518
" " Transit 393
Clamping Handles for Tapes . . 509
Cleaning Rubber 284, 285
Click Pens 76, 119
Clinometer Compasses . . . 419, 420, 422—427, 430
Clinometers, 415, 440—442, 446, 447, 489
" Holden (tape line) . 517
" Military 442
Clips, Spring 27
Cloth-backed Drawing Papers 13—15
" Blueprint 24, 26
" Cross Section . . . . . 28—32
" Maduro, blackprint . . 24, 25
Cloth-Rubber 6
" Tracing 16
Coddington Lenses 490
Colby's Protractor 161
College Drawing Tables 239
Color Boxes 260, 262
Color Saucers and Slabs . . 274, 275
Colonna Tracing Paper 18
Colored Pencils . . . . . 280—283
Colors, Technical 260
Columbia Blueprint Paper . . 23, 26
" " Cloth . . 24, 26
" Indelible Inks . 264—266
" Tapes 499
Comparing Scales 178, 182
Comparison, official (tapes) . . 493
Compass Boat 431
" Box 399
" Clinometer . . . 419, 420, 422—427, 430
" Forester's . . 432, 540, 541
" Geological 430
" Geologist's 420
" Hutchinson's 427
" Magnetic 415—420, 422—436
" Mariner's 431
" Military 432
" Miner's 416
" Mining 415
" Outkeeper for 417
" Pocket, Magnetic 429—436
" Prismatic . . . 426—428
" Sight . 417—420, 429, 430
" Striding 392
" Surveying . . . 417—420

Digitized by Google

PAGE

Compass Tally Register for . . 417
" Timber Cruiser's . . 540
" Tripods 421
" Trough 399
Compasses, Beam, 71—74, 115, 116, 160
" Drawing . . 57—60, 83—88, 106—109, 144
" Hairspring 57—59, 83—88 109
" Lithographic 121
" Pocket, Drawing . . 62, 110
" Tubular 62
" with Dotting Pen 60, 85, 88
Compensatory Handles (tapes) 509
Constructor's Drawing Tables. . 246
" Sketching Paper . 35
Contact Levels . 439, 440, 446—448
Continuous Profile Books . . . 39
Contract Blanks 38
Conventional Colors 260
Convertible Chests of Draw's, 255, 256
" Levels 377, 378
Co-ordinate Paper 86
Copenhagen Curves 207
Copying Pencils 283
Coradi's Integraph 320
Cord for Plumbbobs 474
Cork Penholders 277
Cornell Tapes 500
Counting Machines 534
Covers for rods 472
Crane's Sewer Slide Rule . . . 307
Crayon Pencils 283
Cross Section Blocks and Books 39, 42
" Cloth . . . . . 28—32
" Papers . . . 28—37
" Rod 469
" Tracing Papers 28—37
Cross Staff Heads 445, 446
Cross, Surveyor's 446
Crow Quill Pens and Holders 276, 277
Crozet Protractor 162
Current Meters . . . . . 457—461
Curves, Copenhagen 207
" Irregular (French) . . 205
" Logarithmic 203
" Mech. Engineer's . . 205
" Pens 80
" Protractor (RR) . . . 170
" Radiators 212
" Railroad . . . . . 209—213
" Rubber . . . . . 205—207
" Rulers, Adjustable . . 208
" Ship 207
" Spiral 203
Cutters, Paper 259
Cylindrical Blueprint Frames . 228

D.

PAGE

Dartmouth Tapes 512
Decimal Pointer (slide rule) . . 305
Detail Papers . . . . . 6—8, 10
" Crossection Paper . . . 33
" Pens 79, 120
Developer for Nigrosine 24
Dipping Needles 416
Dividers 57, 58, 83, 85, 87. 88, 106, 107, 108, 144
" Hairspring, 57, 58, 83. 85, 87, 88, 107. 108, 144
" Pocket 62, 110
" Proportional 63—65, 110, 111, 135
" Three-legged . . . 63, 110
" Whole and Half . . 63, 110
Divisions on Transits . . . 322—325
Dotting Pens 78
" Instruments 71, 116
Double Mounted Papers 15
Double Pointed Pens . . . 277, 289
Dowse's Tracing Cloth 16
Drafting Room Furniture . 223—256
Drafting Room Tables, see Drawing Tables
Draftsman's Limb Protractors . 167
Drafting Instrument, Paragon, 160
Draftsman's Alphabets 291
Draftsman's Stools 248
Drawing Boards 233, 234
Drawing Board Mucilage . . . 263
" " Parallel Attachment for 235
" " Trestles 236, 238
" " Unchangeable 15
Drawing Card, Paragon 5
" Inks . . . . . 261—266
Drawing Instruments . . . 46—149
" " Arrow Brand . . 134
" " Beginners . 147—149
" " Cases, for . 137, 138
" " Esser's Pivot Joint 83—86, 89—105
" " Excelsior . 139—146
" " How to Select 46—55
" " in Cases; see Cases of Instruments
" " Key Brand 105—133
" " Lock Joint . . 87, 88
" " Nickelplated 147—149
" " Paragon . . 57—105
" " Parts for 136
" " Pivot Joint . 108, 109, 125—133
" " Synopsis 56
" " Tongue Joint 57—60 81, 82, 106, 107, 121—124, 139—144, 147—147

Digitized by Google

PAGE

Drawing Paper Mounted . . 13, 15
" Papers in Rolls . 7,10—14
" Papers in Sheets 1—4, 15
" Pens see Ruling Pens.
" Pins 257, 258
" Tables . . . 237, 239—253
" " American . . . 247
" " Artists . . 242, 244
" " College 239
" " Constructor's 246
" " Favorite . 240—246
" " Hudson . 249—252
" " Magazine . . . 253
" " Office 245
" " Simplex . . . 237
" " Vertical . . . 248
" Tacks . . . . . 257—258
Dreadnaught Band Chains . . . 529
Drop Spring Bows . . . 66, 114, 145
Dumpy Levels . . 334, 335, 374, 379
Duplex Angle 202
" Drawing Papers . 3, 10, 14
" Slide Rules 302, 305
Durand's Logarithmic Paper . . 36
Dwarf Tapes 508

E.

Ebony Parallel Rules 196, 197
Economy Sketching Papers . . 7
" Drawing " . . . 7
Edging, gummed 6
Eidographs 150
Electrical Blueprint Apparatus 228—231
Electrical Current Meters . 458—460
Ellipses 203
Ellipsograph 160
Embankment Tapes 510
" Triangles 202
Emerald Rubber 285
Emery Pencil Pointers 286
Empty Cases for Instruments 137, 138
Engineer's Field Books . . . 40—45
Engraver's T Squares 222
Equatorial Telescopes 487
Erasers, Rubber 284, 285
" Steel 286
Erasing Fluid, Helios, Maduro . . 27
Erasing Shields 283
Esser's Patent Joint, 48, 83, 86, 89—105
E. T. Paper 22, 26
Excelsior Band Chains 525
" Drawing Inst. . 139—146
" Pocket Tapes 530
" Tapes 510, 530
" Tracing Cloth 16

PAGE

Expedition Transit 358, 359
Express Paragon Pens 76
Extension Measures 191
" Tripods 398, 421
Extra-heavy Band Chains . . . 525

F.

Farm Levels 437, 438
Faustmann Hypsometer 538
Favorite Drawing Tables 240—246
" Slide Rules 301
Federal Blueprinting Machine 230, 231
Felt for Print Frames 225
Field Books . . . . . 39—45
" Glasses . . . . . 476—479
File, Pencil Sharpener 286
Fixing Salt, Maduro 25
Flag Poles . . . see Ranging Poles
Flat Scales . . . . . 175—184
" Wire Tapes . . . . . 518—521
Flexible Leveling Rods 471
" Steel Straightedges . . 220
Floating Current Meter 460
Focus Reducing Lenses 394
Folding Trestles 237, 238
" Rules . . . . . 192—195
Forester's Clinometers 539
" Compass . . 432, 540, 541
" Instruments . . 535—541
Fraction Adder 308
Frames for Blueprinting . 224—229
French Curves 205
Fuller's Slide Rule 295
Furniture for Beam Compasses 73, 74, 115, 116
Furniture for Drafting Room 223—256

G.

Gauge, Boyden's, Hook 461
" Rain 456
Gauge, Tide 462
Gelatine Sheets 4
Geological Compass 430
Geologist's Compass 420
German Instruments . . 134
" " 106—133
German Silver Parallel Rules . . 196
German Silver Slide Rules . . 305
" " Straightedges . 220
" " Triangles 219
Glaisher's Rain Gauge 456
Glass paper 4

Digitized by Google

PAGE

Glasses, Magnifying 489, 490
" Reading 489
" Water-color 275
Gold Ink 262
Grademeter, Hypsometer . . . 539
Gradienter 395
Graduates (rain gauge) 456
Graduations of Transits . . 322—325
Gummed Binding Strips 6

H.

Handles for Tapes 509
Hand Levels . . . . . 439—442
" Transits . . . . . 423—425
Handy Paper Cutters 259
Hairspring Comp's, see Compasses,
" Dividers, see Dividers,
Hangers for Prints 27
Hard Rubber Curves . . . 205, 207
" " Mechanical Engineer's Curves 205
" " Parallel Rules . . 197
" " R. R. Curves . 209—210
" " Ship Curves . . 207
" " Triangles 200
Harvard Geological Compass . 430
Harvard Tapes 511
Hatching Pens 75, 80, 113
Heliographic Papers . . . 20—26
Heliographs, Signaling 413
Helios Erasing Fluid 27
" Papers 22, 26
Higgin's Ink and Adhesives . . 263
Hill's Section Liner 158
Holden Clinometer (for tapes) . 517
Holders for Ink-bottles 266
Holder for Pencil Stumps . . . 281
" " Spyglasses 481
Holders for Tally Sheets . . . 536
Home Tapes 506
Hook Gauge, Boyden's 461
Horizons, Artificial 412, 413
Horn Centres 258
Horses for Drawing Boards . . 236
Horse Power Computer 307
How to Select Drawing Instruments . . . . 46—55
Howard's Rain Gauge 456
Hudson Drawing Tables . 249—252
Hudson's H. P. Computer . . 307
Hutchinson's Compass . . . 427
Hygrograph 453
Hyperbolas 203
Hypsometers . . . . . 537—539

I.

PAGE

Illinois Tapes 503
Imperial Tracing Cloth 16
Impression Papers 4
Improved Drawing Pens . . . 80
Increment Borer 535
Indelible Drawing Inks . 263—266
India Inks, Cakes 267, 268
" " Liquid . . . . 262—266
Indicator Cards 312
" Planimeters . . 311—313
" Scales 312
" for Slide Rules . 299, 305
Ink-bottle Holders 266
Ink, Columbia . . . . . 264—266
" Drawing (liquid) . . . 262—266
" Erasers, Rubber 284
" " Steel 286
" Higgins' 263
" Holders for Pens 289
" India, ... 267, 268
" Liquid Drawing . . . 262—266
" Saucers and Slabs . . . 274, 275
Instrument Cases 137, 138
Integraph, Mechanical 320
Integrators, " . . 318, 319
Ironclad Band Chains 526
Iron Measuring Chains 533
Irregular Curves 205
Isometric Paper 37
Ivorine Pocket Rules 195
Ivory " " 192
" Protractors 172
" Sectors 308

J.

Jacob Staff 421
Japanned Tin Color Boxes . . 262
Jensen's Logarith. Paper . . . 36
Johnson Plane-Table Leveling-head 408
Jupiter Pencil Sharpener. . . . 287

K.

K & E Alphabet Books 291
K & E Calculator 297
K & E Parallel Ruling Attach't, 235
K & E Hand and Pocket Transits 423—425
K & E Stadia Hand Level . . . 439
K & E Tapes . . . see Tapes
KECO finish (on tapes) 492

Digitized by Google

PAGE

Keel, red 283
"Key" Brand Instruments 106—133
Keys for Dividers 121
Klaussner Hypsometer 537
Knife Erasers 286
Koh-i-noor Pencils 282

L.

Lamp, Aladdin 396
" Mining 416
Land Chains 533
Lava Drawing Paper . . . 2, 11, 14
Lead Pencil File 286
" Pencil Pointers . . . 286, 287
" Pencils . . . . . 280—283
Leads for Artist's Pencils . 281, 282
" " Instruments 79, 121
Leadweights (paper) 259
" (spline) 208
Leather Cases for Instrum's 137, 138
" " " Compasses . 417
Ledger Paper 4
Lens, Aladdin Reading 396
" Focus Reducing 394
Lettering Books 291
" Pens . . . . . 276—279
" Templets and Triangles 202
Level Books 42
Leveling Attachments . 422, 425, 439
" Poles, see Ranging Poles
" Rods . . . . . 463—471
Levels Abney's 440, 441
" Architects . . . . 374—378
" and Clinometer 447
" Bench 440, 447, 448
" Convertible 377, 378
" Dumpy . . 334, 334, 374, 379
" Farm 437, 438
" General 331, 333
" Hand . . . . . 439—441
" Locke's 439
" Miner's Abney 440
" Precision . . . . . 340—343
" Reconnoissance 441
" for Rods 472
" Spirit 447, 448
" Spirit, for Instruments . 396
" Stadia, Hand 439
" Y. . . . 336—341, 375—378, 380, 381
Liliput Tapes 501
Limb Protractors 167
Line Clinometers (Holden) . . 517
Line for Plumbbobs 474
Linen Provers 490
" Tapes 514, 515, 531
Lines for Bandchains 528

PAGE

Lines for Tapes (Re-fills) . . 513, 514
Liquid Drawing Inks . . . 262—266
Lithographic Compasses . . . 121
" Pens . . . . 276—277
" T Squares 222
Locating Transit . . . . . 386—389
Locke's Hand Levels 439
Lock Joint Instruments . . 87, 88
Logarithmic Spiral Curves . . . 203
" Papers 36
Log. Log. Slide Rules 304
Lumber Crayons 283

M.

Machinist's Levels 447, 448
" Protractors 167
Madison Tapes 495
Maduro Process 25
Maduro Erasing Fluid 27
Magazine Drawing Table . . . 253
Magnetic Compasses
see Compasses, magnetic
Magnifiers for Slide Rule . . . 305
Magnifying Glasses 489, 490
Mailing Blueprint Papers, 22, 23, 26
Maine Tapes 496
Manilla Papers 6, 8
Mannheim Slide Rules . . 299, 301
Manuals, Slide Rule 305
Map Measures 190
Mapping Pens 276, 277
Marine Glasses . . . . . 476—479
Mariner's Compass 431
" Sextants 410, 411
Marking Chalk 283
" Pins 534
Mathematical Instruments, see Drawing Instruments
Measures, Extension 191
" Folding . . . . 192—195
" Map 190
" Standard 472
Measuring Chains 533
Measuring Tapes . . . . . 491—532
Mechanical Eng'rs. Curves . . . 205
" Integraph 320
" Integrator . . . 318, 319
Mechanic's Tapes 532
Mending Outfit (tapes) 494
Mercurial Horizons 412
Mercury Plumbbobs 473
Mephisto Pencils 283
Metallic Paper 312
" Tapes . . . . . 510—513

Digitized by Google

PAGE

Metal Scales, triangular . . . 188
" Slide Rules 305
" Straightedges 220
" Triangles 219
" Tripod 421
" T Squares 221, 222
Meters, Air 454, 455
" Current . . . . . 457—461
Metric Chains 533
" Poles 471
" Papers 32
" Rods 465, 467, 471
" Scales . 177, 178, 182, 188, 189
Micrometer Targets (for rods) . 463
Midget Tapes 508
Military Clinometer 442
Military Compass 432
Military Protractor 172
Mine tape Reels 524
Miner's Abney Level 440
" Compass 416
Mining Aneroids 450, 451
" Compass 415
" Lamp and Plummet . . 416
" Rods 467
" Transit Books 40
" Transits, 352,353,366,367,393
Moist Water colors 260, 261
Mountain Transits 352—355, 366, 367 386—389
Mounted Drawing Papers . . 13—15
Mounting Board 6
Mucilage 263
Municipal Theodolite . . . 370, 371
Muslin-backed Papers . . . 13—15

N.

Narrow Steel Tapes . . . 518—521
Negative Brown Print Paper . . 25
Nests of Cabinet Saucers . . . 274
New York Tapes 504
Nickelplated Instruments 147—149
Nickelplating Bandchains . . . 529
" Tapes . . . 510, 530
Nigrosine Process 24
Nordell Sewer Slide Rule . . . 307
Normal Drawing Paper 2
Norwegian Dipping Needle . . 416
Numbering of Tapes 492
" Transit Graduations 326

O.

PAGE

Observation Telescopes . . 483—485
Octant 412
Odometer 475
Odontograph 203
Office Favorite Drawing Tables. 245
Office Paste 263
Official Tape Comparison . . . 493
Ohio Tapes 496
Oil Stones 260
Omnimeter 441
Opisometer 78
Optical Squares 445, 446
Outkeeper for Compass 417
Oxgall 262

P.

Pads for Print Frames 225
Paine's Pattern Tapes . . 495, 496, 498, 502—504
Pantographs . . . . . 151—157
" Planimeter 315
Paper, Alba, tracing 19
" Anvil 11, 14
" Black Process 24, 25
" Blanca 2
" Blueprint . . . . . 21—23
" Bond, K & E 4
" Boxes for 3
" Brownprint 25
" Cloth backed . . . . 13—15
" Columbia 23, 26
" Co-ordinate 36, 37
" Cross Section . . . 31—35
" Cutters 259
" Detail 6, 7, 8, 10
" Duplex 3, 10, 14
" Economy 7
" E. T. 22, 26
" for Blueprinting . . . 26
" Helios 22, 26
" Impression 4
" in Sheets . . . . . 1—4, 15
" Isometric 37
" Knife 258
" Lava 2, 11, 14
" Ledger 4
" Logarithmic 36
" Maduro 25
" Manilla 6, 8
" Metallic 312
" Metric 32
" Mounted . . . . . 13—15
" Nigrosine 24
" Normal 2
" Paragon 3, 5, 12, 15
" Parchment (tracing) . . 18
" Parchmine (blueprint), 23, 25

Digitized by Google

PAGE

Paper, Polar Co-ordinate . . . 37
" Profile . . . . . 28—30
" Protractors 171
" Scales 189
" Selecta 3, 13, 14
" Simplex 8
" " Crosssection . 33
" Tide gange 462
" Topographical 34
" Township 35
" Tracing 7, 17, 19
" Transfer 4
" Tubes for 21
" Universal 2, 11, 13
" Vegetable, tracing . . 17
" Weights 259, 266
" Whatman's 1, 15
Parabolas 203
Paragon Dotting Instrument . . 71
Paragon Drafting Instrument . 160
Paragon Drawing Card 5
Paragon Drawing Paper 3, 12, 14, 15
Paragon Instruments . . . 57—105
Paragon Pencils 280
Paragon Pens, Patent 76
Paragon Protractrors . . . 162—166
Paragon Scales . . . 175—179, 285
Parallel Attachment for Drawing Boards and Tables 235
Parallel Rules 196, 197
Parcel Pens 290
Parchment (real) 4
" Tracing Paper . . 18
Parchmine Blueprint " . 23, 26
Parts for Dr'w'g Instruments . 136
Parts for Transits etc. . . . 394—396
Passometer 475
Patent Office Bristol Board . . 4, 5
Patent Ruling Pens 76, 110
Payzant Lettering Pens . . 278, 279
Pearwood Curves 205
" Ellipses 203
" Hyperbolas 203
" Parabolas 203
" R. R. Curves 213
" Ship Curves 207
" Splines 208
" Straight Edges . . . 214
" Triangles 201
" T Squares 215
Pedometers 475
Pencils . . . . . 280—283
" Artists 281, 282
" Castell (A.W.F.) . 281, 282
" Colored . . . . . 280—283
" Copying 283
" Detail K & E. 281
" Paragon 280
" Keel 283
" Koh-i-noor 282

PAGE

Pencil File 286
" Pointers 286
" Rubber 284, 285
" Sharpeners 287
Pencil Stump Holder 281
Penholders 277, 278, 290
Pens, Lettering . . . . . 276—279
" Payzant (lettering) . 278, 279
" Road 277
" Round Writing . . . 289, 290
" Ruling, see Ruling Pens
" Steel 276, 277
Pentagonal Prism 445
Penta-Prism Range Finder . . 442
Perdue Tapes 498
Perspective Lineads 218
Photo Printing . . . . . 20—25
Piccolo Tapes 513
Pillar Compasses 62
Pivot Joint Instruments . . 108, 109
Plane Tables . . . . . 400—408
" " Compass 399
" " Leveling head . . 408
Planetary Pencil Sharpeners . . 287
Planimeters . . . . . 309—317
Planimeter Manual (Directions) 551
Pliable Rubber 285
Plotting Scales 184
Plumb bobs 473
Plumb bob Cord 474
Plummer's Grademeter Hypsometer 539
Plummet Lamps 416
Pocket Anemometer 455
" Aneroids 449, 450
" Barographs 452
" Calculators 296, 297
" Cases for Instruments 137, 138
" Compasses, Drawing, 62, 110
" " Magnetic, 429—436
" Leveling Rods 471
" Levels . . . . . 439—442
" Magnifiers 489, 490
" Omnimeter 441
" Reading Lenses 396
" Rules . . . . . 192—195
" Scales . . 176, 177, 180, 181
" Sextant 412
" Tapes 501, 508, 513, 530—532
" Thermometers 452
" Transits 422, 424
Polar Co-ord. Paper, ... 37
" Planimeters 310, 311, 313—316
Poles, Ranging 471
Polygraph Transfer Paper . . 4
Polyphase Slide Rules 300
Popular Tapes 515
Porch Telescopes 485
Pounce for Tracing Cloth . . . 17
Precision Level's . . . . . 340—343

Digitized by Google

PAGE

Precision Pantographs . . 152—154
" Planimeters . . . 316, 317
" Theodolite . . . 369, 371
" Transits 363
Preserving Tubes for Paper . . 21
Prickers 78, 120
Princeton Tapes 503
Print Frames . . . . . 224—229
" Hangers 27
Prismatic Compasses . . . 426—428
Prisms, Angle 444, 445
Prism Binoculars 478, 479
Profile Books 39
" Cloth . . . . . 28—30
" Papers . . . . . 28—30
" Plan Papers 30
Profile Tracing Papers . . . 28—30
Proportional Dividers . 63—65, 110, 111, 135
Protractors . . . . . 161—172
" Arm . . 165—165, 167
" Boxwood . . . 168, 172
" Brass 168
" Celluloid, see Xylonite
" Colby's 161
" Crozet 162
" Ivory 172
" Limb 167
" Military 172
" Paper, etc. 171
" R. R. Curve 170
" Scale (Tangent) . . 168
" Square 172
" Steel 167
" Tangent 168
" w. Tangent Screw 162, 164
" Three Arm 161
" Transparent 169, 170, 172
" Triangles 169
" T Squares 221
" Xylonite . 169, 170, 172
Purdue Tapes 496

Q.

Quick-Printing Blueprint Paper 21—23

R.

Railroad Bandchain 525
" Curves 209, 213
" Curve Protractor . . . 170
" Levels . . . . . 379—381
" Pencil (Spring Bow) . . 77
" Pens . . . 78, 80, 118, 120
" Protractors 170
Railroad Transits 384, 385

PAGE

Rain Gauges 456
Range Finder 442
Ranging Poles 471
Reading Glasses 489
" Lens, Electric 396
Reckoning Machines . . . 292, 293
Reconnoissance Level 441
Red Chalk 283
Reels for Narrow Tapes . . 522—524
Re-fills (lines) for tapes . . 513, 514
Reflecting Horizons 413
Reflector and Sunshade 394
Registering Rain Gauges . . . 456
Rensselær Tapes 502
Reversible Spirit Level 396
Revolving Print Frame Carriage 227
Reynolds Bristol Board 4
Right Angle Transit 393
Road Pens 277
Rod-level 472
Rods, Crosssection 469
" Leveling . . . . . 463—471
" Levels for, ... 472
" Flexible 471
" Mining 467
" Pocket 471
" Targets for 463
Rogers' Tangent Protractor . . 168
Roll Drawing Papers . . 7, 10—14
Rolling Parallel Rules . . 196, 197
" Planimeter's 317
Roofpitch Triangles 202
Rotameters 190
Round Writing Books 288
" " Instrument . . 290
" " Pens . . . 289, 290
Rubber, Alba 284
" Cloth 6
" Drawing Tools, see Hard Rubber.
" Erasing 284, 285
" Pliable 285
" Sponge 284
Ruby Rubber 285
Rules, Ivorine 195
" Parallel 196, 197
" Pocket . . . . . 192—195
Rules, Scale 192
" Shrinkage 192
" Slide . . . . . 294—307
" Spring Joint . . . . 193—195
" Steel 193
" Stem Analysis 536
Ruling Pens . . . 75—80, 117—120, 134, 144

S.

Sable Brushes . . . . . 269—271

Digitized by Google

	Page
Safety Paper Cutter	259
Sagar's Tracing Cloth	16
Samson Tapes	514
Sandpaper pads	286
Saucers, Color	274
Scale Rules	192
Scales	173—189
" Boxwood	180—184, 187, 188
" Circumference	178
" Comparing	178, 182
" Flat	175—184
" Guards	189
" Improved Triangular	188
" Indicator	312
" Metal	188
" Metric, 177, 178, 182, 188, 189	
" to Order	173, 174
" Paper	189
" Paragon	175—179, 185
" Plotting	184
" Pocket	176, 177, 180, 181
" Protractors, tangent	168
" Rules	192
" in Sets	179, 183
" Sheaths for	185
" on Tapes	531
" Triangular	185—188
" Underwriter's	178
" White-edge triangular	186
" Xylonite, (transparent)	178
School Instruments	139—149
Scientific Books	542—553
Section Liners	158, 159
Sectional Chests of Drawers	255, 256
Sectional Ranging Poles	471
Sectors	308
Selecta Drawing Paper	8, 13, 14
Self-registering Tide Gauge	462
Self-registering Rain Gauge	456
Set of Columbia Inks	266
" " Splines	208
Sets of Instruments, see Cases of Instruments	
Sets of Scales	179, 183, 312
" " Splines	208
Set Squares	see Triangles
Sewer Slide Rules	307
Sextants	409—412
Sheaths for Scales	185
" " Plumb bobs	474
Shields, Erasing	283
Ship Curves	207
Shrinkage Rules	192
Sight Compasses	417—420, 429, 430
Signaling Instruments	413
Sigsbee's Parallel Rule	197
Simplex Crossection Paper	33
" Detail Papers	8
" Drawing Stand	237
Simplex Section Liner	159
Skeleton Reel	521
Sketching Case (Cavalry)	408
Sketching Paper Transparent	6, 7
Slabs, Ink and Color	274, 275
Slate Ink Slabs	274
Slide Rules	294—307
" " Adjustment for	298
" " Books on	305
" " Cases for	301
" " Charpentier	297
" " Circular	296, 297
" " Crane's, Sewer	307
" " Decimal Pointer	305
" " Duplex	302—305
" " Favorite	301
" " Fuller	295
" " German silver	305
" " Hudson's H. P	307
" " Indicators	299, 305
" " K. & E., Circular	297
" " Log. Log.	304
" " Magnifier	305
" " Mannheim	299—301
" " Manuals	305
" " Nordell, Sewer	307
" " Polyphase	300
" " Sewer	307
" " Stadia	306
" " Sperry's	296
" " Student's	301
" " Thacher	294
" " Webb's Stadia	306
Slope Levels	446, 447
" Tapes	510
" Triangles	202
Solar Attachment	372, 373
" Transit	356, 357
Sounding Attachment for Tapes	532
Spads (Surveying)	474
Special Scales to order	173, 174
" Transits to order	391
Specification Blanks	38
Sperry's Calculator	296
Spiral Curve	203
Spirit Levels	396, 447, 448
Splines	208
Spline Pen	77
" Sets	208
" Weights	208
Split Tripods	397
Sponge Rubber	284
Spring Bows &c., see Bow Dividers	
" Clips	27
" Handles for Tapes	509
" Joint Pocket Rules	193—195
" Pocket Tapes	530—532
Squares, Optical	445
Square Protractors	172

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PAGE

Spyglasses 480, 481
" Holder 481
Stadia Hand Level 439
" Hand Transit 425
" Measuring 329, 395
" Slide Rules 306
Staff Heads 445, 446
Staffs, Jacob's 421
Stake Tacks 474
Stamped Steel Tacks 258
Standard Blanks for Architects, 38
" City Tape 518
" Cross Section Papers 31—33
" Measures 472
" Profile Papers . . . 28—30
Stated Tension on tapes 492
Station Pointer 161
Steel Measuring Chains 533
" Erasers 286
" Folding Rules 193
" Pens 276, 277
" Pocket Rules. 193
" Protractor 167
Steel Spring Bows &c., see Bow Dividers
" Straightedges 220
" Tacks 257, 258
" Tapes . . see Tapes, Steel
" Triangles 219
" T Squares 221, 222
Stem Analysis Rules 536
Stevens Tapes 495
Stick India Ink 267, 268
Stools, Draftsman's 248
Straightedges 214, 220
Stretcher, for Tapes 517
Striding Compass 392
Student's Alphabets 291
Student's Slide Rule 301
Subdivisions of Tapes 493
Sun-Dials 414
Sun-shade & Reflector 394
Surveying Compasses . . . 417—420
" Instruments, Description of 321—333
" Sextants . . . . 409—411
Surveyor's Chains 533
" Crosses 446
" Pins 534
" Umbrella 396
Suspended Compass (Mining) . 415
" Pantographs . . 152—156
Swedish Increment Borer . . . 535
Symon's Rain Gauge 456
Synopsis Drawing tools . . 198, 199
" Mathemat. inst's. . . 56
" Transits 390
Systems of Numbering Circles . 326

T.

PAGE

Tables, Drawing . . 237, 239—253
" Plane . . . . . 400—408
Tacks, Stake 474
" Thumb 257, 258
Tack Lifters 258, 286
Tally Registers (on compass) . . 417
Tallying Machines 534
Tally Sheet Holders 536
Tangent Protractor 168
Tangent-screw Protractors 162, 164
Tapes, (Measuring) . . . . 491—532
" Bronze 497
" Certificates, Official . . 493
" Circumference . . . 500, 532
" City Eng'rs. Standard . 518
" Embankment 510
" Excelsior 510, 530
" Handles for 509
" KECO Finish 492
" Linen 514, 515, 531
" Lines (Re-fills) . . . 513, 514
" Mechanic's 532
" Menders 494
" Metallic . . . . . 510—513
" Narrow, Fine . . . 518—521
" Nickelplating . . . 510, 530
" Numbering 492
" Paine's pattern . . 495, 496, 498, 502—504
" Pocket . . . 501, 508, 513, 530—532
" Presto Self Opening Handle 505
" for Range Finder . . . 442
" Reels for . . . . . 522—524
" Re-fills 513, 514
" with Scale 531
" Sounding Attachment . 532
" Stated Tension 492
" Steel . . 495, 496, 498—508, 518—521, 530—532
" Stretcher 517
" Subdivisions 493
" Tension Handles 509
" Tip Top 531
" Thermometer Scale . . 492
" Tree (Forester's) . . . 500
" Unique 505
" Ward's 510
Targets for Rods 463
Technical Water Colors 260
Telescopes . . . . . 480—487
" Astromical 487
" Equatorial 487
" Marine 480
" Observation . . 483—485
" Porch 485
Telescoping Tripod 421
Temperature Scale on Tapes . . 492

Digitized by Google

PAGE

Templet Odontograph 208
Templets, Lettering 202
Tension Tape Handles 509
Texas Tapes 496
Text Books, Round Writing . . 288
Thacher's Calculating Instrument 294
Theodolites . . . 360, 361, 370, 371
Thermograph 458
Thermometers 452
Thermometer Scale on Tapes. . 492
Thompson's Patent Target . . 463
Thread Counters 490
Three Arm Protractor 161
" -legged Dividers . . 63, 110
" -pointed Pens 289
Thumb Tacks 257, 258
" " Lifters . . . 258, 286
Tide Gauge 462
Timber Cruiser's Compass . . . 540
Timber Scribes 536
Tin Boxes, japanned 262
" Tubes (for paper) 21
Tip Top Tapes 531
Tinted Cardboard 5
" Drawing Papers 2,3,10,11,14
Tissue Paper, Manilla 6
Topographical Books 44
" Paper 34
Torchon Papers 1
Township Paper 35
Tracer 78
Tracing Cloth 16
" " Crossection . . 28—32
" " Pounce 17
" " Profile . . . . 28—30
" Papers in Rolls . 6, 7, 18, 19
" " " Sheets 17
Transfer Papers 4
Transit Books 40
Transit Poles, see Ranging Poles
Transits 344—359, 362—367, 382—389
" Architect's 382, 383
" Attachments and Parts 391, 392, 394—396
" Builder's 382, 383
" City 393
" Eng'r's. Expedition 358, 359
" General . . . . . 321—333
" Graduations . . . 322—325
" Hand 423, 425
" Locating . . . . . 386—389
" Mining . . 352, 353, 356, 357
" Mountain 352—355, 366, 367
" Numbering of Limbs. . 326
" Parts for . . . . . 394—396
" Pocket 422, 424
" Railroad 384, 385
" R. A. Telescope 393
" Solar 356, 357
" Special . . . . . 391—393

PAGE

Transits Stadia (hand) 425
" **Synopsis** 390
" Theodolite 360, 361, 370, 371
" Triangulation . . 363, 364
" Vertical Sighting . 391, 392
" Wet Mine 393
" Wisconsin 350, 351
Translux 21
Transparent Drawing Paper . . 7
Transparent Drawing Tools, see Xylonite
Transparent Scales 178
Transparent Sketching Paper . 7
Traverse Tables 399
Trays for Photoprinting 232
Tree Calipers 535
Tree Tape 500
Trestles for Drawing Boards . . 236
" with " " 237, 238
Triangles, Embankments . . . 202
" German Silver . . . 219
" Hard Rubber 200
" Lettering 202
" Protractor 169
" Roof Pitch 202
" Slope 202
" Steel 219
" Wooden 201
" Xylonite 200, 202
Triangular Scales . . 185—188, 312
Triangulation Instruments . 368, 369
Triangulation Theodolite . 370, 371
Triangulation Transit . . 363, 364
Tripods 397, 398, 421
" Metal 421
Trough Compass 399
T Squares, Engraver's 222
" Guide 245
" Protractor 221
" Steel 221, 222
" Wooden . . . 215—217
" Xylonite 217
Tubes for Preserving Paper . . 21
Tubular Beam Compasses . 71, 72
" Compasses 62

U.

Umbrella, Surveyor's 396
Unchangeable Drawing Board . 15
Underwriter's Scales 178
Union Tracing Cloth 16
Unique Folding Trestles . . . 238
Unique Tapes 505
Universal Drawing Paper 2, 11, 13
" Proportional Dividers 65

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PAGE

Unsensitized Blueprint Papers . 26
" " Cloth . . . 26
Useful Pencil Sharpeners . . . 287

V.

Vara Chains 533
Vegetable Tracing Paper . . . 17
Vellum Cloth 16
" (Parchment) 4
Verniers (transits) 322, 325
Vertical Drawing Tables . . . 248
" Print Frames 228
" Sighting Transits . 391, 392
Vials for Spirit Levels 396

W.

Ward's Engineer's Tape 510
Watch Pattern Anemometer . . 455
Water Colors 260, 261
" " Boxes 260, 262
" " Brushes . . 269—273
" " Glasses 275
" " Technical 260
Waterproof Drawing Inks 263—266
Waterproof Tape 497
Wax Crayons 282
Webb's Co-ordinate Paper . . . 36
" Stadia Slide Rule . . . 306
Wet Mine Transit 393
Whatman's Drawing Papers . 1, 15
Whetstones 260
White-edge Scales, 175—179, 185, 186
White Pencils 280

PAGE

Whole and Half Dividers . . 63, 110
William's Section Liner 158
Wind Gauges 454, 455
Winsor & Newton Colors . 261, 262
Wire Tapes . . . . . 518—521

X.

Xylonite Curves 207, 207
" Curve Radiator . . . 212
" Ellipses 203
" Hyperbolas 203
" Lettering Templets . 202
" " Triangles. . 202
" Mechanic. Eng. Curves 205
" Parabolas 203
" Parallel Rules 197
" Protractors . 169, 170, 172
" R. R. Curves . . 211, 212
" " " Protractors 170
" Scales 178
" Section Liners 158
" Ship Curves 207
" Spiral Curve (logarith.) 203
" Splines (black) 208
" Straightedges 214
" Triangles 200, 202
" T Squares 217

Y.

Y Levels . 336—341, 375—378, 380, 381
" " Architect's. . . . 375—378
" " Convertible . . . 377, 378
" " Precision . . . . 340—343
" " Railroad 380, 381

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