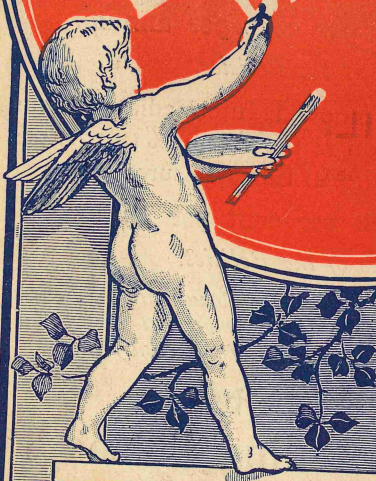


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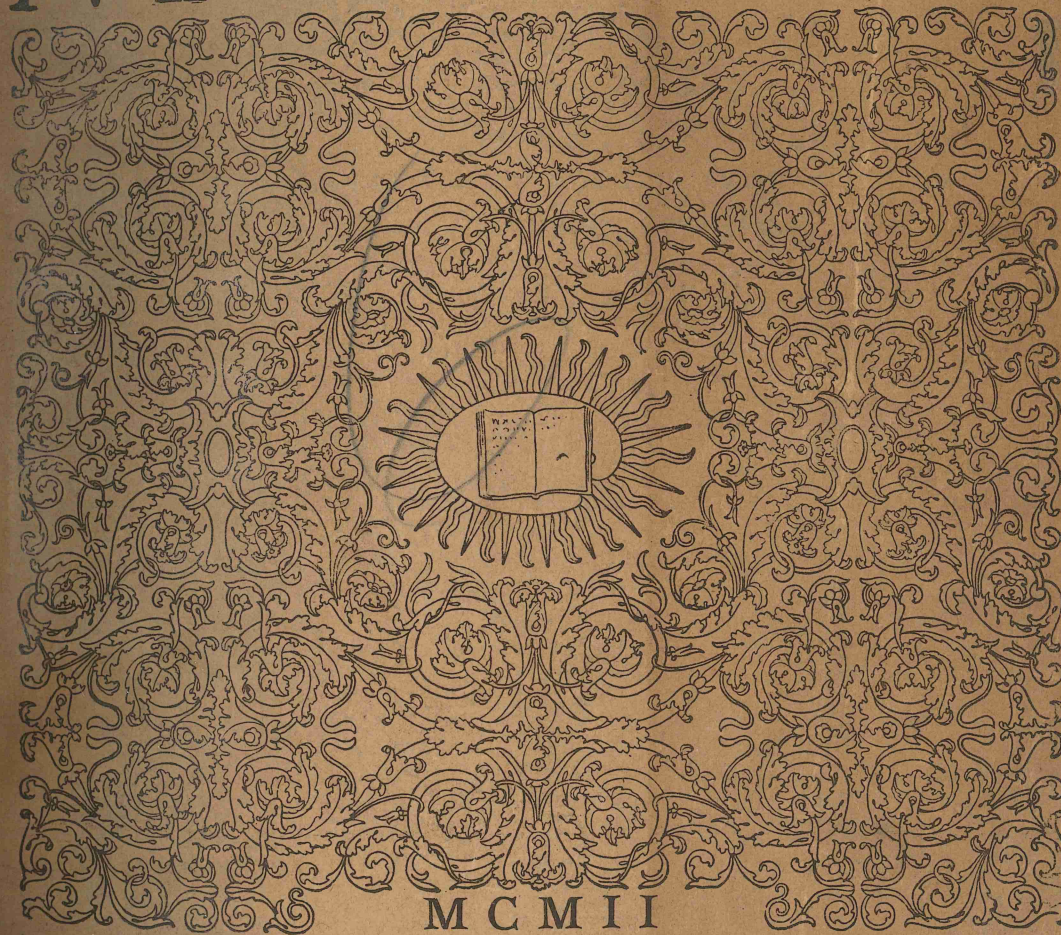
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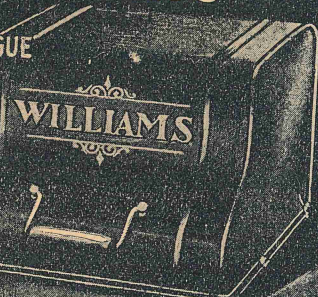
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CONTENTS

OF THE CENTURY MAGAZINE.

FOR JULY, 1902.

(SUMMER FICTION NUMBER)

THE MARQUIS OF SALISBURY. Drawing in tint, by GEORGE T. TOBIN, from photograph	PAGE
Frontispiece	
WANTED, A CHAPERON. By PAUL LEICESTER FORD, author of "The Honorable Peter Stirling," "Janice Meredith," &c. Pictures by C. ALLAN GILBERT	331
EXAMPLES OF AMERICAN PORTRAITURE. VII. Julia Marlowe. By IRVING R. WILES	351
TING-A-LING. By DAVID GRAY. Pictures by DAVID URQUHART WILCOX	352
THE GREAT SOUTHWEST. III. Irrigation. By RAY STANNARD BAKER. Pictures by MAXFIELD PARRISH	361
THE PRISONER. By S. P. LYON	373
LITTLE STORIES. VI. A Dilemma. By S. WEIR MITCHELL	374
CURIOUS ELECTRICAL FORMS. By ANABEL PARKER	376
THE PASSING OF COCK-EYE BLACKLOCK. By FRANK NORRIS, author of "The Octopus," &c.	385
PRINCE LOUIS NAPOLEON AND THE NICARAGUA CANAL. By SARA Y. STEVENSON	391
THE HEART OF TRUTH. By L. FRANK TOOKER	397
WITH FUGITIVE THINGS. By LOUISE COLLIER WILLCOX	397
THE STRANGE EXPERIENCES OF A BLUE JAY FAMILY. By FRANK M. CHAPMAN.	
With illustrations after photographs by the author	405
A MOUNTAIN MATCH-MAKER. By WILL N. HARBEN. Pictures by GEORGE B. WALDO	413
TO OUR "MERRY CHANTER." By JULIE M. LIPPMANN	422
A CAMPAIGN AGAINST THE MOSQUITO. I. Prefatory Note: The Growing Interest in Mosquito Extermination. By Dr. L. O. HOWARD. II. Operations at Oyster Bay, Long Island. By HENRY CLAY WEEKS	423
CHILLON. By LEONARD C. VAN Noppen	429
A PERSONAL RECOLLECTION OF CARLYLE BY A "CAPTAIN OF INDUSTRY." By JAMES D. HAGUE	430
THE MENACE. Verse. By JOHN ALBERT MACY	432
THE LITTLE UNPLEASANTNESS AT NEW HOPE. By HARRY STILLWELL EDWARDS, author of "Two Runaways," "De Valley an' de Shadder," "His Defense," &c.	433
WHY THE ROSE DROOPED. By CHARLOTTE FISKE BATES	440
THE COOK AND THE CONVICT. A West Indian Sketch. By CHARLES BRYANT HOWARD. Pictures by HARRISON FISHER	441
EUGENE FIELD, THE HUMORIST. By FRANCIS WILSON	446
PICQUART. By FLORENCE EARLE COATES	452
CONFESSIONS OF A WIFE. IV. By MARY ADAMS	453
THE MARQUIS OF SALISBURY. By JULIAN RALPH	465
THE VOLCANO SYSTEMS OF THE WESTERN HEMISPHERE. By ROBERT T. HILL, author of "Cuba and Porto Rico, with the Other Islands of the West Indies"	473

DEPARTMENTS:

TOPICS OF THE TIME. Disaster and Doubt—Frank R. Stockton—The Competitive System in "Society"—Maxfield Parrish's Western Pictures—Prize-Winners in "The Century's" Competition for Humorous Drawings	484
IN LIGHTER VEIN. The Gray Stone Wall (Charles Battell Loomis)—Microcosms (Dorothea Moore)—The Disadvantages of Reputation (Catharine Young Glen)—An Old Time Fourth of July. Drawing by Charles D. Hubbard—Molière's Housekeeper (Robert Gilbert Welsh)—The Proposal. Sketch by E. Warde Blaisdell	487

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Two years have gone by, and I am one of the richest men in the city, and have no more money than will keep me alive.

Susan said I was half cracked like Uncle Philip, and broke off her engagement. In my despair I have advertised in the "Journal of Science," and have had absurd schemes sent me by the dozen. At last, as I talked too much about it, the thing became so well known that when I put the horror in a safe, in bank, I was promptly desired to withdraw it. I was in constant fear of burglars, and my landlady gave me notice to leave, because no one would stay in the house with that box. I am now advised to print my story and await advice from the ingenuity of the American mind.

I have moved into the suburbs and hidden the box and changed my name and my occupation. This I did to escape the curiosity of

the reporters. I ought to say that when the government officials came to hear of my inheritance, they very reasonably desired to collect the succession tax on my uncle's estate.

I was delighted to assist them. I told the collector my story, and showed him Uncle Philip's letter. Then I offered him the key, and asked for time to get half a mile away. That man said he would think it over and come back later.

This is all I have to say. I have made a will and left my rubies to the Society for the Prevention of Human Vivisection. If any man thinks this account a joke or an invention, let him coldly imagine the situation:

Given an iron box, known to contain wealth, said to contain dynamite, arranged to explode when the key is used to unlock it—what would any sane man do? What would he advise?

CURIOUS ELECTRICAL FORMS.

AS SHOWN IN MR. T. BURTON KINRAIDE'S RECENT PHOTOGRAPHS OF ELECTRICAL DISCHARGES.

BY ANABEL PARKER.

THE remarkable photographs which it is the object of this article to explain constitute a graphic record, a genuine autobiography, of certain phases of one of the most wonderful and subtle of the great forces of nature. They are the result of several years of experimenting by a Boston investigator, T. Burton Kinraide, and are the record of impressions made upon sensitive plates by discharges of electricity. These photographs show the form and character of the so-called positive and negative phases of electric energy, and of a third phase which has never before been revealed. They hint at an apparatus unique in its delicacy of control. Beyond this, they throw fresh light on the very nature and character of this great force.

All the plates here shown were produced by discharges of minute quantities of electricity. From this point of view, they present a striking contrast to the plates published in THE CENTURY for June, 1900. Those were photographs of the phenomena resulting from discharges from electrical oscillators of great power. They recorded experiments

made by that consummate genius of electrical investigation, Nikola Tesla, who delights in handling enormous quantities of electric energy.

By a cursory glance at the different plates and at the explanatory lines under them, it will be seen that whatever may be the outline of the entire design on the plate, there is one unvarying structural form for the positive phase and one for the negative. These are so dissimilar in character that they need never be confused. The positive phase has always the branching, fern-like structure which Mr. Kinraide calls filiciform, while the negative invariably shows the soft and feathery appearance which is well described as plumous. Whether the plate shows a single large disk composed of exquisitely delicate forms radiating from a center, or a series of zigzagging comets, one can readily tell by noting the structure whether the discharge which printed itself on the plate was in its positive or its negative phase.

This series of electrographs was, with a

few exceptions, produced by means of a condenser apparatus, upon one surface of which the sensitive plate was placed. This surface can be electrified either positively or negatively at the will of the operator. Suppose it to be negatively electrified, and then touched at the center by a small brass sphere which is in connection with the positive terminal of the apparatus. The instant discharge from the sphere rushes out in all directions over the surface of the plate, and there is produced the beautiful figure shown in Plate I. Suppose, on the other hand, that the condenser surface on which the sensitive plate rests is positively electrified, and that a brass sphere connected with the negative terminal be brought in contact with it. The energy is gathered up, as it were, from the plate, and rushing toward the conducting sphere, leaves on the surface the print of its vanishing footsteps, as in Plate II.

With one or two exceptions, all the plates here shown are based upon the existence of these two sets of conditions, i.e., a surface negatively electrified brought in contact with a positive terminal, and a surface positively electrified brought in contact with a negative terminal. The terminal may be connected with a single sphere, as already suggested, with a roller, or with tiny metallic balls or needle-points. The deft manipulation of these mechanical devices produces the variety of design. The plates which were produced under conditions other than these will be noted farther on.

It is now five years since Mr. Kinraide made the happy discovery which led him to experiment along the lines of electrical photography of which these beautiful plates are the result. The apparatus he at first used was quite unlike the one he is now using, and was without the condenser plates. Many of the results that can be obtained from the one now in use he was unable to obtain by means of the former, but untiring efforts to discover the causes of his failures finally brought a knowledge that enabled him to construct an apparatus capable of producing the perfect plates here shown. As in many other instances, failure lighted the way to success.

It is necessary to touch briefly on the construction of the apparatus and on the experiments carried on by means of it in order to give a clear idea of the way in which Mr. Kinraide has arrived at certain important conclusions. The apparatus has, as an interesting feature, a unique kind of secondary induction-coil consisting of a cir-

cular disk of fine wire wound in about one thousand turns. The peculiarity of this coil is that it will discharge out into the air as easily as the Ruhmkorff coil discharges toward its other terminal. In other words, the electric energy, instead of discharging from two equal potential terminals, as is the case where the Ruhmkorff coil is used, passes into the air almost wholly from one terminal. The non-discharging terminal is connected to an earth-wire, and thus its influence is entirely removed. The coil has a superb insulation, and will easily withstand a pressure under which the Ruhmkorff coil splinters to atoms. Thus the apparatus controls a higher voltage for the quantity than any other so far made.

It was while studying the discharge from this apparatus in the dark that Mr. Kinraide noticed peculiar, fern-like forms of a pale violet color radiating from the two-inch brass sphere which formed the discharging terminal. By manipulating the discharge, he could make a number of these beautiful, quivering forms appear. By using spheres of larger diameters and increasing the potential, he could increase the length and size of the light-forms until they would shoot out thirty inches beyond the sphere and reach an apparent thickness of half an inch. They looked like miniature forks of violet-tinged lightning, cleaving the darkness of the laboratory. By balancing an ordinary photographic plate on the top of the spherical terminal, film side down, and opening and closing the circuit once, a photograph of the quivering light-forms was secured. They recorded themselves as the filiciform or positive phase of electric energy. This was a first effort, and a first success.

Upon a reversal of the current, an entirely different phenomenon was observed. Instead of the branching outshoots of violet light, there appeared plume-like forms resembling the attail of the meadow-flag. These seemed to be about an inch in diameter and seven inches long. An attempt to secure a photograph of these plume-like forms was made, but though the plate was as carefully adjusted and the current as skilfully manipulated as before, there was no record found upon the plate when it was developed. The experiment was repeated again and again, but with disheartening results. The plumous forms could not be induced to make any impression on the sensitive plates. For two years Mr. Kinraide experimented, sacrificing plates enough to build a greenhouse. Then he made a discovery. The plumous

forms were not, as he had supposed, discharging outward from the sphere; they were discharging inward from the surrounding air.

The discovery of this fact was of the greatest significance. It seemed to proclaim electric energy not a dual force with a dual activity, but a single force with a single line of direction for the sweep of its energy. Furthermore, it showed plainly that the so-called positive and negative phenomena indicate, the one an accumulation or heaping up of electric energy, the other a corresponding withdrawal. It was through study of the plumous forms that Mr. Kinraide was led to the discovery of the conditions necessary for the successful production of these photographs. He realized that, in order to secure on a photographic plate the record of the so-called negative electricity, the plate must represent the withdrawal of energy; in other words, it must be electrified and then made to discharge itself into some conductor.

With the condenser apparatus, he found no difficulty in securing the record of the negative phase. A photographic plate placed upon the positively electrified surface of the condenser became in turn positively electrified. Then, when any conductor connected with the negative terminal was brought into contact with it, the stored-up energy immediately sought an equilibrium and rushed from all directions toward the conductor. This produced a condition of withdrawal on the plate, or, in other words, showed the so-called negative phase of electricity.

It was then that Mr. Kinraide made another discovery. Not only did he secure photographs of the positive and negative phases, but there was revealed on some of the plates the existence of comet-like forms in which the positive and negative were seen to be united, base to base. The meaning of these comet forms was not at first understood, nor did Mr. Kinraide know how it was that they appeared on the plates. Former photographs had indicated a separation between the two phases; none had ever shown that they were united. These comet forms, therefore, presented a new field for investigation, and it was only after careful study and experimentation that their significance was discovered.

The comet structure Mr. Kinraide has called, by reason of the conditions under which it is created, the electric entity. It is a record of the entire activity of one small quantity of electric energy, an embodiment, as it were, of the force, and literally an entity

of energy, having a birth, a growth, and a subsequent death or dispersion. Its center, or body part, is plainly neither positive nor negative in character. Mr. Kinraide calls it the third or dynamic phase of electricity. His reasons for this will be apparent farther on.

In order to make clear the way in which the comet structure was secured, it may be well to explain first the development of the figure on Plate III. This is not one of the condenser series of photographs, but was secured from a very different and quite simple apparatus. It is introduced here to make clearer the interpretation of the other plates.

Without describing the apparatus in detail, it is sufficient to say that it presented a flat surface about twice as long as wide. This surface was divided by a narrow strip of dielectric or non-conducting material into two areas of equal extent, each of these being nearly square. The apparatus was so arranged that when the current was turned on, one of these areas would become positively, the other negatively electrified, the dielectric between them preventing the energy from reaching a state of equilibrium.

The photographic plate was placed in position on the flat surface, half of it on one side of the dielectric, half on the other. A metallic bar was then laid upon the plate at right angles to the dielectric. Thus its ends lay at the respective centers of the two areas which were to be oppositely electrified. By closing the current and then breaking it once, Plate III was obtained. The two ends of the photographic plate became oppositely electrified, like the areas over which they were superimposed. When the current was broken, the energy in the two oppositely electrified surfaces immediately rushed to an equilibrium, using the metallic bar as a conductor. From the positively electrified surface the energy shot into the bar, recording its withdrawal in the delicate plumes of the negative phase. Then it hurried along and finally shot out and dispersed itself over the negatively electrified surface in the filiciform streamers, which always indicate the outward rush of the current.

In the evolution of the comet structure, analogous conditions obtain, with the exception that the electric energy uses the air as a conducting medium instead of a metal conductor. This enables it to record the entire history of its action on the sensitive plate. Keeping this explanation in mind, the reader will be able to understand Plate IV, which is one of the condenser series.

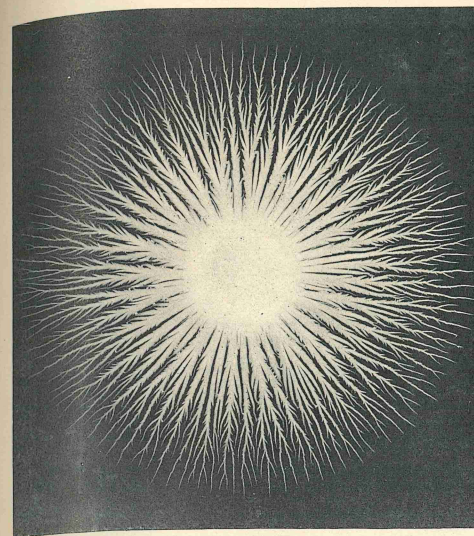


PLATE I. ANODOS.

A discharge of electric energy over the negative surface of a condenser from a two-inch sphere connected with the positive terminal.

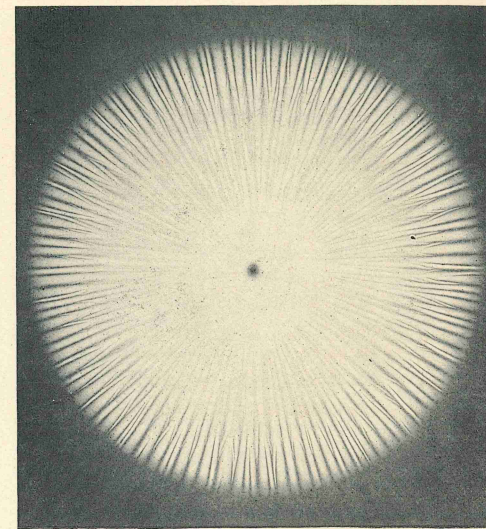


PLATE II. KATHODOS.

A discharge of electric energy over the positive surface of a condenser toward a two-inch sphere connected with the negative terminal.

In order to secure this, the condenser surface upon which the sensitive plate was to be placed was first highly charged with electric energy. Then the photographic plate was carefully placed upon it, film side up. A metallic discharger, fitted with an adjustable spark-gap, was now used. By means of this spark-gap it was possible to regulate the amount of energy to be withdrawn from the plate. After being connected with the negative terminal of the apparatus, the discharger was placed at the center of the plate, and a small quantity of the energy was permitted to escape. This created a circular, negative area on the plate, while surrounding it was a charged area.

As in the case of the two oppositely electrified squares previously referred

to, the energy sought an equilibrium. Small quantities of it shot inward toward the circular, negative area, and the onward rush was recorded on the plate in the filiciform streamers extending toward the center, while the withdrawal from the outer rim produced the soft plumous forms. All this took place before the discharger in the operator's hand could be withdrawn from its instant of contact with the plate.

The energy started from a condition of diffusion, and ended in a condition of diffusion, but at the instant of its greatest power it was focalized. This instant of focalization is represented on the plate by the slender spindle joining the plumous and the filiciform. This is what Mr. Kinraide calls the dynamic phase of electric energy.

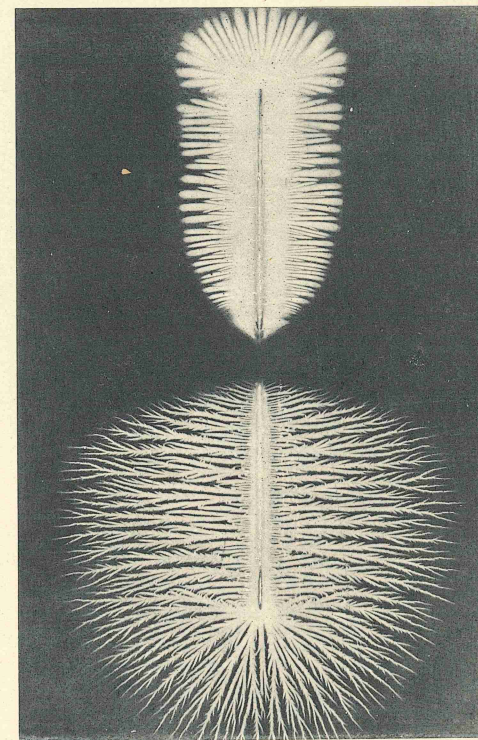


PLATE III. COMPOSITE ELECTRIC ENTITY.

A transfer of electric energy produced by placing a short, metallic rod across the line dividing two oppositely charged areas. The part of the plate upon which the plumous or negative phase is seen is the part which was at first positively electrified. The part upon which the positive streamers are seen was the negatively electrified areas.

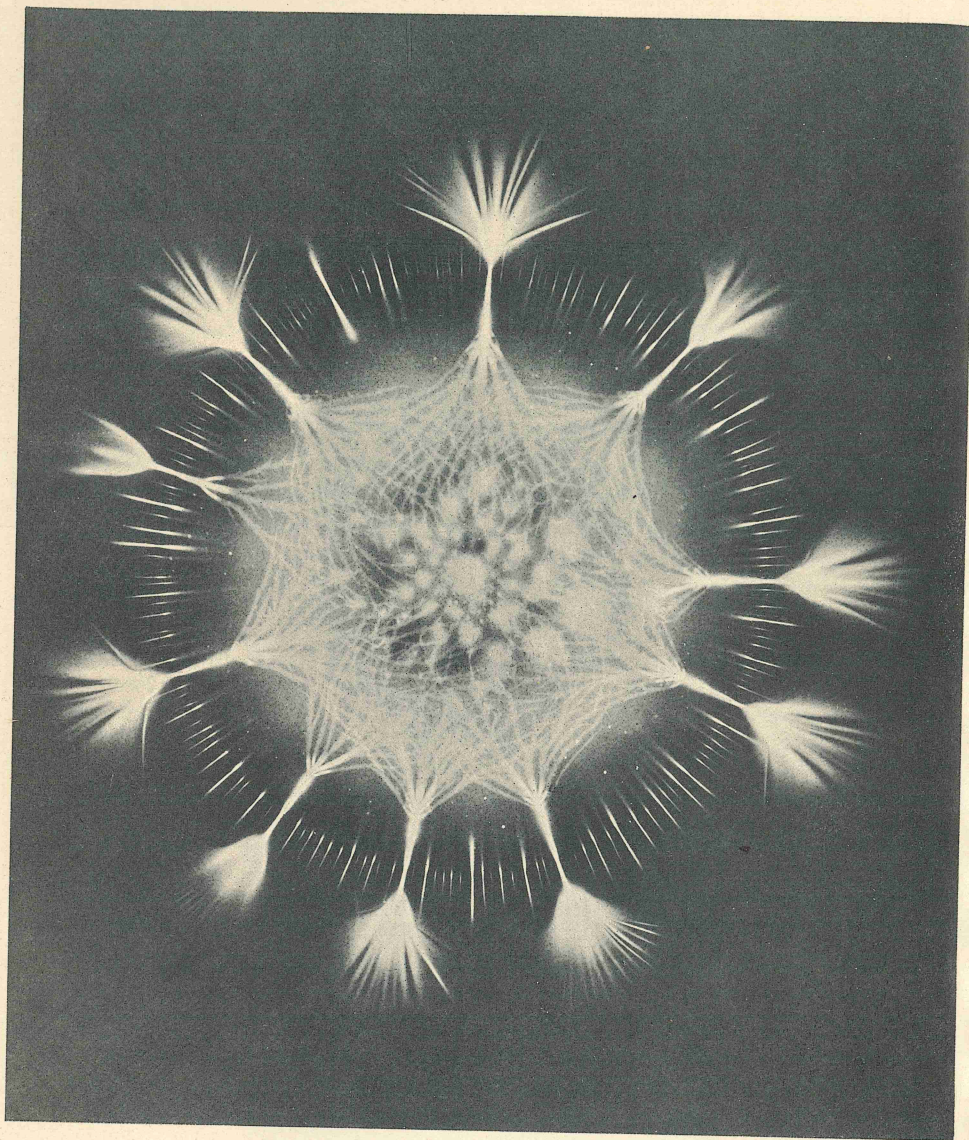


PLATE IV. SYMMETRICAL GROUP OF ELECTRIC ENTITIES.

Each comet structure in the group is a record of the entire history of a small quantity of electric energy.

In general terms, the spindle of one of these comet structures represents the dynamic center of a discharge, for each tiny comet records the entire evolution of an electric discharge, and the phases through which it passes are identical with those through which every uninterrupted discharge must pass.

That this spindle has never before been shown in any photographs of electricity is due to the fact that no apparatus has ever before been constructed whereby the entire action of an electric discharge through the air could be recorded. In the action of the energy in Plate III its moment of greatest

focalization was during its passage through the metallic bar. Hence its form could not be recorded.

Examine for a moment this spindle (see Plate V). It seems to be wound in a conical spiral, as if the lines of energy, which focalize at the point of greatest intensity, assume at once a spiral motion. This spiral whirl is at first very narrow, but as it passes away from the point of greatest intensity, it becomes wider, and its whirls are farther apart. Under favorable conditions they are far enough apart to be seen, forming a sharply pointed cone with a very small base. Thus it seems

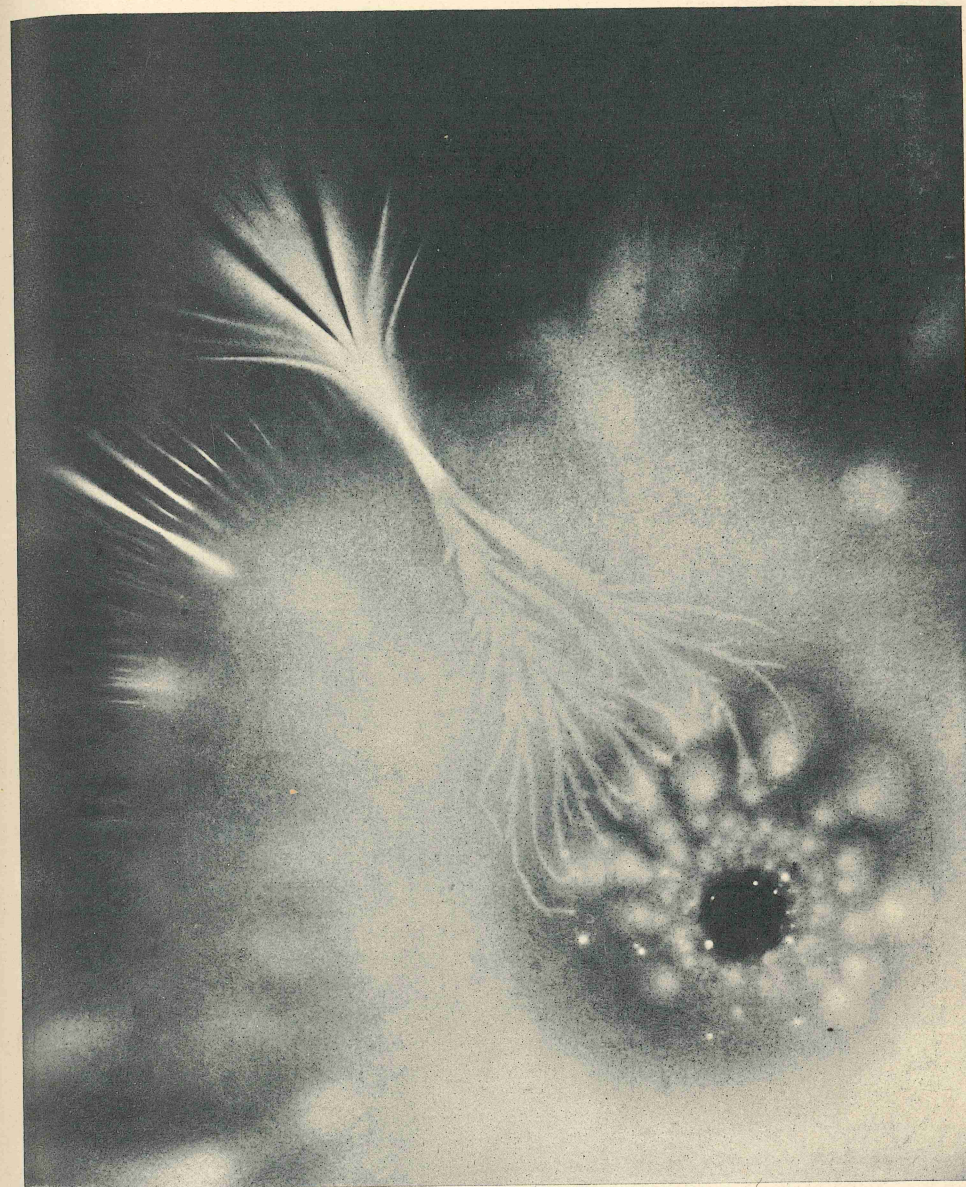


PLATE V. ELECTRIC ENTITY, OR EMBODIMENT OF ELECTRIC FORCE. (ENLARGED.)

that the electric energy focalizing at this point translates itself, by means of the electromagnetic action which takes place in the spindle, from its negative phase into a curiously interacting form, the positive phase.

Mr. Kinraide's conclusions may be summarized as follows: The plates here shown, especially those which record the action of the electric entity, form an electrographic demonstration of the meaning of the terms positive and negative electricity. When electric energy changes from a condition of diffusion to a center of focalization it is

passing through its negative phase. When it changes from a condition of focalization to a condition of diffusion it is passing through its positive phase. These two conditions may be correctly termed the anodos, or going in, and the exodos, or going out, of electric energy. They are unmistakably recorded on the photographic plates, which show that there are not two separate electricities, but one developing entity of energy. There is no photograph of the diffused condition in either case. It is only when the energy is passing through one or the other

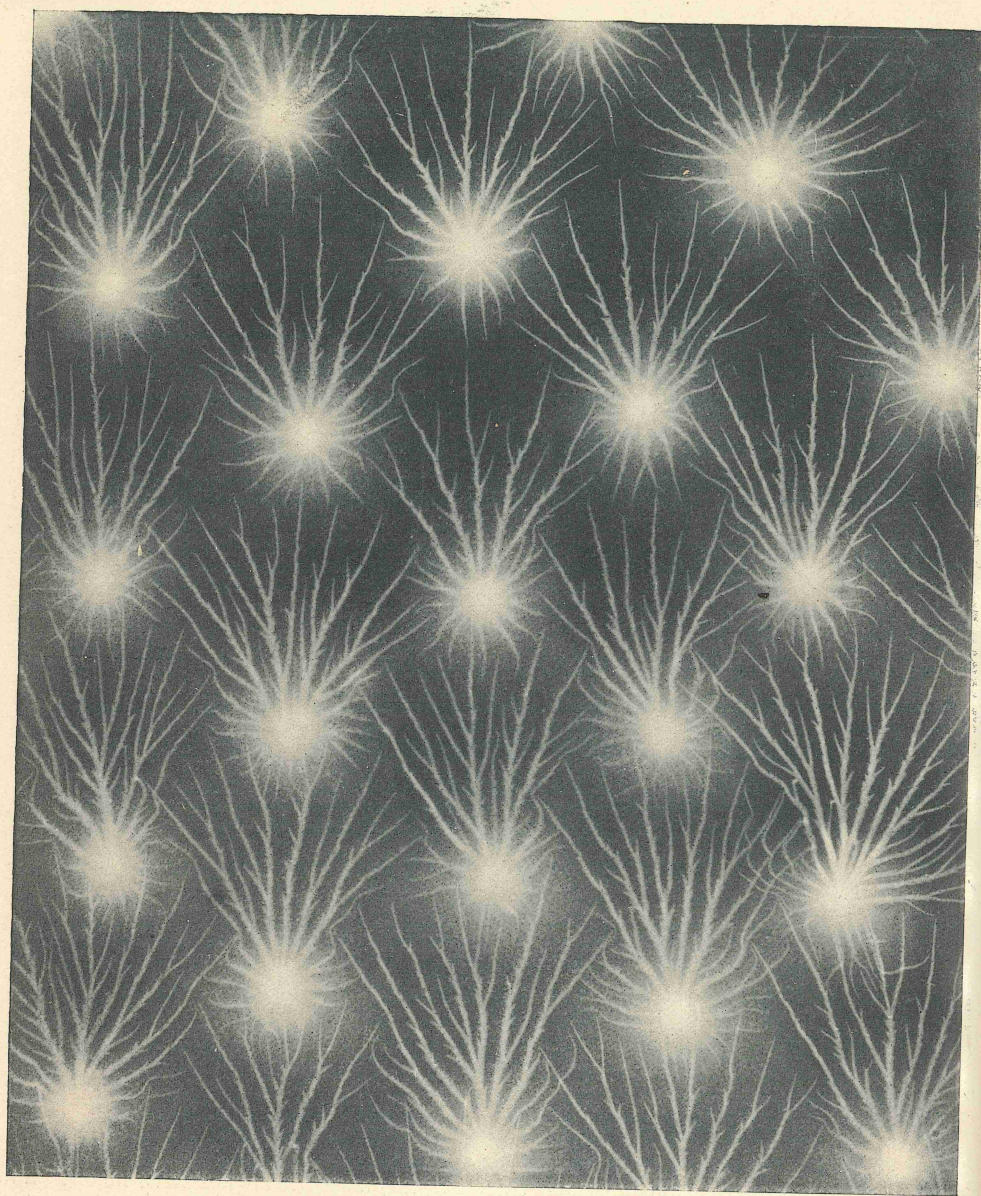


PLATE VI. POSITIVE ENDS OF ELECTRIC ENTITIES.

A discharge from a metallic roller in its passage over the film side of a photographic plate placed upon the uncoated, negative surface of a charged condenser. The conditions of electrification here are the opposite of those in Plate VII.

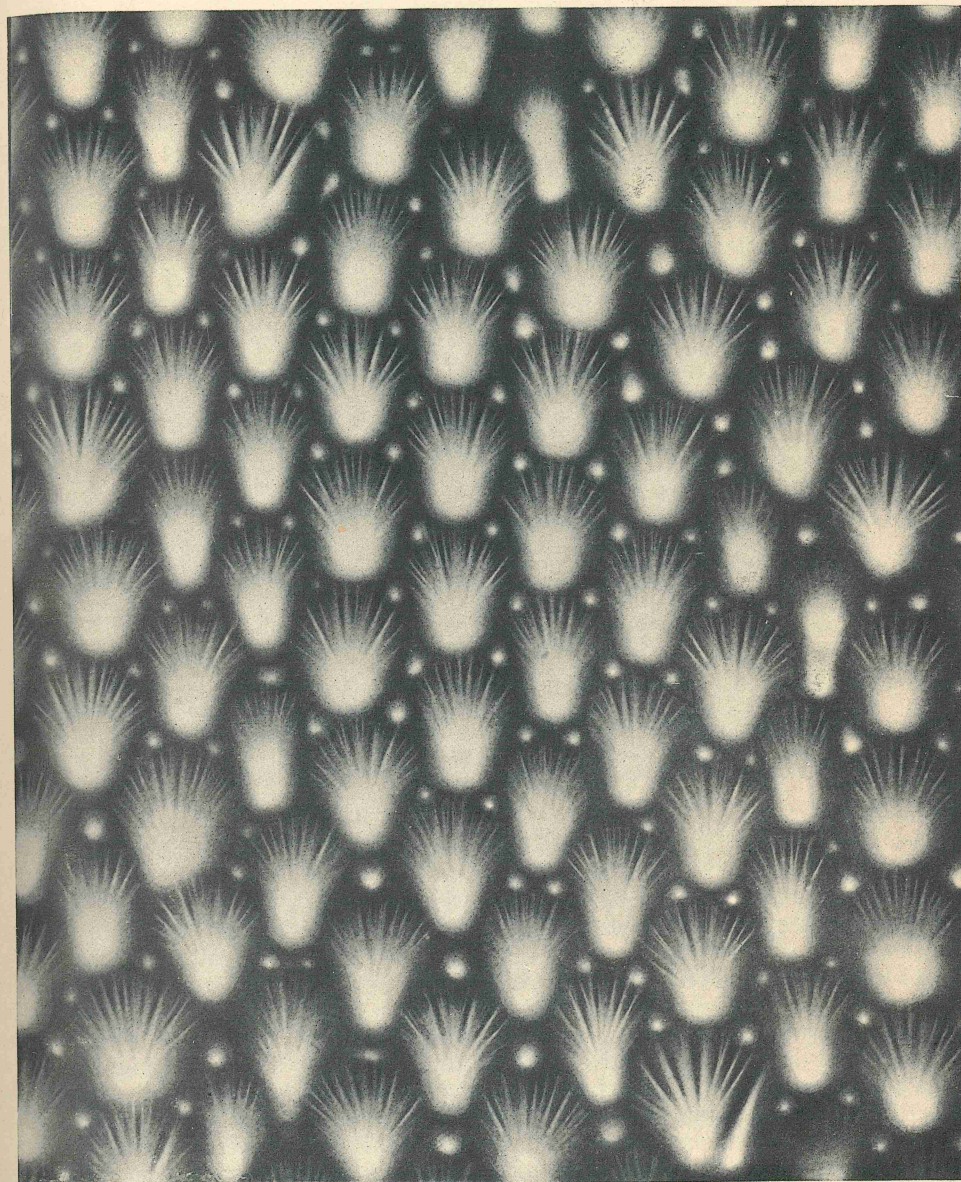


PLATE VII. NEGATIVE ENDS OF ELECTRIC ENTITIES.

A discharge from a metallic roller in its passage over the film side of a photographic plate placed upon the uncoated, positive surface of a charged condenser. This plate is a companion to Plate VI.



PLATE VIII. ELECTRIC ENTITIES IN SERIES.

A discharge between plates produced by the passage of a metallic roller over a photographic plate laid film side down upon a positively charged, uncoated condenser surface.

of its three phases that it becomes manifest upon the sensitive plate.

Plate V is an enlarged record of one small quantity of electric energy: its origin, or negative phase; its transformation, or dynamic phase; its final diffusion, or positive phase. In the negative phase the energy consists of numerous units of energy uniting to produce a single unit, which, after spiraling through a small space, is changed into a number of streamers to be again diffused.

Plates VI and VII, which show respectively the positive and negative ends of electric entities, belong to the condenser series. As explained in the lines under them, they were secured by means of a roller passing over the surface of the photographic plate. Plate VI shows the outrushing or positive ends of the tiny entities that shoot off from the roller on to the negatively electrified plate as the roller is passed over the plate. Plate VII shows the retreating or negative

ends of the entities that rush from the positive plate into the negative roller.

Plate VIII shows how comets in series are formed when the energy *between* condenser surfaces is permitted to escape into a metallic roller passed over the outer surface of the plate. This was secured by placing the photographic plate film side down.

The photographs here reproduced form a representative selection from many hundreds secured by Mr. Kinraide. They are much reduced in size, the negatives being eighteen by twenty-two or eight by ten inches. A set consisting of about fifty photographs has recently been presented to the Massachusetts Institute of Technology, where it is available to students and other interested persons.

The conclusions as to the nature of electricity reached by Mr. Kinraide through his study of its movement differ to a considerable extent from those reached by Lord Armstrong, the noted English scientist who

has conducted experiments along similar lines. Lord Armstrong has secured some extremely interesting photographs of the phenomena resulting from discharges of electricity over dust plates. He has also experimented with photographic plates, and a number of the results secured in both cases bear an interesting resemblance to those obtained by Mr. Kinraide. Lord Armstrong has not, however, shown the development of the electric entity.

It may be interesting to add that, as a result of his study of electric energy as manifested in these plates, Mr. Kinraide inclines to the theory that every form of energy, as heat, sound, light, gravity, etc., has what he would term an entity of energy, corresponding in structure and function to the electric entity, and that it only requires

a knowledge of how to create conditions in order to demonstrate this.

He asks the interesting questions: "May it not be that the whirlwind and the water-spout proclaim the presence of entities of thermal energy, the whirlpool the presence of an entity of gravity, and the sound-waves recently photographed the presence of the entity of sound force?" He maintains, also, that if the conditions are constant, the entity will be constant. *A prime condition must be that the energy be able to mold the substance which is the medium of its manifestation into its own form.* Its power to do this demonstrates that it is a force-entity. Mr. Kinraide proposes to experiment with other forms of energy and to obtain, if possible, a complete demonstration of this theory.

THE PASSING OF COCK-EYE BLACKLOCK.

BY FRANK NORRIS,
Author of "The Octopus," etc.

WELL, m' son," observed Bunt about half an hour after supper, "if your provender has shook down comfortable by now, we might as well jar loose and be moving along out yonder."

We left the fire and moved toward the hobbled ponies, Bunt complaining of the quality of the outfit's meals. "Down in the Panamint country," he growled, "we had a Chink that was a sure frying-pan expert; but *this* Dago—my word! That ain't victuals, that supper. That's just a' ingenious device for removing superfluous appetite. Next time I assimilate nutriment in this camp I'm sure going to take chloroform beforehand. Careful to draw your cinch tight on that pinto bronc' of yours. She always swells up same as a horned toad soon as you begin to saddle up."

We rode from the circle of the camp-fire's light and out upon the desert. It was Bunt's turn to ride the herd that night, and I had volunteered to bear him company.

Bunt was one of a fast-disappearing type. He knew his West as the cockney knows his Piccadilly. He had mined with and for Ralston, had soldiered with Crook, had turned cards in a faro game at Laredo, and had known the Apache Kid. He had fifteen

separate and different times driven the herds from Texas to Dodge City, in the good old, rare old, wild old days when Dodge was the headquarters for the cattle trade, and as near to heaven as the cow-boy cared to get. He had seen the end of gold and the end of the buffalo, the beginning of cattle, the beginning of wheat, and the spreading of the barbed-wire fence, that, in the end, will take from him his occupation and his revolver, his chaparejos and his usefulness, his lariat and his reason for being. He had seen the rise of a new period, the successive stages of which, singularly enough, tally exactly with the progress of our own world-civilization: first the nomad and hunter, then the herder, next and last the husbandman. He had passed the mid-mark of his life. His mustache was gray. He had four friends—his horse, his pistol, a teamster in the Indian Territory Panhandle named Skinny, and me.

The herd—I suppose all told there were some two thousand head—we found not far from the water-hole. We relieved the other watch and took up our night's vigil. It was about nine o'clock. The night was fine, calm. There was no cloud. Toward the middle watches one could expect a moon.