

How are New Bushing Designs Adapted to Older Apparatus:

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using present
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The answer is, "Yes, in most cases."

We wish to emphasize, however, that O-B merely supplies the bushings and would not presume to make recommendations for adaption of such bushings to the equipment in question. This rightly belongs within the realm of the apparatus builder and the user. Mechanical and electrical clearances, oil levels, and many other factors must be considered. While the problem is not at all formidable, it does require competent advice.

If one is considering modernization of older equipment, a few general pertinent facts regarding bushings may be of interest. ASA Standards now control physical dimensions in the range of voltages between 23 and 69 kv, and the principles of this Standard rule the designs for other voltages not yet included. These modern bushings have much smaller radial dimensions than their predecessors. In this category, there is generally room to spare in making a replacement. An adapter plate at the flange line is the customary means for compensating for differences between old and new mounting flanges.

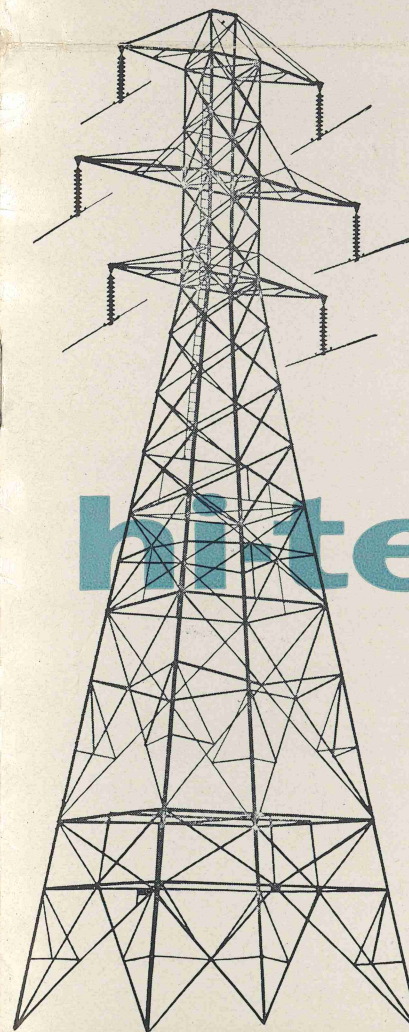
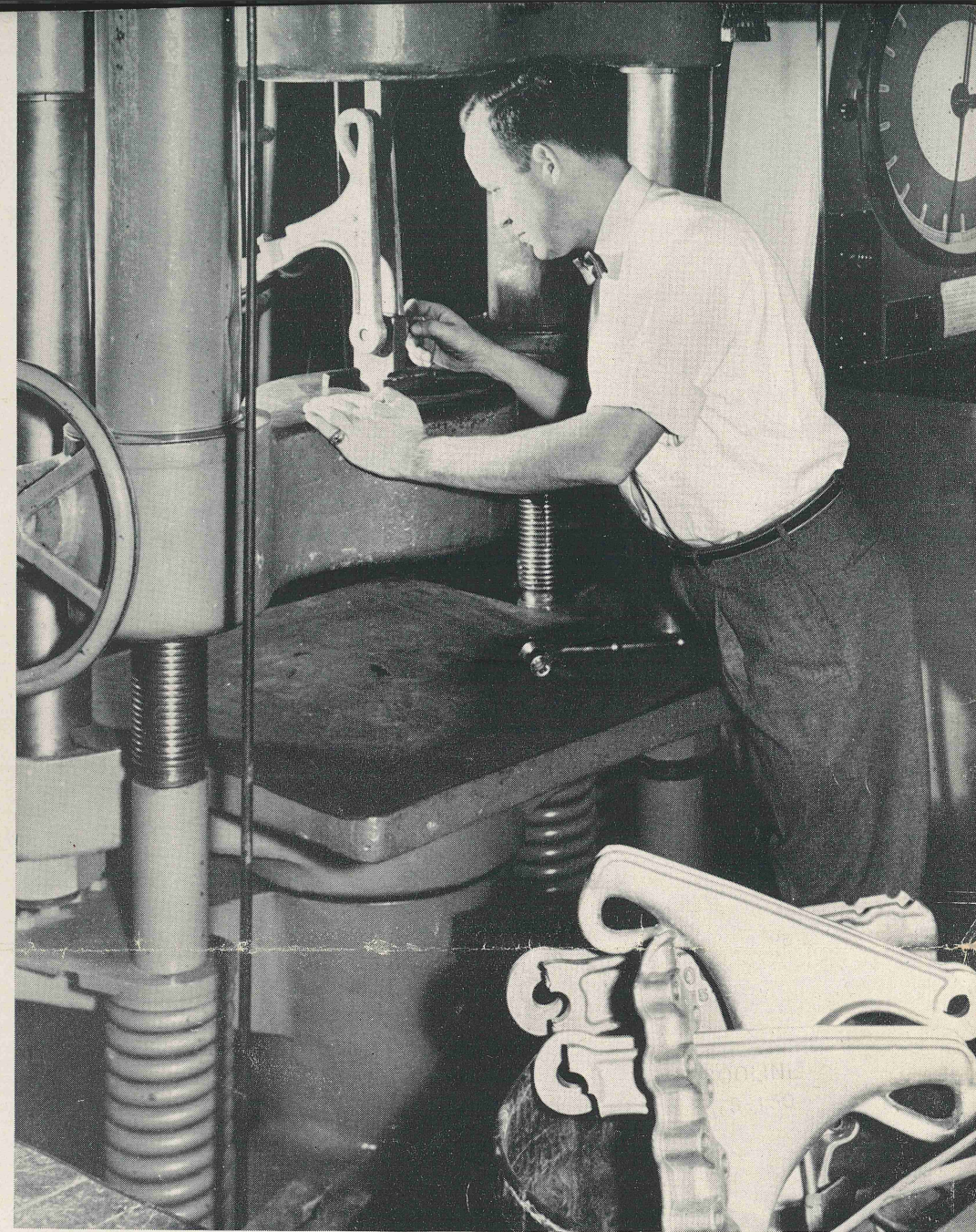
Bushings for older equipment were built for the specific purpose in many cases. In other cases, regular production bushings were subject

to degrees of alteration in dimensions and terminal devices. There were literally thousands of bushing variations. Today, however, bushing manufacture has been greatly simplified. A comparatively few designs are built to a set of fixed dimensions and follow a uniform system of terminal arrangements. Obviously this is a desirable development, but naturally introduces some complications in the transition period. Here, especially, is where advice from the apparatus builder is essential.

In order to adjust for certain dimensions within the tank, it is often necessary to raise a new bushing above its normal mounting level. This may be done with a simple extension or sleeve welded to the adapter plate. O-B does not regularly supply such adapting devices, as the cost penalty for such miscellaneous manufacture in a large plant would be prohibitive. Either the adapter or dimensional details for local fabricating can generally be obtained from the apparatus manufacturer.

If you are contemplating a modernization program for certain older equipment, discuss it with your apparatus builder. He can supply you with considerable basic information that will aid your preliminary plans, and can be of help in many other ways.

Bear in mind that new O-B bushings are not only the most advanced designs on today's market, but have the virtue of 45 years' successful manufacturing background.



high tension news

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 JULY 1956

These Broken Bodies Pay the Price of Quality

And even at \$30,000 for Five Years It's a Bargain!



The man in the photographs on this page is doing a routine testing job, according to one point of view.

But the more imaginative and appreciative among us might call him a modern-day vigilante, working to protect the quality of an important product.

Several times each week it's his job to break a group of clamps on the tensile testing machine . . . clamps taken at random from an average day's production.

He carefully records the breaking strength of each item in a years-old record of the performance of similar clamps.

Through the years we've built a valuable record on the strength of O-B clamps. Moreover, we can correlate our laboratory test record with the record of actual performance in the field by units taken from the same manufacturing runs.

With this wealth of information we can predict the minimum performance of an entire day's production of clamps, after testing only a few.

Once in a while, we get a danger signal. Tests show that ultimate strength, while still well above rated strength, is lower than it should be. Then we find out what's wrong, and correct it before quality is affected.

If there's any serious question about the strength of the sample clamps, the entire production lot is scrapped. We refuse to take a chance. Rather than run the risk of one questionable clamp being delivered to a customer, we prefer to scrap the entire lot.

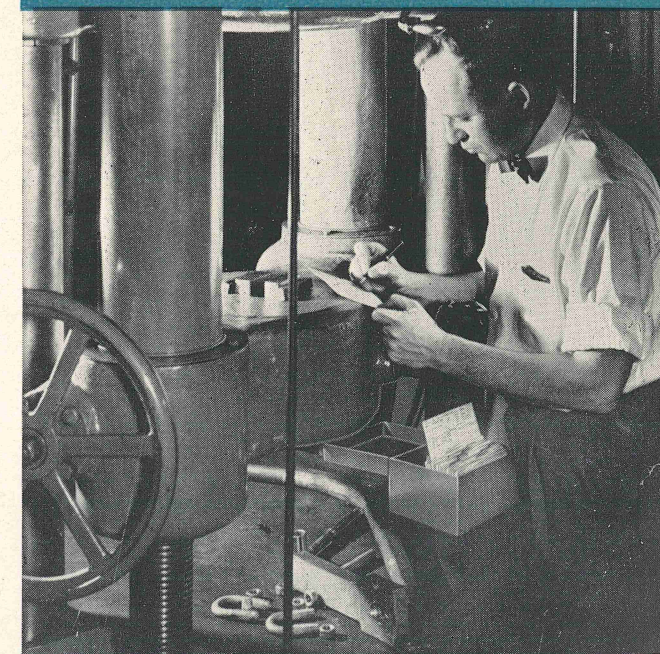
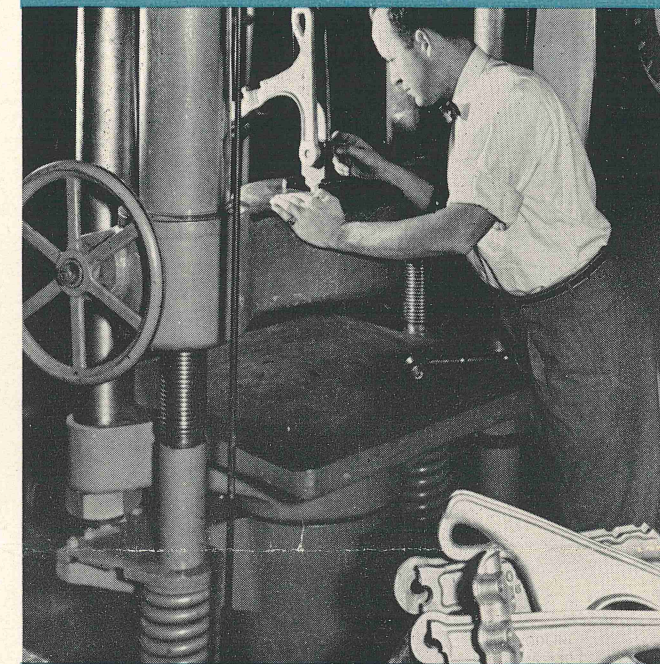
Test samples of clamps (and other O-B hardware) die in an orderly fashion. A card file, kept handy at the test machine, lists specific jigs and fixtures to hold every size of O-B clamps for pulling. Always, in testing, the clamp is loaded to destruction.

We don't need to break a lot of clamps to get the answers we want. The sample size is adequate according to accepted statistical methods for controlling quality. Even so, over the past five years, we've broken \$30,000 worth of clamp bodies. But we consider this a very reasonable price to pay for the assurance that every O-B clamp will perform up to and beyond actual field requirements.

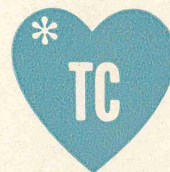
The willingness to make the extra effort in checking on clamps and to profit from what we learn, for your benefit and ours, is just one phase of the Technical Competence concept which is followed throughout the O-B organization.

TECHNICAL
COMPETENCE

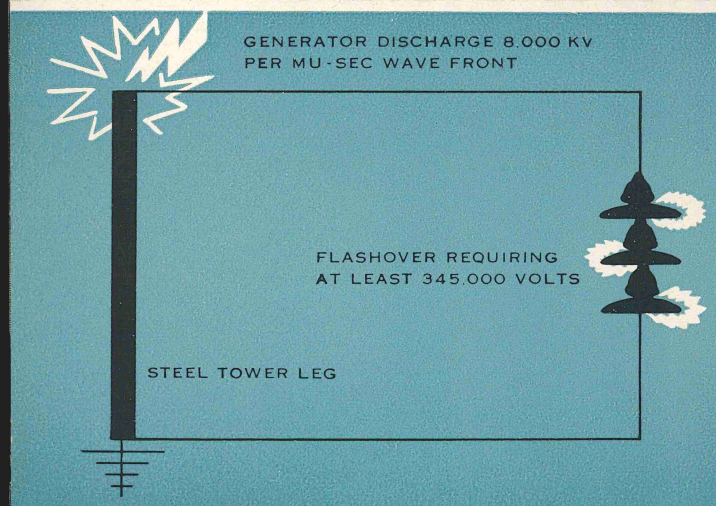
Cooline strain clamp is placed on tensile machine, and pulled until it fractures.



Results are recorded in a permanent record.



WHEN LIGHTNING BREAKS ITS OWN RULES . . .



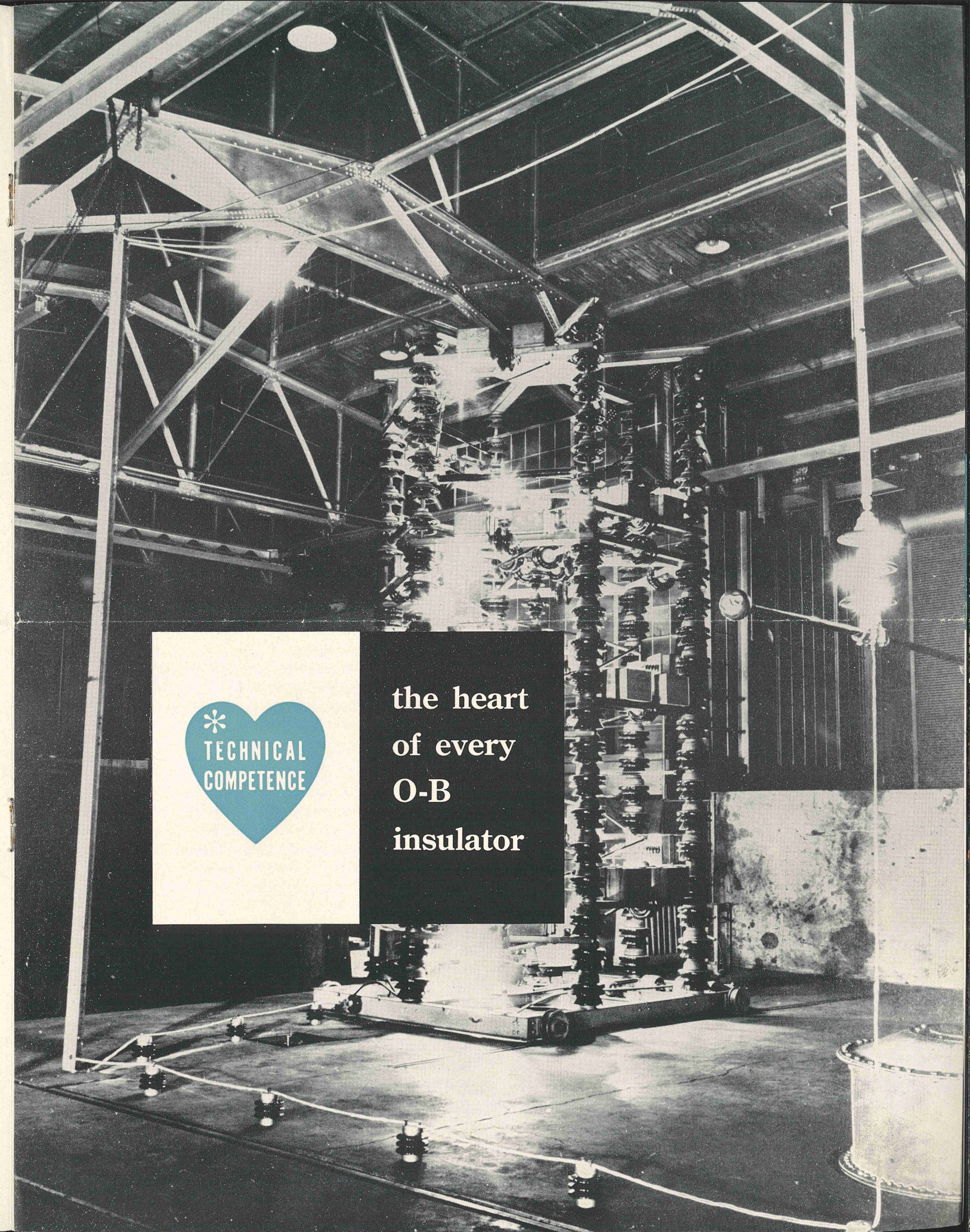
First, this may appear merely to be three suspension insulators on impulse flashover -- a very commonplace event in a laboratory. But study the hook-up. In parallel with, and "shorting-out" these insulators is 22 feet of steel tower leg! According to published $1\frac{1}{2} \times 40$ mu-sec ratings, it takes 345,000 volts at critical flashover level to flash these insulators. How did this considerable voltage build up in a system having a "dead short" across the insulators?

For years, there has been reasonable correlation between estimated lightning outages and actual performance on steel tower lines. Basically the same design of tower, except for greater height, has recently been employed on some of our heavy extra-high-voltage construction. Some of these lines have sustained lightning outages many times in excess of the estimated rate and out of all relation to past design experience. What is the reason? The "dead-shortened flashover" in our picture contains many elements of the answer.

Day and night for months, the O-B High Voltage Laboratory has been at grips with this problem -- a matter of major concern in modern transmission developments. We've been writing our textbooks as we go. It's all unexplored territory. The first concrete results of this extremely interesting research have just been published in a new AIEEE paper.*

One of the necessities in such a project has been the production, control, and recording of phenomenally-steep impulse wave fronts in order to simulate lightning. But the big part of the story is not concerned with equipment and facilities but with the quality of manpower, and the progressive attitude of management that makes possible such advanced research. And it is also true that all these factors leading to a high degree of Technical Competence are likewise available to every-day problems of design that have given O-B insulators such a wide margin of performance and value.

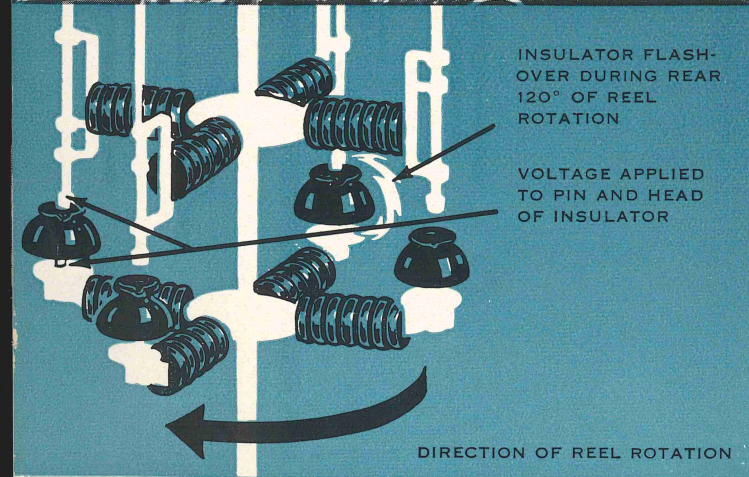
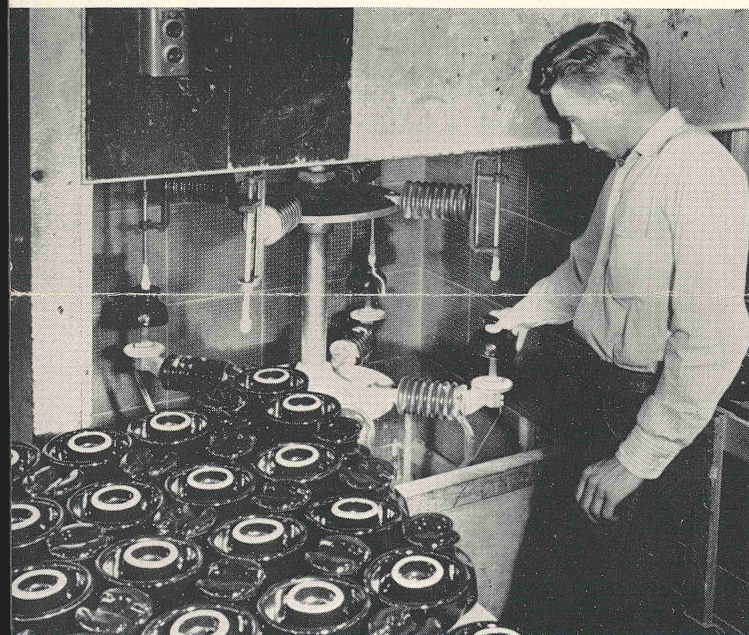
*AIEEE Paper 56-201, "Anomalous Flashovers On Transmission Lines," by C. J. Miller, Jr., Ohio Brass Company. Presented Feb. 2, 1956 before Winter General Meeting in New York. Copies available on request to Ohio Brass Company, Mansfield, Ohio.



the heart
of every
O-B
insulator

MONOGRAPH #9

What is the REEL TEST?



The man in this photograph is carrying out a routine high-frequency test on pintype insulators, as prescribed in standards established by ASA, NEMA, and AIEE.

We call this particular test the "reel test" because each insulator is placed on a revolving reel. The four-position reel carries each insulator from the loading position through the test position to the unloading position where it is removed and another piece put in its place.

The reel makes one revolution each 15 seconds and each insulator is subjected to high frequency voltage (200,000 cycles per second) of flashover magnitude for five seconds.

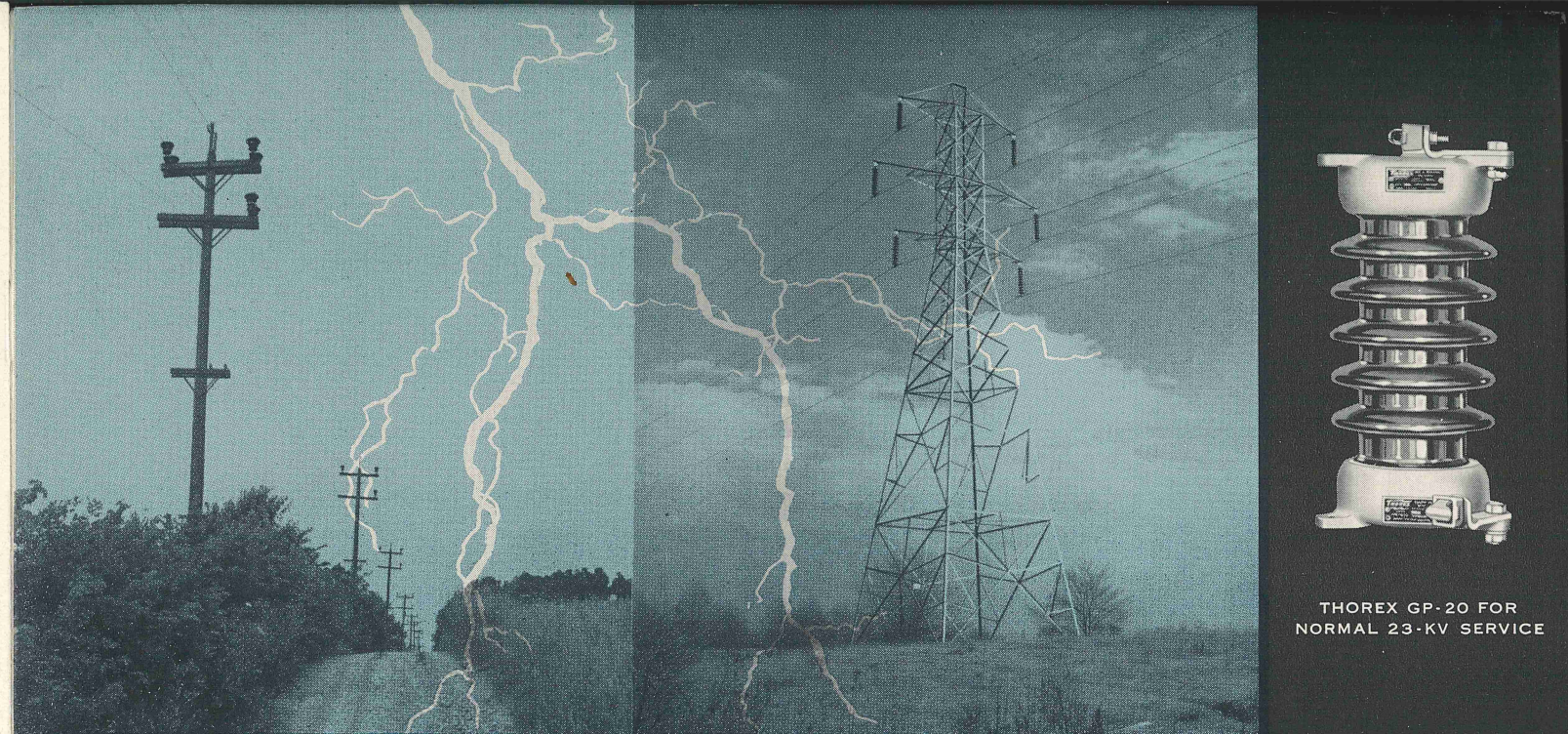
During the five seconds for which the voltage is applied, there are in the order of two million opportunities (half cycles) for the insulator to flash over.

Compare this with service in an average lightning area. (30 storm days per year is considered average, and with this number of storm days, one lightning stroke per mile of line per year is assumed.) Expectancy of an insulator being struck is slight, which is further modified by number of structures per mile, overhead wires and other protection.

During the test, arc streamers seek out weak spots in the shell area. If they find a void, crack or other dielectric defect, the insulator punctures, the flashover ceases and the insulator is discarded.

Incidentally, well designed insulators have a low rejection rate, possibly one for every two or three thousand insulators. Nevertheless, all O-B pintypes and suspension discs are inspected 100 per cent on the reel. Although the odds may be 2000 to 1 in our favor, we don't want that one insulator to cause a customer trouble on some stormy night. It's easier for us to find it in our factory than for him to find it after it's installed and causes an outage.

The reel test is described in paragraph 7.1 of ASA Standard C 29.1 - 1944. More than 30 years ago, long before it became standard, we started reel testing 100 per cent on all pintypes and suspension discs. Although some of these insulators sell for as little as 40 cents, we think 100 per cent inspection is well worth the effort. It's the one way we can be absolutely sure we're always shipping a top quality product to you.



THOREX GP-20 FOR NORMAL 23-KV SERVICE

Lightning doesn't know the difference

Thorex GP Arresters Offer Economical Protection for Lines that Can't Enjoy Heavy Transmission Construction

It may come as a surprise to read elsewhere in this issue that a moderate storm frequency (30 annual storm days) will produce an average of one lightning stroke per mile, per year, on a power line. This not only applies to high voltage transmission but to any exposed line, of any voltage -- lightning doesn't know the difference!

This last point is important. **Lightning doesn't know the difference.** And since most lines of 22 kv and below seldom have the elaborate shielding and grounding of their higher voltage associates, they are especially vulnerable to lightning interruptions.

Thinking of engineers is changing quite rapidly on the question of lightning arrester protection on these lower voltage networks. Such protection was once either very expensive or inadequate. Low cost arresters could not be trusted, and high cost ones could not be justified. This situation has changed abruptly within the last few years. For example take the Thorex GP. It has proved itself exceptionally well adapted to

sub-transmission and primary distribution voltages, and for good reason. These lines perform a very important task under conditions of inherently low lightning protection. In the past, this was an accepted part of operation. Today, however, such lines can enjoy protection of the highest order at "rock-bottom" price through use of the Thorex GP. This arrester passes every modern requirement for top grade performance. In fact, it is materially better than any lightning arrester on the market only five or six years ago.

Investigation of the price of the Thorex GP will reveal that it can be justified on almost any line. And one of its best justifications is the added protection it gives to "under-privileged" sub-transmission and primary distribution systems at a price that is economically sound. The same lightning hits such lines that hits the heavier high voltage system. It hits them just as hard and just as often. And it probably causes the bulk of its trouble in the lower voltage category. This is no longer necessary when full station quality protection can be provided by the Thorex GP arrester at the lowest cost.

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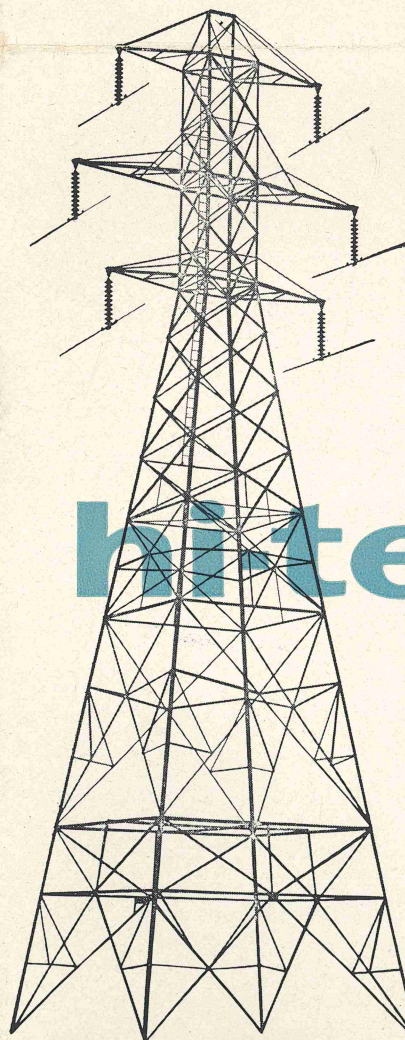
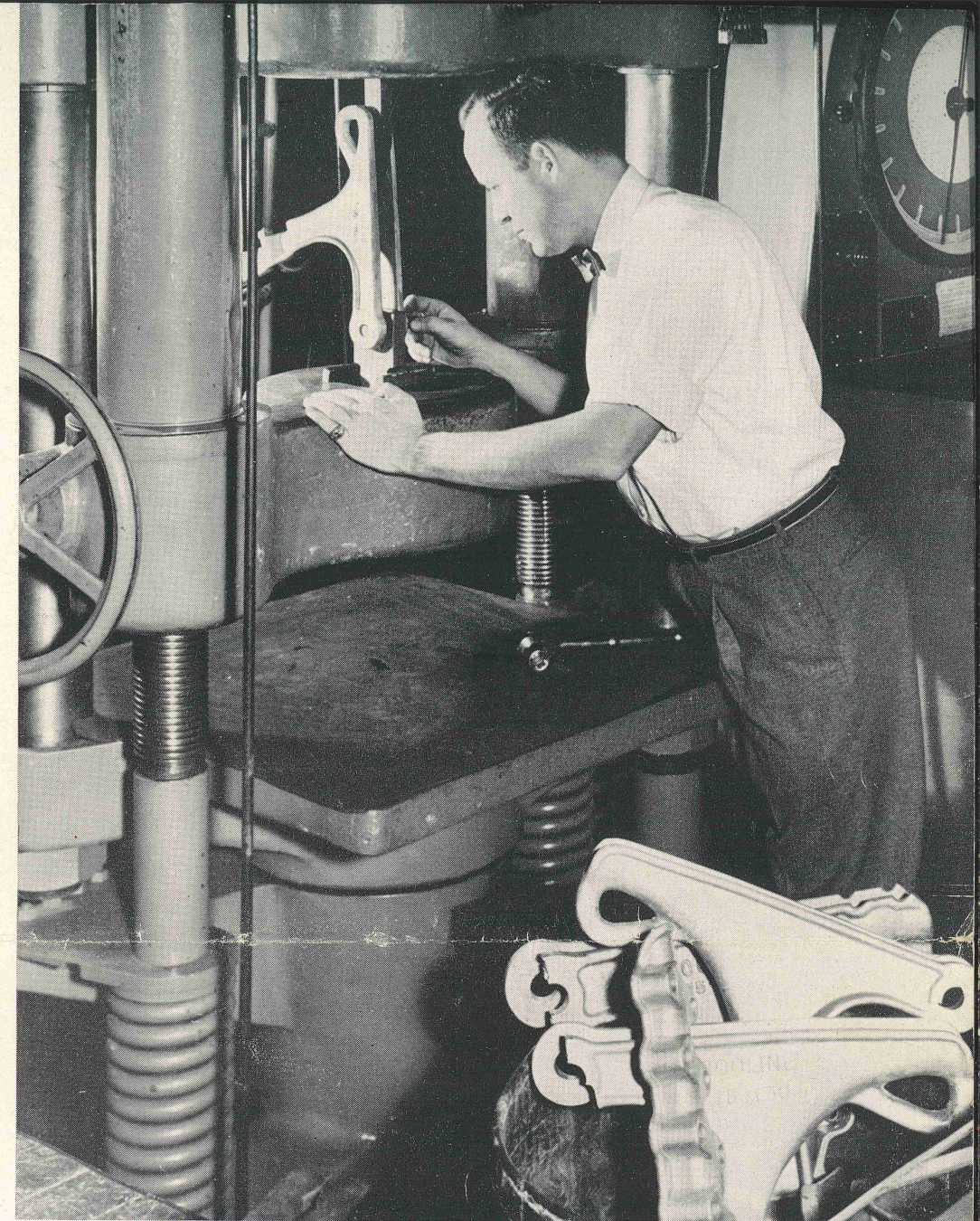
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