4 WAYS to get more service from WIRE ROPE

Yes, wire rope is tough. It can stand up to the most rigorous service—and ask for more.

But that's no reason to abuse it. With a little care, by applying a few simple rules, you can get a tremendous amount of extra service from your rope.

1 Break it in with light loads

For example, when breaking in a new rope, don't slam on full power and speed right off the bat. Begin with fairly light loads. Operate at moderate speed. Give the strands of the rope a chance to seat down snugly and uniformly upon the core, so that each strand is carrying its fair share of the load. This way, the rope will assume its proper "constructional stretch" without damage, and you'll be assured of better spooling and easier handling throughout the entire life of the rope.

2 Treat it with consideration

After the rope is broken in, you can safely use whatever speeds and loads it was designed for. But don't be unnecessarily rough, even then. A smooth, gradual application of power is just as efficient as slamming into the load with a jerk. The same is true of braking. It's the heavy jerks and surge loads that beat the guts out of a piece of rope. Nine times out of ten these can be avoided without losing time.

3 Know your rope

For example, if you're using a flexible 8-strand rope for high-speed work, don't overload it. This rope is built to withstand bending fatigue and fast operation—not for heavy hogging lifts. The opposite is true of heavy-duty 6-strand rope. Lift with it—but don't try to break speed records.

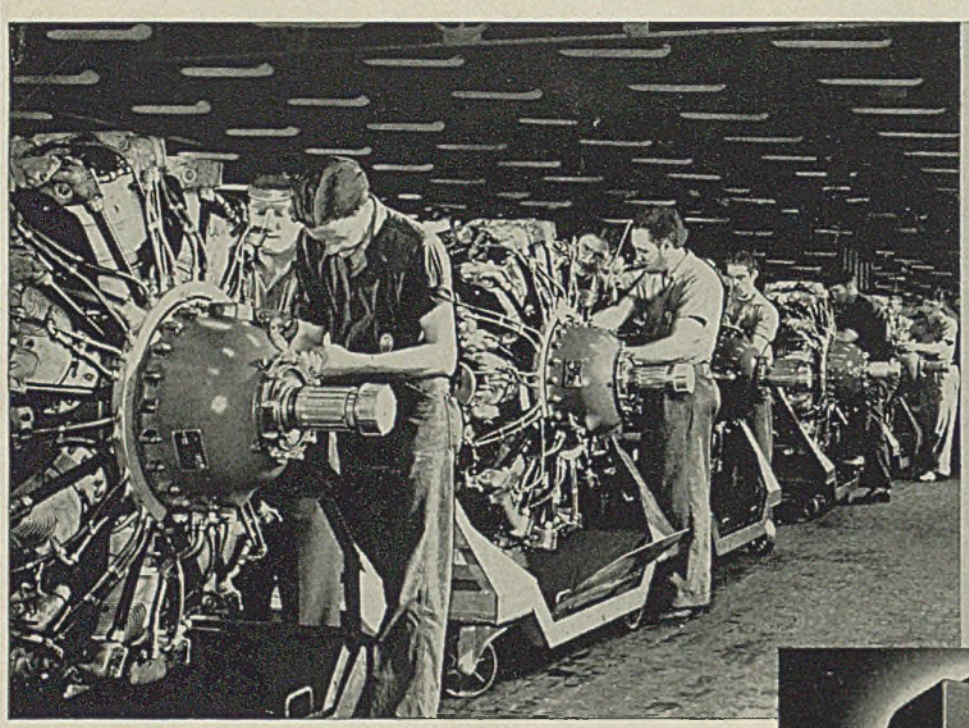
4 Right maintenance means plus service

Don't neglect the few simple maintenance precautions which require so little time yet return so much in extra service. Keep your rope properly lubricated. Don't operate it over sheaves that are abraded, damaged, or out of line. Fasten clips in the approved manner. Cut off a short length from the drum end of your rope from time to time so that "grief spots" are relocated over sheaves and drums.

Wire rope is now a war weapon. Its proper use is a service to your country and to yourself. If you want good, dependable rope, and friendly service, get in touch with the Bethlehem Wire Rope distributor in your territory. He's always ready and willing to serve you.

Bethlehem Manufactures Wire Rope for all Purposes

LINES BEHIND THE LINES

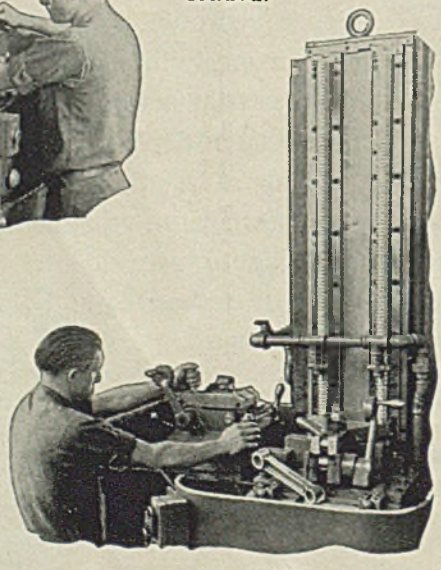


FROM PRODUCTION LINES TO FIRING LINES, IN WAR AS IN PEACE, THE AUTOMOTIVE INDUSTRY DELIVERS THE GOODS

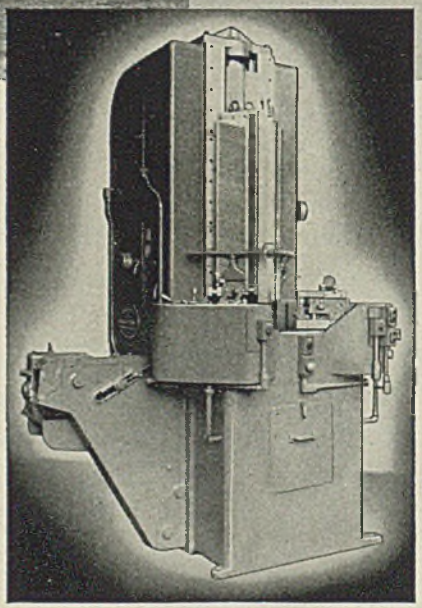
NO INDUSTRY has gone more "all out" for war than the automotive. None manufactures a greater amount or variety of war matériel. For many years the industry has relied on broaching as a better way to do many metal-working jobs—the only *right* way to do some!

* * *

RELATIVELY LOW COST Single Ram Machine performs two different surface broaching operations. One tool (left) broaches flat on rod, while second fixture is being loaded.



RADII ARE FINISHED (right) with second broach while first fixture is being re-loaded. One operator plus one machine plus tooling by *American*—equals a precision job at a production rate!



FAST PRODUCTION with high finish is obtained by broaching sides of articulated rod for aircraft engine, shown in position (left) on *American* SB-48-15-2 Single-Dual Machine.

BROACHING IS BETTER THE *American* WAY

American
BROACH AND MACHINE CO.

ANN ARBOR, MICHIGAN

BROACHING MACHINES
PRESSES
BROACHING TOOLS
SPECIAL MACHINERY

DIVISION OF SUNDSTRAND MACHINE TOOL CO. ROCKFORD ILLINOIS U.S.A.

MACKLIN
GRINDING WHEELS

MADE in all sizes and shapes there is a Macklin Grinding Wheel for every type of grinding job that will show cost-saving results and *"Protect Your Production."* An experienced Macklin Field Engineer is available at all times for the asking—*no obligation.*

DON'T TAKE BONDAGE..
INVEST IN WAR BONDS

MACKLIN COMPANY

***Manufacturers of* GRINDING WHEELS — JACKSON, MICHIGAN, U. S. A.**

Distributors in all principal cities

Sales Offices: — Chicago - New York - Detroit - Pittsburgh - Cleveland - Cincinnati - Milwaukee - Philadelphia

BEHIND THE SCENES

Purchasing Agents' Headaches

■ What some P. A.'s are up against these days is enough to bring about many an early gray hair and reduce stout specimens of manhood to babbling wrecks. Here, for example, are a few of the replies a purchasing agent over East received from his regular sources of supply after writing them requesting new catalogs, price lists and other data:

"We are glad to advise the illustrations in our catalog are still O.K., only we have discontinued practically every item. If we sent you the whole list of what we are not making, the catalog would be useless, as it is anyhow."

"Forget the prices. Also forget the descriptions. By the time you get this letter we don't know ourselves how or what we will be making the stuff out of."

"Thank you for your note indicating you still have one of our complete catalogs. Please return it at once. You ought to see the prices we are getting here for our waste paper."

"After reading your inquiry we are afraid you are thinking of sending us an order. It looks suspicious to us. Nevertheless, we will gladly meet you halfway by showing you how to calculate costs, if you promise to send the order to someone else."

"The only part of that catalog we are still certain about is the line that says, "Established in 1885." All other information and prices have been withdrawn."

Sherman Was Right

■ But purchasing agents aren't the only ones with headaches. Just take the poor people who are gallantly sacrificing the use of paper liners for finger bowls since WPB recently prohibited their manufacture.

Johnny Russell—In Memoriam

■ Have you Raymond Rubicam's "Johnny Russell—In Memoriam"? It ran first in the *New York Times* late in January and has since been broadcast over the radio, quoted in various newspaper columns and circulated to plant employes in booklet form. It is one of the most inspiring true stories to come out of the war so far and we feel sure the men all through your organization will get a tremendous lift from it. Copies of the little booklet are now available in quantity at cost price from the Writers' War Board, 802 Chanin Building, New York City.

Double-Talk

■ Another very sad situation is developing and the implications and complications involved are so far reaching we shudder to think about them. Business men have become so benumbed by the double-talk of government regulations that they've started to use the same clear-as-mud language. At least it would seem that way from the following gem that appears in a recent advertisement for a well-known icebox. As you will see immediately, the item simply explains under what conditions the price quoted in the advertisement applies. It reads:

The suggested retail price may be charged only by anyone reselling this article if the maximum price for that article as established by the person so reselling under the appropriate OPA regulations is at least equal to this suggested retail price.

Two Ways To Cure Absenteeism—No. 1

■ "Adolph Hinder", shipping clerk of the Manufacturers Screw Products, Chicago, was found guilty of absenteeism and tardiness in a mock trial and sentenced to hard labor "in a war plant in the land of the free for the duration of the war". Request for a new trial was denied.

The mock trial was conducted to illustrate the effect of absenteeism on war production with Robert Gale playing the part of "Adolph Hinder" and Municipal Judge J. M. Braude presiding.

No. 2

■ All of which is fine and dandy but we'll side with Judge Harold P. O'Connell, also of Chicago, who is conducting a one-man drive against absenteeism in his own little way. Over a recent week-end the judge put the bee on 12 defendants, arrested for drunken driving, to the tune of $100 each after they admitted their little escapades had caused them to stay away from their war jobs at least a day. If the defendants stay sober until September 15, he told them he will vacate their fines—which may prove to be a wee bit difficult in Chicago but would be a snap in Ohio, the situation being what it is.

More On NE Steel Handbook

■ Now, because of the unusual number of advance reservations which have piled up for copies of the new NE STEEL HANDBOOK and NE STEEL SELECTOR, we have doubled the original press run and as a result are able to reduce the selling price to only $1.00 for both the handbook and selector.

They are on the press now and are promised for the week of April 12. All prepaid orders will be refunded 50c and we suggest you check again now to see how many copies you will want if you haven't already placed your advance reservation. The Readers Service Department, Penton Building, Cleveland, O., is the address.

Postwar Planning Reprint

■ Also under consideration now is a 48-page reprint booklet containing the complete series of ten articles on Postwar Planning which have run in Windows of Washington during the past two and a half months. Because of the amount of interest shown in this special report to industry we are anxious to give it even wider circulation as a contribution toward a more intelligent and better planned future after the war.

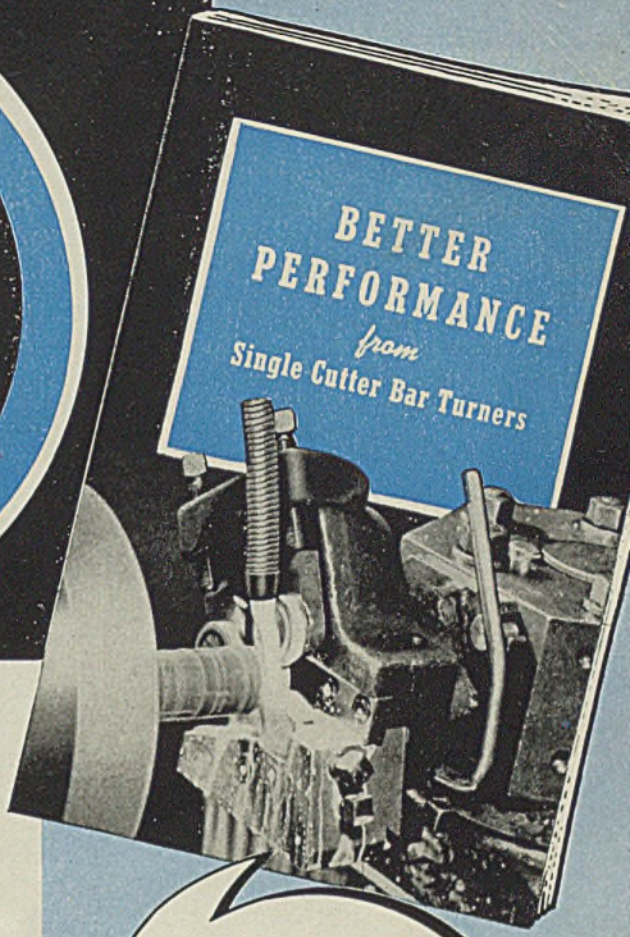
Wide Open Door

■ *Elmer Davis says one of the things that is wrong with America is that everybody who has done anything at all in his own field is expected to be an authority on every subject under the sun.*

Vol. 112, No. 14, April 5, 1943, issue of STEEL, published every Monday at Cleveland, Ohio. Entered as second class matter at the post office, Cleveland, O., under act of March 3, 1879. U. S. and possessions, Canada, Mexico, Cuba, Central and South America, 1 year $6; 2 years $10; all other countries, 1 year $12. Current issues, 25c. Yearbook of Industry issue, $2.00.

Editorial Contents—Page 61

DO YOU REALLY KNOW YOUR BAR TURNER?



Here's How You Can Learn the Full Possibilities of Your Bar Turner

ONE of the most important tools employed in metal turning is the Warner & Swasey Single Cutter Bar Turner. It is used more than any tool on turret lathes set up for bar work.

Field studies in dozens of plants indicated the urgent need for a better understanding of the several fundamentals governing the setup and operation of this tool.

The information and many helpful hints assembled in the new Warner & Swasey booklet, "Better Performance from Single Cutter Bar Turners", can improve performance of this basic turret lathe tool and increase production in your shop.

Just issued — new 32-page illustrated booklet shows how to make the most efficient use of the Single Cutter Turner on bar work.

GET IT QUICKLY BY USING THE CONVENIENT COUPON

WARNER & SWASEY
Turret Lathes
Cleveland

Warner & Swasey Operator's Service Bureau, Cleveland, Ohio

Please send booklet, "Better Performance from Single Cutter Bar Turners".

Name _____

Company _____

Address _____

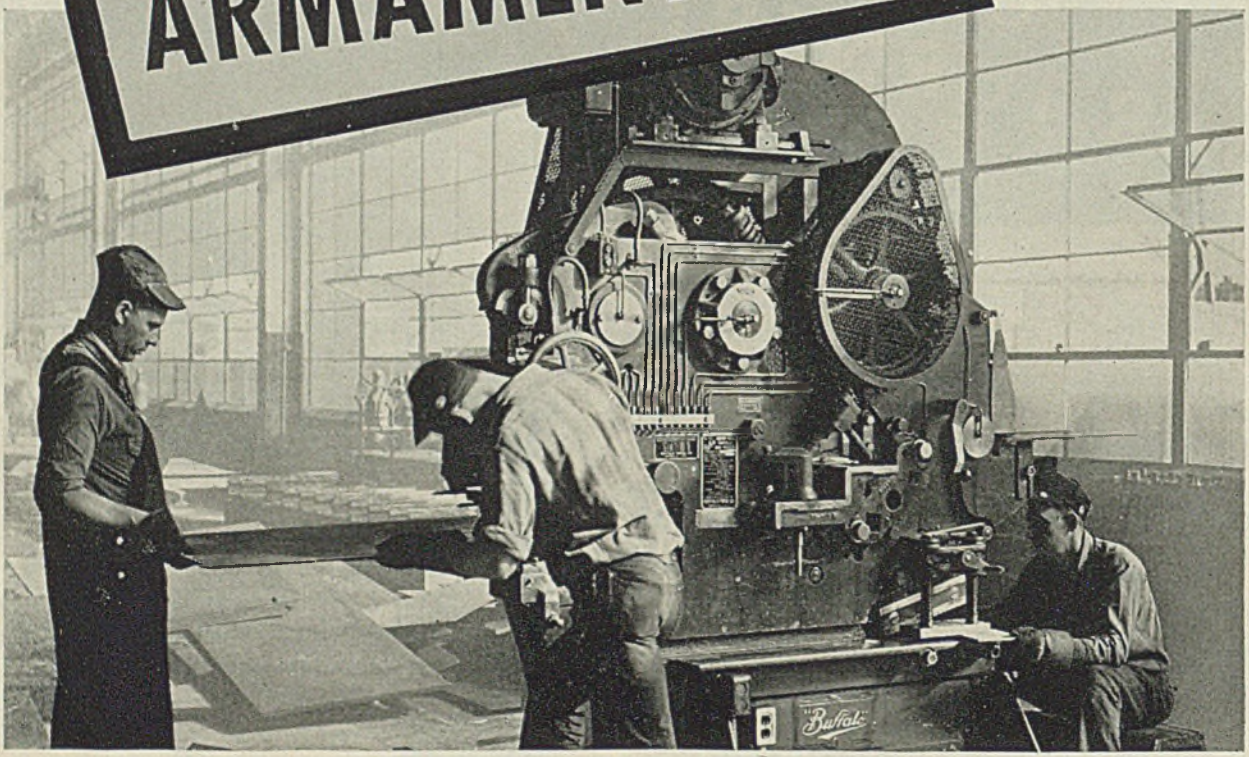
City _____ State _____

I work at (Company) _____

ST-10

YOU CAN TURN IT BETTER, FASTER, FOR

Active "EXPEDITER" in the ARMAMENT RACE



"Buffalo"

UNIVERSAL IRON WORKER

HIS giant heavy-duty tool, with a couple of operators at the controls, literally converts them into a whole crew of skilled metal fabricators! Swiftly, accurately, difficult types of armament fabrication move along on schedule. Such work as punching, shearing, slitting, coping and notching are finished with dispatch, and a wide variety of stock and forms are handled. . . Here, as in so many ways, Buffalo ingenuity of design plus Buffalo quality constructing, is fighting for unconditional Victory!

ARMY E NAVY

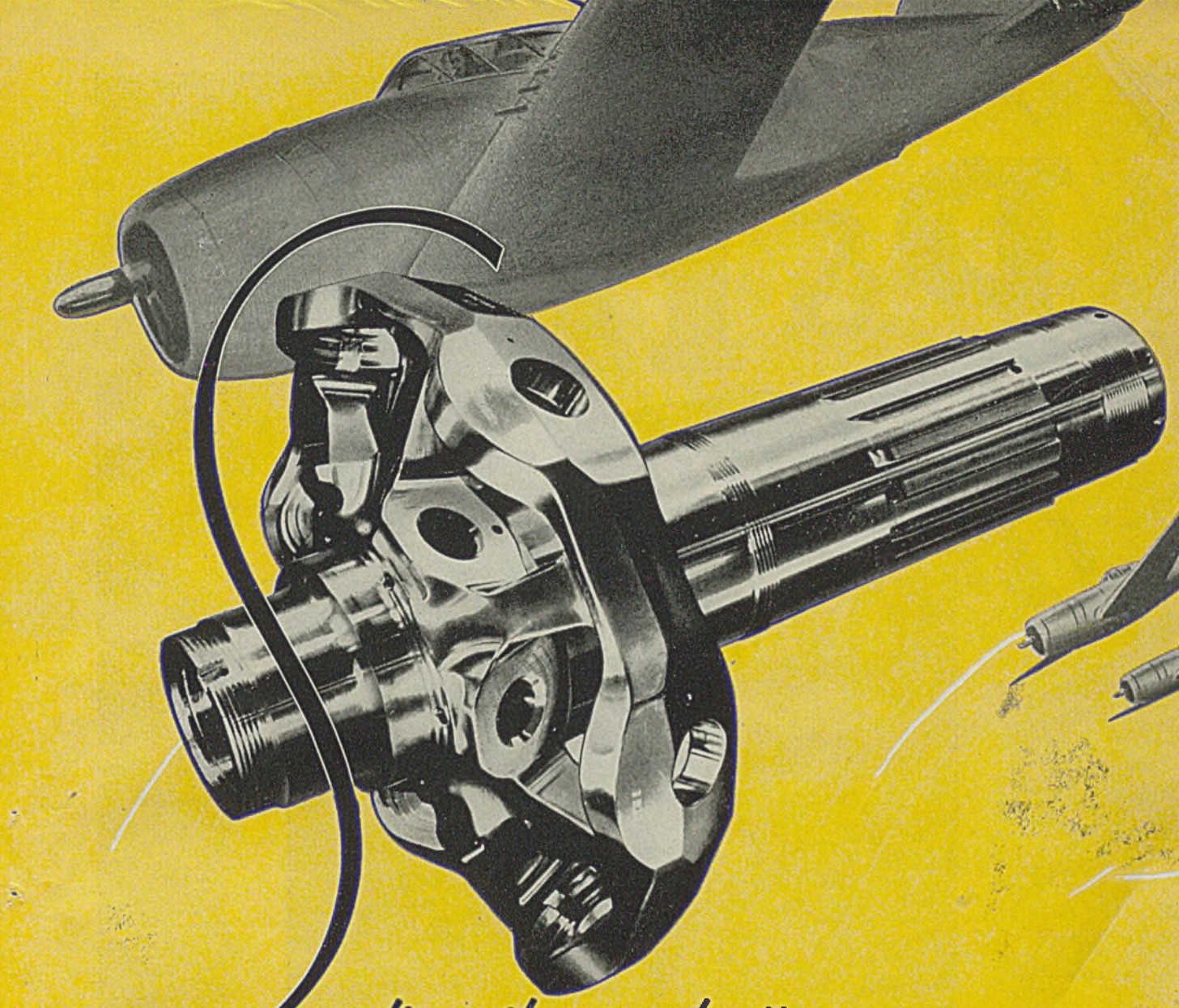
"Buffalo" MACHINE TOOLS

BUFFALO FORGE COMPANY

158 Mortimer St. **Buffalo, N. Y.**

Branch Engineering Offices in Principal Cities

Canadian Blower & Forge Co. Ltd., Kitchener, Ont.



Speeding the production of a famous aircraft engine

WITH PENNSALT CLEANER

A leading automobile manufacturer now making Pratt & Whitney aircraft engines had done a remarkable job of mechanical production . . . and was interested in stepping up the efficiency of the metal cleaning (chemical) operations.

A wide variety of steel and brass engine parts—including the polished steel propeller shaft illustrated—had to be cleaned of mineral cutting oil, black emery, or tallow polishing compound, prior to tin or cadmium plating . . . All work went through a solvent degreasing operation. Electro-cleaning, with two kinds of cleaners, was carried on in two crane operated tanks, with both direct and reverse current. But even with this cycle, cleaning of polishing compound was not complete.

A Penn Salt technical representative was able to do a real job of improving this method. He eliminated the solvent degreaser—and with the same Pennsalt Cleaner in each tank, he used it as both a soak-cleaner and electro-cleaner.

The resulting work was excellent. There were no rejects. The finish was judged to be the brightest ever obtained. Moreover, everybody in the plating room welcomed the elimination of the costly solvent degreasing operation.

What's *your* metal cleaning problem? Whatever the kind of metal or the type of material to be removed, you can benefit by the experienced advice of a Penn Salt technician. Let him tell you what the family of Pennsalt Cleaners is doing throughout industry today to save time, materials and labor. If you prefer, write fully to our Pennsalt Cleaner Division, Dept. S.

PENNSYLVANIA SALT MANUFACTURING COMPANY
Chemicals
1000 WIDENER BUILDING, PHILADELPHIA

P&H

Announces

AC ARC WELDERS

In presenting to American industry this outstanding new line of AC arc welders, P&H rigidly adheres to the policy of offering only the most advanced type of equipment.

To assist the buyer in selecting the unit best suited to his particular requirements and to assure him that it will provide the desired *usable* welding current, all models are rated on the basis of WSR (Welding Service Range) which clearly specifies a practical minimum and maximum current output.

All models are built for heavy duty service, with corrected power factor and continuous current settings. A wide variety of sizes, with both stationary and portable mountings, are available. Information on request.

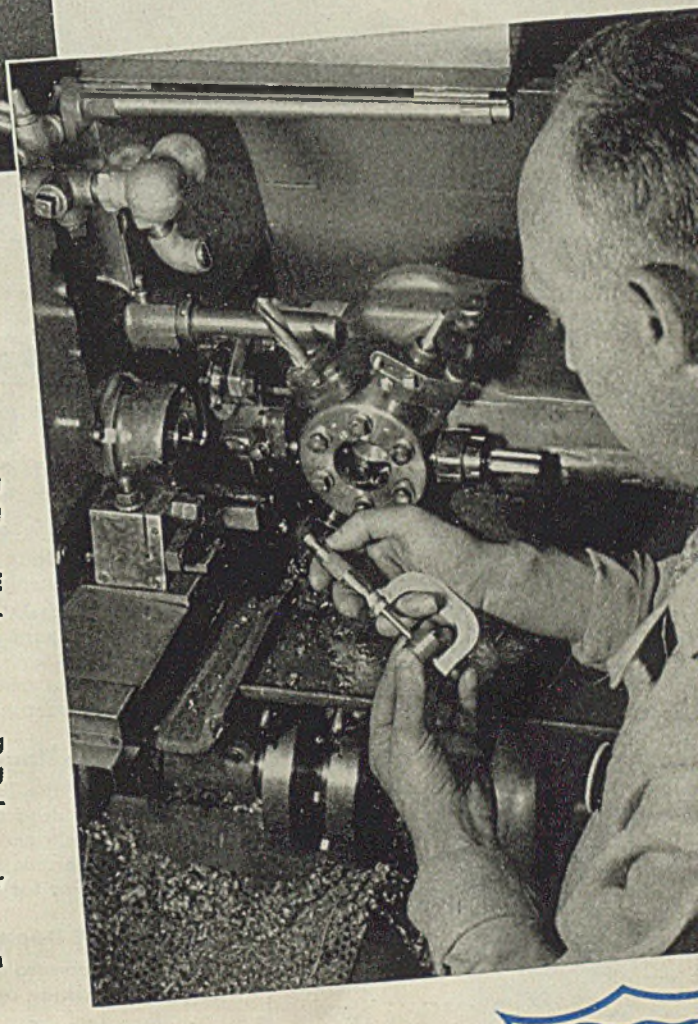
Gen. Offices: 4400 W. National Ave., Milwaukee, Wis.

HARNISCHFEGER
CORPORATION

ARC WELDERS • EXCAVATORS • ELECTRIC CRANES P&H MOTORS • HOISTS • WELDING ELECTRODES

MAKE THEM LAS

Micrometers cannot be replace easily today — don't let your be damaged — handle it with unusual care



The following suggestions will help save many a micrometer — make others last longer and serve better:

DO NOT measure revolving work.

DO NOT JAM the work against the anvil by forcibly turning the spindle. This may spring the frame or force the measuring surfaces out of line.

Unless micrometers have special measuring surfaces, **USE EXTREME CARE** in measuring over cutting edges, such as reamers and drills.

DON'T OPEN a micrometer by twirling it.

DO NOT LOCK the Micrometer Caliper at a particular setting and use it for long periods as a caliper gage. The measuring surfaces are too small in area to permit such use for a considerable length of time without excessive wear.

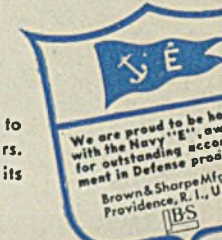
In the grinding room, **AVOID EXPOSING** your Micrometer Caliper to a flood of coolant containing grit or emery.

DO NOT CARRY your Micrometer Caliper in a pocket in which there may be dirt or grit. Keep it in its box when not in use.

KEEP the measuring surfaces apart when putting the tool away. If left together, moisture on them can cause rusting.

FOLLOW lubricating and adjusting instructions issued by the manufacturer.

The care of Micrometer Calipers is essential to the united war effort . . . be careful of yours. This is **one** way **you** can help America reach its maximum output.

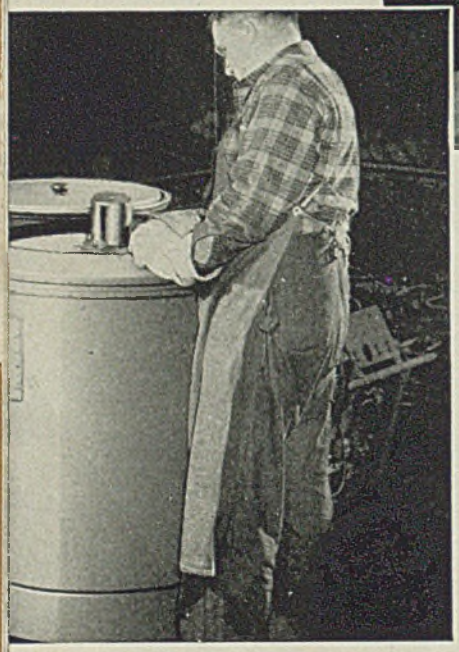


Reproductions of this advertisement for use on your bulletin board furnished on request.

BROWN & SHARPE TOOLS

NOW a faster, better way to get shrink-fit assemblies

(Above) Operator merely slips chilled plug into heated strut for a permanent shrink-fit assembly.



pfreeze Cascade Unit (−120° F.) used rinking plug for landing strut.

DATA AND PART INFORMATION

Shrink-fit assembly of steel plug in airplane landing strut.

Diameter of Plug..... 3.880″ / 3.879″

Diameter of Bore..... 3.875″ / 3.874″

Shrink of Plug.. .0026″ @ −120° F.

Expansion of Bore..... .0050″ @ +450° F.

FORMER DIFFICULTIES

Heating by torches did not impart uniform temperatures. Heating in oil bath alone did not produce sufficient expansion for assembly.

SOLUTION

The Deepfreeze Cascade −120° F. used on plug plus heating of bore results in permanent shrink-fit assembly, speeds operation.

Deepfreeze METAL CHILLING SPEEDS ASSEMBLY OF LANDING STRUTS . . . ELIMINATES "FATIGUE" STRAINS

This is another excellent example of how intense cold (−120° F.) in conjunction with normal heating (+450° F.) has increased the production and improved the manufacture of airplane landing struts.

Formerly the female part of the assembly was heated with torches. This was unsatisfactory, because the torches did not impart a uniform heat nor was the heat intense enough for sufficient expansion. In addition, it was necessary to assemble the units with an arbor press which produced scratches in the mating surfaces... *dangerous future* fatigue and breaking points.

"Production Time Cut in Half"...Completes Operation in 10 Minutes

The barrel of the DEEPFREEZE Cascade Unit is filled with a non-inflammable solvent which does not freeze at −120° F. The plug is immersed in the liquid, while the female part is subjected to an oil bath of 450° F. and expanded .005″. The plug is shrunk .0026″, making it simple for the operator to insert the plug by hand. Total time for the entire operation is approximately 10 minutes.

The Uses of Deepfreeze in YOUR Plant

Deepfreeze sub-zero temperatures (as low as −120° F.) can help you in the following metal working operations.

1—Shrinking of metal for ease of bearing assembly, etc.

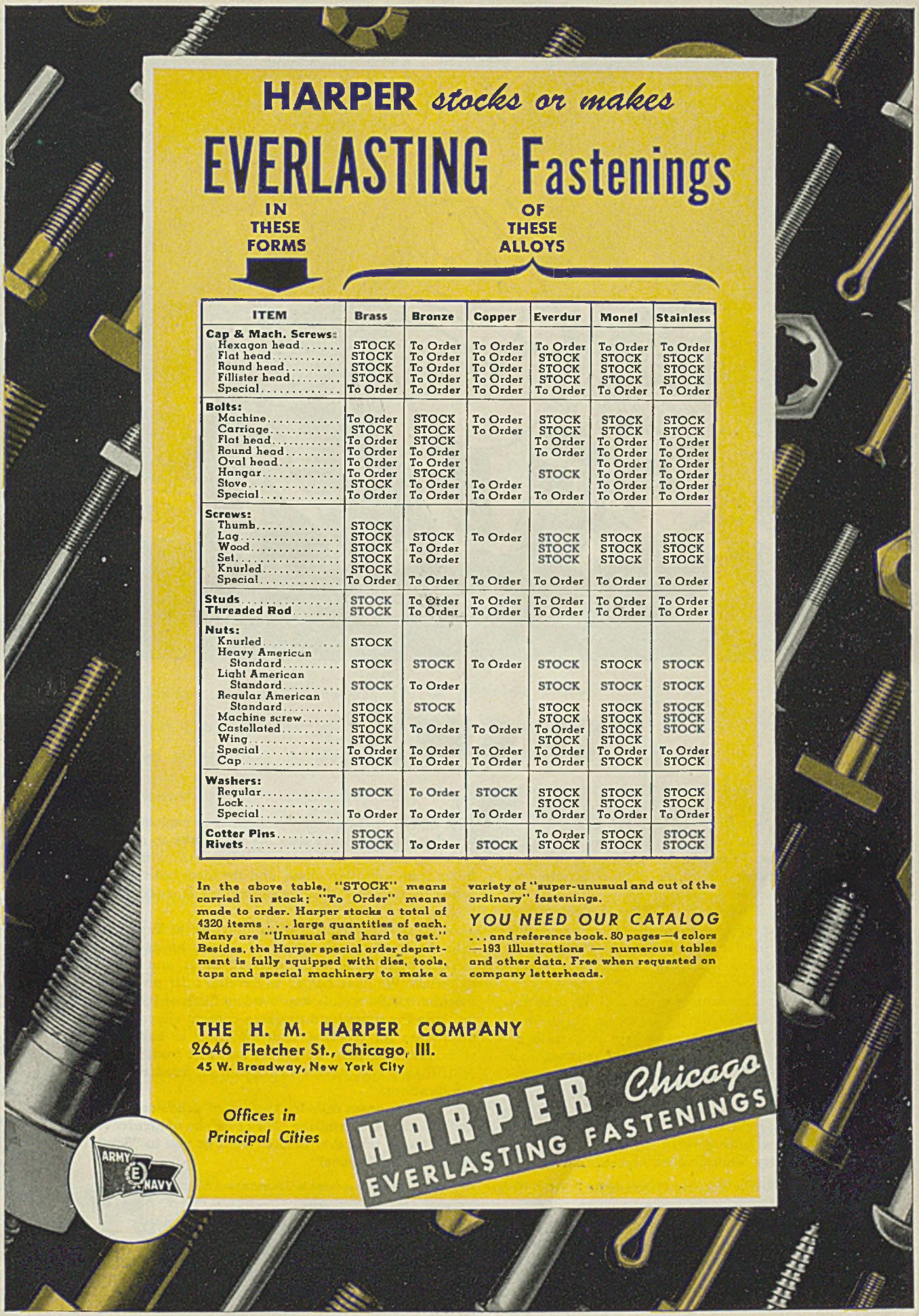
2—Testing of metals for reaction of sub-zero temperatures to aircraft instruments, etc.

3—Treating of metals for prevention of growth or warp in gauges, etc.

FREE ADDITIONAL DATA and proof of the outstanding success of the Deepfreeze method for chilling metals are included in this booklet. Write for *your* copy today.

Deepfreeze
DIVISION

MOTOR PRODUCTS CORPORATION
2309 DAVIS ST., NORTH CHICAGO, ILLINOIS



HARPER *stocks or makes*

EVERLASTING Fastenings

IN THESE FORMS

OF THESE ALLOYS

ITEM	Brass	Bronze	Copper	Everdur	Monel	Stainless
Cap & Mach. Screws:						
Hexagon head	STOCK	To Order	To Order	To Order	To Order	To Order
Flat head	STOCK	To Order	To Order	STOCK	STOCK	STOCK
Round head	STOCK	To Order	To Order	STOCK	STOCK	STOCK
Fillister head	STOCK	To Order	To Order	STOCK	STOCK	STOCK
Special	To Order	To Order	To Order	To Order	To Order	To Order
Bolts:						
Machine	To Order	STOCK	To Order	STOCK	STOCK	STOCK
Carriage	STOCK	STOCK	To Order	STOCK	STOCK	STOCK
Flat head	To Order	STOCK		To Order	To Order	To Order
Round head	To Order	To Order		To Order	To Order	To Order
Oval head	To Order	To Order			To Order	To Order
Hangar	To Order	STOCK		STOCK	To Order	To Order
Stove	STOCK	To Order	To Order		To Order	To Order
Special	To Order	To Order	To Order	To Order	To Order	To Order
Screws:						
Thumb	STOCK					
Lag	STOCK	STOCK	To Order	STOCK	STOCK	STOCK
Wood	STOCK	To Order		STOCK	STOCK	STOCK
Set	STOCK	To Order		STOCK	STOCK	STOCK
Knurled	STOCK					
Special	To Order	To Order	To Order	To Order	To Order	To Order
Studs	STOCK	To Order	To Order	To Order	To Order	To Order
Threaded Rod	STOCK	To Order	To Order	To Order	To Order	To Order
Nuts:						
Knurled	STOCK					
Heavy American Standard	STOCK	STOCK	To Order	STOCK	STOCK	STOCK
Light American Standard	STOCK	To Order		STOCK	STOCK	STOCK
Regular American Standard	STOCK	STOCK		STOCK	STOCK	STOCK
Machine screw	STOCK			STOCK	STOCK	STOCK
Castellated	STOCK	To Order	To Order	To Order	STOCK	STOCK
Wing	STOCK			STOCK	STOCK	
Special	To Order	To Order	To Order	To Order	To Order	To Order
Cap	STOCK	To Order	To Order	To Order	STOCK	STOCK
Washers:						
Regular	STOCK	To Order	STOCK	STOCK	STOCK	STOCK
Lock				STOCK	STOCK	STOCK
Special	To Order	To Order	To Order	To Order	To Order	To Order
Cotter Pins	STOCK			To Order	STOCK	STOCK
Rivets	STOCK	To Order	STOCK	STOCK	STOCK	STOCK

In the above table, "STOCK" means carried in stock; "To Order" means made to order. Harper stocks a total of 4320 items . . . large quantities of each. Many are "Unusual and hard to get." Besides, the Harper special order department is fully equipped with dies, tools, taps and special machinery to make a variety of "super-unusual and out of the ordinary" fastenings.

YOU NEED OUR CATALOG

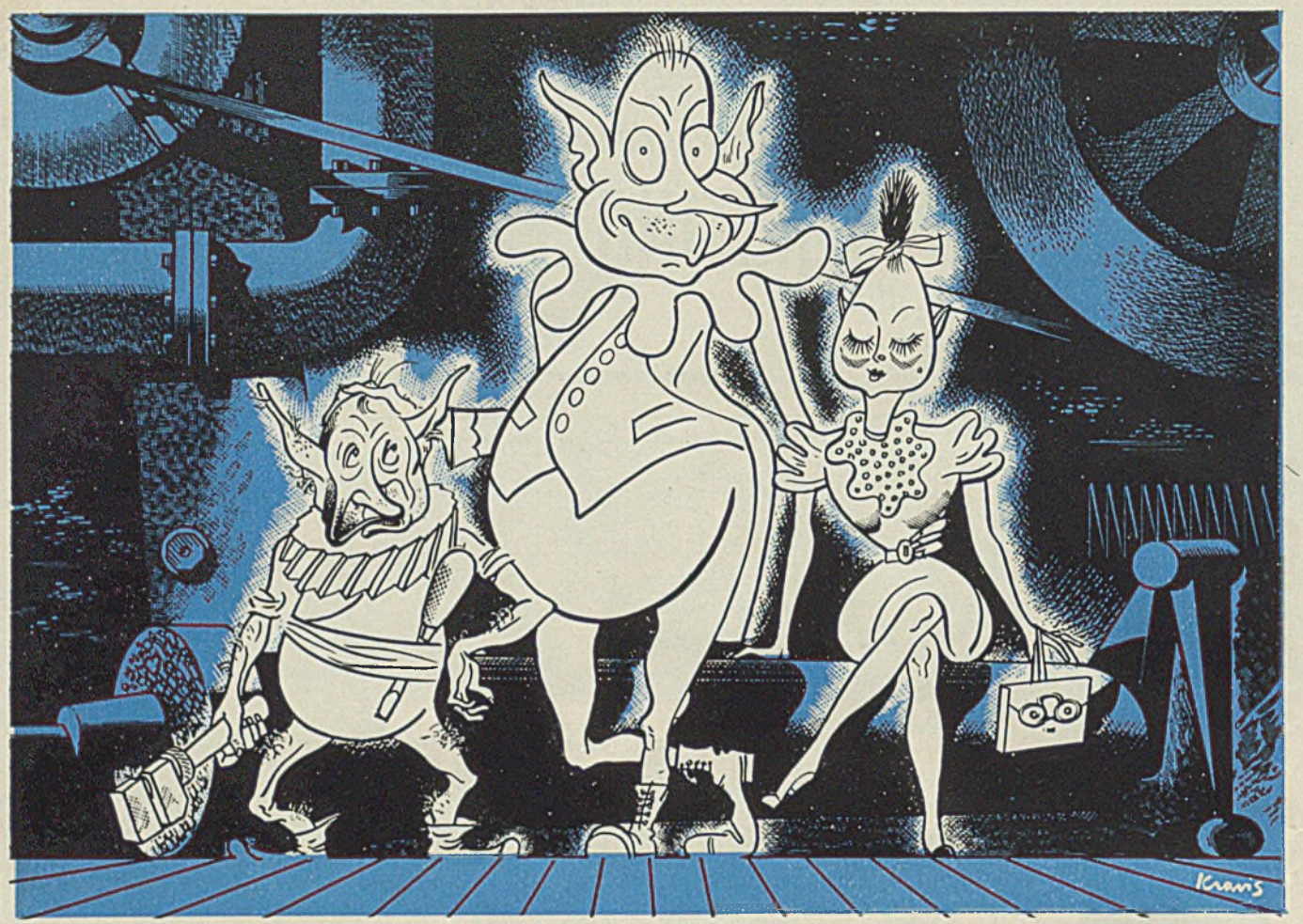
. . . and reference book. 80 pages—4 colors —193 illustrations — numerous tables and other data. Free when requested on company letterheads.

THE H. M. HARPER COMPANY
2646 Fletcher St., Chicago, Ill.
45 W. Broadway, New York City

Offices in Principal Cities

ARMY E NAVY

HARPER Chicago
EVERLASTING FASTENINGS



THEM!

You are looking at the Board of Directors of one of the busiest companies in the world. It is the firm of Gremlin, Widget & Finella, Inc.,* specialists in the new light-metal headaches — magnesium migraines, aluminum ailments and general alloy trouble.

As the Light Metal Age swings into mass production, this company finds itself with advance orders on hand for some of the biggest headaches in history, and already its record in the highly technical field of industrial interference is an impressive one.

One of the most notable achievements of G. W. & F. has been their handling of the weight factor in horsepower development. For years they have kept the ratio of pounds to horsepower high in all types of engines, and only the sheerest engineering genius has succeeded in producing one horsepower with slightly less than a pound of metal — yet 5 or even 10 horsepower may be possible with a pound of the right alloy.

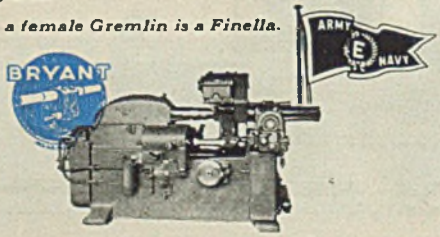
Likewise, this new subsidiary of the Headache Trust has done some pretty whimsical and spectacular things with metal, causing magnesium dust to explode, and the metal to dissolve back into sea water like so much salt. Bearings have been known to crystallize within a few hours from vibration alone, and the ideal bearing surface is one so hard that the cost of working it is still a major headache.

As specialists in internal grinding, we at Bryant have helped to cure many a new and serious headache in the working of light metals, super-hard alloys, and other new materials. We have helped to develop safer processes for machining light metals, improved methods of grinding and finishing the super-hard tungsten-content alloys, and new techniques for working such materials as hard rubber, glass, graphite, plastics, bronze and cast iron, as well as centrifugally cast steels and alloys from hundreds of new specifications.

If your business calls for the use of precision machine tools, Bryant's Consulting Service can be of greater value to you today than ever before. We urge you to "Send for the man from Bryant!"

Subsidiary of the Gremlin Headache Trust. A Widget is a young Gremlin; a female Gremlin is a Finella.

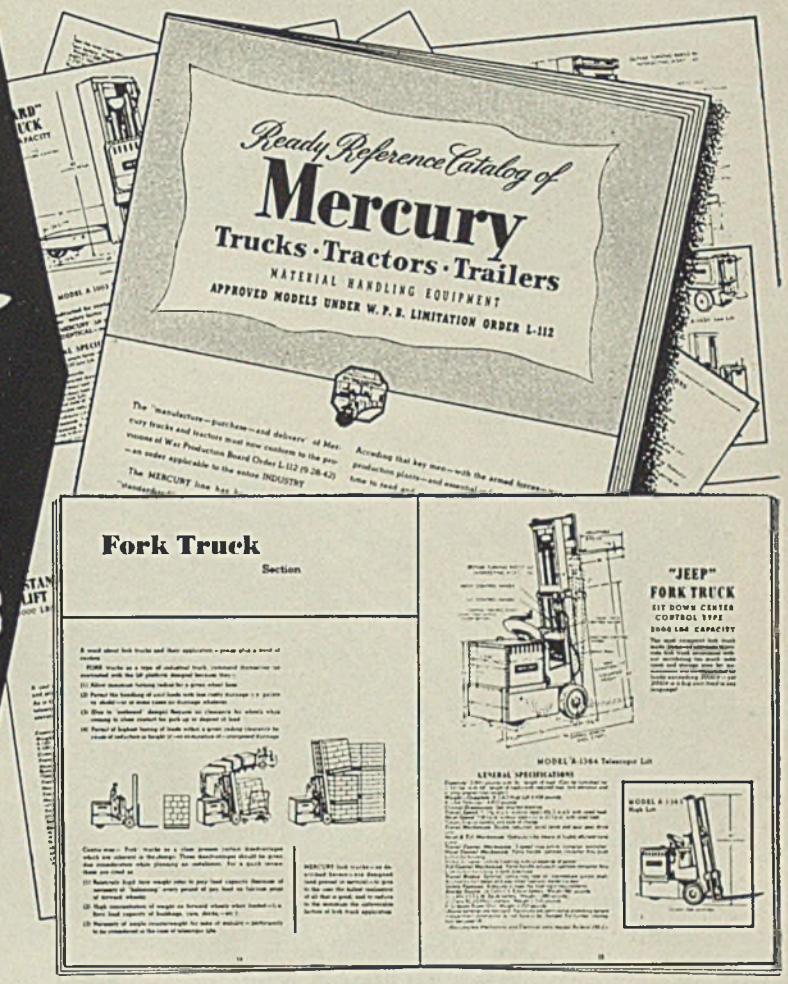
SEND FOR THE MAN FROM BRYANT



Bryant Chucking Grinder Co.

Springfield, Vermont, U. S. A.

FREE New Booklet helps solve handling problems



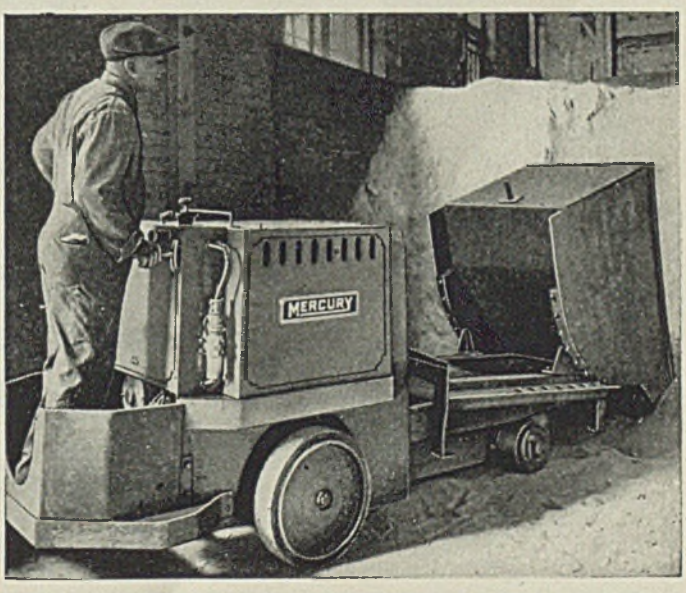
Quick Answers to important questions like these

Am I eligible for an industrial truck or tractor under W. P. B. Limitation Order L-112? How do I go about ordering? What equipment is available? When can I expect delivery? Which type of equipment will best serve my needs?

For the vitally important job of keeping materials moving in your plant, you'll find invaluable the data contained in the new Mercury Reference Catalog.

Written specifically for the busy handling executive, and based upon the combined experience of leading material handling engineers, the book quickly and specifically presents factual information on the most modern material handling methods.

Every executive concerned with materials handling will profit from a study of this booklet. Write for your free booklet today.

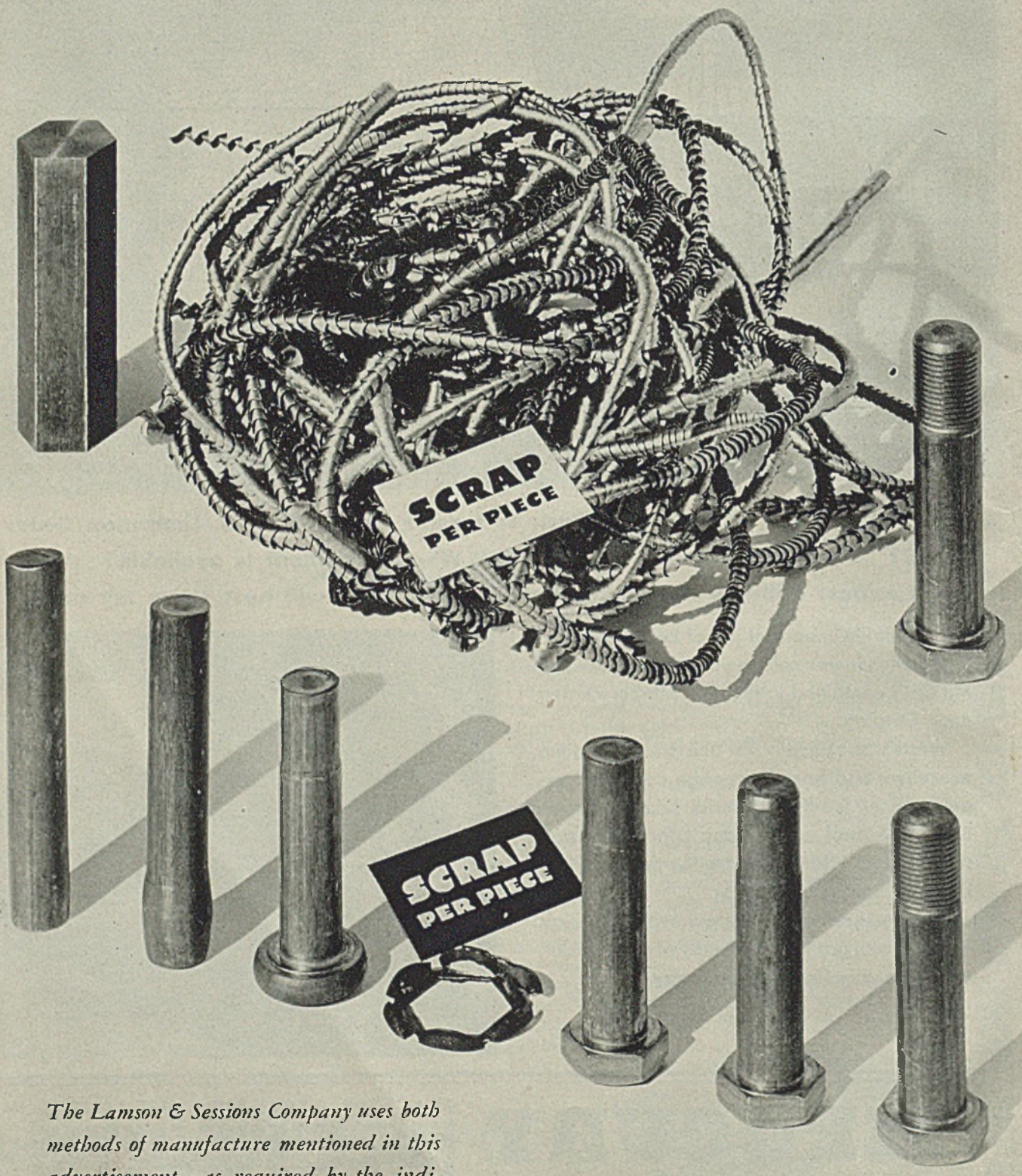


MERCURY

TRACTORS · TRAILERS · LIFT TRUCKS
MANUFACTURING COMPANY
4140 South Halsted Street, Chicago, Illinois

One Way to Save Steel

. . . AND THIS IS ONE



The Lamson & Sessions Company uses both methods of manufacture mentioned in this advertisement—as required by the individual specifications of the customer.

is to produce less scrap

WAY YOU CAN DO IT

This is an actual, practical, everyday example of how cold forging (upsetting) conserves raw materials and reduces scrap.

We realize that the difference in scrap produced in just this one common bolt product shows up in a startling way to you. However, you can be sure that this is not "trick" photography or in any sense a fake or exaggeration, for here are the facts relating to this photograph. The example shown at left is a ¾ x 6" S. A. E. hexagon head cap screw.

Weight of Finished Bolt per 1000 pieces, 849 lbs.	Milled from the Bar	Made by Cold Forging
Raw Material Required	1639 lbs.	880 lbs.
Total Scrap Loss	759 lbs.	31 lbs.
Amount of raw material saved per 1000 pieces by upsetting method		728 lbs.

In short, excepting for the bit of metal trimmed off the head of the cap screw made by the upsetting method, *there is no scrap produced.* Since the weight of 1000 pieces of these head trimmings is only *31 lbs.,* the scrap loss that is measurable in production is less than *.031 lbs.* per bolt!

And obviously, the scrap loss in producing this same bolt by milling from the bar is 0.759 lb. per piece, *or about 25 times as much!*

That is why we can say that if a part that is made on a screw machine can be produced by the upsetting method you will save raw materials. Since heading and threading today is done to very close tolerances and with a minimum of scrap, it is extremely important to remember this when every pound of steel is "ear-marked" for a purpose—*to win the war.*

But that is not the only reason why, in war production, you should consider upsetting as a method opposed to a milled-from-the-bar product. Here are two more excellent reasons.

1. If a part now made on a screw machine can be made by upsetting, you can release a machine tool badly needed to make another part which can only be made by a screw machine!
2. Upsetting and threading a part, compared with producing the same part on a screw machine, is generally many times faster, and in every way as satisfactory or more satisfactory as the milled product.

There are still other good reasons why upsetting may solve a problem for you—and of course the relative importance of each reason we present will vary with your position in war production.

3. You can specify upset products with a reasonable expectation of getting better deliveries, without sacrificing standards of accuracy, strength or finish. (Please refer to the photograph. Upsetting uses *round* wire for the part, which is more readily available, and less expensive, than *cold hexagon drawn* bar stock used by the milling process.)
4. Accuracy and finish? The aviation industry is now using products made by the upsetting method, which meet every laboratory test and the most exacting inspections.
5. Lamson & Sessions make cap screws with a minimum tensile strength of 150,000 lbs. psi in diameters up to and including ½-inch; up to 125,000 lbs. psi in diameters over that! *A smaller bolt made by modern bolt practise will often* PROVIDE ALL THE STRENGTH YOU WANT but will require much less material—and the saving of material thus gained can be put to other war production purposes.

Engineering departments less familiar than Lamson & Sessions' engineers with these facts given you, can confidently come to *bolt specialists* for help—for our experts in bolt production are able and willing to give you correct information on your problems, and without obligation.

THE LAMSON & SESSIONS COMPANY, 1971 W. 85th St., Cleveland, O.

These four books will help you in specifying and buying "standard" bolts, nuts and "specials"

THE LAMSON BLUE BOOK—is our complete Catalog of standard products excepting our Aircraft products.

"BOLTS, NUTS & SCREWS"—70 pages of technical and practical information. First copy gratis, requested on your letterhead. Additional copies $1 each.

"BOLT, NUT & RIVET STANDARDS"—175-page book published by the American Bolt, Nut & Rivet Manufacturers Association, 1550 Hanna Bldg., Cleveland, Ohio. Price one dollar per copy. *(Order from publisher, please.)*

"SIMPLIFIED STOCK LIST"—Of bolts, nuts and screws, conforming to latest revisions of the Office of Price Administration, and of great value in showing you in what ratio quantities of various standard products are kept in stock for deliveries, by your jobbers and in our own (and other bolt manufacturers') warehouse stocks.

LAMSON & SESSIONS

BOLTS · · NUTS · · COTTERS · · CAP SCREWS · · SPECIALS

Your Jobber Stocks the Lamson Line

This CONSERVATION PLAN

will help YOU *save man-hours . . . save materials . . . speed production*

Wartime Conservation means MORE than just conserving copper, steel, aluminum . . . it means the most strategic possible use of all of the ingredients of Victory—materials, manpower, time and ingenuity.

These five major points comprise a complete program developed by Westinghouse for Wartime Conservation. This program packages up Westinghouse engineering experience in the entire field of electric and power equipment and related materials. Examples noted are but five of many specific recommendations.

This experience and these recommendations are offered fully and without obligation. If you are not already familiar with them, consult your Westinghouse representative or send for the book described below. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. J-90478

★

"WARTIME CONSERVATION," *a new 100-page book issued by Westinghouse, contains complete recommendations covering the points suggested here. It will be sent you without cost, on request.*

Westinghouse

PLANTS IN 25 CITIES... OFFICES EVERYWHERE

1. Conserve by strategic selection, application and use of electrical equipment.

EXAMPLE

Various accessories will produce large increases in capacities of existing equipment, with a small use of critical materials. For instance, either air-cooling or oil-circulating equipment can increase transformer capacities up to 30%. Use of both can add as much as 60%.

2. Conserve by utilizing new developments that reduce need for critical materials and man-hours.

EXAMPLE

Hipersil*—a new electrical steel—increases the flux-carrying capacity of transformer and similar cores, large and small, up to 35%. Weight and amount of critical materials can be reduced as much as 50%.

3. Conserve by utilizing available facilities for preventing breakdowns and reducing machine outages.

EXAMPLE

"Maintenance Hints" — a complete, pocket-size manual covering recommended upkeep practice for electrical apparatus——is a maintenance help available without charge. Check your Westinghouse representative for copies.

4. Conserve by utilizing materials which in many cases can replace critical materials and do a better job.

EXAMPLE

Prestite—a new pressure-molded porcelain which can be solder-sealed to metal—is replacing bushing assemblies requiring rubber or gaskets to keep out moisture, in many types of electrical apparatus.

5. Conserve by tapping all sources of salvageable scrap.

EXAMPLE

Systematic planning can uncover many ways of reclaiming worn equipment and waste material. Samples of salvage forms and organization charts in use in Westinghouse plants will gladly be made available on request.

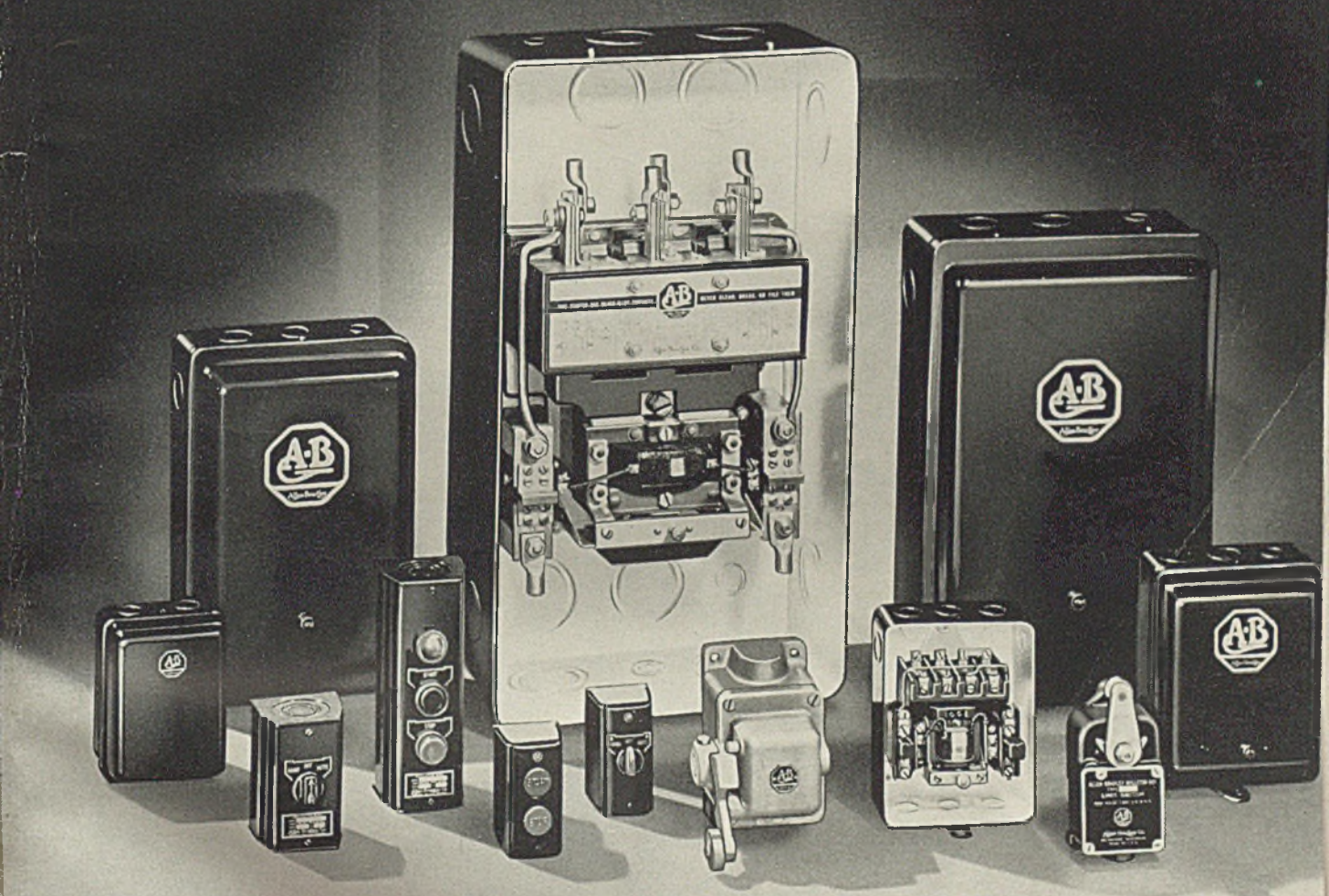
*Registered trademark, Westinghouse Electric & Mfg. Co., for HIgh PERmeability SILicon steel.

NO CONTACT MAINTENANCE • NO WASTED CONTACT MATERIAL
NO BEARINGS • NO PINS • NO PIVOTS • NO HINGES
NO COPPER CONTACTS • NO FLEXIBLE JUMPERS

Just one word

SIMPLICITY

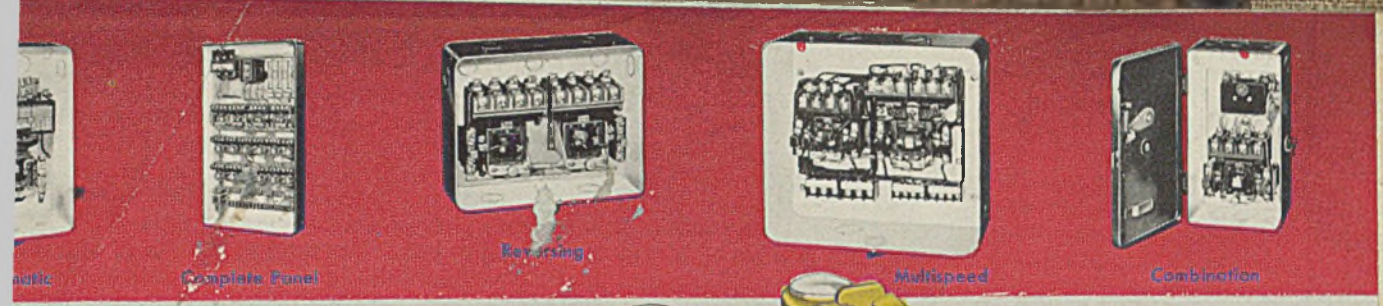
accounts for the overwhelming popularity of Allen-Bradley Solenoid Starters . . .

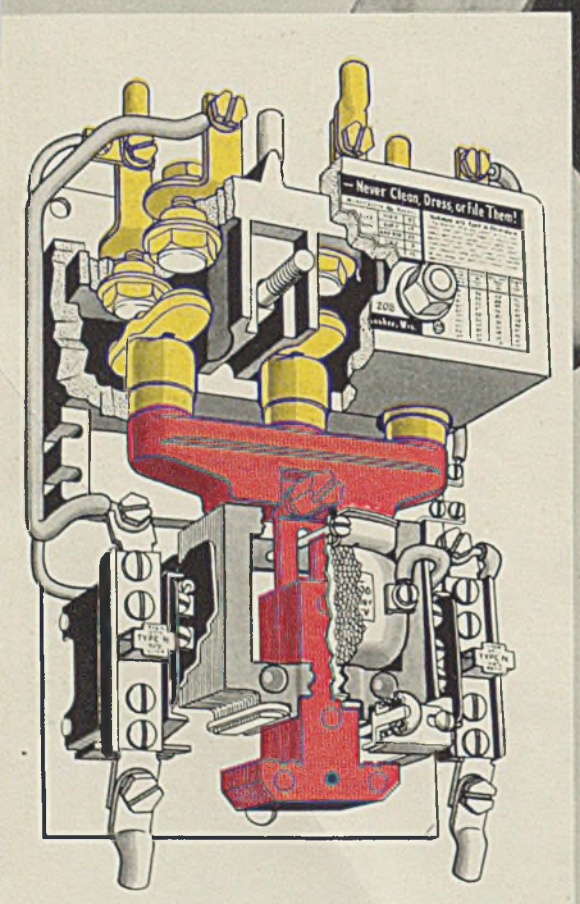


STARTERS • PUSH BUTTON STATIONS • LIMIT SWITCHES • RELAYS • CONTACTORS

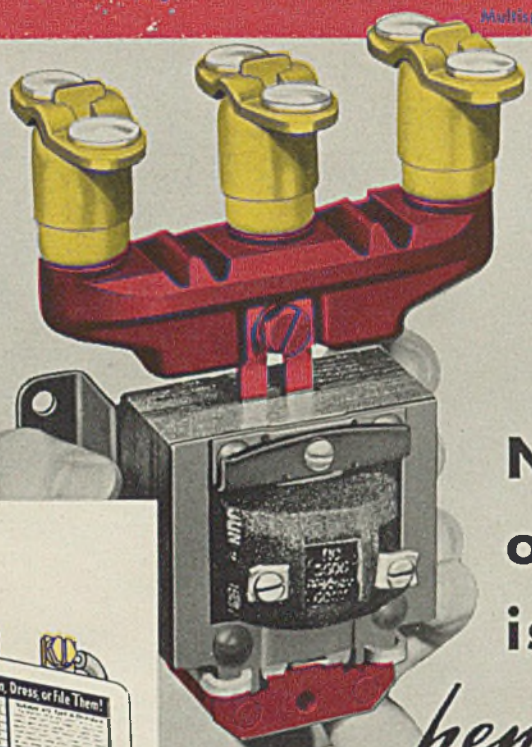
ALLEN-BRADLEY
SOLENOID MOTOR CONTROL

QUALITY





The only moving part . . . the vertical solenoid plunger . . . is shown in red. Arc hood is broken away to reveal contacts.



No other starter is so simple

hence, so TROUBLE FREE

Allen-Bradley Solenoid Starters are surprisingly simple in design. They have only one moving part . . . the plunger that opens and closes the double break contacts with a straight line vertical motion.

This simple construction does away with pivots, pins, bearings, hinges, flexible jumpers, and other trouble-breeders that can gum up, corrode, or stick.

To be completely trouble-free, a starter must not only be simple . . . it must have double break contacts that can operate indefinitely without maintenance. A-B patented silver alloy contacts never need filing, dressing, or cleaning. You can install A-B Solenoid Starters . . . and forget them. They are good for millions of trouble-free operations. These features explain why A-B starters are so popular in machine tool and industrial applications.

Allen-Bradley Company, 1320 S. Second St., Milwaukee, Wis.

A-B Quality

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL

HIGH PRODUCTION THAT SPEEDS WINNING

PRECISION is the "secret weapon" that flies "into the blue horizon" with the fighting lads who man American-made planes.

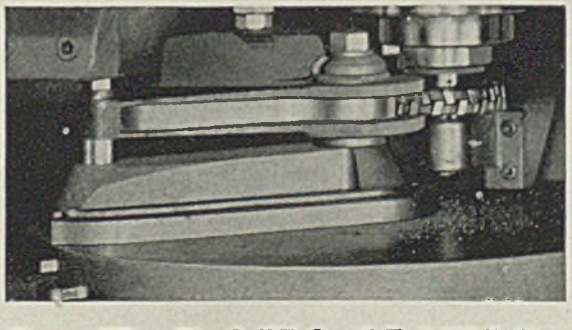
In America's aircraft plants and other metal-working industries, high speed automatic machinery specially designed and built by Davis & Thompson, has advanced new standards of precision and speed . . . higher precision parts, in greater numbers, are being made faster than ever before in history.

Fortified by many years of pre-war experience, Davis & Thompson engineers are boosting production by creating multiple-spindle boring, drilling, milling machines and other high speed precision units . . . rugged, compact, hydraulically operated, fully automatic machines to meet specific requirements.

Write for copy of the book,
"VICTORY PRODUCTION"

DAVIS & THOMPSON COMPANY
Milwaukee, Wisconsin, U. S. A.

BUY MORE U. S. WAR BONDS!



The machine shown here, for instance, automatically completes approximately 20 steps in the process of rough and finish-milling on aircraft engine connecting rods, on a single setup, with unvarying precision and speed that cuts production time down to a fraction of former methods. This uniform accuracy simplifies final inspection, precludes rejections, saves vital metal and manpower. The operator merely touches the proper control buttons on this hydraulically operated machine and ultra-automatic devices activate the complete operating cycle.

D&T ROTO-MATIC HIGH PRODUCTION MACHINERY

meet the WASHBURN WIRE FAMILY

Flat Cold Rolled Strip 6" and Narrower, Bright, Galvanized, Tinned and Cadmium Finish

Flat Tempered and Untempered Wires in .50 to 1.25 Carbon Range

Round Untempered Low and High Carbon Spring Wires

FAMOUS FOR HALF A CENTURY

WASHBURN WIRE COMPANY, NEW YORK CITY

WASHBURN

CLEAN, UNIFORM BILLETS – STRIP – RECTANGULAR, ROUND, FLAT RODS
TEMPERED AND UNTEMPERED FLAT AND ROUND HIGH CARBON WIRES

HERE'S PROOF OF THE SUPERIOR PERFORMANCE OF

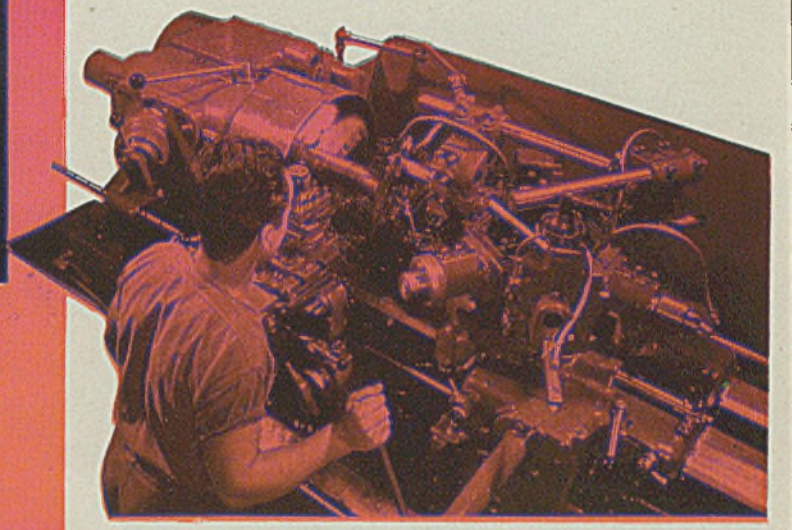
Gulf Cutting Oils

A FEW OF THE HUNDREDS OF SIMILAR CASES IN GULF'S FILES

Tank Tread Pins . . . A manufacturer of tank tread pins increased production per tool dressing from 85 pieces to 600 pieces by using Gulf Lasupar Cutting Oil C.

★

Artillery Recoil Cylinders . . . By using Gulf L. S. Cutting Base A, a large ordnance plant increased production 30% and increased tool life 300% in machining operations on hardened nickel chrome steel forgings for artillery recoil cylinders.



Gun Barrels . . . Consulted by a large ordnance plant on the possibility of obtaining greater production in the reaming of cartridge chambers in 1.1 gun barrels, a Gulf Lubrication Service Engineer recommended Gulf Electro Cutting Oil A. Result: production of reamed barrels increased 1500%—rejections reduced 50%.

★

37 Mm. Shot . . . A manufacture of 37 mm. shot increased production 30%, reduced tool regrinds and down time for machine maintenance 50%, reduced cutting oil consumption 50%, and obtained better finishes on the work through the use of Gulf L. S. Cutting Base B blended with Gulf Cut-Aid.

★

Torpedo Gears . . . By using the cutting oil recommended by a Gulf Lubrication Service Engineer, a manufacturer of torpedo parts increased output 41%, improved finish, and reduced rejects in cutting Monel metal gear blanks.

★

Bomb Striker Nuts . . . Consulted by a manufacturer of steel striker nuts for bombs on the problem of 100% rejection of production due to torn threads in a tapping operation, a Gulf Lubrication Service Engineer recommended Gulf Lasupar Cutting Oil A and a suitable level on the end of the tap. Result: rejections entirely eliminated, production greatly increased.

★

As a result of proven performance, over a thousand plants with difficult machining operations have adopted Gulf Cutting Oils during the past six months. Here's the record of improved machining practice in these plants: Production increased as much as 300%, tool life increased as much as 2000%, and marked improvements in finish. Write or 'phone your nearest Gulf office today for effective help on *your* machining problems.

GULF OIL CORPORATION · GULF REFINING COMPANY
Gulf Building, Pittsburgh, Pa.

GULF INDUSTRIAL LUBRICATION

S

Gulf Oil Corporation · Gulf Refining Company
3800 Gulf Building, Pittsburgh, Pa.

Please send me, without obligation, a copy of the new booklet, "Gulf Cutting Oils," which includes a 24-page Machining Guide.

Name.....

Company.....

Title.....

Address.....

FIVE HEADS are better than one!

AHEAD WITH ME because I need a machine that has a great range of *conditioning applications* for varying types and conditions of work. I can get the number of work cycles needed per unit simply by varying the roll angle!

AHEAD WITH ME because I need flexibility and quick adjustment. Through-put speed variation of 50 to 1,000 R. P. M. by changing the roll angularity and by varying the gear arrangement built right into the machine!

AHEAD WITH ME because I need a machine that takes up a minimum of floor space . . . and Medart 2 & 2 Universal takes less floor space than any other machine of equal capacity!

AHEAD WITH ME because I need simplified operation! A machine with a minimum of working parts and a minimum of maintenance. No universal joints, no bevel gears . . . no separate gear reduction unit!

AHEAD WITH ME because I need a machine that can be used on scaled or rusty work pieces. All driving mechanisms on the Medart 2 & 2 Universal are completely enclosed for protection against dirt. A coolant or circulating fluid may therefore be used on the workpiece with absolute safety.

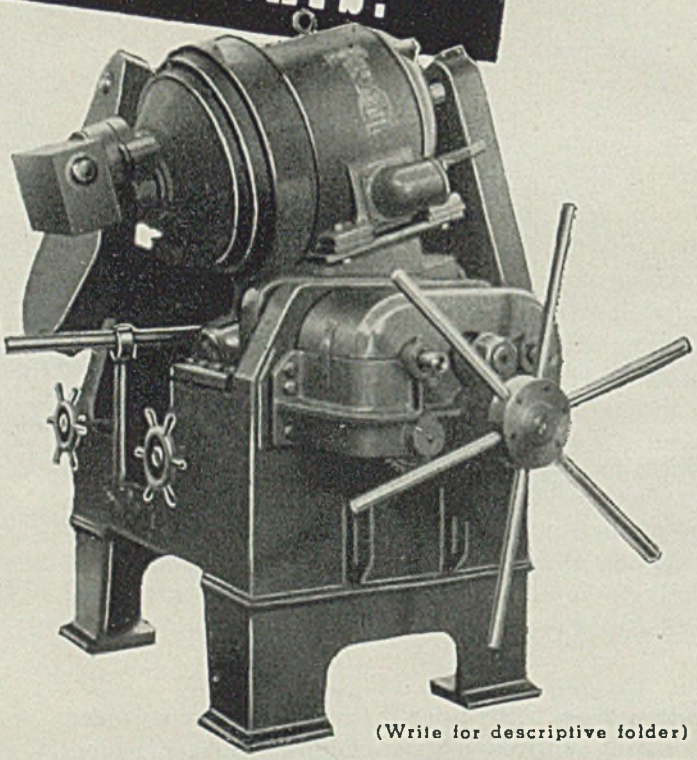
AHEAD IN FIVE WAYS!

the new MEDART 2 & 2 UNIVERSAL { 2 ROLLS AND 2 MOTORS

bar and tube straightening . . . sizing . . . polishing machines

For high speed, precision production . . . Medart's new 2 & 2 Universal gets the call among bar and tube machines. Similar in operating principle to the Standard Medart 2 Roll Machine, has same patented concave and straight roll arrangement. Difference is, each roll *with its individual driving motor and reduction gearing* is an integral unit. Work piece ranges 1/16 inch to 6 inches in diameter capacities.

Only Medart presents a complete, proven line of all-purpose bar and tube machines



(Write for descriptive folder)

Manufacturing Engineers of Complete Transmission Equipment and Specialized Machinery

MEDART

THE MEDART COMPANY
3500 DE KALB ST., ST. LOUIS, MO.

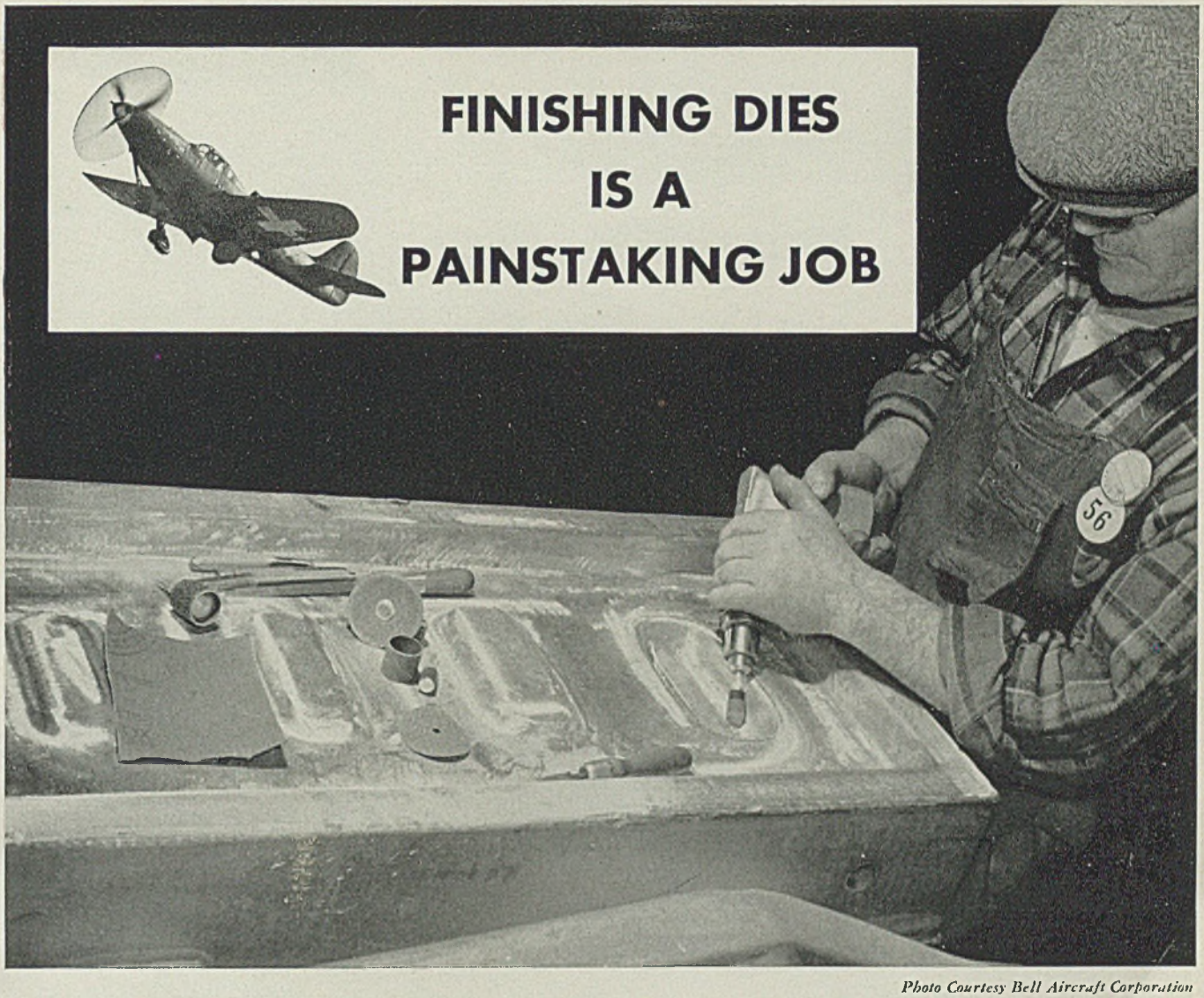


Photo Courtesy Bell Aircraft Corporation

THIS airplane worker is finishing up a die for a fuselage part for Bell Airacobra P-39 pursuit planes. It's just another instance of how Bell Aircraft is speeding production with the help of improved finishing operations.

Finishing the die is a painstaking job calling for specialized skill. The rough casting must be scraped and then sanded and finished with coated abrasives to give the required fidelity to the specified contours and to produce the smooth surfaces necessary for perfect stamping operations.

This process is speeded by using Aloxite Brand Aluminum Oxide Coated Abrasives in various forms specially adapted to the different contours encountered. Abrasive discs, No Lap bands and cloth sheets are used as the particular operation requires. Net result to Bell: speed-up of the die preparation process and saving of precious man-hours for tooling operations.

The Carborundum Company has been a leader in developing a number of new forms of coated abrasives to meet the requirements necessitated by war production. A number of these items are described in our pamphlet "Weapons for Production." Send for your copy.

CARBORUNDUM
ABRASIVE PRODUCTS

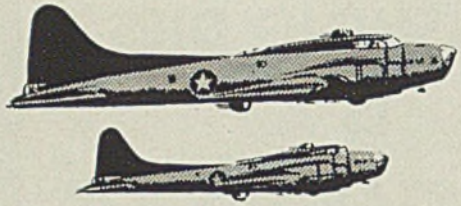
THE CARBORUNDUM COMPANY, NIAGARA FALLS, N. Y.

REG. U. S. PAT. OFF.

MANUFACTURERS OF GRINDING WHEELS, COATED ABRASIVES, SUPER REFRACTORIES, HEATING ELEMENTS

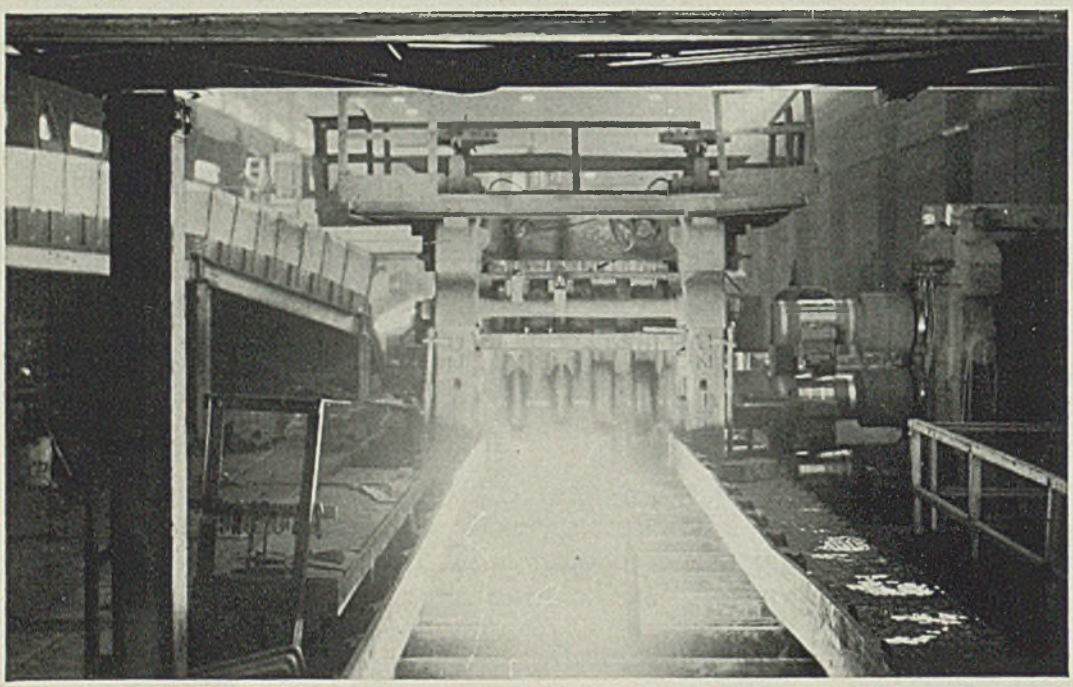
Sales Offices and Warehouses in New York, Chicago, Philadelphia, Detroit, Cleveland, Boston, Pittsburgh, Cincinnati, Grand Rapids

(Carborundum and Aloxite are registered trade-marks of and indicate manufacture by The Carborundum Company)



To our Armed Forces

Weirton dedicates its "DOUBLE CONTROL" of quality



To meet exacting standards for fighting equipment, "Double Control" of Quality here at Weirton starts at the very first step in steel-making—with the iron ore. The combination of control by men and machines guards each step in the steel-making process—that's Weirton's "Double Control" of Quality.

Not ordinary men—not ordinary machines. The men who man the machines are highly skilled in the art and science of making better steel. Machines are the very latest—the most modern—developed by and for the steel industry.

Better steel for tanks, guns, cannons, ships, planes and all the many other items needed by our Armed Forces is assured by Weirton's "Double Control" of Quality. Steel from Weirton is going to our Navy, our Army and our Maritime Commission . . . for Victory.

WEIRTON STEEL COMPANY

Weirton, West Virginia

Sales Offices in Principal Cities

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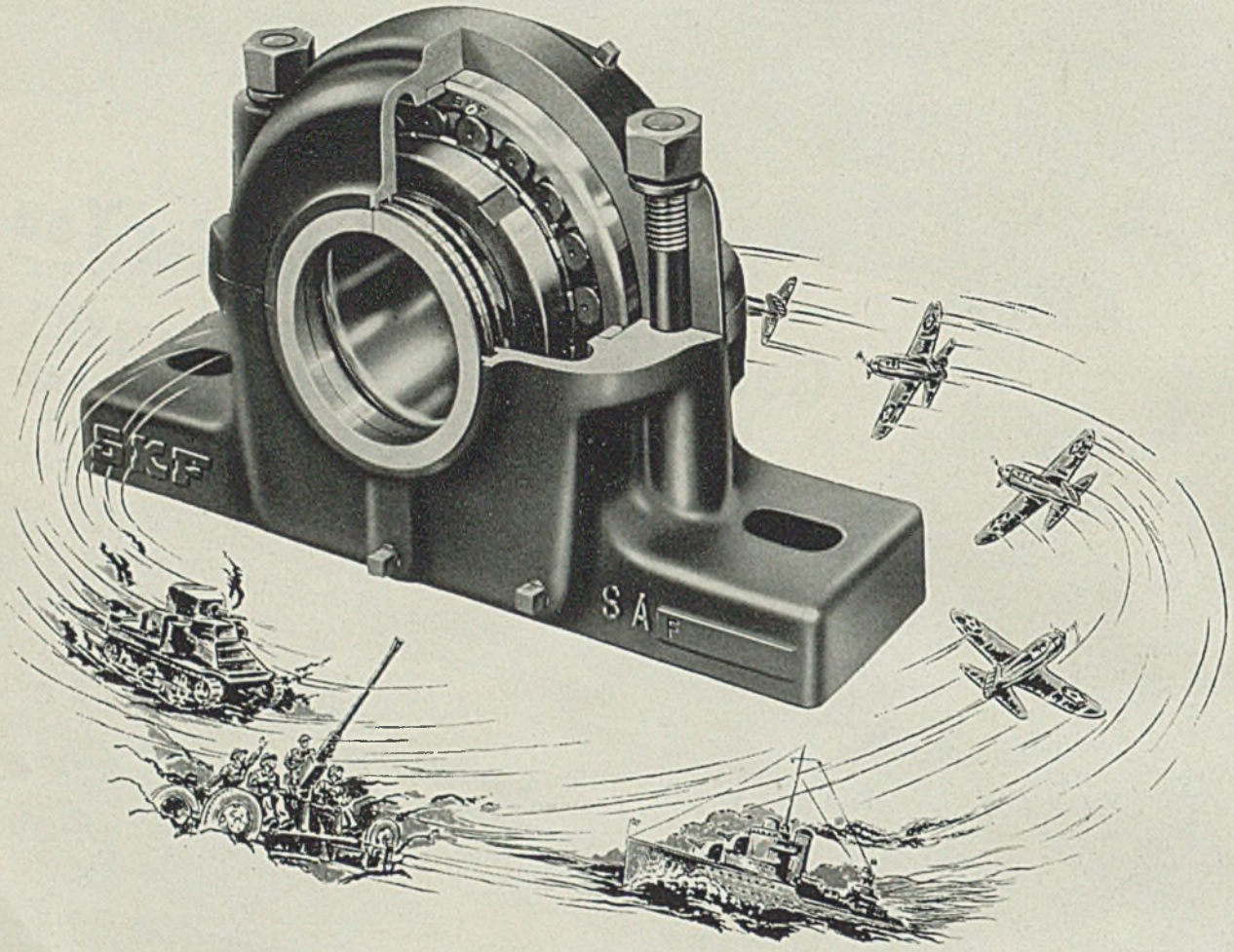
NATIONAL STEEL CORPORATION

Executive Offices · Pittsburgh, Pa.


Get this G-2* Working For You
. . . A COMPLETE INTELLIGENCE SERVICE* OF VEEDER-ROOT COUNTING DEVICES
Assign a Veeder-Root Counter to every one of your vital war-production machines, and get a powerful new aid in protecting your work-schedules against the subversive effects of delays, mechanical slowdowns, short-ages, over-runs, wasted material, and all the other penalties caused by lack of accurate Control by Count. There are Veeder-Root Counters, mechanically and electrically operated, that will give you up-to-the-minute information on the performance of any machine or process, in any terms or units. And these devices are easy to install, without interrupting production. Find out whether Veeder-Root can help to make your work count for more — toward V-Day.
7 7 2 0 4
7 7 2 0 4
VEEDER-ROOT Inc
Hartford, Connecticut

MORE POWER FOR *America*



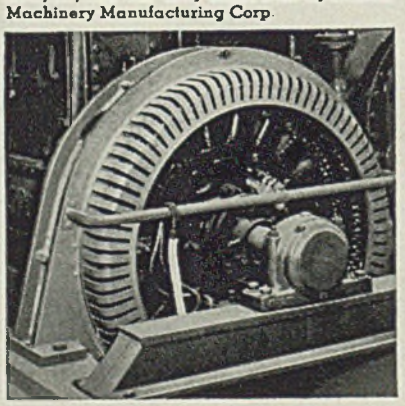
All the mighty power that America wields with guns, tanks, planes, and battleships comes from millions of tiny sources. Sources of day-and-night working machines . . . of smoothly rolling shafts . . . of carefree bearings in rugged SKF Pillow Blocks that guard them by retaining lubricant and stopping the entrance of injurious material. Easy installation, inspection, and lubrication are certain with these well-designed pillow blocks. And their exclusive SKF Triple Seals block all efforts of dirt and water to reach bearings on shafts 5/8" in diameter and up. Their presence on a machine or a lineshaft is a move toward Victory. 5261

SKF INDUSTRIES, INC., PHILADELPHIA, PA.

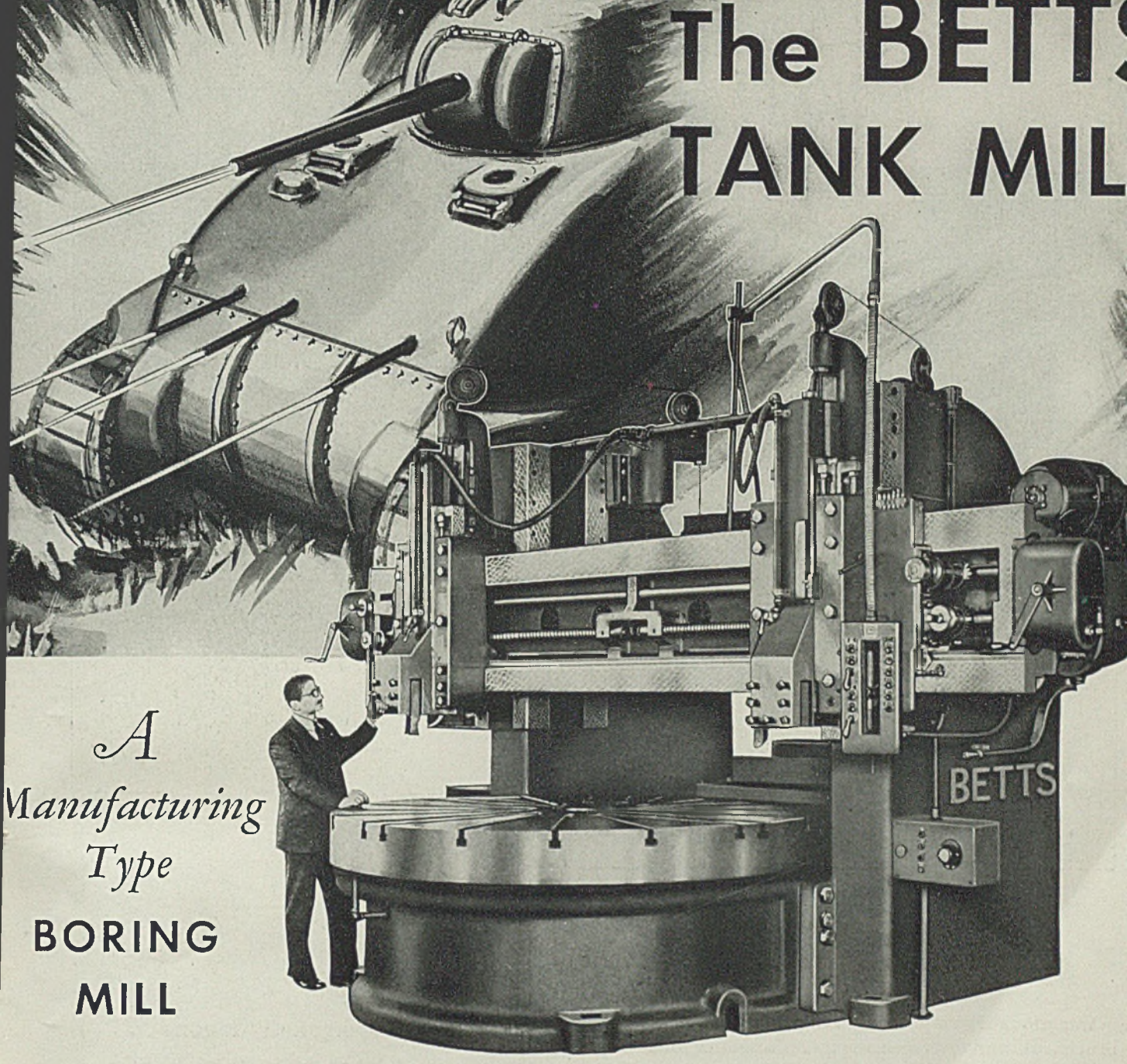
SKF

PILLOW BLOCKS

● SKF Pillow Block helping to build America's power on a 125 h.p., 360 r.p.m., 3-phase, 60-cycle, 208 volt unity motor built by Electric Machinery Manufacturing Corp.



The BETTS TANK MIL



A Manufacturing Type

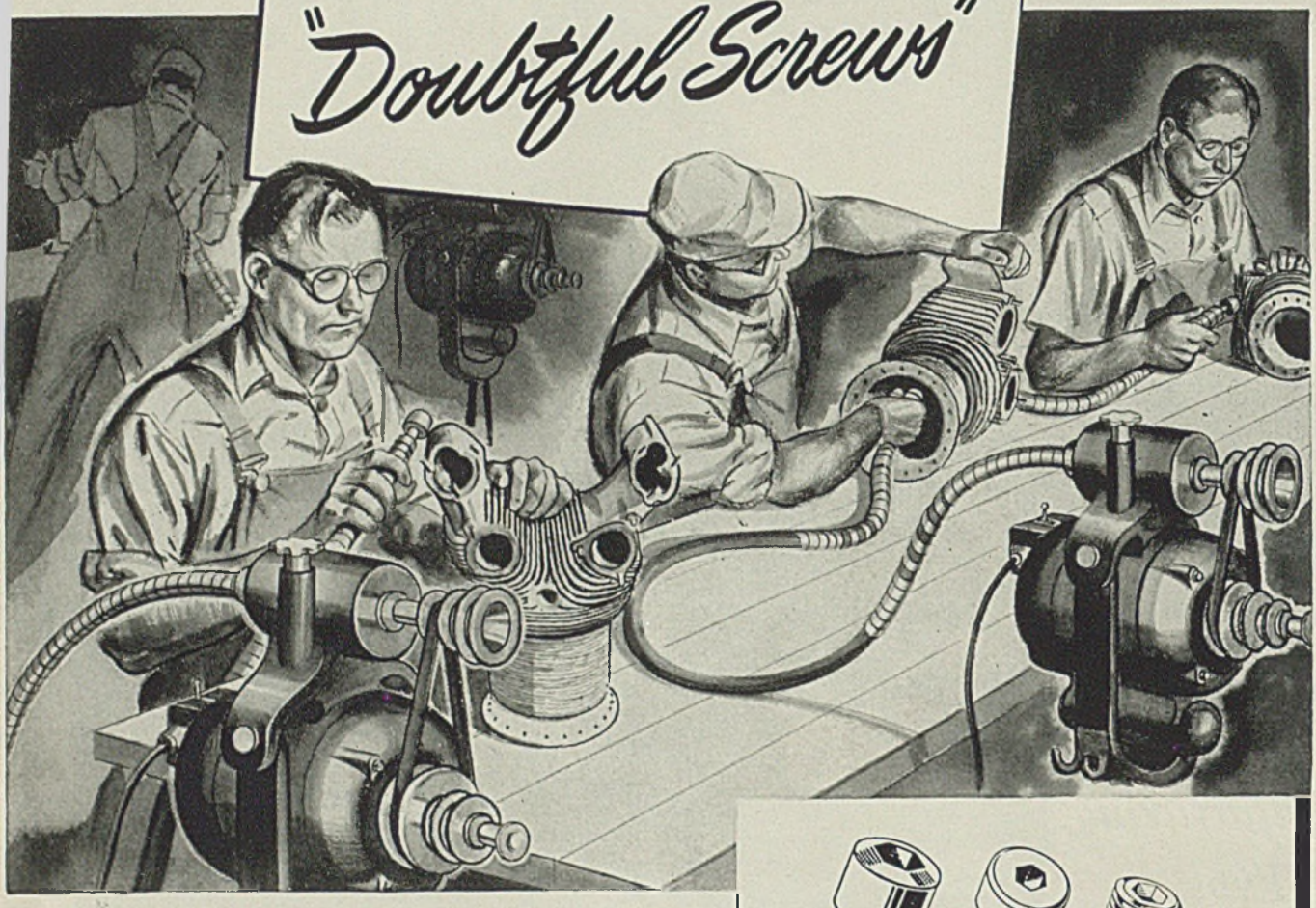
BORING MILL

The machine shown above is known as a 100" Tank Mill. It is so named because it was planned for the mass production of parts for tanks. In designing this machine there were two principal factors involved, first—a construction which would permit building the machines on a quantity basis, thus permitting quick deliveries; and second—a construction insuring the utmost in productiveness of parts for tanks.

BETTS • BETTS-BRIDGEFORD • NEWTON • COLBURN • HILLES & JONES • MODERN

CONSOLIDATED
MACHINE TOOL CORPORATION
ROCHESTER, NEW YORK

NO PLACE FOR "Doubtful Screws"

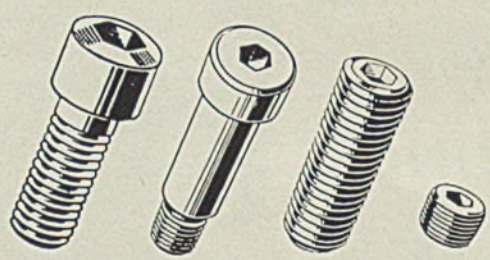


—In Power Tools that Must Do Double-Shift Duty!

War production schedules have proved that motor-driven bench and hand tools deserve something better than the pre-war classification of "light duty tools". Countless grinders, drills and other tools operate on a double-shift, often substituting for heavy machines. And, they don't "give up" under the unexpected strains.

The reason lies in the policy of the builders to make "hundred-dollar" tools as though they were "thousand-dollar" machines. Every integral part must satisfy rigid standards . . . doubtful materials will not be trusted.

That policy has put Parker-Kalon Quality-Controlled Socket Screws on the "preferred list" of a good share of the power tool builders, and the makers of the motors that drive them. For P-K Socket Screws are made to the same uncompromising standard. "Doubtful screws" . . . screws that *look* all right but some of which fail to *work* right . . . are barred by the unequalled quality-control routine of the Parker-Kalon Laboratory. P-K Screws have the extra dependability to stand unexpected strains . . . yet they cost no more. Parker-Kalon Corporation, 194-200 Varick St., New York.



"Quality-Controlled" means . . .

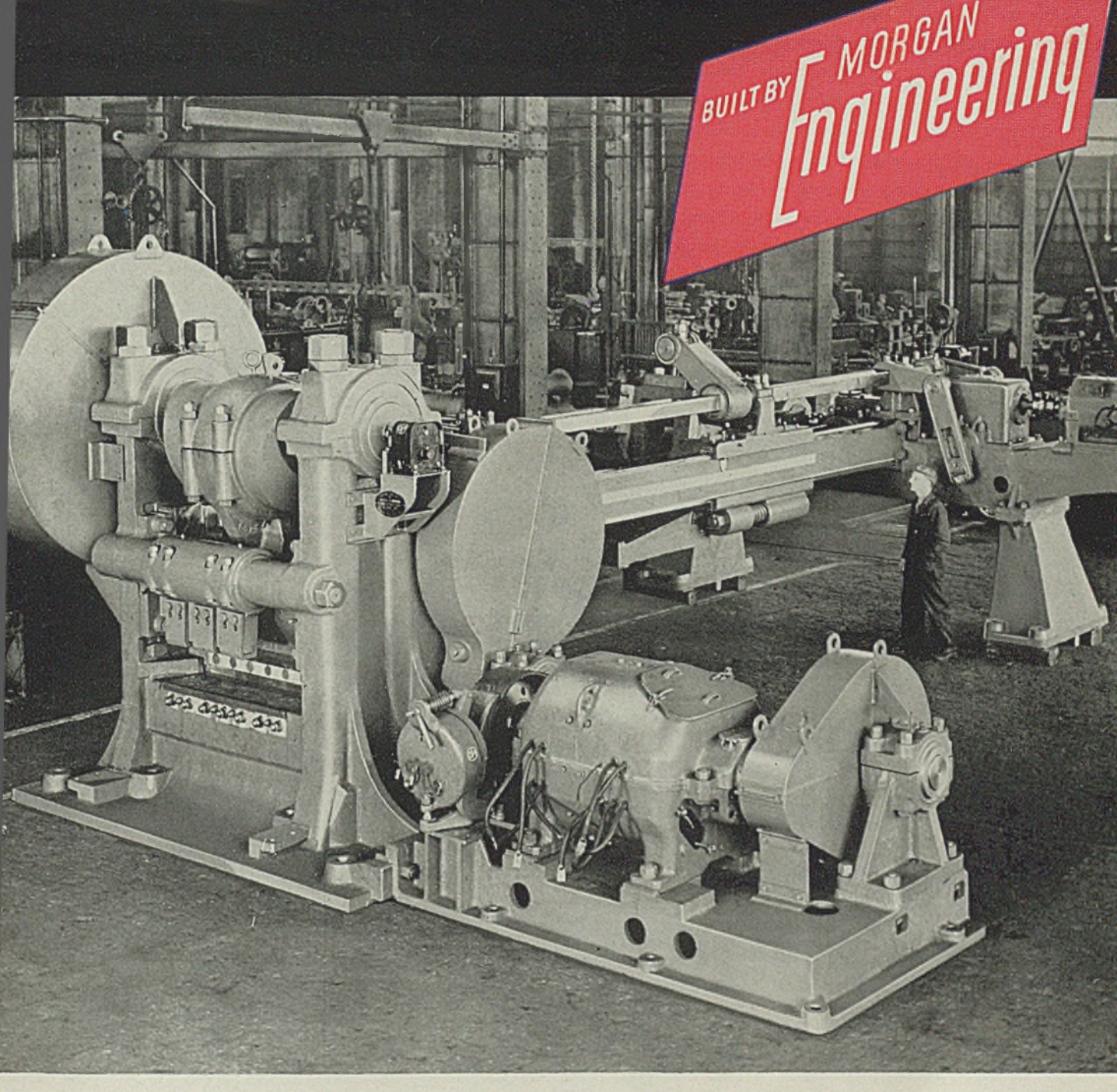
Complete test and inspection covering; Chemical Analysis; Tensile and Torsional Strength; Ductility; Shock Resistance under Tension and Shear; Hardness; Head diameter, height and concentricity; Socket shape, size, depth and centricality; and Thread fit.

PARKER-KALON

Quality-Controlled

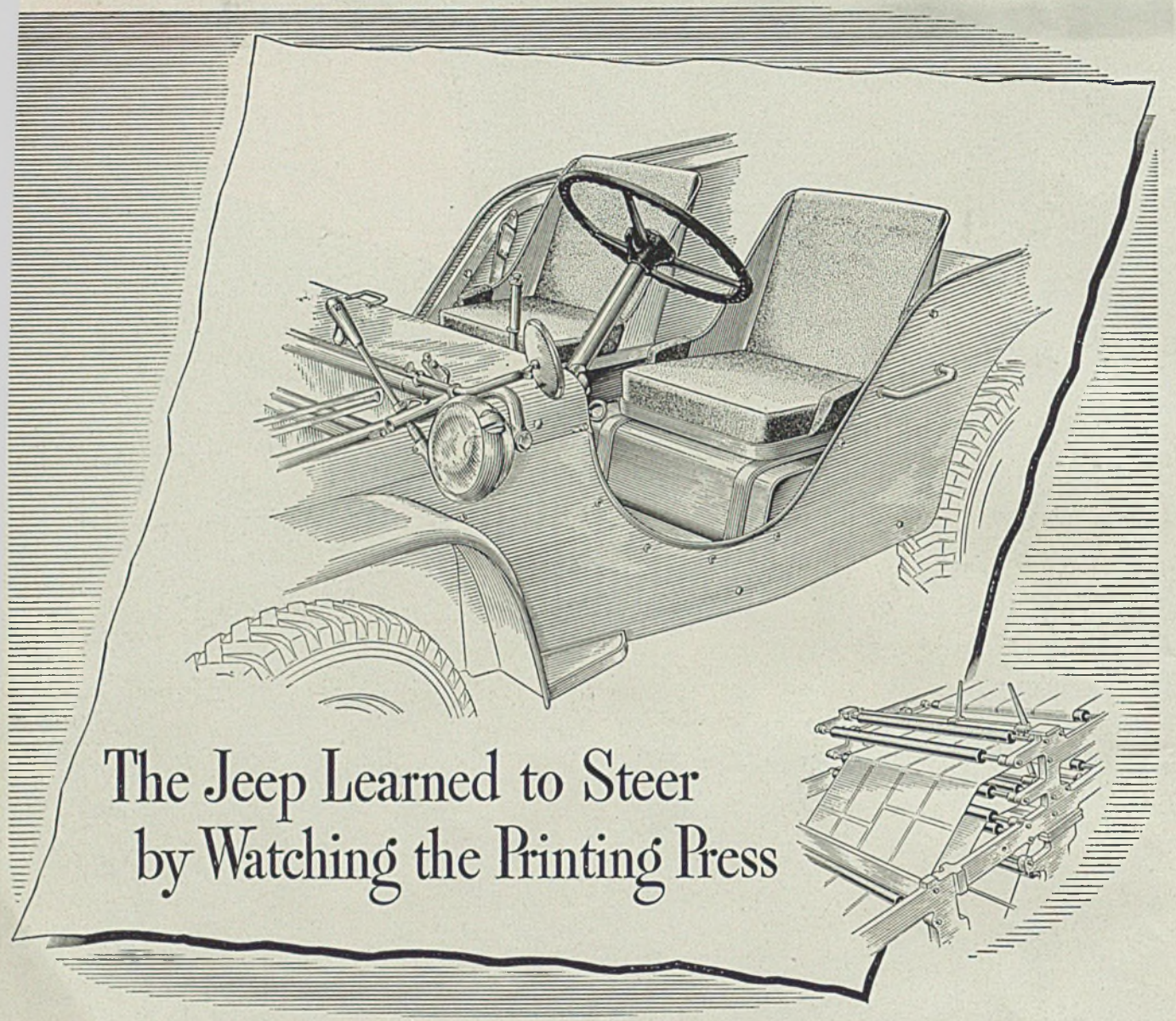
SOCKET SCREWS

Give the Green Light to War Assemblies



MORGAN 450-TON BLOOM AND SLAB SHEAR

● Among the many types of mill equipment built by Morgan, is the 450-Ton Bloom Shear illustrated above for shearing 12″ x 12″ blooms and equivalent slab sections. Shear is designed without flywheel or clutch for start and stop operation. Hold-down gag is of the independent hand adjusted type. A motor operated gauge is provided for gauging lengths from 2′0″ to 15′0″. Of massive construction, this shear is typical of the types of mill equipment Morgan designs and builds.



The Jeep Learned to Steer by Watching the Printing Press

IT'S TOP-SPEED operation hour after hour in a printing press—no leeway for breakdowns that might delay the newspaper on its way to the waiting delivery trucks. So printing press makers picked the Torrington Needle Bearing for its ability to operate successfully in high-speed service, with little need of attention.

There's no question of high speeds in the steering column of a jeep, of course . . . just an occasional turn through a fraction of a revolution. But that point of long life with little attention looked just as good to the jeep builders as it did to the press manufacturers. They, too, turned to the Needle Bearing, not only for its ability to stand up in severe service, but for its low friction coefficient that gives quick response to the steering wheel, its small size that contributes to compact design, its effective system of lubrication, its ready availability for all essential applications.

THERE'S A THOUGHT HERE FOR YOU TO CONSIDER when you start the design of your post-war products. Whether your problem is one of oscillation or of high-speed rotation, the Torrington Needle Bearing will give your customers the advantages of dependable operation, efficient lubrication, low starting and running friction. And of course, *you* will benefit by the Needle Bearing's low cost and ease of installation. You can get the preliminary information you will need by writing for Catalog No. 110, which lists sizes, rates, and typical applications—and Torrington engineers will assist you in working out specific service problems.

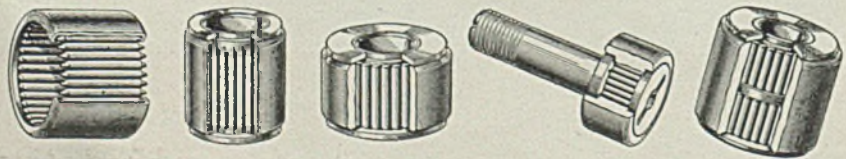
THE TORRINGTON COMPANY
Established 1866 • Torrington, Connecticut, U. S. A.
Makers of Needle and Ball Bearings
New York Boston Philadelphia Detroit
Cleveland Seattle Chicago San Francisco
Los Angeles Toronto London, England

LET'S GO! WAR! KEEP 'EM FLYING!

TORRINGTON NEEDLE BEARINGS

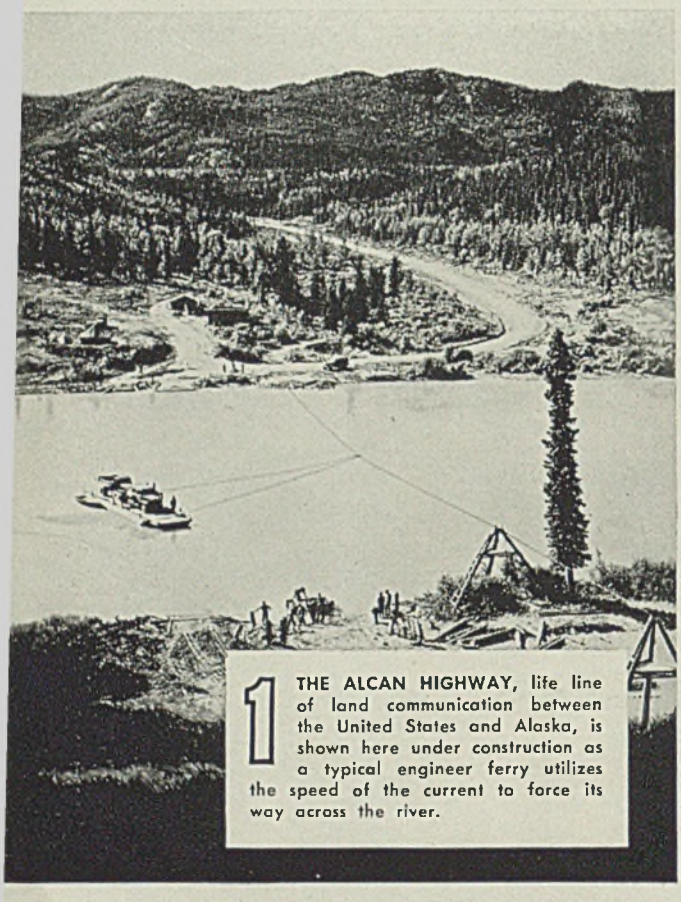
KEYED TO TODAY'S NEEDS

AND TOMORROW'S TRENDS




Drawing the
WINGED TUBES
OF VICTORY!
A unique
double-side
high-spee
draw bench
small tubi
VAUGHN
Draw
Benches
THE VAUGHN MACHINERY COMPA
Cuyahoga Falls, Ohio, U. S. A.
COMPLETE COLD DRAWING EQUIPMENT
Continuous or Single Hole . . . . . for the Largest
and Tubes . . . . . for the Smallest Wire . . . . . Ferr

FAMOUS LIFE LINES



1 **THE ALCAN HIGHWAY,** life line of land communication between the United States and Alaska, is shown here under construction as a typical engineer ferry utilizes the speed of the current to force its way across the river.

2 **MECHANIZED CAVALRY'S STEEL HORSES,** like these of the 107th Cavalry Regiment, as well as practically every other type of motorized military vehicle, have many of their "life lines" — fuel and lubrication lines, brake tubes, and other parts — of Bundy Tubing.

All Photos by U. S. Army Signal Corps

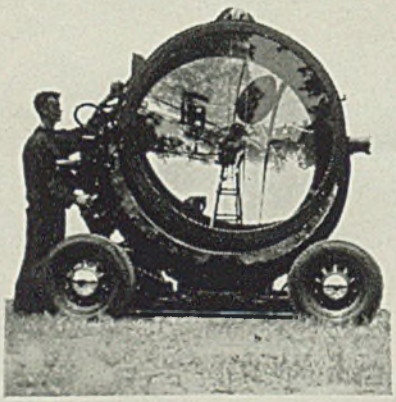
EVERY SECOND is a crisis when tanks clash in the desert or planes dive for the kill. There is no time for mistakes . . . no time for repairing faulty mechanisms.

Bundy Tubing fills an urgent role in providing vital lines for tanks, planes, PT boats, all types of fighting equipment.

Power boats, tandem rollers and Diesel engines depend on Bundy Tubing for fuel and lubrication lines. Hydraulic pressure is transmitted through Bundy Tubing for tank turrets and motor vehicles. Refrigerants for cooling ammunition and powder rooms pass through lines of Bundy Tubing. Structural or mechanical tubing is provided for radios, aircraft, gliders, tanks.

Wherever fuel and lubrication lines are needed, or where hydraulic pressure or refrigerants must be transmitted, Bundy Tubing is on the job.

We are proud that our product serves in so great a cause. We shall see to it that only the finest tubing Bundy can make goes into the equipment for our fighting forces. Bundy Tubing Company, Detroit.



U. S. ARMY SEARCHLIGHTS such as this more and more frequently have their "life lines" — lubrication lines for trailer and for power generating units — made from Bundy Tubing.

Buy U. S. War Bonds
Get in Your Scrap

BUNDY TUBING

ENGINEERED TO YOUR EXPECTATIONS

BUNDYWELD double-walled steel tubing, hydrogen-brazed, copper-coated inside and outside. From Capillary sizes up to and including ¼" O. D. This double-walled type is also available in steel, tin-coated on the outside, and in Monel.

BUNDY ELECTRICWELD steel tubing. Single-walled — butt welded — annealed. Available in sizes up to and including 2" O. D. Can be furnished tin-coated outside in smaller sizes.

BUNDY "TRIPLE-PURPOSE" tubing. Double-walled, rolled from two strips, joints opposite, welded into a solid wall. Available in all Monel; all steel; Monel inside—steel outside; Monel outside—steel inside. Sizes up to and including ⅝" O. D.

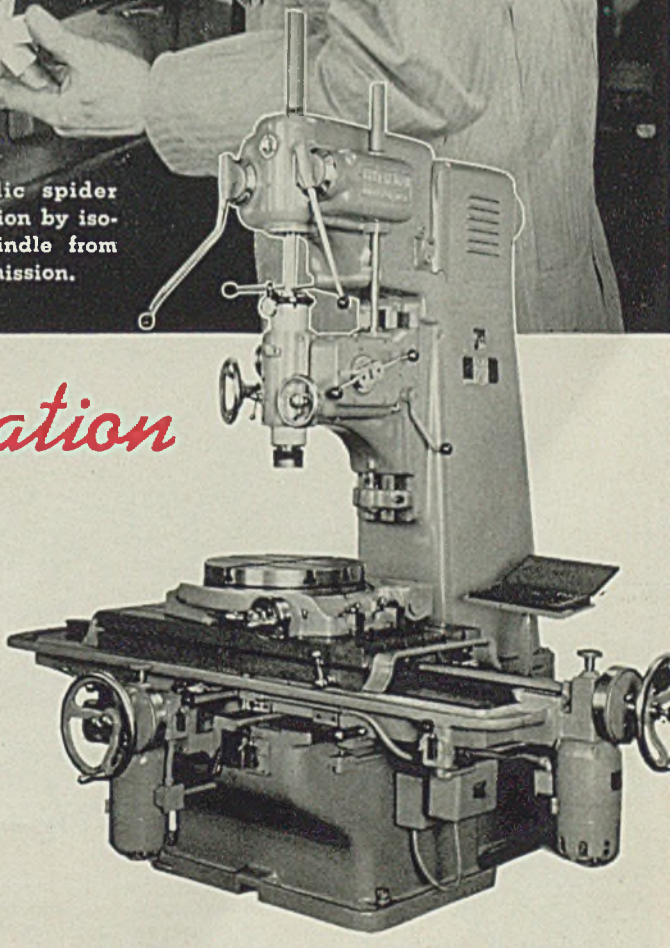
CLEEREMAN
Jig Borers and Drilling Machines

A non-metallic spider reduces vibration by isolating the spindle from the transmission.

Freedom from Vibration

. . . a feature which contributes to the extreme precision of Cleereman Jig Borers!

Write today for the new *Cleereman* Jig Borer and Drilling Machine catalogs!

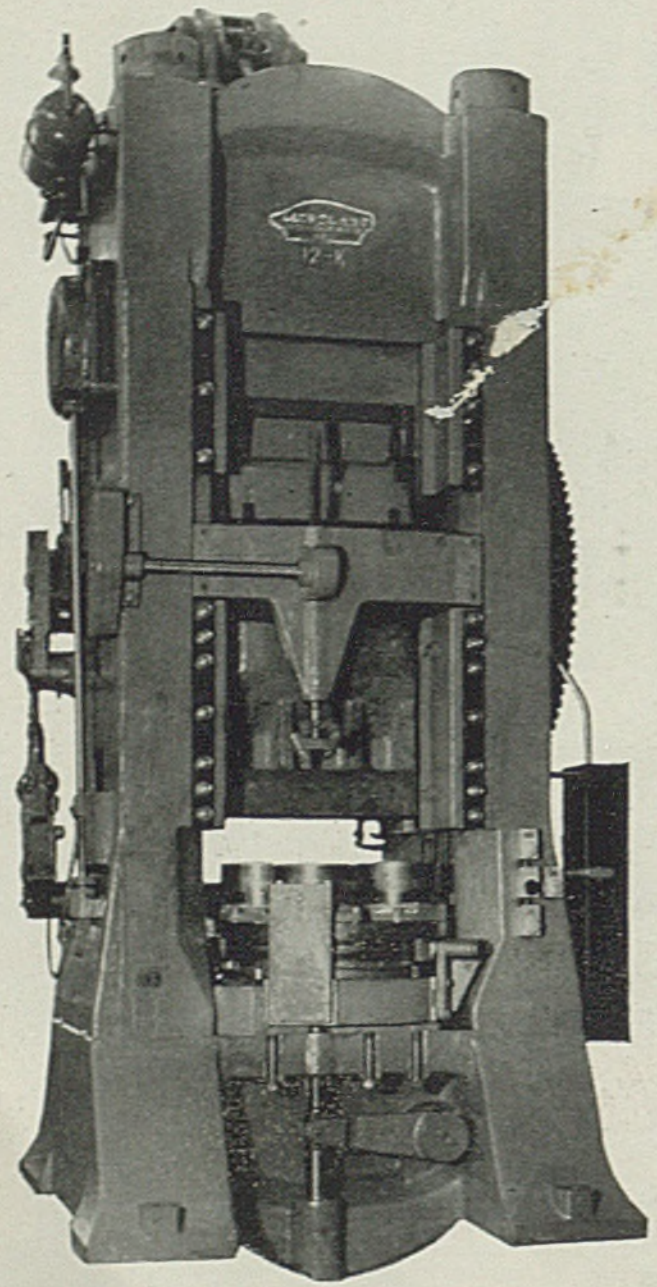


A *Cleereman* Jig borer equipped with micrometer head stop, rotary table, and power rapid traverse to table and carriage.

BRYANT MACHINERY & ENGINEERING COMPANY

Associated with **CLEEREMAN MACHINE TOOL COMPANY**

General Sales Offices **400 W. Madison St. • • Chicago • Ill. • U.S.A.**



1200 TONS CAPACITY *for*

The change over from the manufacture of *brass* shell casings to *steel* casings, can usually be accomplished by adding some heavier Mechanical Presses to the line. Manufacturers interested can obtain full information by addressing our Engineering Department.

The Production of Steel Shell Cases--

There are several different types of Cleveland Power Presses used in the production of shell cases, each type being particularly suited to perform a given operation or series of operations such as heading, sizing, drawing, indenting, etc., efficiently and economically.

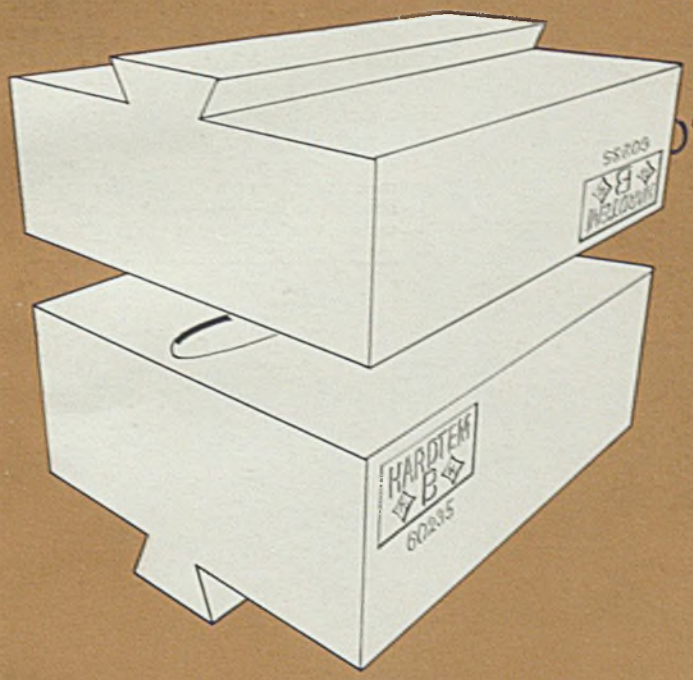
The Press illustrated above is used for heading 75mm shells. It is arranged with an electrically controlled air operated friction clutch and brake and equipped with a five station automatic dial feed. The Press has a capacity of 1200 tons and operates at 20 strokes per minute.

Modern Presses THE CLEVELAND PUNCH & SHEAR WORKS COMPANY *Cleveland, Ohio*

NEW YORK • CHICAGO • DETROIT • PHILADELPHIA • PITTSBURGH

NOTICE

Heppenstall Hardtem Die Blocks



can now be delivered more promptly*

*Due to greatly expanded production facilities, Hardtem Die Blocks are currently available for quick delivery on AA and AAA ratings.

Heppenstall quality standards are unchanged. Hardtem Die Blocks are still scientifically forged from the best acid open hearth alloy die block steel and heat treated by the exclusive Hardtem process which assures you more forgings per sinking. To obtain die blocks in a hurry, write or phone Heppenstall.

Heppenstall

PITTSBURGH • DETROIT • BRIDGEPORT
EDDYSTONE

Forging Fine Steels for Fifty Three Years

Why PREforming Conserves Steel, Makes Wire Rope Last Longer

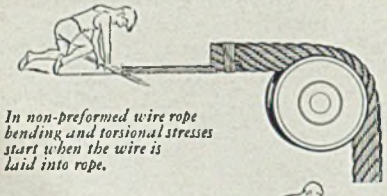
(Note: More and more wire rope users change to PREformed rope each year. During peacetime the reasons for changing from ordinary to PREformed wire rope were primarily two: the cost is lower; PREformed is easier to handle.

Today, with our nation at war and with steel at a premium, there is another and most important reason for using PREformed. It lasts much longer under high speed, severe bending and continuous operation. PREforming thus conserves steel. It conserves workmen's time; rope changes are less frequent. It reduces the accident potential; there is no wickering to harm hands or damage sheaves.)

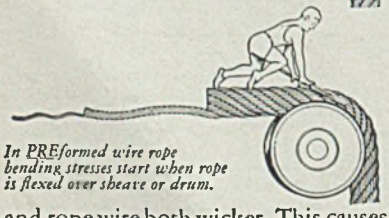
There are two kinds of wire rope. One is called Regular, or ordinary, wire rope. The other is known as PREformed.

In ordinary rope wires are held together under tension. The wires are laid into the rope by bending them to the desired shape. Bending and torsional stresses thus remain in the rope . . . are kept under control by seizing the ends of the rope.

If the wire breaks, it immediately wickers. If the seizing breaks, the strands



In non-preformed wire rope bending and torsional stresses start when the wire is laid into rope.



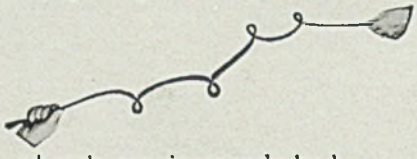
In PREformed wire rope bending stresses start when rope is flexed over sheave or drum.

and rope wire both wicker. This causes damage and delay. In PREformed wire rope, the strands and wires are preshaped to the exact curvature they will take in the finished rope. Bending and torsional stresses are eliminated (except of course when the rope bends over a sheave). If a wire breaks, it does not wicker but remains relaxed, thus causing no delay or damage.

Advantages of PREforming

PREformed wire ropes are like shoes that have been broken in. Instead of being stiff and unwieldy, they are flexible, easier to handle.

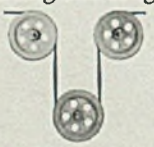
They are better adapted to bending and spooling, also. They resist kinking



when the rope is not under load.

PREformed wire ropes are easier to handle also because broken wires lay flat.

And finally, most important, PREformed wire ropes have greater resistance to bending and fatigue. This is



another way of saying that they last much longer, do a better job when the pressure is on, as it is today in war production.

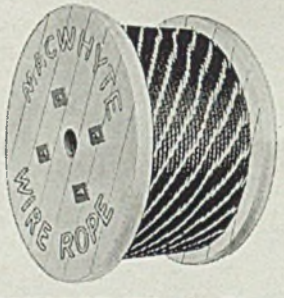
When next you need wire rope, consider seriously the purchase of PREformed wire rope. Today the job we must all do is the "best" job possible. When it comes to wire rope there is no question as to which does the "best" job. It's PREformed.

Consult with Macwhyte

Don't overlook the help that Macwhyte engineers will gladly give you on any wire rope problem. Their advice gained from many years' work on all kinds of jobs is yours for the asking. Let us know the kind of work to be done; we will tell you the rope best suited for the job.

And this we urge you to do: take extra care of your present ropes. Inspect them regularly; lubricate them often. By so doing you can make them last longer and thus aid the war effort. That's what you want; that's what your country asks of you.

This is Number 13 in a series of informative articles prepared by the Macwhyte Company to help wire rope users obtain better and longer service from ropes on the job. All articles in this series are available on request.



MONARCH Whyte Strand PRE-FORMED WIRE ROPE

. . . Macwhyte premier wire rope, famous for its strength, toughness, and internal lubrication.

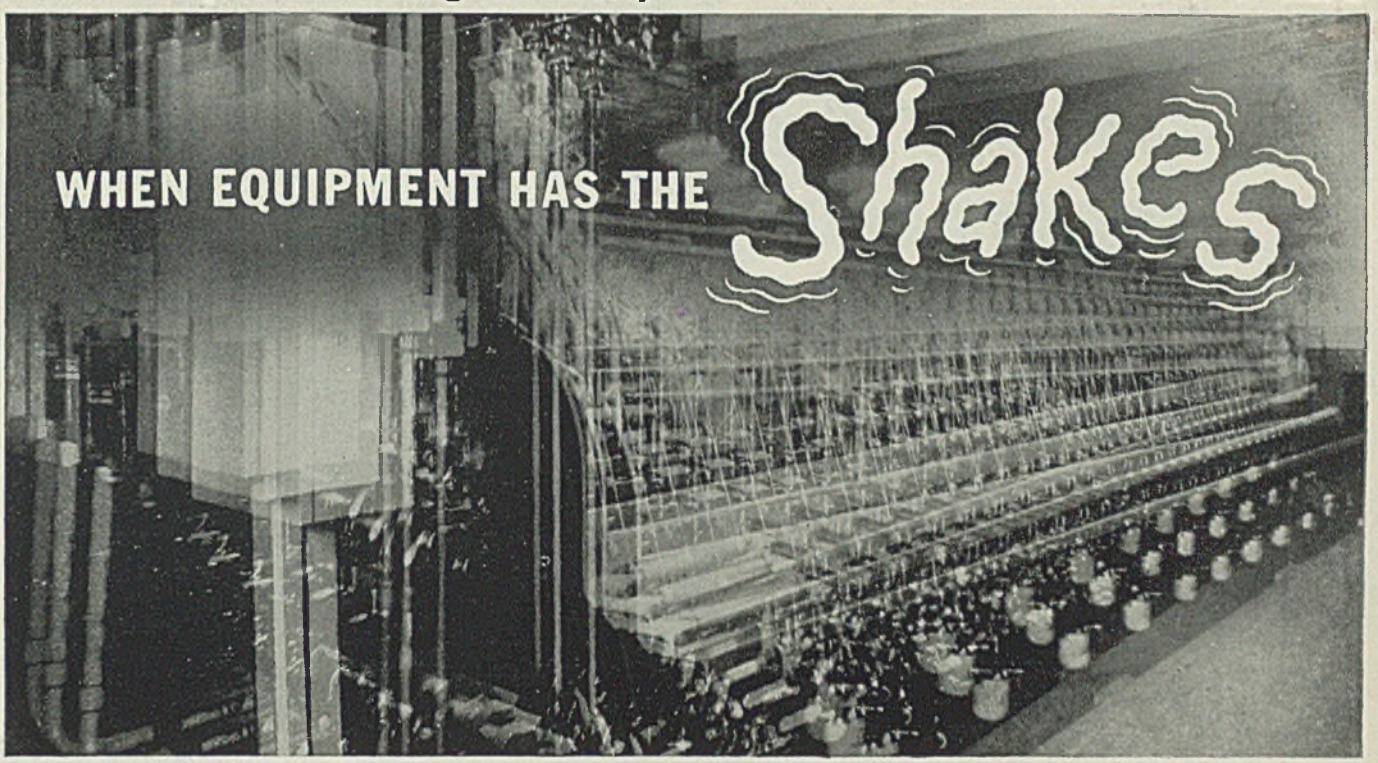
NO. 852

MACWHYTE COMPANY

WIRE ROPE

2940 FOURTEENTH AVE., KENOSHA, WISCONSIN

Manufacturers of MACWHYTE PREformed and Internally Lubricated Wire Rope — MONARCH WHYTE STRAND Wire Rope
MACWHYTE Special Traction Elevator Cable — MACWHYTE Braided Wire Rope Slings — MACWHYTE Aircraft Cables and Tie-Rods



WHEN EQUIPMENT HAS THE Shakes

WITH process industries driving toward ever higher production of vital materials—*acid handling equipment must not fail.* And in many cases Tellurium Lead is helping to keep it on the job.

* * *

One possible source of trouble in such equipment is vibration. The resultant dynamic or fatigue stresses, acting in combination with corrosion, are destructive to acid-resistant linings or coverings—more destructive than either factor alone.

To help combat this stress-corrosion, Tellurium Lead offers two important properties. First, it has the corrosion resistance for which lead is well known. Second, it has improved fatigue resistance. When tested in a Haigh "fatigue" testing machine, it exhibited a 60% greater endurance limit than lead without tellurium.

* * *

Another condition which sometimes causes trouble in acid processing is the repeated, drastic change in temperature to which tanks for heating and cooling are subjected. The continued expansion and contraction, with accompanying movement or working of the lining, may create severe stresses, resulting in failure. Some users report that, in certain cases of this kind, the use of Tellurium Lead results in definitely longer lining life.

This advantage of Tellurium Lead has been attributed, among other things, to its ability to *work harden*—to toughen and increase in tensile strength as it is worked.

This work-hardening property of Tellurium Lead tends to be of value in applications where lead must be bent, stretched or hammered—as in turnover points, elbows, flanges, coils and joints—as well as in equipment which must withtstand vibration.

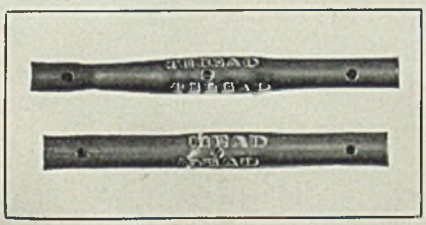
* * *

Another factor in Tellurium Lead's resistance to corrosion under severe conditions of stress and heat is undoubtedly a result of its generally finer, more uniform grain structure, shown in the photomicrographs below. As a result, the surface of Tellurium Lead sheet and pipe tends to be smoother, with less possibility of pitting and local corrosion.

* * *

Tellurium Lead of our manufacture is time-tested St. Joe chemical lead alloyed with a small quantity of tellurium. It is available in sheet or pipe form, or fabricated in coils for heating and cooling purposes.

For further information address the nearest Company branch listed below.



Strengthens under Stress: A section of Tellurium Lead pipe (top) and a section of regular lead pipe (bottom) were stamped with their respective names and pulled out at equal rates in a tensile testing machine. Note how the Tellurium Lead pipe developed strength where it was work hardened by the stamping, whereas the other lead was weakened . . . and fractured.

Finer Grain Structures: Photomicrographs of Tellurium Lead (left) and ordinary lead (right), showing the generally finer, more uniform grain structure brought about by the addition of tellurium. Another significant point: In laboratory tests extruded strips of Tellurium Lead, annealed at 150°C for six months, showed no grain enlargement. Metallurgists agree that freedom from grain growth means less danger of rapid corrosion at elevated temperatures.

USERS "TELL" THE DIFFERENCE

"We find Tellurium Lead stands up much better than other lead under vibration. The trouble we encountered (cracking of the corrosion-resistant covering on rayon spinning machines) has been entirely eliminated."

* * *

"We are using Tellurium Lead regularly in our steam jet mixer heads, as we feel it greatly improves resistance to crystalline fracture under conditions of vibration or mechanical stress."

* * *

"For the last two years we have purchased all our requirements in Tellurium Lead. We find a considerable advantage in resistance to vibration crystallization."

* * *

"We find this material has a greatly improved resistance to so-called vibration crystallization."

TELLURIUM LEAD

Save Time and Money on Wartime Jobs with

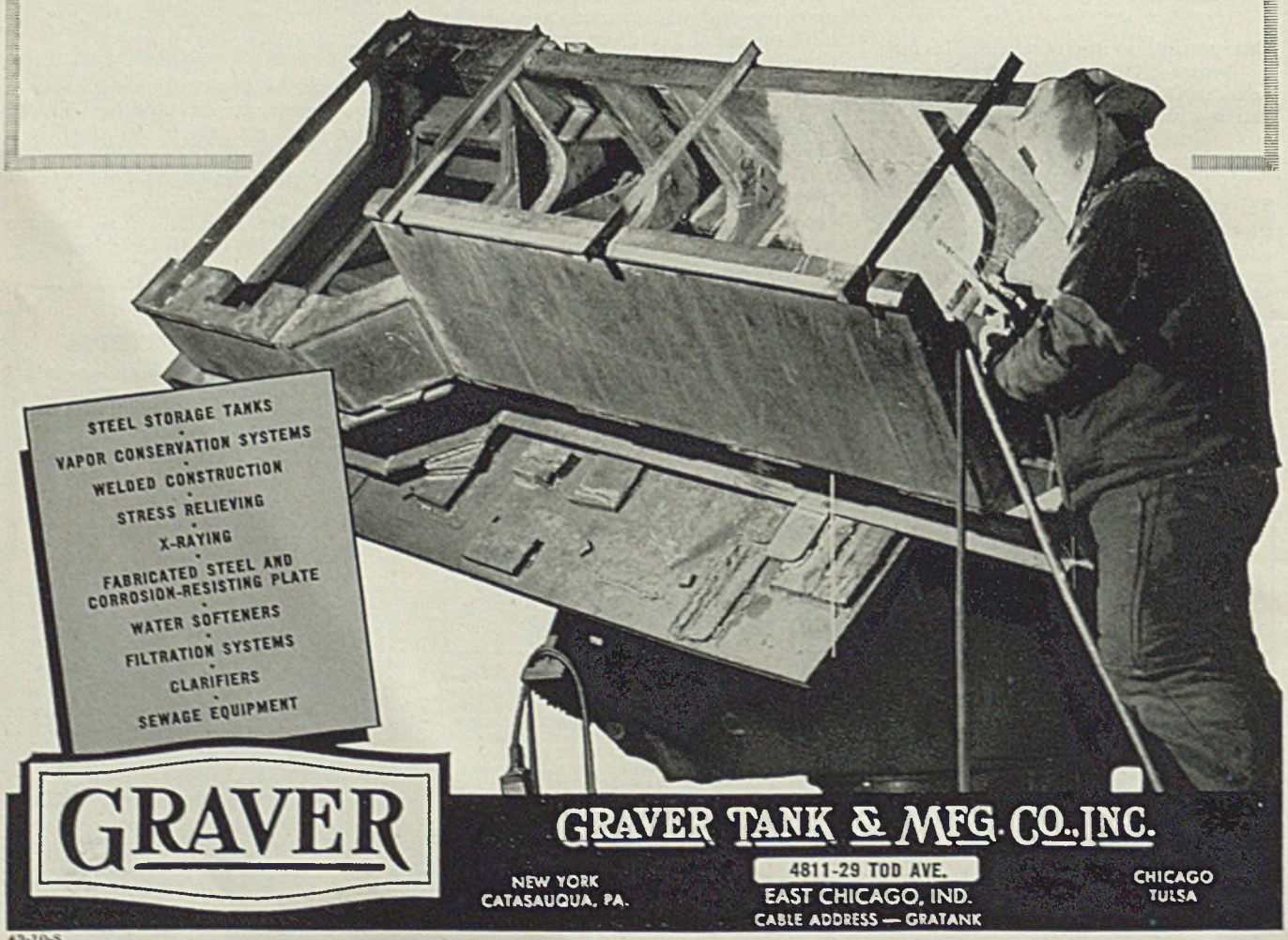
GRAVER WELDED CONSTRUCTION

Always important in any production problem, speed, efficiency, and economy are doubly important today. In the fabrication of machine bases, frames, and many other types of equipment, Graver Welded Construction is saving man-hours and money for hundreds of industries engaged in war production.

There are many reasons for this. In the first place, the expense and delay of pattern making are eliminated. Graver welding experts work directly from your blue-prints. Close tolerances are maintained and there is no deadweight. This modern method of construction insures maximum strength and rigidity resulting in years of trouble-free service. Furthermore, assemblies can be built of two or more dissimilar metals. Mild steel, alloy steels, steel forgings and castings can be welded into a single unit.

Graver facilities include the most modern flame-cutting, forming, grit blasting, and arc-welding equipment manned by experts. A complete X-Raying service is available and Graver's stress-relieving furnace provides the means of minimizing residual stresses which may have developed during welding.

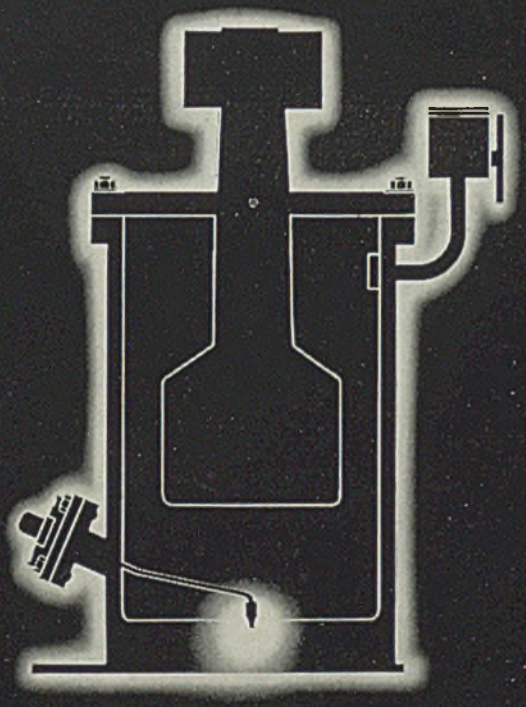
Consult Graver today. We shall be glad to discuss your welded construction problems with you and submit estimates on your requirements without obligation.



43-10-S

have you added up the facts on ignitron power conversion?

1. *No major rotating or moving parts.*
2. *High short-time overload capacity.*
3. *Lightweight, compact, durable.*
4. *High Efficiency over entire load range.*



MORE THAN 2,000,000 KW serving war industries—in the electrochemical, steel, mining and transportation fields.

The above characteristics, found only in the Ignitron Rectifier, add up to tangible advantages for d-c power users.

Ignitron operating costs are low. Simplified automatic operation, low arc drop loss, the elimination of high starting demand and absence of any major moving parts hold operating and maintenance costs to a minimum.

Load shifting is seldom necessary with an Ignitron. It will handle high load swings easily, making it adaptable to widely diversified service conditions.

Installation is easy, too. No special foundations are required. With its lightweight construction and vibrationless operation, an Ignitron can be installed on any level concrete floor of reasonable strength.

Equally important is the uniformly high efficiency of power conversion with the Ignitron, which can operate at full capacity 24 hours per day.

These are a few of the reasons why more than 2,000,000 kw have already been installed. Ignitron may be the solution to your d-c power problems. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

in the steel industry

The inherent advantages of the Ignitron Rectifier make it ideally suited for steel mill service. The outstanding feature is its practically straight-line efficiency from light load to overload. Also, since there are no major moving parts to be affected by dirt and grit the Ignitron requires less maintenance. Operation can be made completely automatic to provide unattended service.

For further information about the Ignitron Rectifier, write Dept. 7-N for your copy of Book B-3024.

J-10243-1

Westinghouse *Electronics at Work*

IGNITRON RECTIFIERS

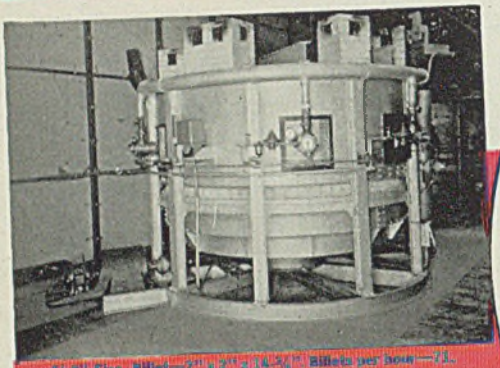
PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Hagan

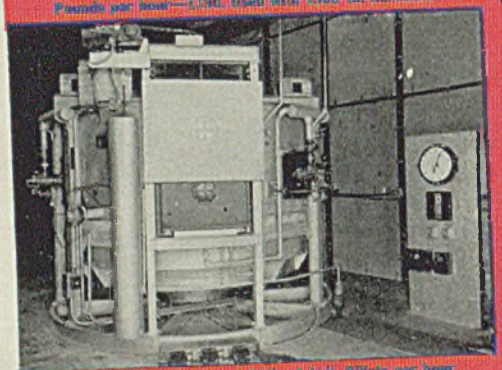
Check these plus features

PROVIDED BY

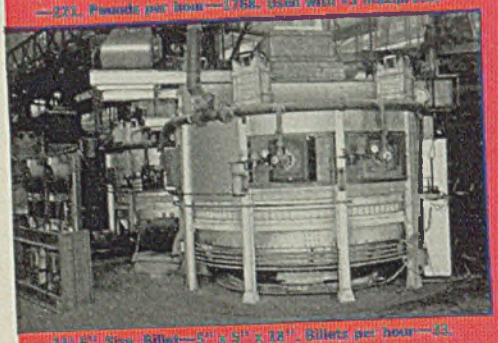
HAGAN
ROTARY FORGING
FURNACES



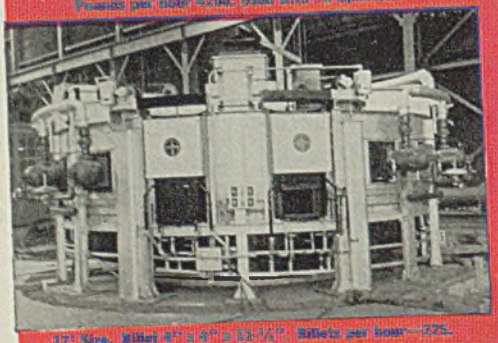
5' 0" Size. Billet—2" x 2" x 14-3/4". Billets per hour—71. Pounds per hour—1190. Used with 1500 lb. hammer.



7' 0" Size. Billet 2-1/4" x 2-1/4" x 4-1/2". Billets per hour—231. Pounds per hour—1768. Used with #3 Maxipress.



11' 6" Size. Billet—5" x 5" x 18". Billets per hour—41. Pounds per hour 4200. Used with #8 Upsetter.



17' Size. Billet 8" x 8" x 11-1/4". Billets per hour—225. Pounds per hour—11,250. Used with 2—200 Ton Presses.

- ✓ Continuous flow of uniformly heated billets.
- ✓ Every billet forges the same.
- ✓ Complete heating control with tangential heat sources.
- ✓ Lower furnace temperature—shorter heating time.
- ✓ PATENTED hearth construction—there is no vertical slot between the moving hearth and the fixed side wall to cause sticking or freezing.
- ✓ Minimum scale-burned steel is eliminated.
- ✓ Lower labor costs because furnace is charged and discharged at one central point.
- ✓ Fuel consumption in many instances reduced as much as 58%.
- ✓ Extremely low maintenance costs—lost furnace time is negligible.
- ✓ Die life increased because of controlled forging temperatures.

GEORGE J. HAGAN CO.
PITTSBURGH, PA.
DETROIT · CHICAGO · LOS ANGELES · SAN FRANCISCO

YOU can't get another one—*for a lon time!* The Northwest that you woul ordinarily get for that job next year working for the one big customer th represents all of us to the world — an as always it's on a big job — a repe order for the world's biggest name *Uncle Sam.*

It is equipped just as it would be for yo with all the features that helped yo make money last year and the ye before—and will help you in the futur

You can't get a Northwest today — b you can plan for the future.

The machines that are standing up und "highball" jobs today are the machin that are going to make successful co tractors tomorrow—*and that's Northwe*

Buy war bonds and plan for the futur

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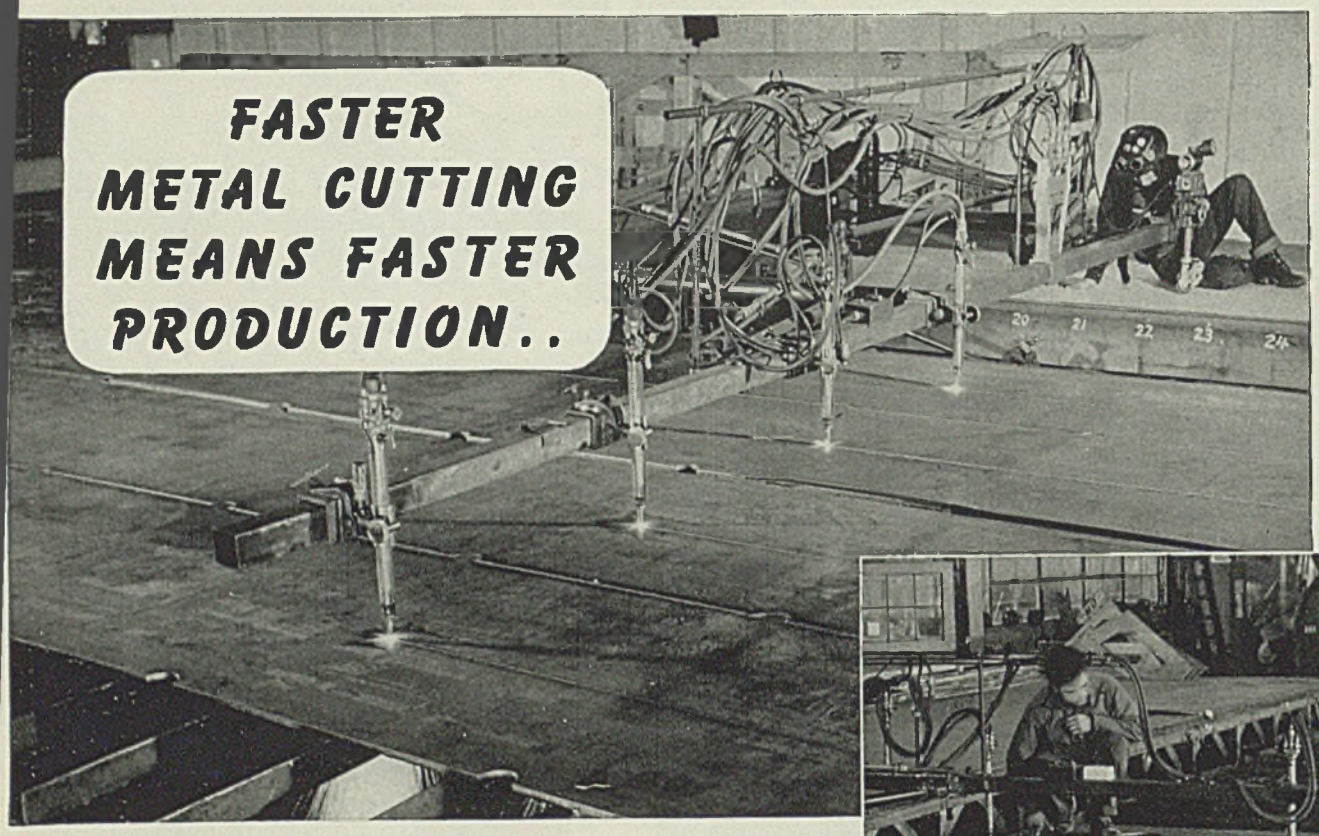
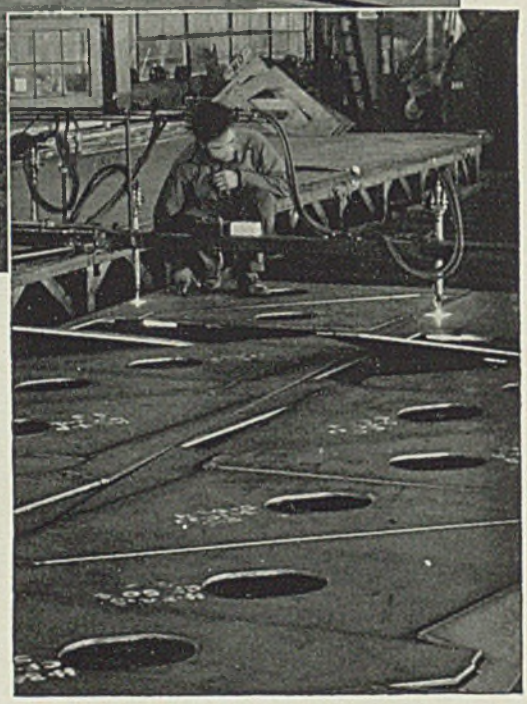
NORTHWEST

After VICTOR
Buy
THWES



FASTER METAL CUTTING MEANS FASTER PRODUCTION..



...with an Airco Travograph

FAST, modern multiple-torch gas cutting with an Airco Travograph machine has brought new speed to metal cutting operations. Plates, slabs, billets and forgings are shaped — cut to dimensions, squared, and beveled for subsequent fabrication faster than ever before. Thanks to the speedy metal shaping possible with the Airco Travograph, over-all production time for many important war weapons has been considerably shortened.

The Travograph cuts large plates or heavy, high-alloy steel with equal facility. Regular shapes or intricate contours are produced in quantity, using a number of torches guided by a tracing device which accurately follows a template of the desired shape.

Motor driven and operating on a track, the Airco Travograph assures unequalled speed in production cutting of large metal shapes. For full details on this modern metal cutting machine — including prices, priorities and delivery schedules—get in touch with your nearest Air Reduction office.

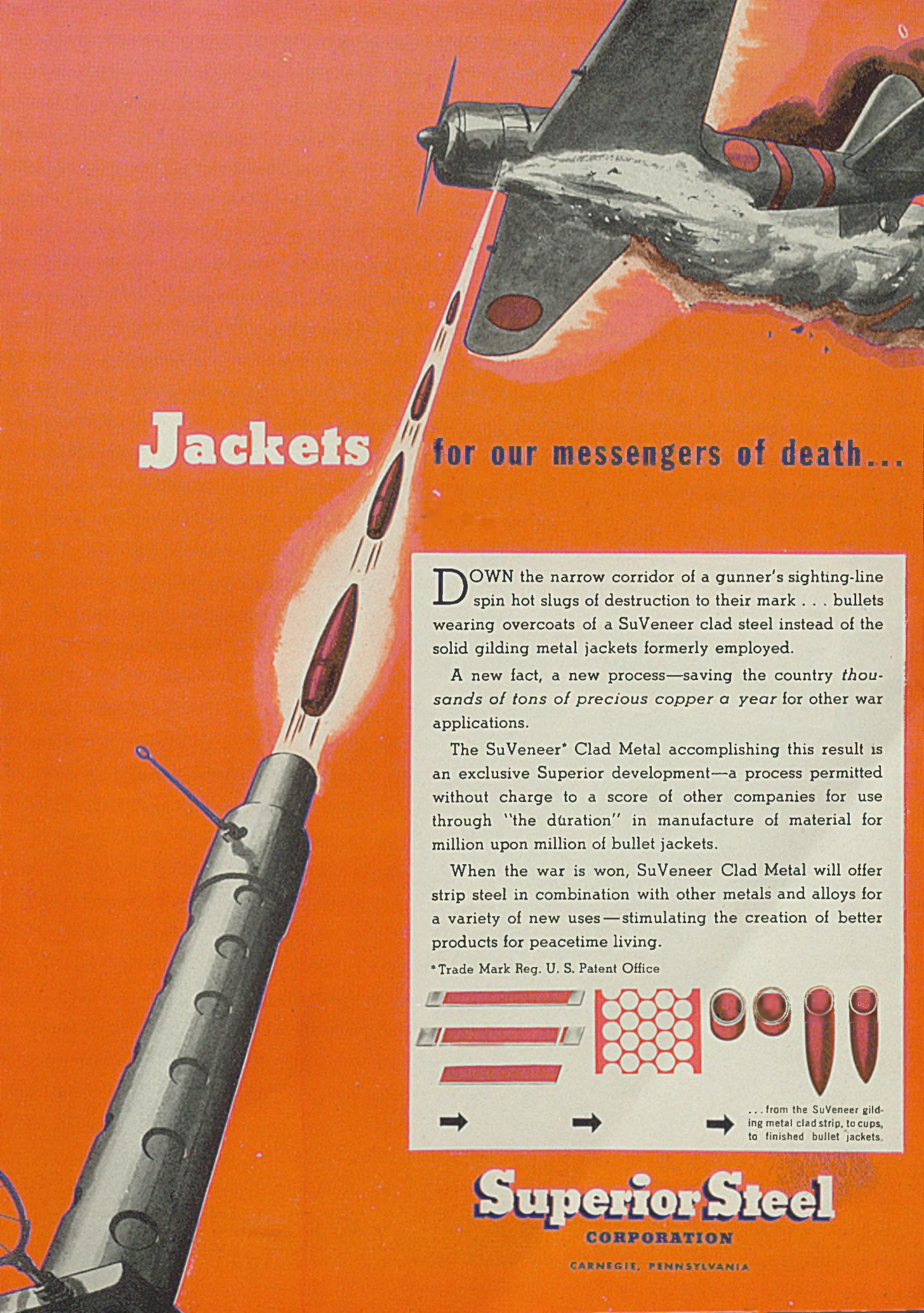
Free copies of this poster available.

Air Reduction

General Offices:
60 EAST 42nd STREET, NEW YORK, N. Y.
IN TEXAS
MAGNOLIA-AIRCO GAS PRODUCTS CO.

AIRCO WILSON

IDLE CYLINDERS ARE PRODUCTION SLACKERS: *Keep 'em rolling for victory!*



Jackets for our messengers of death...

DOWN the narrow corridor of a gunner's sighting-line spin hot slugs of destruction to their mark . . . bullets wearing overcoats of a SuVeneer clad steel instead of the solid gilding metal jackets formerly employed.

A new fact, a new process—saving the country *thousands of tons of precious copper a year* for other war applications.

The SuVeneer* Clad Metal accomplishing this result is an exclusive Superior development—a process permitted without charge to a score of other companies for use through "the duration" in manufacture of material for million upon million of bullet jackets.

When the war is won, SuVeneer Clad Metal will offer strip steel in combination with other metals and alloys for a variety of new uses—stimulating the creation of better products for peacetime living.

*Trade Mark Reg. U. S. Patent Office

. . . from the SuVeneer gilding metal clad strip, to cups, to finished bullet jackets.

Superior Steel
CORPORATION
CARNEGIE, PENNSYLVANIA

PROPERLY DESIGNED DROP FORGINGS

Airplane propeller hub being forged on Chambersburg Steam Drop Hammer

THE solution of the increased load thrown on the forging industry lies not only in the use of modern equipment . . . such as Chambersburg Hammers . . . but also in properly designed forgings . . . which mean less metal . . . and less machining. Less metal for each forging, less machining necessary to finish, fewer man-hours per piece and less horsepower mean savings of vital importance NOW.

CHAMBERSBURG ENGINEERING CO • CHAMBERSBURG, PA.

THE CECOSTAMP • A NEW METHOD OF PRODUCING AIRPLANE STAMPINGS

A new, high-production, easily controlled, impact-type drop stamp, designed by Chambersburg engineers after a close study of aircraft manufacturing requirements. In the rapid production of drop stampings from stainless steel, high strength aluminum alloys and other metals of low ductility, the CECOSTAMP has taken its place with the newer tools and techniques made necessary by this great industry.

CHAMBERSBURG
HAMMERS • CECOSTAMPS • PRESSES

Since 1940, when the advertisement shown at the left was first run, Chambersburg Engineering Company has been urging the careful design of drop forgings to eliminate excess scrap, excess machining, excess man hours. The Buick advertisement shown below is an excellent example of careful design—plus Chambersburg Hammers.

A Case of LESS SCRAP, MORE FIGHT

THIS sleek and polished example of superfine machining is a propeller shaft for a Buick-built Pratt & Whitney aircraft engine.

It used to be cut by slow and painful whittling from a forging made from a 184-pound bar of steel.

By changing the forging method, Buick found a way to get the same results from a steel bar weighing only 165 pounds.

Nineteen pounds less material to be cut away, 19 pounds less scrap to be sent back for remelting, considerably less expenditure of precious machine tools and—*111 propeller shafts from the same material that used to deliver only 100—in less time per shaft!*

The country needs scrap metal—all you can dig up.

It also needs to *avoid* waste of materials in the making of fighting tools.

So we'll strike a bargain with you.

Do your share in "getting in the scrap"—and we'll do ours, in this and other instances like it, to get the utmost "fight" out of the materials we work with.

FOR VICTORY BUY UNITED STATES WAR BONDS AND STAMPS

BUICK DIVISION OF GENERAL MOTORS

CHAMBERSBURG
HAMMERS • CECOSTAMPS • PRESSES
Chambersburg Engineering Co. Chambersburg, Pa.

LADISH

quality

DROP FORGINGS

ON EVERY BATTLEFRONT

TO MARK PROGRESS

LADISH DROP FORGE CO.

PLANT AND GENERAL OFFICES CUDAHY . . . WISCONSIN

WOMEN DRIVERS BREAK SPEED RECORDS

. . . when they drive AMERICAN Phillips Screws

Inspectors hand out no rejection slips on work assembled with American Phillips Screws. These are the screw fastenings that drive straight, keep their heads, and keep the driver from skidding out to spoil work and slash hands. The firm fit between screw and bit permits the use of electric and pneumatic drivers, yet only one hand is needed to drive, so the other can brace the work. Screw sets up uniformly tighter, holds better. Head is unmarred, plumb-level on work surface. This unmatched speed and ease of driving keeps production at maximum levels to the end of the shift . . . enables women to do better work, *and far more of it*, than men could do with slotted-head screws.

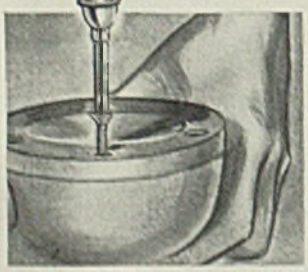
American's engineering service, production control, and piece-inspection is so effectively co-ordinated that today scores of plants in every war industry are using millions of standard and special American Phillips Screws.

AMERICAN SCREW COMPANY

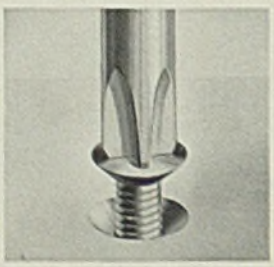
PROVIDENCE, RHODE ISLAND

Chicago: 589 E. Illinois Street *Detroit:* 5-267 General Motors Bldg.

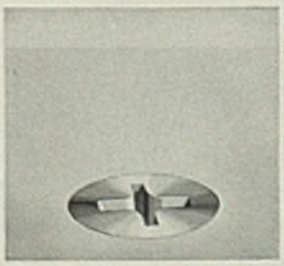
The American Phillips Recess Was Scientifically Engineered . . . The Modern Key To Highest Fastening Speed And Greatest Economy in War-Production Assemblies.



Fast Starting—Driver point automatically centers in the recess . . . fits snugly. Screw and driver "become one unit." Fumbling, wobbly starts are eliminated.



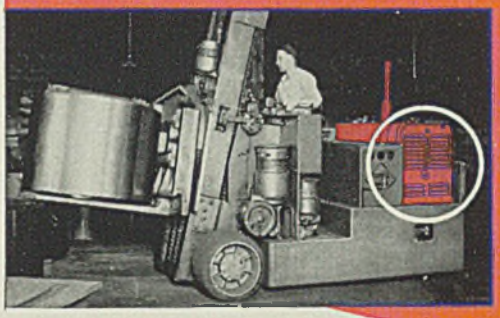
Faster Driving—Spiral and power driving are made practical. Driver won't slip out of recess to injure workers or spoil material. (Average time saving is 50%.)



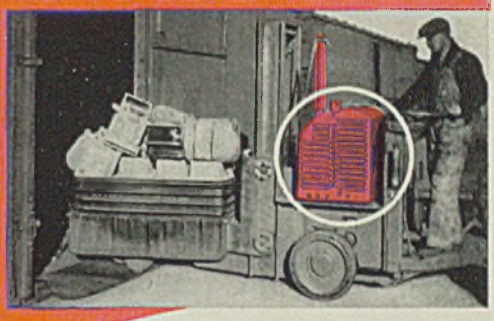
Better Fastenings—Screws are set up uniformly tight, without burring or breaking heads. A stronger, neater job results and there are no gouges on work-surface.

READY-POWER

EQUIPPED ELECTRIC TRUCKS

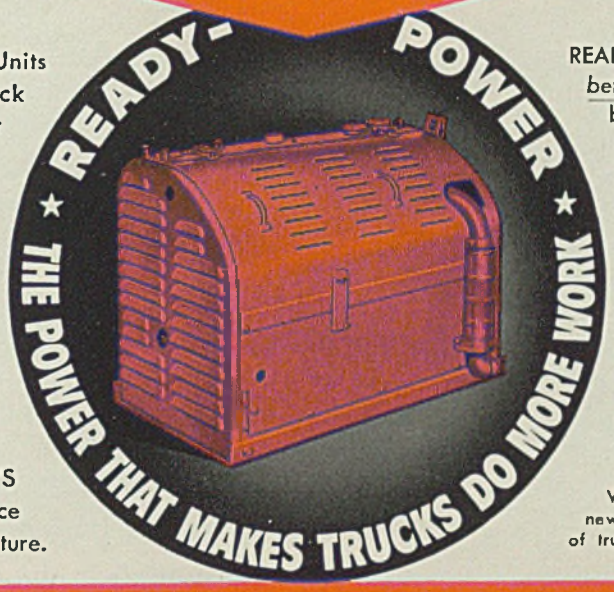


Gas-Electric
POWER PLANTS
for
ELECTRIC TRUCK OPERATION



CONTINUOUS POWER

READY-POWER (Gas-Electric) Units on *new* or *existing* electric truck equipment handle more loads per hour per day and per year than the same equipment battery powered. This means a saving in time as well as a saving in money by accomplishing a given amount of work in less time at a lower cost per ton handled. Since 1924, thousands of Ready-Power Units have been adapted by industry to their toughest jobs. READY-POWER'S reliability and superior performance have been proved. Ask for literature.

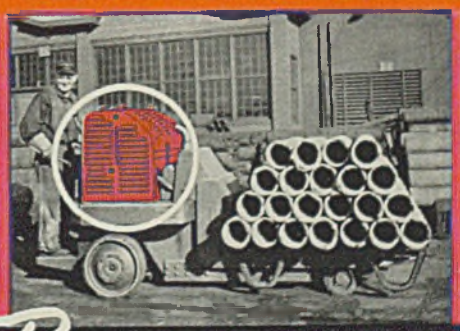


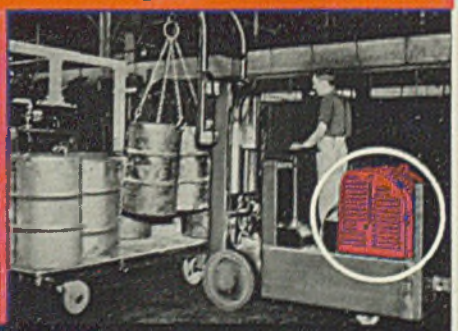
PEAK PERFORMANCE

READY-POWER today serves industry *better*, more *completely*, than ever before with power units that cover the range of trucks from 2000 to 60,000 pounds rating. READY-POWER manufactures a complete line of Gas-Electric Power Units—*not complete trucks*. You can secure *new trucks* complete with READY-POWER from truck manufacturers or you can get READY-POWER units to replace batteries for trucks now in operation in your plants.

Write for information, mentioning type of new trucks contemplated or make and type of trucks now being operated.

MORE PER DAY PER YEAR ★ MORE WORK IN LESS TIME ★ HANDLES MORE LOADS MORE QUICKLY





Get *Wartime Power* for your NEW or PRESENT Trucks

THE **READY-POWER** CO.

3842 GRAND RIVER AVENUE ★ DETROIT, MICHIGAN, U. S. A.

BALES *Any Kind of Sheet Metal Scrap*

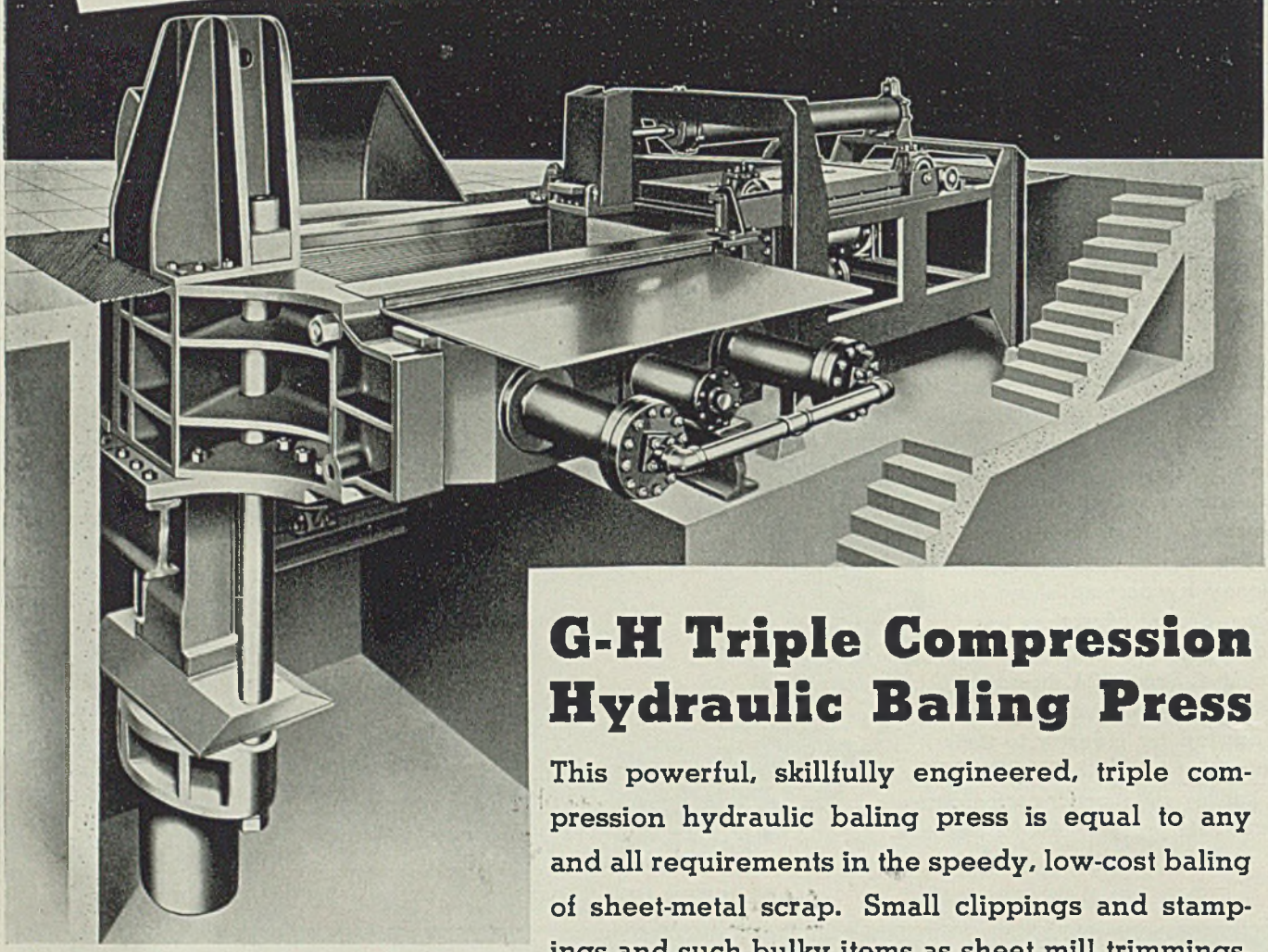


Illustration shows typical industrial installation of 150 T-C Hydraulic Baler — with cut-away view of pit.

T-C Balers are built in capacities from 4 to 20 tons per hour and more. Other G-H Scrap Metal Balers from ¼-ton per hour and up.

G-H Triple Compression Hydraulic Baling Press

This powerful, skillfully engineered, triple compression hydraulic baling press is equal to any and all requirements in the speedy, low-cost baling of sheet-metal scrap. Small clippings and stampings and such bulky items as sheet mill trimmings, auto bodies, fenders and oil drums . . . all look alike to this versatile three-compression baler.

In steel mills, in heavy stamping plants, in metal working plants . . . and in the scrap-yards of America . . . it has set new records in preparing vital scrap-for-victory. There's a Galland-Henning Baler to meet your baling needs.

For Experienced Counsel on Baling Scrap-For-Victory, Write

G-H

GALLAND-HENNING MFG. CO.

2747 SOUTH 31ST STREET • MILWAUKEE, WISCONSIN

A 4049-1P

IN New Guinea . . . North Africa . . . in every theater of action—war materials created in our plants are helping to smash enemy resistance. We're passing the ammunition to Tojo and his pal, Hitler, on land by means of the 75mm. field gun shell forging shown above. And at sea we're giving them a taste of their own medicine through the medium of similar shell forgings designed for use in 3-inch Navy anti-aircraft guns.

And that's only part of it! Our tube forming equipment is working right along with our shell forging plants—in continuous production of WELDED STEEL TUBING for Smoke Shells, Utility Bombs, Steering Columns and Tie Rods for Motorized Equipment, and Links for Tank Treads.

We want to keep going full blast to help get this war won as soon as possible. We have capacity for additional work on certain items. We'd like to help you—if you need help in the way of Steel Forgings or WELDED STEEL TUBING. Write, wire or telephone and let us show you fully and completely just what we are prepared to do.

THE STANDARD TUBE CO.

Detroit STANCO Michigan

Welded Tubing *Steel Forgings*

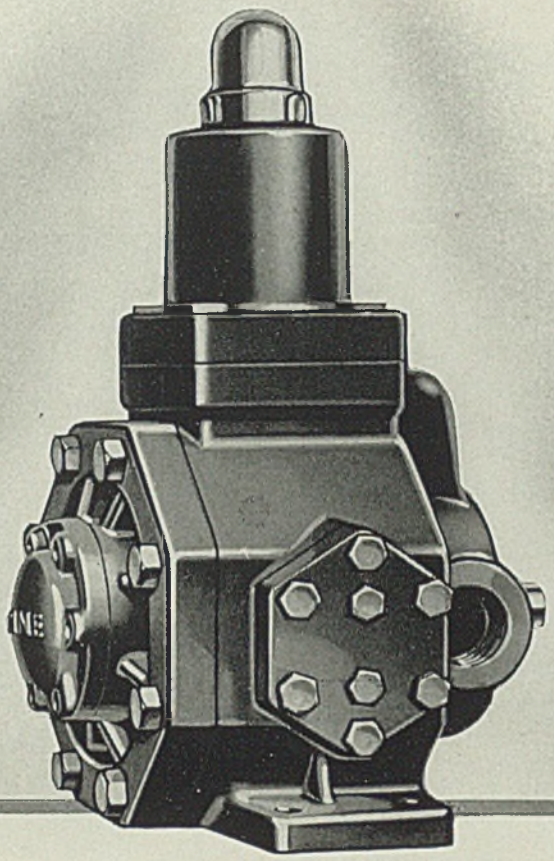
★ *Complete Tube Stocks Maintained by* ★

STANDARD TUBE SALES CORP., One Admiral Ave., Maspeth, L. I., N. Y.
LAPHAM-HICKEY COMPANY, 3333 West 47th Place, Chicago, Ill.
UNION HARDWARE & METAL CO., 411 East First Street, Los Angeles, Calif.

WHEELS for *TOOL* and *CUTTER* and *SURFACING* jobs—any size, shape, grit, porosity or grade hardness! Whatever your requirements may be BAY STATE will serve you well. Send in your problems. We can help you.

BAY STATE

ABRASIVE PRODUCTS CO., WESTBORO, MASS. U.S.A.



RACINE

Variable Volume

HYDRAULIC PUMPS

A Modern Source of Hydraulic Force

With EXCLUSIVE "Vane Type VARIABLE VOLUME" FEATURE for vibrationless performance in modern machine design. Designed for long life, efficient low cost operation, these pumps are the latest "Source of Force" for metal working and industrial machinery—for clamping, forming, moulding, forcing, feeding, straightening, bending, lifting, holding and numerous other operations.

Delivery of Pump is varied by changing the position of the "True Circle" pressure ring to the rotor—pumps only the amount of oil you need to do the job—no relief valve required. Racine tilted Vane Rotor design prevents gouging of chamber ring. Vanes tend to polish the surface and cannot seize.

Because the flow of oil is automatically varied, Racine Pumps operate at reduced horsepower. Momentary shock loads are avoided, hydraulic hammering and oil heating are reduced at constant operating pressures from 50 to 1000 lbs. per sq. in.

Racine Oil Hydraulic Pumps are made in three sizes—0-12, 20 and 30 gal. per min. capacity at 50 to 1000 lbs. pressure per sq. in.

Equipped with standard automatic pressure controls; or with Solenoid, Lever or Hydraulic two pressure control; or with handwheel or lever for manual volume control.

RACINE OIL HYDRAULIC VALVES

With Balanced Piston—"Sleeve Type" Construction

Exclusive honed alloy "Sleeve Type" construction provides a continuous bearing and sealing surface—piston always in alignment, cannot sag.

These Racine Four-Way Oil Hydraulic Valves are available in 3/8" to 1 1/2" standard pipe sizes with mechanical, electrical or manual operating device. Various porting arrangements can also be furnished to suit your requirements.

Racine makes available to all Tool Engineers and Designers a complete service for your oil hydraulic problems. For complete information, address Dept. S-P.

RACINE HYDRAULIC METAL CUTTING MACHINES

The Production Saws of Modern Industry

Racine's Metal Cutting Machine line is complete for either general purpose or production cutting—Wet and Dry Cut Models. Hydraulically fed and controlled to produce fast, accurate and efficient metal cutting. Capacities 6" x 6" to 20" x 20".

RACINE TOOL and MACHINE COMPANY

STANDARD FOR QUALITY AND PRECISION

RACINE, WISCONSIN • U. S. A.

FOR YOUR PRODUCT PLANNING DIVISION

a Double Feature

SEYMOUR NICKEL SILVER

ALLOY	Alloy No.	Form	COMPOSITION Approximate Percent				Tensile Strength lbs. per sq. in.		Elongation Percent in 2" min.		Rockwell Hardness No. "B" Scale Ball		Density (Specific Gravity)			Melting Point °F	Elect. Resist. I.A.C.S.	Elect. Conductivity I.A.C.S. 20°c
			Copper	Zinc	Nickel	Lead	Hard to Spring	Soft	Hard to Spring	Soft	Hard to Spring	Soft	4°c	lbs. per cu. in.	lbs. per cu. ft.			
5%-GRADE A	5	Wire	61.00	34.00	5.00		135,000	50,000	2.									
10%-GRADE A	10A1	Sheet	67.00	23.00	10.00		109,000	52,000	1.5	40.	88.	32.	8.64	.312	539	1920	11.1	12.0
12%	12X1	Sheet	61.00	26.00	12.00	1.00	90,000		5.		87.							9.0
12%	12X1	Rod	61.00	26.00	12.00	1.00	82,000	53,000	7.	40.	90.	35.	8.70	.314	542	1965	15.9	6.3
15%-GRADE A	15A	Sheet	64.00	21.00	15.00		93,000	58,000	5.	36.	94.	37.	8.62	.311	537	1900		
15%-GRADE B	15B	Sheet	58.00	27.00	15.00		100,000	55,000	2.		80.						16.7	6.0
15%-F.T.	15X1	Rod	60.00	24.00	15.00	1.00	85,000		10.	40.	90.	38.	8.75	.316	545	2030	16.7	6.0
18%-GRADE A	18A3	Sheet	65.00	17.00	18.00		100,000	54,000	3.	40.			8.75	.316	545	2030	16.7	6.0
18%-GRADE A	18A3	Wire	65.00	17.00	18.00		120,000	55,000	3.	40.	95.	40.	8.68	.313	541	1940	18.2	5.5
18%-GRADE B	18A4	Sheet	55.00	27.00	18.00		110,000	60,000	2.	45.			8.68	.313	541	1940	18.2	5.5
18%-GRADE B	18A4	Wire	55.00	27.00	18.00		145,000	62,000	3.	50.							17.6	5.7
18%-F.T.	18X1	Rod	62.00	19.00	19.00				13.		80.							
18%-SPECIAL	18A7	Sheet	75.00	7.00	18.00		85,000		4.	32.	88.	25.	8.83	.319	550	2090	16.2	6.2
		Rod	75.00	7.00	18.00		85,000	50,000	7.	45.								
		Wire	75.00	7.00	18.00	1.00	80,000	55,000	2.	30.							23.8	4.2
		Sheet	56.00	7.00	25.00		115,000	55,000	4.	30.	94.	60.					12.2	8.2
		Sheet	85.00		15.00		110,000	72,000	4.	30.	83.	34.					2065	15.4
		Sheet	80.00		20.00		70,000	45,000	3.	30.	85.	37.5	8.85	.320	552	2100		6.5
25%							85,000	50,000	2.									
15%-CUPRO NICKEL																		
20%-CUPRO NICKEL																		

AVAILABLE IN:	Gage Range (inclusive)	Width Range (inclusive)
SHEET	16-36 B&S	Rods up to 2"
CIRCLES	16-28 B&S	
COILS (STRIP)	16-36 B&S	
WIRE	4-30 B&S	Sheets up to 40"
WIRE (FLAT)	8-30 B&S	
ROD	2"-1/32"	

MISCELLANEOUS

WIRE AND ROD supplied Round, Half-Round, Quarter-Round, Oval Half-Oval, Hexagon, Octagon, Square, Triangular, or Fancy – tinned or bare.

SHEET AND STRIP in roll finish or Patent Level. Strip tinned if desired.

SEYMOUR PHOSPHOR BRONZE

ALLOY	Alloy No.	COMPOSITION Approximate Percent				Tensile Strength lbs. per sq. in.		Elongation Percent in 2in. min.	
		Copper	Zinc	Tin	Lead	Hard to Spring	Soft	Hard to Spring	Soft
GRADE A (Sheet)*	950	95.00		5.00		105,000	45,000	1.5	50
" B (Rod)*	494	94.00		5.00	1.00	61,000	50,000		40
" C (Sheet)*	928	92.00		8.00		112,000	55,000	3	
" D (*)*	910	90.00		10.00		115,000	60,000	5	65
PHOSPH. BRONZE (Rod)*	444	88.00	4.00	4.00	4.00	*60,000		20	

*Contain Phosphorus

*Small Sizes Only

DITTO	Alloy No.	Rockwell Hardness No."B" Scale 100 Kg		Density or Spec. Grav.			Melting Point °F	Elect. Resist. I.A.C.S.	Elect. Conductivity % I.A.C.S. 20°c
		Hard to Spring	Soft	4°c	lbs per cu.in.	lbs per cu. Ft.			
DITTO	950	95	30	8.86	.320	552	1920	6.1	16.5
	494	85						6.0	16.8
	928	98	38	8.80	.318	549		7.8	12.8
	910	100	52	8.76	.316	546		9.4	10.6
	444	75		8.86	.320	552	1830	8.2	12.2

AVAILABLE IN:	Gage Range (inclusive)	Width Range (inclusive)
SHEET	16-36 B&S	Rods up to 2"
BRIDGE PLATES	3/4"-1/8"	
CIRCLES	16-28 B&S	
COILS (STRIP)	16-36 B&S	
WIRE	4-30 B&S	Sheets up to 40"
WIRE (Flat)	8-30 B&S	
ROD	2"-1/32"	
ROD (Welding)		

MISCELLANEOUS

WIRE AND ROD supplied Round, Half-Round, Quarter-Round, Oval, Half-Oval, Hexagon, Octagon, Square, Triangular or Fancy-tinned or bare.

SHEET AND STRIP in roll finish or Patent Level. Strip tinned if desired.

HUNTING for data these days is expensive. Yet, a good understanding of the possibilities of materials being worked is necessary for best results. So, to save your time, here are the principal characteristics of two Seymour Alloys—long-time stand-bys in peace production, now vital features in war production:

SEYMOUR NICKEL SILVER — Takes any hardness from dead soft to spring temper. Excellent for deep draws and difficult spinning. Has fine grain and good corrosion resistance. Its silvery white color makes it an ideal base for plated items. Leaded, it machines freely.

SEYMOUR PHOSPHOR BRONZE — Highly resistant to corrosion, abrasion, friction and fatigue. Produces springs that withstand almost indefinite flexure. Practically indifferent to thermal variation in most ordinary uses. Has wide application in electrical design. Available leaded; also in rods for welding.

SEYMOUR

Non-Ferrous Alloys Since 1878

THE SEYMOUR MFG. CO., SEYMOUR, CONN.

Make it fit to fight!

PARTS from Bridgeport... and Dallas ARE NO STRANGERS!

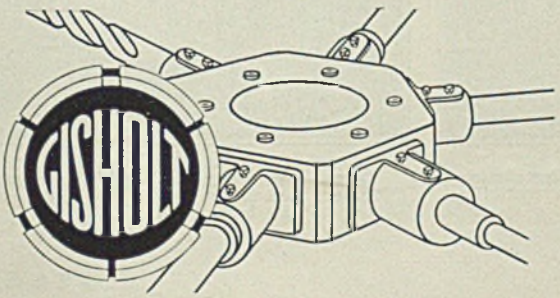
AS THOUGH made by the same hands—carefully matched and fitted—these parts slip together in a final machine assembly. Both are accurate, *right*—and ready to fight for America.

Distance is no barrier to interchangeable manufacture when close limits of accuracy are observed. This fact makes possible the larger manufacturing volume to speed up the war effort.

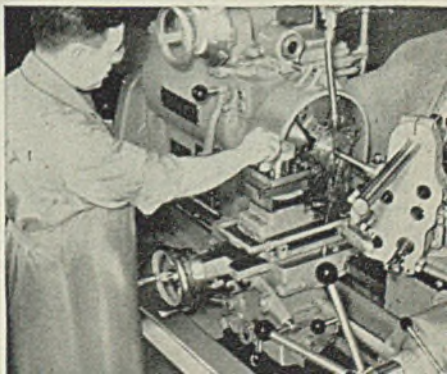
This close-tolerance machining is the work Gisholt Turret Lathes are doing as their part to hasten the day of Victory.

GISHOLT MACHINE COMPANY, 1217 East Washington Ave., Madison, Wisconsin

Look Ahead . . . Keep Ahead . . .
With Gisholt improvements in metal turning

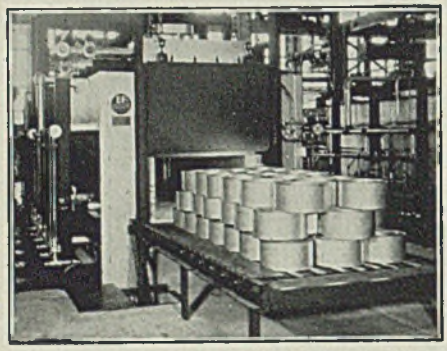


At Gisholt, the Army-Navy "E" and the Treasury Flag fly side by side.



EF FURNACES

For Every Industrial Heat Treating Process



EF gas fired hearth type furnace annealing brass for cartridge cases.

EF FURNACES ARE BUILT FOR EVERY PROCESS, INCLUDING

Annealing	Carburizing	Hardening
Copper Brazing	Drawing	Nitriding
Billet Heating	Enameling	Process Heating
Bright Annealing	Forging	Normalizing
Scale-free Hardening	Malleablizing	Ceramic Firing, etc.

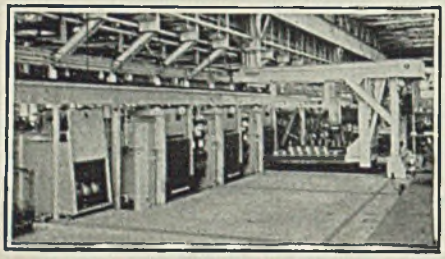
EF FURNACES ARE BUILT IN VARIOUS TYPES, INCLUDING

Bell Type	Chain Belt Conveyor Type
Box Type	Chain Strand Conveyor Type
Car Type	Continuous—miscellaneous types
Hearth Type	Reciprocating Hearth
Pit Type	Rotary Hearth
Pusher Type	Rotary Drum
Recuperative	Suspended Conveyor
Roller Hearth	Vertical Cylinder
Forging Furnaces	Walking Beam

EF double ended electric furnaces nitriding aircraft engine parts.

SOME ACCESSORIES WE BUILD FOR FURNACES

Conveyor Equipment	Special Atmosphere Generators
Transfer Mechanism	Pumping Equipment
Automatic Pushers	Continuous Quench Tanks
Charging Machines	Quenching Machines
Gantry Cranes	Washing Machines
Transformers	Switchboards
Pressure Systems	Contactors, etc.



EF forced circulation furnaces, quench, cooling chamber, and material handling crane.

THE COMPANY AND ITS SERVICE

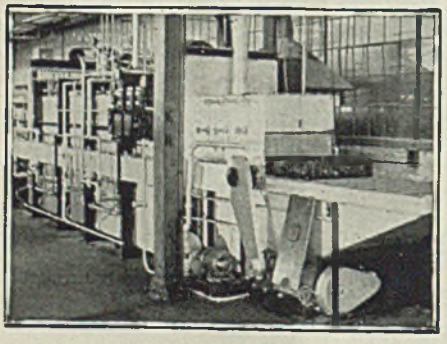
The Electric Furnace Company, with a background of over twenty-five years of furnace building experience, is prepared to furnish any type of kiln or furnace required for any firing or heat treating process.

With both electric and fuel divisions, EF engineers are in a position to make a thorough and impartial analysis of any furnace or heat treating problem and recommend and build the best size and type furnace for the job.

The Electric Furnace Company engineers have been able to improve heat treating processes, increase furnace production capacities or reduce the cost of heat treating operations in hundreds of prominent plants.

Consult EF Engineers on your next furnace or kiln problem. We shall be glad to give complete information, including installation and operating costs—and submit samples of products treated in equipment we have built.

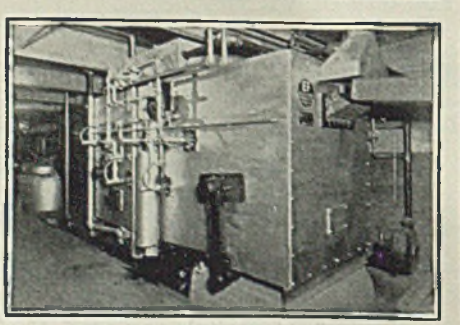
We Specialize in Building Production Furnaces.



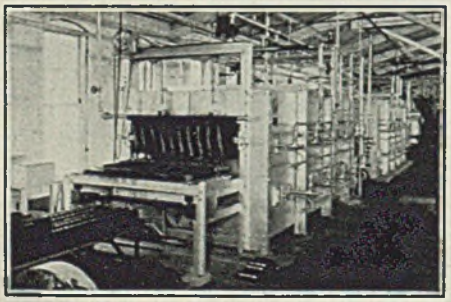
EF gas fired continuous roller hearth furnace annealing shell cases.

The Electric Furnace Co., Salem, Ohio

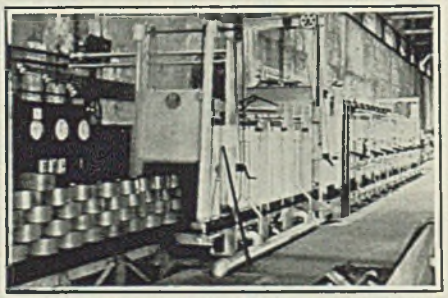
Gas Fired, Oil Fired and Electric Furnaces — For Any Process, Product or Production



EF special atmosphere furnace scale free heat treating machine gun cartridge clips—continuously.



EF gas fired special atmosphere installation heat treating shell forgings—automatically and scale free.



EF gas fired continuous roller hearth type furnace annealing 10,000 lbs. cartridge brass per hour.

Champion Welding Electrode handbooks are obtainable for distribution to apprentice classes.

● As Victory is reflected in the productive might of American industry, the shadow of the welder hovers over the crumbling bulwarks of the enemy.

Champion Welding Electrodes produce clean, smooth welds down to two inch lengths. All sizes and styles are available. Uncle Sam expects every operator to conserve by using the utmost utility in each electrode.

Be sure it's a stub before it's thrown away.

THE CHAMPION RIVET COMPANY

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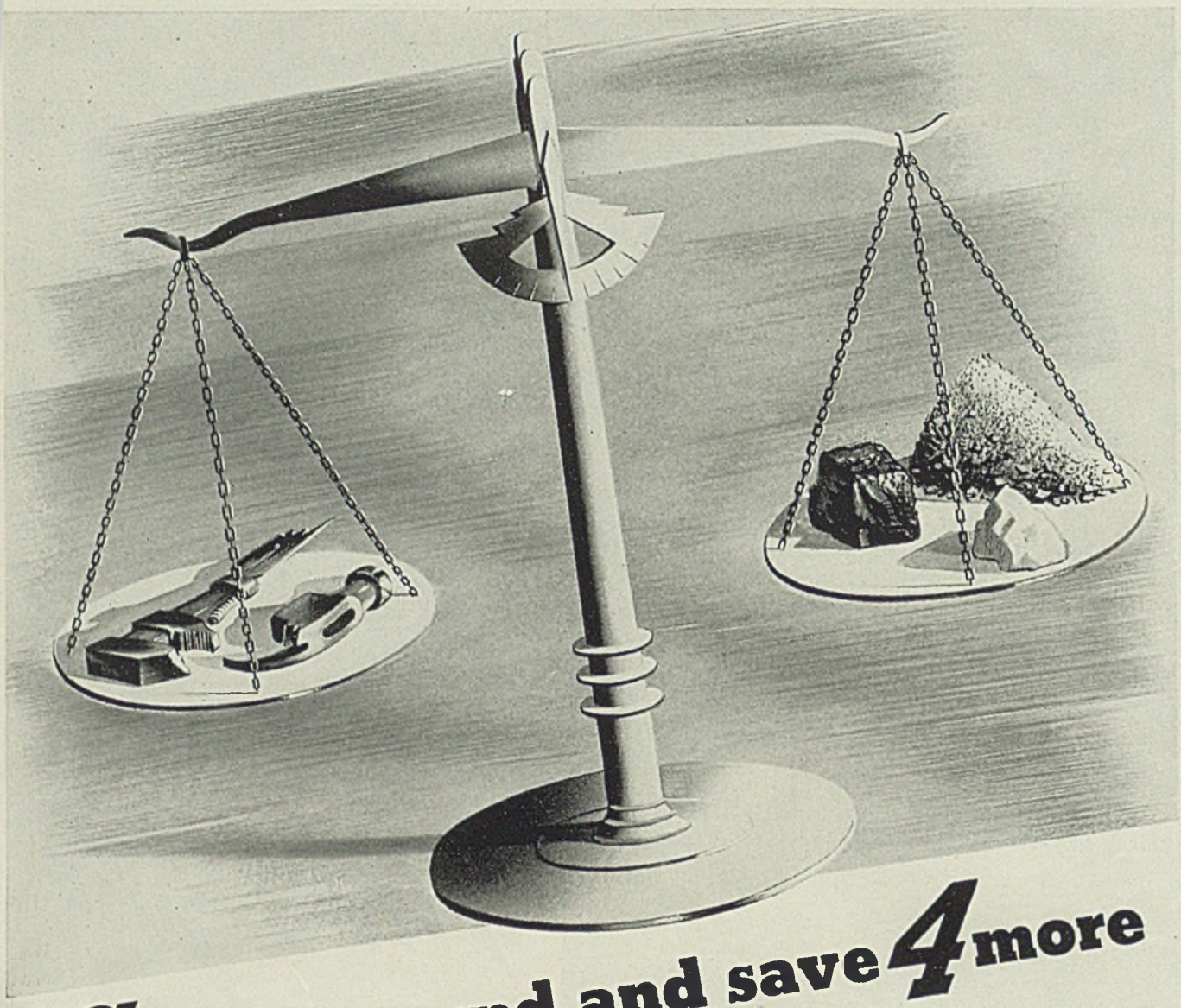

Scrap a pound and save 4 more

EACH pound of scrap used in making war steel replaces a pound of pig iron.

To make one pound of iron requires nearly four pounds of ore, coal and limestone.

So when you turn in a pound of scrap you also conserve four pounds of vital raw materials. Translate this saving into terms of the 6,000,000 tons of steel scrap that the industry needs today. It is the equivalent of:

12,000,000 tons, or 240,000 carloads of iron ore,

7,200,000 tons, or 144,000 carloads of coal,

3,000,000 tons, or 60,000 carloads of limestone.

Think also of saving the millions of man hours of labor involved in mining, transporting and processing these 444,000 carloads of raw materials — enough to form a solid train stretching from Boston to San Francisco.

The more dormant scrap YOU salvage, the greater the amount of America's materials, machines and manpower is released for the all-important task of winning the war now.

FOR VICTORY BUY UNITED STATES WAR BONDS AND STAMPS

THROW YOUR SCRAP V YOUNGSTOWN INTO THE FIGHT

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THE YOUNGSTOWN SHEET AND TUBE COMPANY

Youngstown, Ohio

25-43E

Enlist GIRLS for MANpower in Your Screw Driving Army

WOMEN DRIVE PHILLIPS SCREWS EASILY!

Now you can recruit women for your screw driving army and be sure of fast, *skilled* work from the very start.

Big muscles aren't needed to drive Phillips Recessed Head Screws. Further, it requires no mechanical aptitude... even novices produce without wobbly starts, slant-driven screws and slips that cause accidents or mar work.

Automatic centering of the driver in the Phillips Recess makes such efficient use of turning power that screws set-up uniformly tight... with so little effort that workers maintain speed without tiring. Screw and driver "become one unit," making driving so easy and fool-proof that work is greatly speeded up, regardless of the driving method employed. In most cases, power driving becomes practical.

They cost less to use! Compare the cost of driving Phillips and slotted head screws. You'll find that the price of screws is a minor item in your total fastening expense ... that it actually costs less to have the many advantages of the Phillips Recess!

KEY TO FASTENING SPEED AND ECONOMY

The Phillips Recessed Head was scientifically engineered to afford:

Fast Starting – Driver point automatically centers in the recess ... fits snugly. Screw and driver "become one unit." Fumbling, wobbly starts are eliminated.

Faster Driving – Spiral and power driving are made practical. Driver won't slip out of recess to injure workers or spoil material. (Average time saving is 50%.)

Easier Driving – Turning power is fully utilized by automatic centering of driver in screw head. Workers maintain speed without tiring.

Better Fastenings – Screws are set-up uniformly tight, without burring or breaking heads. A stronger, neater job results.

PHILLIPS *Recessed Head* SCREWS

WOOD SCREWS • MACHINE SCREWS • SELF-TAPPING SCREWS • STOVE BOL

21 SOURCES

American Screw Co., Providence, R. I.
The Bristol Co., Waterbury, Conn.
Central Screw Co., Chicago, Ill.
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Continental Screw Co., New Bedford, Mass.
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The National Screw & Mfg. Co., Cleveland, Ohio
New England Screw Co., Keene, N. H.
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Pheoll Manufacturing Co., Chicago, Ill.
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True measure... of what your welding dollars can buy...

Answer this important question in your own interest: What is the most sensible way to buy welding heat? On a theoretical or nominal rating which does not consider minimum and maximum output? Or on the WSR (Welding Service Range) which is actual delivered output over a *usable range*?

The WSR (Welding Service Range) method enables you to measure welding heat by the cost per ampere, based upon the machine's *maximum* output.

Measure this cost for P&H Arc Welders. Then measure the added values in P&H's *single control* and automatic arc response for all classes of work. Get this accurate appraisal before you invest in welding equipment. See your P&H Representative or write for the folder, "The Welder-Wise Way to Buy Welding Heat."

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Alloys in

ENGINEERING STEELS

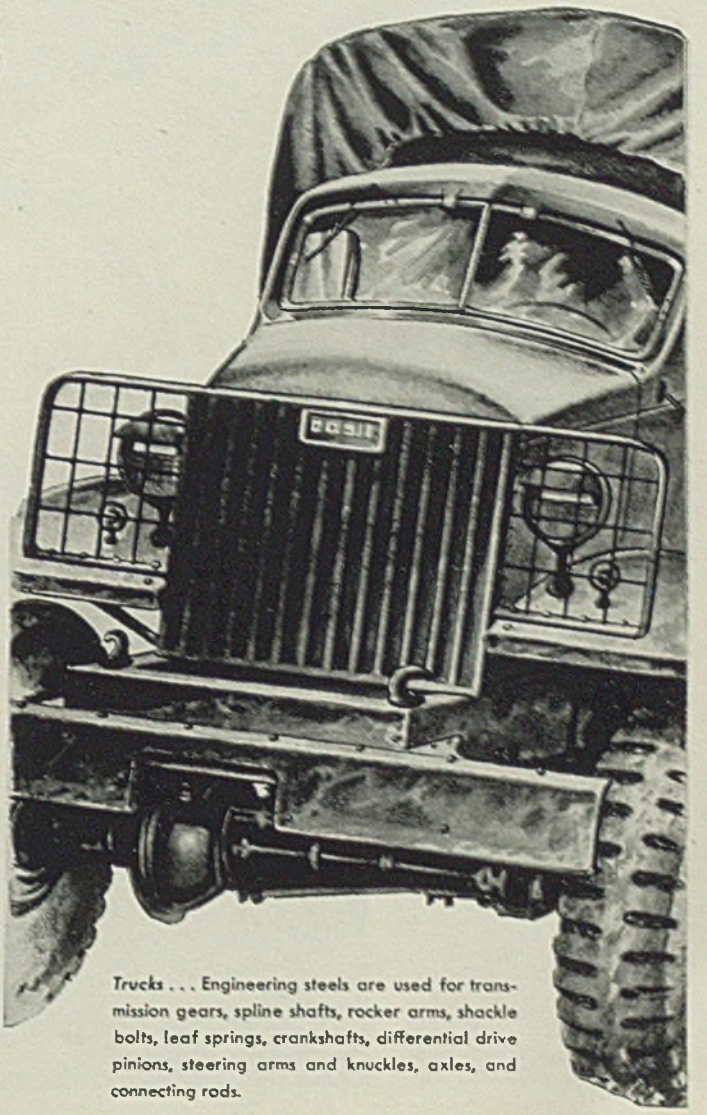
When chromium, silicon, manganese, molybdenum, tungsten, nickel, or vanadium are added to a plain carbon steel, the steel acquires new properties. Depending on the alloys added, and the amount, the steel is made stronger, tougher, harder, more heat-resistant and more corrosion resistant. Such steels are called alloy steels. When these steels contain less than 5 per cent alloy and are used for mechanical parts, they are usually known as engineering steels. Shown here are some typical uses of engineering steels.

Minimum effective amounts of these alloys, largely obtained from scrap, are used in the wartime alternate National Emergency steels, which are in many cases satisfactory substitutes for the standard alloy steels.

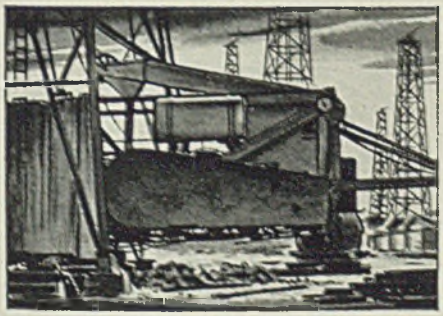
However, because of service conditions in many applications, the standard steels of higher alloy content must be used. In ball bearings, for example, where abrasive wear is a problem, the usual steel is SAE 52100, which contains 1.2—1.5% chromium and 0.30—0.50% manganese.

For more than 35 years we have produced the ferro-alloys used in making alloy steels. If you have a problem in the selection, fabrication, or use of an alloy steel, call on us.

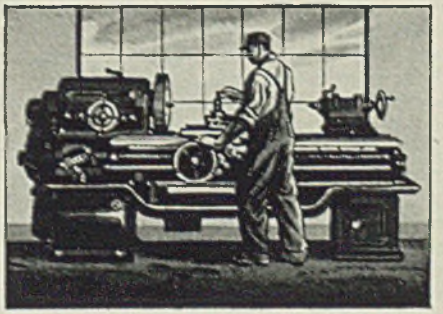
BUY UNITED STATES WAR BONDS AND STAMPS



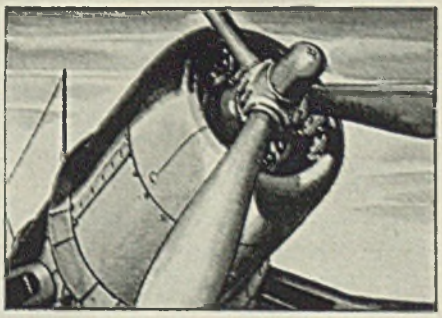
Trucks . . . Engineering steels are used for transmission gears, spline shafts, rocker arms, shackle bolts, leaf springs, crankshafts, differential drive pinions, steering arms and knuckles, axles, and connecting rods.



Petroleum Equipment . . . Pressure vessels, pipes, draw works shafting, drill collars, kelly bars, rotary table shafts, slush pump rods, and tool joints are usually made of engineering steels.



Machine Tools . . . Engineering steels are used for precision lead screws, spindles, toolholders, gears, collets, feed fingers, cams, shaftings, pneumatic toolholders and pistons.



Planes . . . Propeller blades and shafts, connecting rods, shafts, rocker arms and gears, cylinder liners, tubing, hydraulic parts, and structural parts are made of engineering steels.

ELECTRO METALLURGICAL COMPANY
Unit of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York, N. Y.
In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario

Electromet
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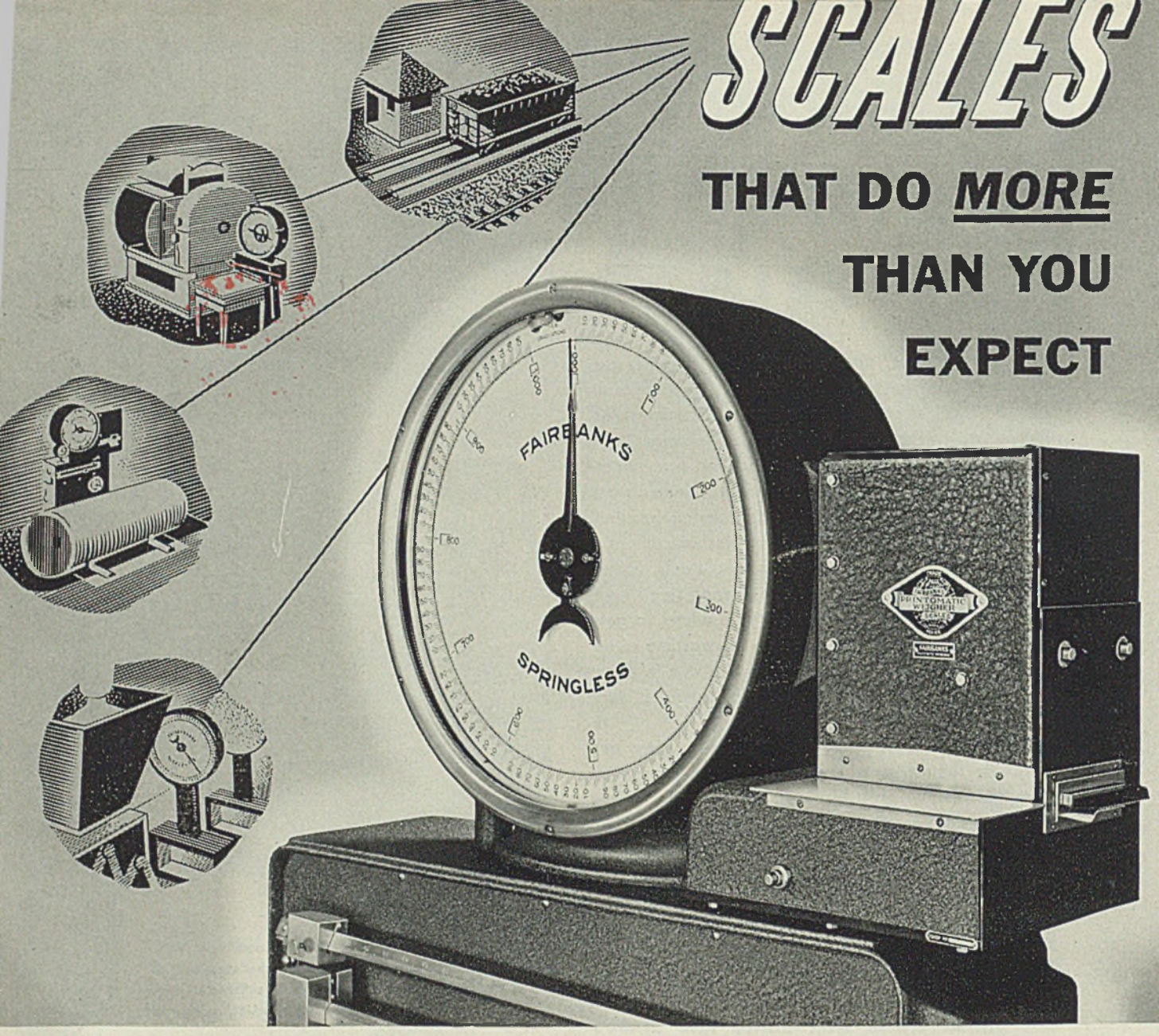
SCALES

THAT DO *MORE* THAN YOU EXPECT



OF course, Fairbanks Scales are big, husky, and accurate. You have a right to expect these things in *any* good scale — and particularly of Fairbanks Scales with the world's broadest scale manufacturing experience behind them.

The feature about Fairbanks Scales that may surprise you the most, is their ability to do things you *don't* expect of scales.

Here are a few of many jobs done by Fairbanks Scales:

- They count small parts — more accurately than manual counting
- They weigh carloads of coal in motion and make a printed record of each weight
- They automatically control paint ingredients
- They automatically control aggregates
- They "keep the books" in steel plants, making printed records of incoming and outgoing shipments
- They keep accurate records on chlorination in water treatment
- They record the *flow* of liquid chemicals
- They guard secret formulas in compounding
- They control batching in bakeries
- They prevent disputes by eliminating the human element in weighing.

AND all of these things, only the beginning of the story, they do automatically and mechanically thereby eliminating human errors.

How Fairbanks Scales can be fitted into your production flow to speed up operations and eliminate errors may prove to be the most interesting discovery you ever made. Investigate now. Write Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Illinois.

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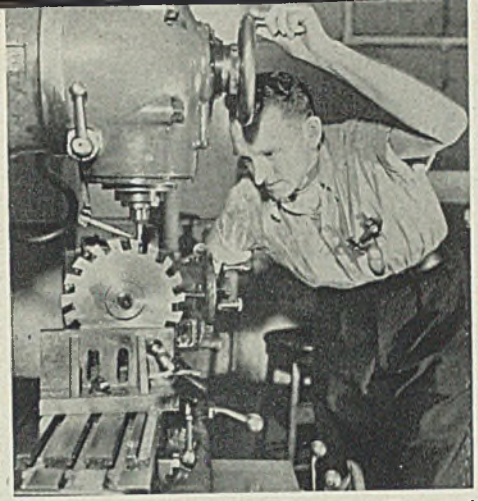
Scales



Tool engineers, machine tools and cutting tools. Pages 66-71.

STEEL

The Magazine of Metalworking and Metalproducing

APRIL 5, 1943

Volume 112 *Number 14*

NEWS

FEATURES

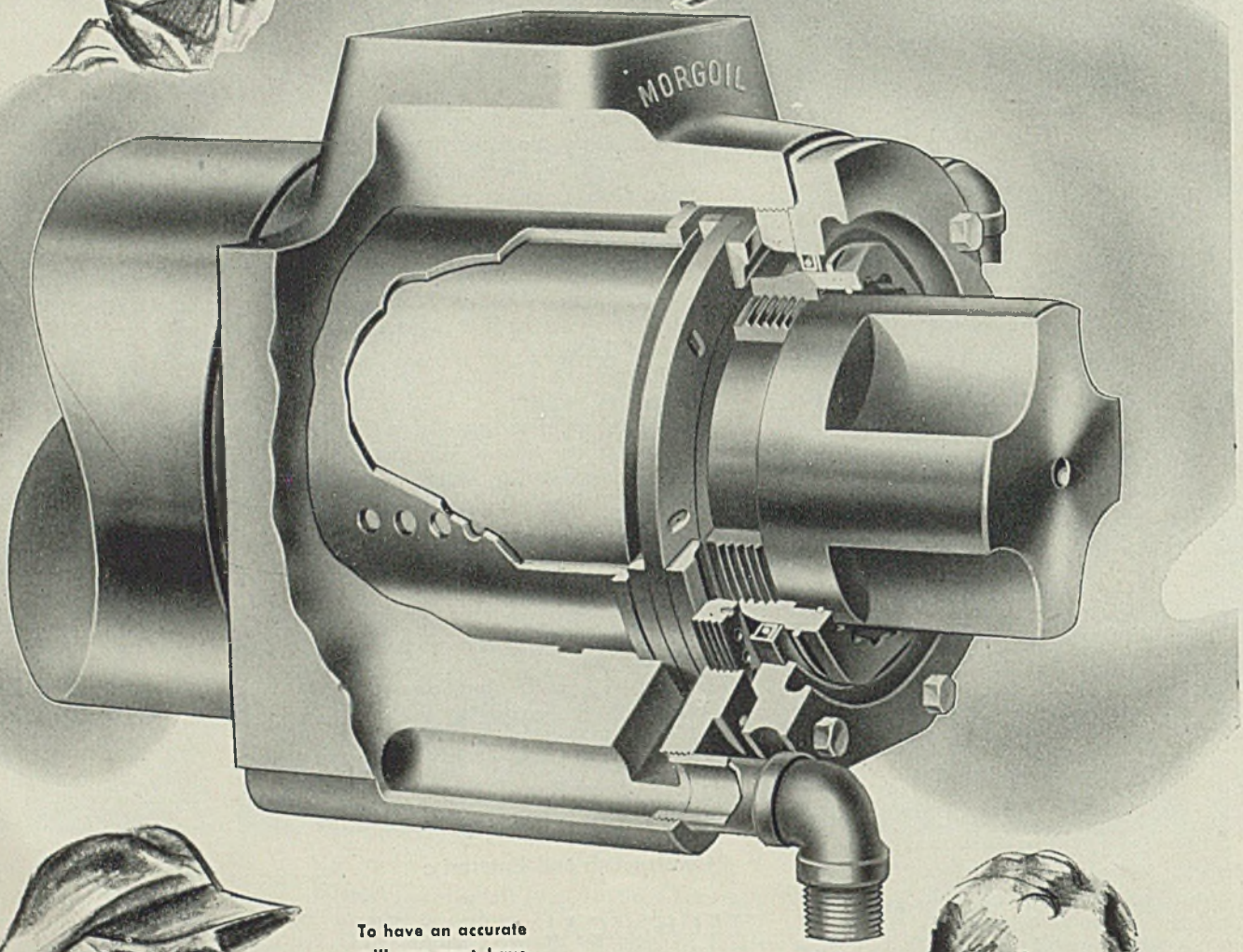
TECHNICAL

PRODUCTION

MARKETS

Never could figure out how a thin film of oil could support 5 million pounds, but it does — in a Morgoil.

Nowadays we run a mill around the clock and never have to worry about the bearings. They're Morgoils.



To have an accurate mill you must have accurate bearings — Morgoils.

Believe me, when it comes to bearing cost per ton of product, these Morgoils have everything licked.

MORGOIL BEARINGS

ride on a film of oil

MORGAN CONSTRUCTION COMPANY • WORCESTER, MASS.

R-112

HIGHLIGHTING

this issue of STEEL

TOOLING Tool engineering developments of major importance in still further speeding up the tempo of the war production program are pointed out by Guy Hubbard (p. 66) in his report covering personal observations during the national meeting and exhibition staged by American Society of Tool Engineers at Milwaukee. . . This vital subject of wartime tooling also is dealt with effectively (p. 71) in a revelation as to how Ternstedt Mfg. Division has smashed its cutter bottleneck. . . Machine tool builders (p. 70) insure against possible future letdown by lining up subcontracts on war materiel work now. Ceiling prices on used machine tools may be eased to stimulate rebuilding.

WASHINGTON Considerable attention is being focused upon food dehydration because of the importance of conserving vital cargo space in food shipments. Windows of Washington (p. 76) discusses the postwar business opportunities of this project in the first of two articles. . . Petroleum operators, mining producers, and utilities have been exempted (p. 81) by the WPB from inventory provisions of CMP Regulation No. 2. . . Office of Price Administration reportedly will establish ceiling prices on such products (p. 91) as sheets, bars, plates, strip and structural shapes. . . WPB has approved (p. 89) construction of a custom mill at Butte, Mont., to produce 400 tons of manganese each day.

WAR PRODUCTION Maritime Commission believes United States shipbuilders will produce 19,000,000 deadweight tons of merchant vessels (p. 99) in 1943. In its annual report, the group reveals all shipbuilding records were broken last year. . . Various engineering features of the Douglas Aircraft plant at Oklahoma City (p. 86) are covered in detail in Wing Tips. The vast two-mile long windowless factory, which is producing transport planes, embodies a "breathing" wall of masonry that has conserved many tons of critical materials. . . Great Lakes shipping season is expected to open April 15. Operators believe the 95,000,000-ton goal (p. 97) will be achieved without difficulty because of the new freighters being added to the lake fleet.

IN THE NEWS From Detroit comes news that Henry Kaiser, shipbuilding magnate, has gained (p. 83) a "toehold" in the auto industry. He has obtained the services of a well-known body designer and stylist to develop a modification of the jeep for the Army. Thirty-eight top flight auto executives are intensively studying manpower problems. Chrysler released a detailed report of progress at its new Dodge Chicago airplane engine plant. . . Another example of how women in industry indirectly have "revolutionized" (p. 95) the interiors of war plants evidenced at the N. A. Woodworth Co., Ferndale, Mich. A beauty salon and cosmetic canteens are scattered throughout the plant. An elaborate lounge which seats 160 has been provided as a "morale builder" during recreation periods. . . Kansas has adopted legislation controlling labor unions (p. 72). In Colorado and Texas similar measures, requiring annual financial reports and banning unfair labor practices, have been approved and await the governors' signatures.

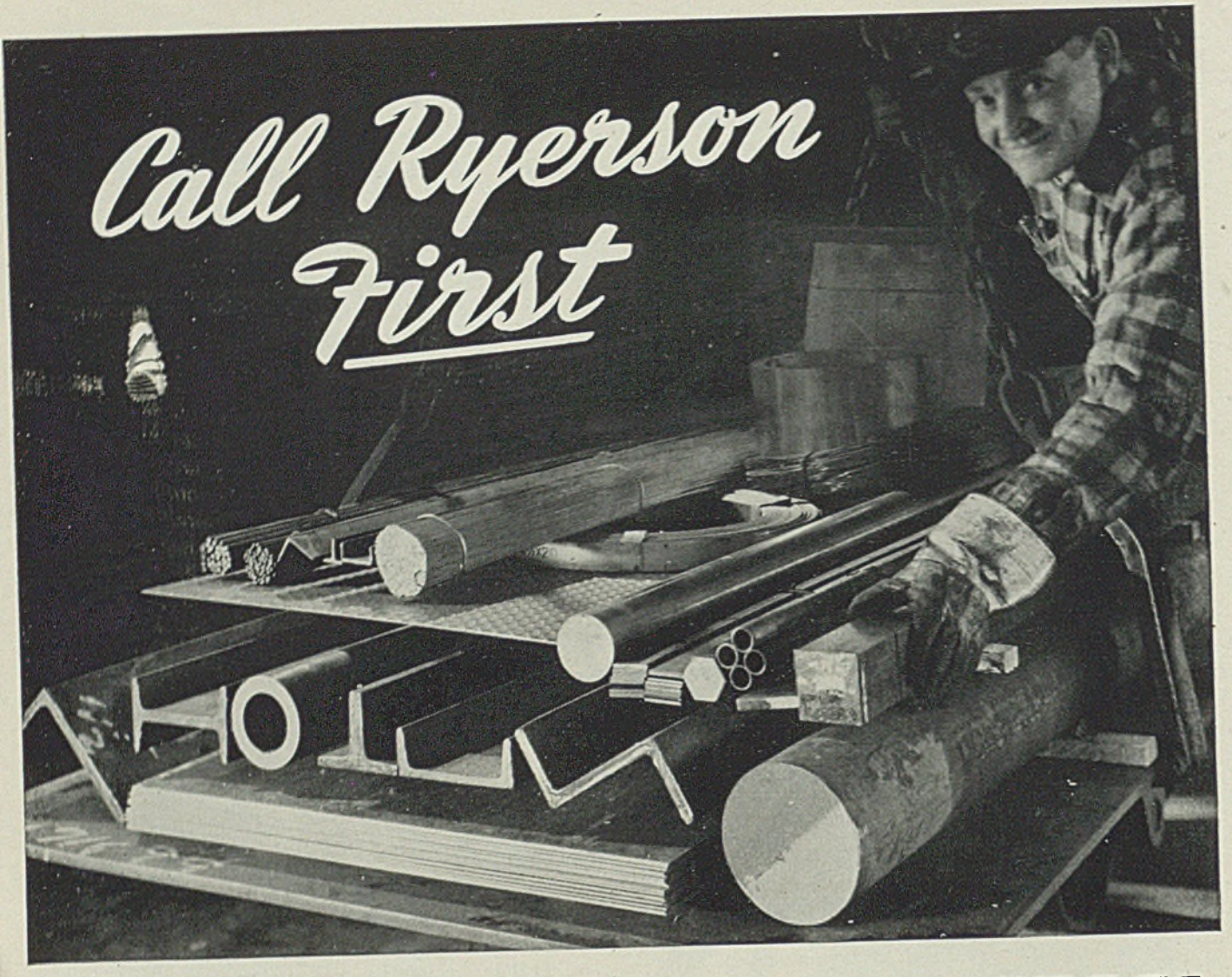
TECHNICAL Frank J. Vosburgh examines carbon as a material for applications where a refractory is needed (p. 106). He points out that well over a million pounds of carbon are used yearly in that capacity. Many applications where carbon can be used to advantage are detailed.

J. O. Almen concludes his discussion of how design and internal stresses influence fatigue of steels (p. 112) by examining gear applications. Contact impressions of gear teeth are pointed out as a valuable means of finding out how the load may be distributed on the gear teeth.

The great interest in addition of small quantities of boron in steelmaking has focused attention on methods of analyzing the boron content, since it is used in quantities of only a fraction of 1 per cent. Thus the description (p. 114) of an analytical procedure for determining boron content within an accuracy of plus or minus 0.0005 per cent is very timely. G. A. Rudolph and L. C. Flickinger describe the reactions, the equipment and procedure.

A number of simplified charts presented by C. Nilson and A. W. Herbenar (p. 118) aid in examining hardenability tests in evaluating NE steels. . . Walter Bridgeman explains the important place being assumed by rust-inhibiting wax finishes to protect metal surfaces (p. 122). . . E. S. Evans begins a timely description of a highly effective method of packing shipments in freight cars to avoid damage and fully utilize all space available (p. 125).

D. G. Clark shows how tipping cutting tools saves important amounts of alloying elements (p. 128). Maximum savings accrue when a carbide tipped tool is used in a toolholder, since this permits 0.10-pound of alloys to replace the pound required for a solid high-speed steel tool doing the same work.



FOR QUICK ACTION ON STEEL

"WE'RE having better luck on steel, now," said a manufacturer the other day. "There *were* times when we had to 'phone and 'phone, but now we are going to the warehouse with the most complete stocks, with best facilities for handling and delivery. We are saving the time of shopping around—and saving man-hours in our plant—by calling Ryerson first."

Sound reasoning, isn't it, when you want something, to go where you're most apt to get it. Whether it's fast service, a steady, reliable source, a cutting or fabricating operation that will facilitate your production, or just information and assistance, you're most apt to get what you want by calling Ryerson first!

Ryerson has maintained its leadership in the steel business by making good every promise, by knowing the kind of service customers want and giving it to them, and above all else, by having *in stock* most of the time the kinds, shapes and sizes of steel they want, ready for immediate delivery.

Stocks are reasonably complete, considering the war demand placed upon them. But, whatever kind of steel you want, within the WPB plan; whatever service you would like to have, *call Ryerson first!* You'll get prompt, intelligent cooperation—at Ryerson!

JOSEPH T. RYERSON & SON, *Inc.*, Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City

RYERSON STEEL-SERVICE

STEEL
April 5, 1943

A Place for Teamwork

In recent weeks there has been a noticeable inclination on the part of some business leaders to confer with responsible labor union officials on postwar social, economic and political problems. The object of these discussions is to find common points of interest on which capital and labor can unite to their mutual advantage.

Concurrently another movement affecting labor relations has been gaining headway. Kansas has passed a labor law, effective May 1, 1943, which is intended to protect union members, non-union employes, employers and the public against improper union practices, such as racketeering. The governments of several other states have passed similar laws, or are considering legislation.

At first glance, it may seem that these two independent movements are contradictory. The conferences between business leaders and union officials may appear to be a courting of union power, whereas the state laws may be construed as an attack against this power.

We believe this is a narrow and distorted interpretation. We prefer to think that both movements are constructive and are pointed toward a common objective.

The conferences on postwar problems are intended to marshal the resources of capital and labor for the preservation of private enterprise—an aim which is just as vital to a wholesome union movement as it is to the owners of private enterprise.

The Kansas law and others which may be enacted are intended not to curb the legitimate power of unions but to discourage the abuse of union power. While some shortsighted union leaders may deplore these laws and fight hard against their enactment, union statesmen who are thinking of the future realize that a clean-up of racketeering, whether accomplished by law or otherwise, will be as beneficial to good unions as to employers and the public.

For every point in which the interests of capital and labor are antagonistic there are dozens in which their interests run parallel. Fortunate will be this nation when both sides recognize this fact and act accordingly.

E. L. Shaner

Editor-in-Chief

20,000 Learn About New Techniques at Milwaukee

Heat treating by "freezing," glass gages, salvaging broken tools, adapting standard machines for special purposes in war production, highlight eleventh annual convention and exposition

By GUY HUBBARD
Machine Tool Editor

SCIENTISTS, physicians, surgeons and others of the learned professions periodically take advantage of "refresher courses" — usually called clinics — to keep up with the times in their respective fields. Why shouldn't engineers and production specialists do likewise?

That was the question in mind when, in the face of not-too-encouraging conditions, the American Society of Tool Engineers staged its eleventh annual convention and machine tool and progress exhibition in Milwaukee, March 25-27, 1943.

What was the verdict? Suffice it to say that 20,000 key men of American and Canadian industry responded to the call, were amazed and enlightened by what they heard at the technical meetings and saw in the 138 company and institutional exhibits, and have returned to their duties throughout the Arsenal of Democracy with hundreds of new ideas and fresh techniques with which they now face with renewed confidence and renewed energy the ever-growing problems of material and worker shortages, and the mounting demands for better war materiel faster and in greater volume.

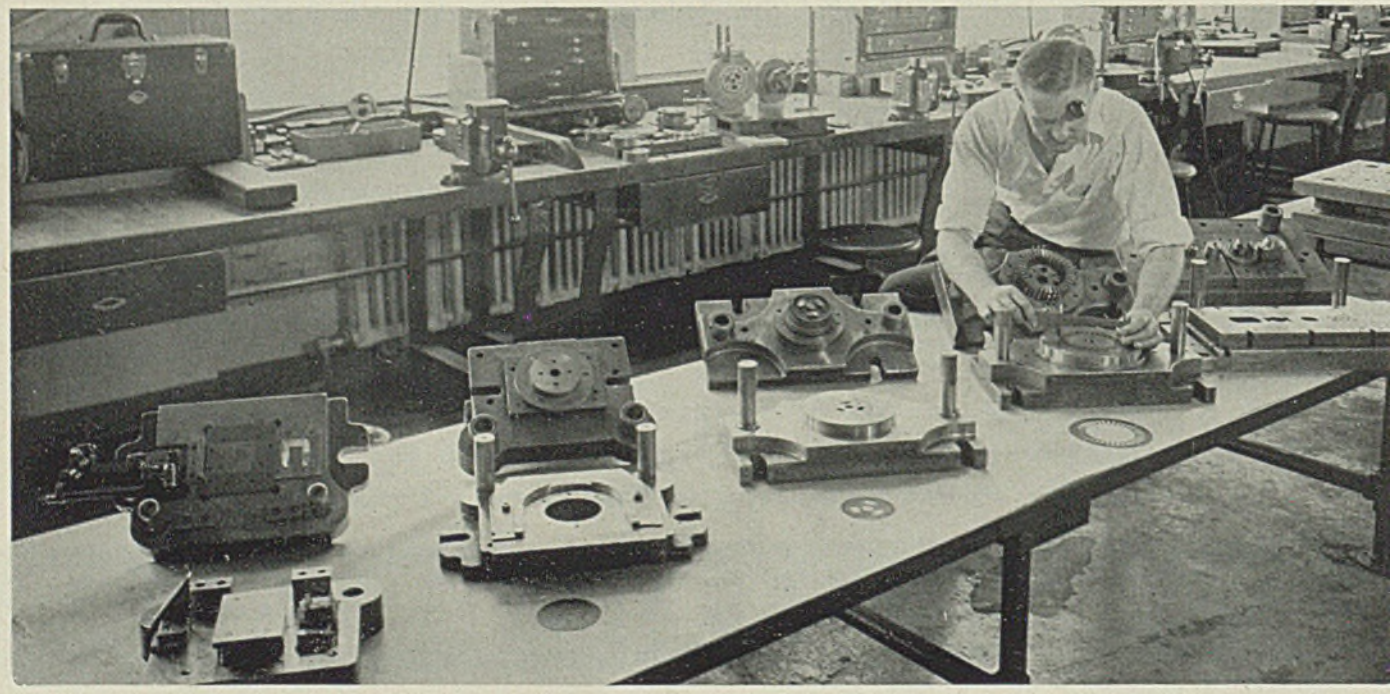
In other words, this ASTE venture turned out to be very much worth while as a "shot in the arm" to keep Uncle Sam wide awake on the job of supplying all the United Nations with the quality and quantity of war goods which eventually, and we hope in the not-too-far distant future, will crack the citadels of the Axis powers on all fronts.

This writer, who spent three busy days at the Milwaukee convention and show, has been asked what his primary impression was. Well, here it is. My primary impression was (and is) that American engineers and technicians now top the list in their ability to grasp the significance of new scientific discoveries and quickly to apply them successfully to the practical purpose of producing more and better goods for more people—at this time represented by the land, sea and air forces of the United Nations.

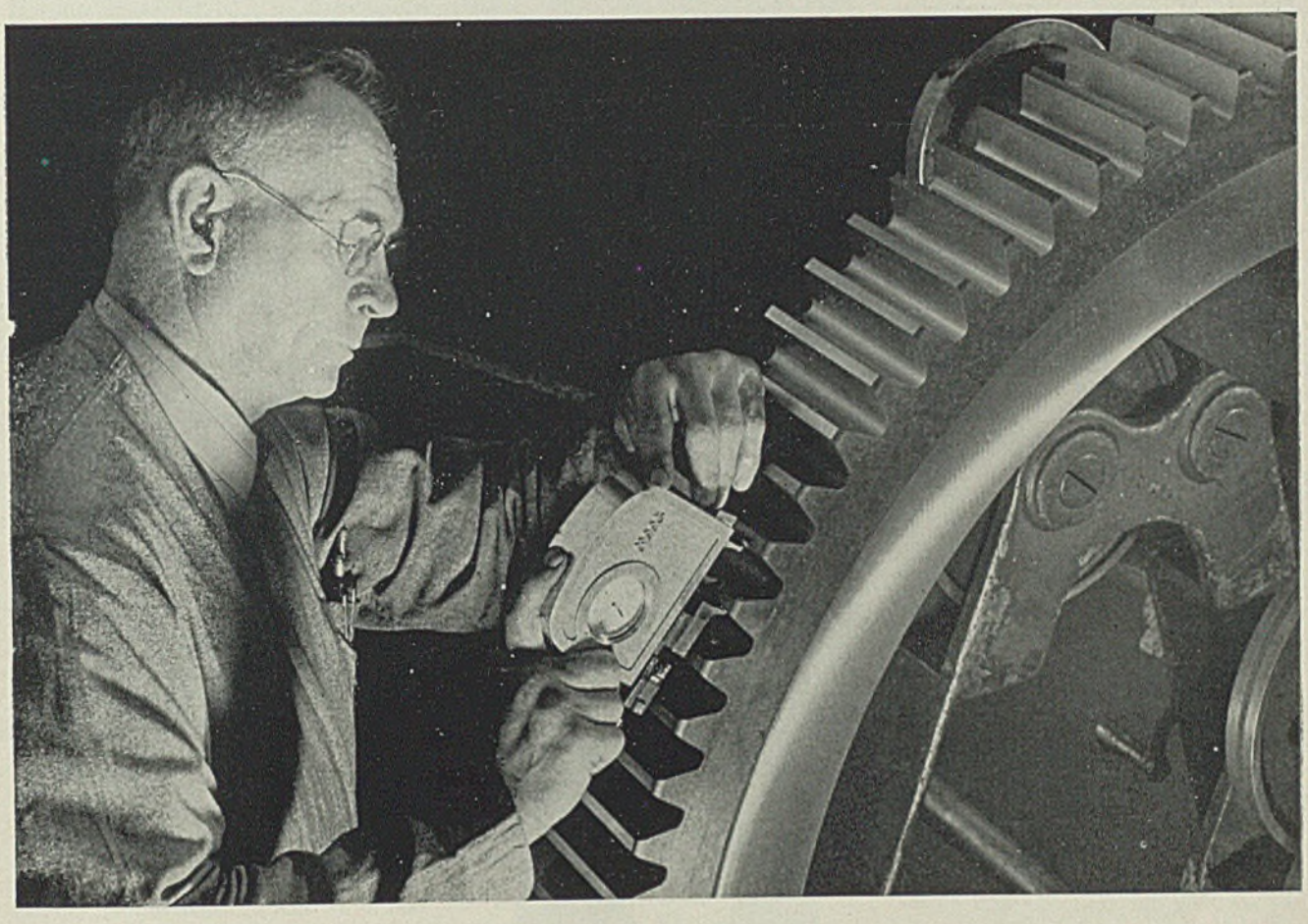
Just to illustrate how this co-operation between scientists and production specialists is working in this country, let me cite a few examples out of my recent Milwaukee experience. First, consider the technical sessions, which incidentally were of very high caliber. There, for example, we heard Prof. O. W. Boston, College of Engineering, University of Michigan, give a paper on "Machinability Ratings of Metals and Cutting Fluid Recommendations" with special reference to national emergency steels.

Professor Boston's laboratory at Ann Arbor obviously is not of the "ivory tower" variety. Rather, it is an experimental machine shop where things theoretical are reduced to usable machine shop facts by painstaking series of tests involving standard machine tools equipped with special instruments which record exactly what goes on over wide ranges of speeds and feeds with various lubricants and coolants.

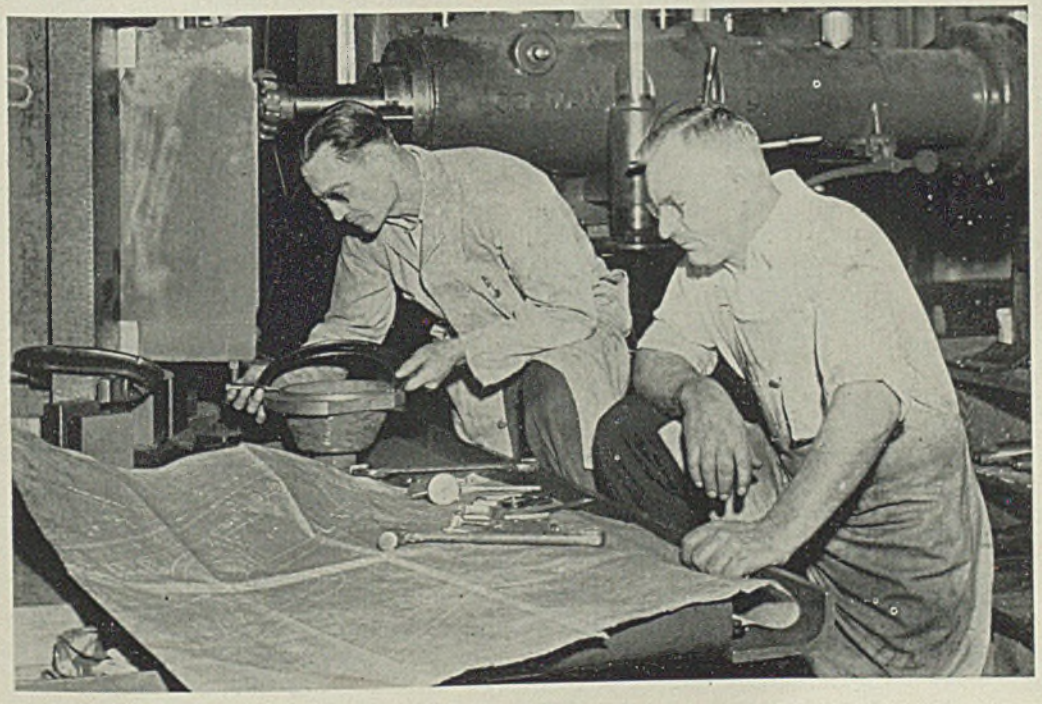
Out of this patient, common sense research, Professor Boston has evolved and constantly is evolving data on a wide variety of materials, which give to machine shop men definite guidance on



Engineering ingenuity and painstaking craftsmanship required in making and checking special tools, is emphasized by this array of punches and dies for motor laminations in the toolroom of the Westinghouse plant in Lima, O.



Tool engineers must "follow through" every step of the way from the initial design of tools, to their performance on the finished product—as in the case of this big ring gear which is being checked for tooth spacing by means of a special dial gage at Westinghouse Nuttall works, Pittsburgh



Initial tooling setups demand close co-operation between tool designers and toolmakers, inasmuch as the engineering drawings have to be translated directly by the machine tools rather than interpreted through jigs and fixtures as in production work. OEM Defense Photo by Palmer, courtesy Frederick Colman & Sons Inc., Detroit

speeds, feeds, coolants and type of tools which should be used for maximum efficiency in roughing and finishing work under production conditions. These tables of machinability factors—too extensive of course to reproduce here—are being made available to industry as rapidly as they are being worked out. To my mind this project is as sweeping in its effect as was Frederick W. Taylor's original work along this line about 50 years ago.

Stepping into another session, I heard a gentleman who described himself as a "country doctor" give a straight-from-the-shoulder talk as to what must be done to make machine shops fit for women to work in, and what kind of supervision they must have. Dr. B. I. Beverly knows, because as director of health and personnel, Republic Drill & Tool Co., Chicago, he has accomplished things which are attracting competent women to that shop and causing them to remain there.

The Doctor "Prescribes"

Three of the many points which he stressed are: Keep the shop as clean, orderly and quiet as it is possible for a machine shop to be; figure women workers as having about half the physical strength of men; and above all, don't let "Bull-of-the-Woods" type foremen have anything directly to do with supervision of women workers. There is a lot more to it than that, but this will give some idea as to the scope of the doctor's work in solving personnel problems related to manpower shortage.

Another experience at Milwaukee which sticks in my memory was that of hearing Arthur Schwartz, chief tool research engineer, Bell Aircraft Corp., Buffalo, tell of the stunts being done in his shop with some home made cutters of unconventional design. Possibly "stunt" is not the right word for a job where an odd looking milling cutter with a cast body and two teeth shod with cast cutting alloy, removes metal so fast that a man literally has to stand at the machine with a pitch fork to keep the chips cleared out. Nor is it a stunt when wood saws running at 12,000 surface feet per minute are used successfully day in and day out to cut armor plate just as though it is wood. These and many other feats are in the production picture at Bell Aircraft.

Mr. Schwartz, I might add, uses simple terms in describing things. When low co-efficient of friction between tool and work is desirable, he likes "blank" metal tool bits because they are "blank slippery". That is plain talk that all men in industry understand. He did a grand job of putting his paper across.

I heard T. J. Thompson, manager, industrial division, Corning Glass Works, Corning, N. Y., tell about glass gages and saw him toss heat treated glass blanks about as though they were tough metal. These tempered glass gage blanks had been heated, then as Mr. Thompson said, "dunked to quick freeze the outside surface", following which the core was allowed to cool slowly. Center holes are drilled with carbide drills using turpentine as a lubricant. Surfaces are wet rough ground up to 6000 feet per minute, then finished at 1000 to 2500 feet per minute with extremely slow traverse. Final cuts not exceeding 0.0004-inch in depth should be taken with a dry wheel to glaze the surface.

Less than 0.020-*inch* should be removed from the surface of glass gage blanks to avoid removing the tough outside "skin" already mentioned. Generous pilots must be provided to prevent chipping at the ends of plug gages. Markings can be etched or can be cut by tungsten carbide tools in an engraving machine.

Rationing is a new experience for the average man-in-the-street, but is by now an old story to the man-in-the-shop as far as cutting tools are concerned. With vital alloying elements literally worth their weight in gold, it not only is desirable but a "must" to make existing cutting tools give up their last usable fraction of an inch in metal cutting. Speakers at the ASTE sessions dealt with this from two angles; first, provisions that allow "pushing" of tools as hard as possible as long as possible; second, that of repairing tools which have worn or broken under this heavy service. Typical of the first was the method revealed by Axel Lundbye, chief engineer, Crowell-Collier Publishing Co., Springfield, O., whereby cutting tools are hard chromium plated, thus lengthening their useful life—in the case of doctor blades used in shearing paper—from eight hours (unplated) to 110 hours (plated). Inasmuch as Mr. Lundbye's company offers the use of their patented process royalty-free to war industry for the duration, no further details are necessary here.

Spliced Cotton for Belting

Westinghouse, through R. W. Mallick, section engineer at East Pittsburgh, did likewise on that company's new technique for splicing cotton belting used to replace scarce rubber and leather belts. Belting may not exactly be a "tool" but many a tool is driven by it these days, so it is not out of place to mention it here.

Broken tools no longer are thoughtlessly tossed into the scrap bin. They are salvaged by silver alloy brazing (A. M. Setapen, Handy & Harmon, New

NEW OFFICERS

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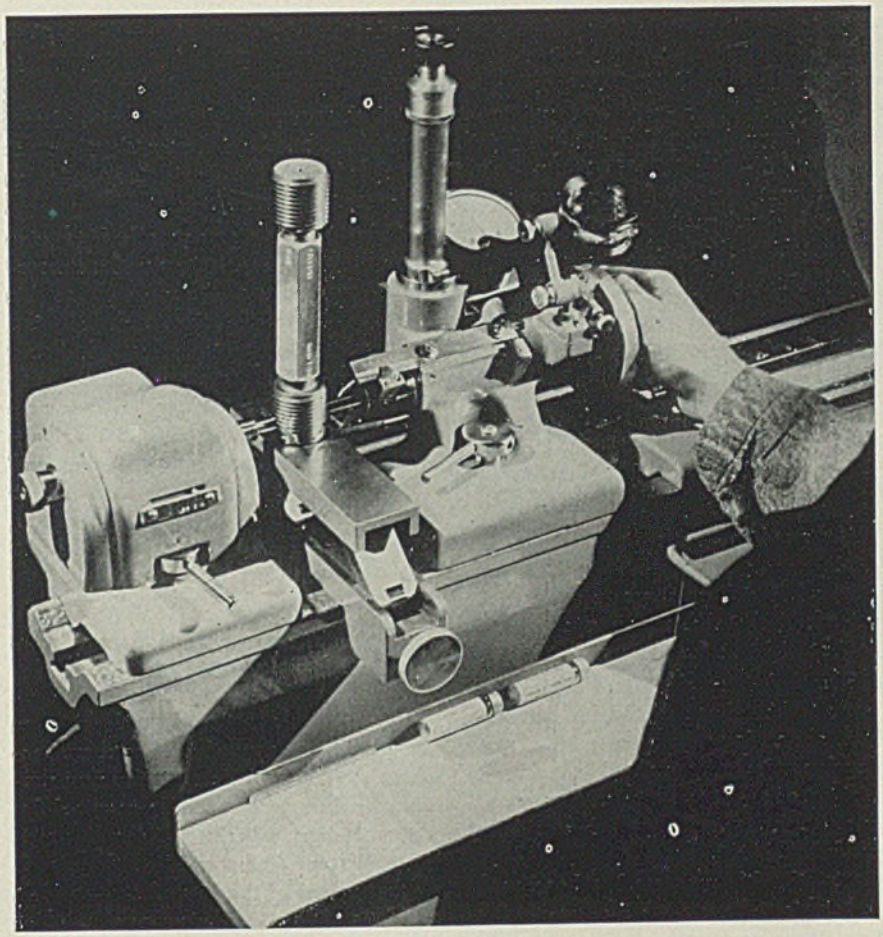
Secretary: Earl V. Johnson, engineering representative, Firth-Sterling Steel Co., Dayton, O.
Treasurer: Floyd W. Eaton, War Manpower Commission, Detroit.
Adrian L. Potter was re-elected executive secretary, with headquarters at ASTE main office in Detroit.



Let those who are unduly impatient for delivery bear in mind that there is no royal road to accuracy of precision tools and gages. Unless exactly to specifications, they "infect" with inaccuracies the products on which they are used. Step-by-step checking—as of the thread gage on this precision measuring instrument—therefore is a "must". Photo courtesy Pratt & Whitney, West Hartford, Conn.

York dealt with that); by low temperature brazing (H. W. Foege, Eutectic Welding Alloys Co., New York, covered that); or by use of cast high speed steel welding rods (according to technique revealed by L. C. Gorham, Gorham Tool Co., Detroit). If you have broken broaches, milling cutters, drills, reamers, form tools, etc., hold on to them—and the pieces. As Dr. Munyon used to say: "There is hope!"

Among various new techniques emphasized at Milwaukee were high speed milling cutters with sintered carbide blades set at negative rake angles. I heard Malcolm Judkins of Firth-Sterling Steel Co., McKeesport, Pa., describe the cutters and their use, but couldn't believe it. I looked at the cutters on display in the show. Still I didn't believe it. Finally, I visited the plant of Kearney & Trecker, where I saw there cutters roughing out tough steel forgings at an amazing rate of speed (fire flew freely) but leaving surfaces which require little or no finishing. It is just one of those many things which can't work — but does. Mathematicians figured out conclusively that bumble bees theoretically can't fly—but they do. One must have an open mind these days.

In passing, I should mention that among many other uses of induction heating, Frank Curtis, chief engineer, Van Norman Machine Tool Co., mentioned tempering and salvaging of tools. We will deal completely with Mr. Curtis' paper in a later issue.

Exponents of hot and cold forging await the day when these processes will be so accurate that they will make machining unnecessary. That this is no idle dream was proved at the convention by facts, figures—and samples, having to do with "forged-to-form" differential side gears. R. J. Goldie, president, Timken-Detroit Axle Co., Detroit, explained how these were produced in exceedingly rigid dies in powerful presses by hot forging and subsequent coining in accurate, rigid dies. About one pound of steel per gear is saved by this process, and Mr. Goldie sees the day not far distant when many gears will be forged to close limits, then finished by shaving.

To try to cover the show comprehensively in a report of this kind is of course impossible. It had to be seen and seen again, and still again, to be appreciated fully and for its significance to soak in. However, I may be able here to hint at some of the trends which were indicated.

As far as machine tools are concerned —and a rather suprising number of them were shown—it was obvious that new cutting materials make it possible in many cases to do "heavy" jobs in light or medium duty machines. Instead of slow speeds and heavy feeds, these new machines and tools make it possible to attain the same ends by high speeds and lighter feeds per cutter revolution. This was amply demonstrated by a number of milling, boring and cutting-off machines—some of which have direct motor driven spindles.

Looking Into the Future

It looks very much as though the machine tool of the future is destined to do a great deal of its work at speeds which were associated with "open belt drive" in the pre-motorized era. This kind of equipment in some cases was originally most familiar in the field of woodworking but it is destined to be a big factor in metalworking from now on. Incidentally, these light, fast machines are ideal for women to operate.

The show demonstrated that undue consumption of elbow-grease in machine shops is a thing of the past. Heavy operations of control, positioning, chucking, clamping, etc., can be done pneumatically, hydraulically, electrically or by combinations thereof. Even the familiar bench vise is now power-driven—so I discovered at the show.

In the field of gaging, a trend toward direct comparison was evident in several directions—notably that of optical projection. Improved lens systems and screens make possible the quick superimposing of a greatly enlarged "shadowgraph" of the part itself, upon an equally enlarged theoretically correct and accurate outline drawing of the part, thus making possible almost instantaneous checking both of size and shape by relatively inexperienced inspectors. Without intending to belittle any of the more conventional systems, this optical projection method holds great possibilities and deserves careful attention, especially where great numbers of parts must be dealt with.

I have been asked what—if any one thing — in the show best exemplified Yankee ingenuity and convinced me that America still leads the field in finding new and unusual ways to accomplish

industrial ends. My answer to that one is:

"Heat treating by freezing".

Years ago a French-Canadian lumberjack on Mount Ascutney in Vermont told me in all seriousness: "The ax and saw make change when she get down to 50 below!" I didn't take much stock in it at the time. However, after seeing refrigerating units at the Milwaukee show which actually do "heat-treat" steel at 120-150 below zero Fahr.—thereby increasing its hardness several points—it looks as though that Vermont lumberjack actually had sensed a scientific principle which metallurgists finally have rediscovered, developed and put to work in the machine shops of America.

Industry Produces "Itself Out of Business for at Least a Decade"

POSITION of machine tool interests in respect to contract renegotiations has not yet been clarified, despite the fact a number of companies have had the matter up for discussion with the adjustment boards for some time.

Chief difficulty of the boards in meeting this problem is that they haven't been able to construct a yardstick to determine how much profit machine tool interests can keep to tide them over the postwar period.

Some of the factors being taken into consideration in arriving at a fair profit return for these companies include:

1. Machine tool output in the past four years is said to be equivalent to a normal demand through 1965.

2. During 1940 and 1941 machine tool interests were not able materially to build up cash reserves, for they plowed back earnings into new plants and inventories. Last year and this would appear to be the only chance these companies will have to build up reserves.

3. After World War 1 about one-quarter of the industry either went broke or consolidated with other interests.

Taking Subcontracts

As a hedge against possibility of sharply curtailed operations during the closing months this year a number of machine tool interests are already making tests and otherwise preparing production facilities for subcontract war work. One plant is in production of aircraft wheel hubs, while another is making test runs on a precision part for diesel engines. Still another is said to be in position to make tanks if and when plant facilities become available. Official of one machine tool interest is quoted as saying that if it were to accept all the orders for making aircraft engine parts offered them by Detroit manufacturers, its plant could be kept busy through 1944.

Spread between machine tool output and volume of new orders has been widening steadily in recent months. Production is nearly twice that of new orders, while deliveries on an average are extended slightly under six months, against eight at the close of last year.

The peak in machine tool demand appears to have been passed for the duration, although spurts in new orders may develop following radical changes in designs of military equipment or changing emphasis on type of equipment needed.

Considerable progress has been made in bringing about a more even distribution of order backlogs among machine tool builders by the transferring of idle units to plants urgently needing them. This has measurably aided production when new tools could not be obtained soon enough to meet requirements.

Supply of cutting tools used on machine tools, including reamers, milling cutters, taps, twist drills, dies and particularly broaches, is becoming tighter. Round the clock operations of most machine tools, indicate no let up in cutting tool requirements and skilled toolmakers are increasingly hard to find. No progress is being made against order backlogs despite the fact suppliers have sharply expanded output.

Move to reduce ceiling prices on used machine tools and to widen the margin percentagewise between "as is" and rebuilt prices is still pending.

A. G. Bryant, president, Bryant Machinery & Engineering Co., in a letter to the War Department urged that the job of skimming off excess profits in the machine tool industry be left to the Treasury Department's tax collectors. Mr. Bryant said that the industry needs something more than moderate reserves for contingencies in the next few years.

"It is obvious that by equipping the country for war during 1940, '41, '42 and '43, the industry has practically put itself out of business for at least a decade

"After World War 1, machine tool production declined 90 per cent from $222,000,000 in 1918 to $23,000,000 in 1921.

"With the rapidly declining rate of new business . . . the industry shortly must be faced with the danger of producing at an actual loss. . .

"The industry cannot afford to give up a dollar of its earnings under renegotiation procedures. Price levels at this time must not deteriorate and in the face of higher costs and much lower volume later this year, some upward adjustments may be necessary. Any weakening in the discount basis to the long-established machine tool distributors will be disastrous not only to them but to the industry as a whole and, therefore, to the peacetime economy as well as to the wartime effort of America."

Stilwell Cites Appeal for Careful Review of All Orders

The nation's machine tool builders have repeatedly urged that no more machine tools should be built for war production than were actually required by the war effort, Charles J. Stilwell, president, Warner & Swasey Co., Cleveland, told members of the Manufacturers Club of Mansfield, O., at their annual meeting last week.

"We urged that all existing machine tools be used to their maximum extent," Stilwell said. "We urged that orders for new machine tools be carefully reviewed by the War Production Board and by the Army, the Navy and the Air Corps—to make sure that new orders did not exceed actual requirements.

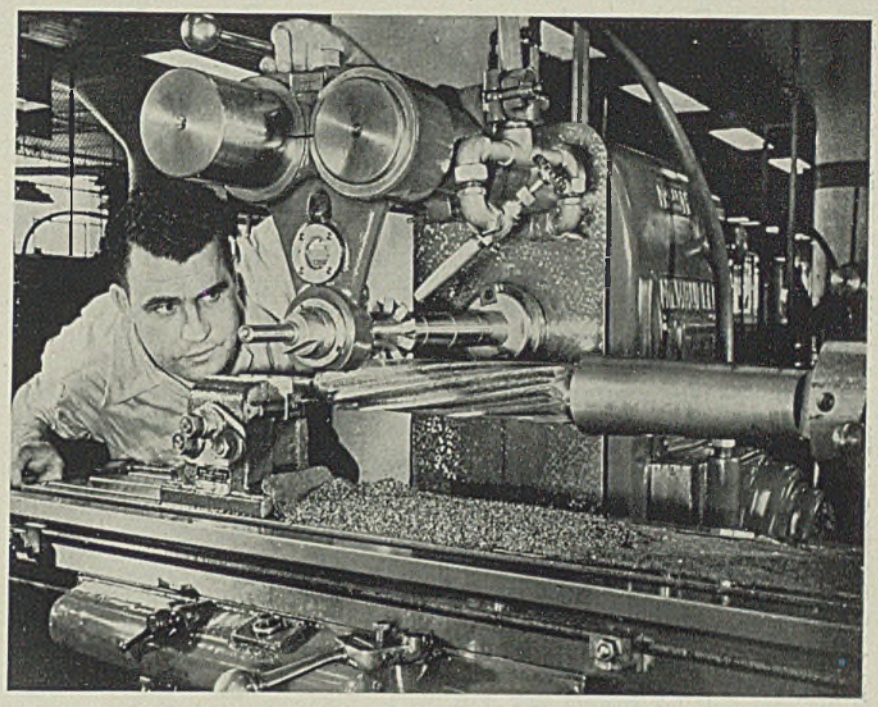
"We further urged that the War Production Board inspect war production plants to see whether or not all new machine tools in those plants were actually being used—and that any machines not being used be sent to other plants where they could be put into use immediately.

"These things are today being done. Today new machine tool orders are being carefully analyzed and representatives of the War Production Board are visiting war production plants and allocating to other plants any new machine tools which they find idle."

National Safety Council has launched a campaign against "off-the-job" accidents that are hindering the war effort. Col. John Stilwell, president of the council, says such mishaps are as preventable as work accidents and that their prevention is just as vital to victory. In 1942 a total of 29,000 workers met death off-the-job; compared with 18,500 killed at work..

Deliveries Slow, GM Makes Own

Ternstedt Division turns out 500 special purpose units daily. Has produced 50,000



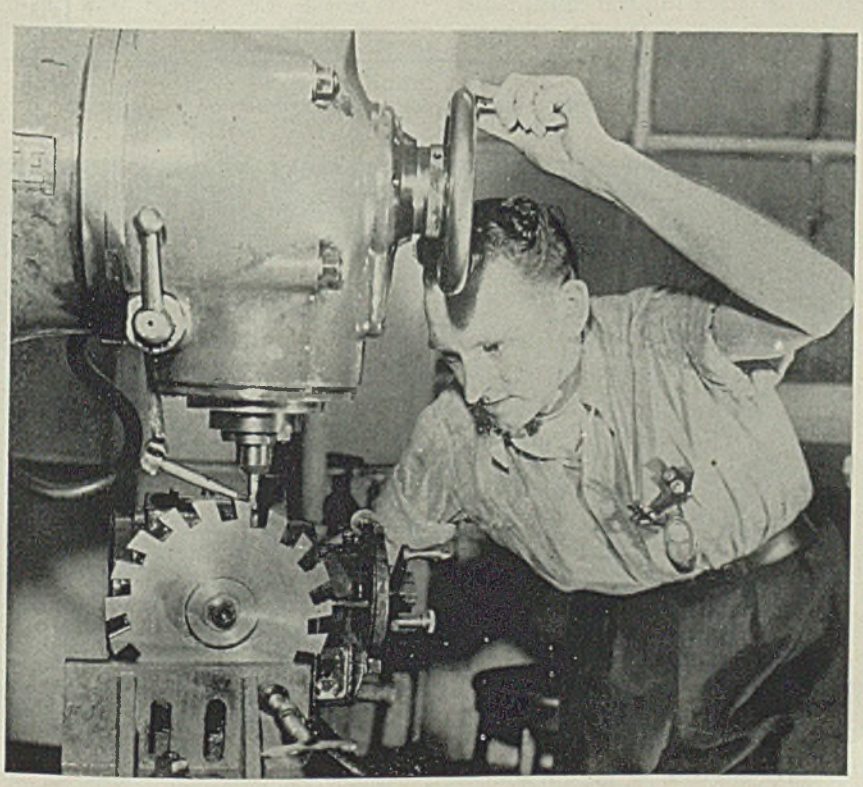
Machining spiral flutes of an end mill. This tool is 3½ inches wide and 26 inches long. Cutting end is of high-speed steel, but the shank end is of mild steel welded to the cutter

A CUTTING tool war production program which has proved invaluable in manufacture of many types of armament has been instituted at Fisher Body's Ternstedt Manufacturing Division plant, Detroit, as slow delivery of vital cutting tools threatened to delay Fisher's tank, antiaircraft gun, naval gun, bomber, aircraft instrument, and other projects.

As a result, some cutting tools which could not have been obtained for 15 weeks were built in a week or less. The program was started principally to assist in production on M-4 tanks, but subsequently it was expanded to give assistance to various other armament jobs in Fisher Body, and then to other divisions of General Motors Corp.

At present more than 750 different kinds of cutting tools are being manufactured, and since its inception the plant has turned out a total of more than 50,000.

Although manufacture of cutting tools is as foreign to automotive building as is production of tanks or guns, nevertheless Ternstedt can now turn out up to 500 tools a day. Nearly all are built on special order to meet specific requirements, rather than on a mass production basis of standardized types. Those now being turned out range in weight from 4 ounces to 100 pounds, and quantities of different types range from a single tool to several hundred.



Machining a blank for inserted-tooth cutter. This tool could not be obtained for 25 weeks from normal sources, but here it is being made on a three-week delivery promise

Numerous developments have been achieved on this job in methods of making such tools. An example is improvement of the use of tool holders—a method whereby the cutting unit consists of a holder and the tool itself. When the tool breaks or becomes dull, a new one can be inserted in the holder, eliminating replacement of the entire unit.

Development of this idea for cutting tools to be used in connection with tank ring and turret turning operations had resulted in a monthly saving of 30,000 pounds of steel a month, on this one operation alone.

The plant also has devised a means of salvaging cutting tips on small tools. Such tips are usually small pieces of tungsten carbide fastened to the end of the unit. When the tip becomes worn or broken it is removed by acid (dissolving the copper brazing), reworked and resharpened, then reinserted in the holder.

In this connection it might be mentioned that a bulletin issued by the Central Procurement District of the Army Air Forces, Detroit, last September, outlined an acid method for removing tungsten carbide tips from tool shanks, based on a procedure worked out at Ford Mo-

(*Please turn to Page* 163)

Three State Legislatures Pass Measures To Regulate Unions

STATE legislatures are taking action on measures imposing more control over trade unions. A bill requiring all unions to make annual reports to the secretary of state recently passed both Houses of the Texas legislature and now awaits the governor's signature. In Kansas a similar measure becomes effective May 1.

The Texas bill requires all unions to elect officers annually by majority vote, except those which continuously for four years have held their elections at three or four-year intervals and which have not charged more than $10 for initiation. The annual reports would not be open to public examination.

Gov. Andrew Schoeppel in signing the Kansas bill said "labor has now come of age and it is my concept that it is now strong enough to accept equal responsibilities with management."

The Kansas bill was the first important one regulating labor relations to be adopted this year by a state legislature. In some respects it is similar to the Wisconsin Employment Peace Act and a measure recently approved by one chamber of the Ohio legislature. A tripartite tribunal which includes a state labor commissioner is set up to represent employes. Listed among unfair practices are secondary boycott, failure to give notice of intention to strike, and coercion and intimidation of employes or their families. It also contains a "cooling off" provision concerning strikes and lockouts and requires an annual financial report by unions to membership and registration by unions. Salaries and wages paid union officers and fees and assessments collected from members must be published. Jurisdictional disputes are declared illegal.

Both branches of the Colorado legislature have approved a bill which would require labor unions to incorporate and would place them under closer scrutiny of the state industrial commission. Like the Texas and Kansas measures, it calls for regular financial reports and classifies sit-down strikes and secondary boycotts as unfair labor practices. Another provision outlaws union initiation fees for temporary workers.

Management-Labor Council To Meet with Nelson Periodically

Formation of a management-labor council to meet periodically with the chairman and other top officials of WPB, to discuss plans and policies as they may affect organized industry and organized labor and in general to bring both groups more intimately and effectively into the war program, was announced last week by Chairman Donald M. Nelson.

The council will have eight members, four of whom have been named by Mr. Nelson. They are:

Eric Johnston, president, Chamber of Commerce of the United States.

Philip Murray, president, Congress of Industrial Organizations.

Fred Crawford, president, National Association of Manufacturers.

William Green, president, American Federation of Labor.

Each of these men will select one additional member from his own organization to sit with him in the meetings of the Council.

48-Hour Week for Calumet Area Upheld by McNutt

Hope that the recent WMC order for the 48-hour week in the Calumet district beginning May 1 might be moderated or rescinded was blasted last week when War Manpower Commissioner Paul V. McNutt announced that original plans will be carried through.

Industry, labor and business groups had vigorously protested the move, and had carried their case to Mr. McNutt, who had promised consideration of their pleas and corrective action if justified. The delegation maintained there is no shortage of manpower in the Chicago area at present and no sharp decrease in labor supply is expected in the immediate future.

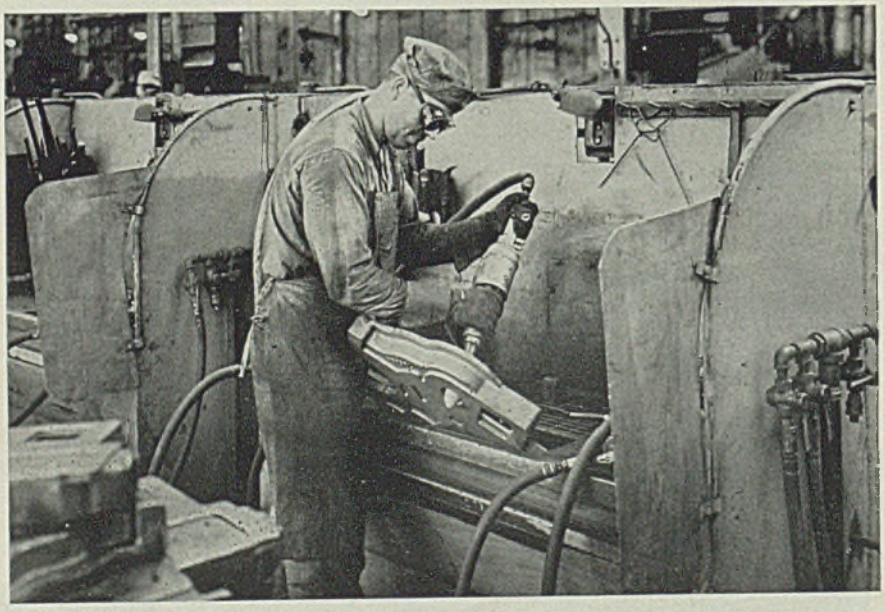
Meanwhile, there is as yet no indication how the district's steel plants, most of which are in the Calumet area, will work out schedules to put their employes on a 48-hour basis. Insofar as is known, no plan has been evolved for the problem is a complex one and will require extensive study.

Southern Operators, Miners To Continue Negotiations

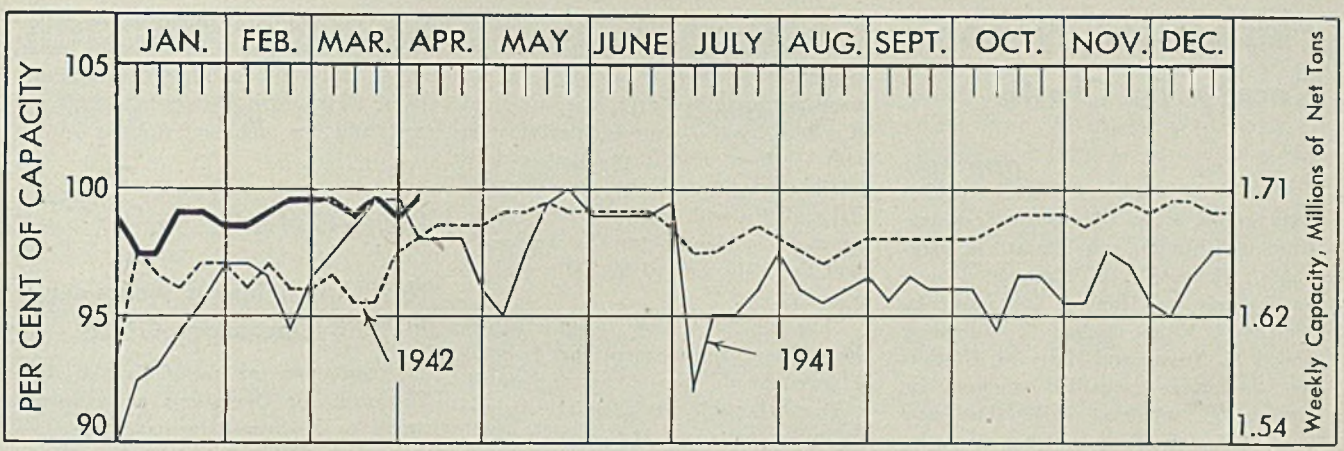
Possibility of a widespread shutdown of soft coal mines before the end of April was averted last week when Southern operators and miners agreed to continue negotiation for 30 days after contracts expired March 31. Northern miners and operators had reached a similar agreement earlier. Similar agreements have been signed in outlying districts.

Meanwhile, the National War Labor

VENTILATED WORK BENCH MINIMIZES DUST HAZARD



DUST-LADEN air is pulled downward through the grill and filtered in this ventilated work bench at the Caterpillar Tractor Co., Peoria, Ill., foundry. Such devices as these help prevent industrial illnesses, result in increased production of war materials



STEEL INGOT PRODUCTION BY MONTHS

Net Tons, 000 omitted

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1943	7,408	6,811										
1942	7,124	6,521	7,392	7,122	7,386	7,022	7,148	7,233	7,067	7,584	7,184	7,303
1941	6,922	6,230	7,124	6,754	7,044	6,792	6,812	6,997	6,811	7,236	6,960	7,150

PIG IRON PRODUCTION

1943	5,194	4,766										
1942	4,983	4,500	5,055	4,896	5,073	4,935	5,051	5,009	4,937	5,236	5,083	5,201
1941	4,666	4,206	4,702	4,340	4,596	4,551	4,766	4,784	4,721	4,860	4,707	5,014

Board indirectly served notice on John L. Lewis, president of the United Mine Workers, that it intends to pass on all labor disputes not settled by peaceful procedures and to settle them on their merits. Mr. Lewis earlier had assailed the NWLB as a "packed court" and had indicated his unwillingness to submit the coal dispute to it.

Agreement to continue negotiations 30 days after contract expiration was reached after Dr. John R. Steelman, director of the Labor Department's conciliation service and understood to be representing the President personally, had intervened in the negotiations.

Principal issues in the dispute are Lewis' demands for a $2-a-day wage increase, computation of a day's work on a portal to portal basis, and the unionization of about 50,000 minor bosses.

Aluminum Production Up 50 Per Cent Over 1941

Aluminum Co. of America's production last year increased 50 per cent over the tonnage made in 1941, according to the company's annual report. Eighty-five per cent of output came from company-owned plants and the remainder from government-owned Defense Plant Corp. units built and operated by the company.

When DPC plants now under construction are completed and placed in operation, aluminum capacity will be double 1942 output. By the year end, total aluminum capacity will be 2,100,000,000 pounds.

DISTRICT STEEL RATES

Percentage of Ingot Capacity Engaged in Leading Districts

	Week ended Apr. 3	Change	Same week 1942	Same week 1941
Pittsburgh	101	None	96.5	102
Chicago	99.5	+0.5	104.5	101.5
Eastern Pa.	95	+ 2	90	96
Youngstown	97	— 1	94	97
Wheeling	88.5	None	82.5	88
Cleveland	93	+ 1	90.5	96
Buffalo	90.5	None	93	88.5
Birmingham	100	None	95	90
New England	100	+ 5	80	92
Cincinnati	91	+11	92	93.5
St. Louis	93	None	87	98
Detroit	94	None	88	74
Average	99.5	+0.5	°98	°98

°Computed on bases of steelmaking capacity as of those dates.

Canada's Output Back To Normal After Strike

Steel production in Canada has returned to capacity following the strike interruption which reduced output in January. Pig iron output currently is at 93.3 per cent, due to blowing out one stack at Sault Ste. Marie, Ont., for relining.

Production comparisons in net tons follow:

	Steel ingots, castings	Pig iron	Ferro-alloys
Feb. 1943	245,588	157,467	16,356
Jan. 1943	207,008	116,327	15,331
Feb. 1942	242,921	143,973	17,358
2 Mos. 1943	452,596	273,794	31,687
2 Mos. 1942	501,937	307,129	35,362
2 Mos. 1941	402,067	217,559	29,906

Ingot Rate 99½ Per Cent, Up ½-Point

Production of open-hearth, bessemer and electric furnace ingots last week was at 99½ per cent of capacity, ½-point higher than the prior week. Five districts gained slightly, one declined and six were unchanged. A year ago the rate was 98 per cent; two years ago also 98, based on capacity as of those dates.

Principal factors in the increase were resumption after flood in the Cincinnati district and after a short strike in eastern Pennsylvania. Other changes were of minor character.

Steel Payrolls, Employment Down Slightly in February

Because of the short month, steel payrolls of $122,759,000 in February were somewhat below the January figure of $129,760,000, according to The American Iron and Steel Institute. In February, 1942, payrolls amounted to $108,563,000.

Employment also declined to 635,000 from 637,000 in January. February, 1942, employment averaged 651,000.

Wage-earning employes worked an average of 41.6 hours a week, compared with 39.8 in January, and 39 in February last year.

Wages averaged 110.5 cents an hour, against 110.7 cents in January and 99.5 cents in February a year ago.

Plane Flew, Nelson Ready To Chute

CHICAGO

Donald M. Nelson's arrival in Chicago, March 31, to address the Economic Club of Chicago, was almost via parachute. Enroute from Washington on a navy plane with four of his assistants, Merrill C. Meigs, Sydney J. Weinberg, David M. Noyes, and Harry M. Gustaffson, they were compelled to circle the airport 45 minutes while the crew worked frantically to release a faulty landing gear.

Faced with the alternative of parachute jumps or sticking with the plane in a crash landing, the passengers decided in favor of jumping and started preparation. In the nick of time, however, a mechanic freed the landing gear and the plane was landed safely. Commenting upon the exciting incident, Mr. Nelson said "the boys offered me a priority on the first jump."

"Today we are turning out more goods for war than we ever produced for our peacetime needs, yet we have enough industrial power left over to keep civilian standards of living at a high level," the WPB chairman told the group.

Regarding the outlook for continued maintenance of civilian goods output, he stated: "At this time it is desirable that we do not curtail civilian production much further. On the other hand, we must not be too optimistic. In these uncertain times there is no telling how heavily the hand of the war may yet fall upon us, though I am convinced that psychologically we Americans are now in fighting trim. We are ready for whatever may come."

Mr. Nelson asserted the nation this year will turn out more than 80 billion dollars worth of goods for war purposes. This compares with 48 billion in 1942, 17 billion in 1941, and 4 billion in 1940.

Referring to recent WPB personnel changes, he said, "as a war agency, WPB must always be ready to reorganize when necessary to keep in line with the requirements of the dynamic war effort. Now that we are approaching production in full blast, if I had to find the keynote word for WPB work from now on it would be flexibility."

Industry Now Can Meet Demands of "Third Front"

Arriving March 31 for a three-day inspection tour of nearly a score of war plants in this area, Lt.-Gen. William S. Knudsen, director of production for the Army, stated in a press conference that American industry has reached a point in production where it can meet any demand put upon it—"even a second front or a third front". Expressing satisfaction with all lines of war production, with possible exception of airplanes, the general said that with improvement now being made in plane output he was confident the 1943 goal of 90,000 would be reached.

"The efficiency now being attained, the constant improvement that is being achieved in all lines of industry are almost unbelievable. It is the interchangeability of parts, no matter where they are manufactured in this country, that is licking the Axis."

Whereas we emerged from World War I predominant in motor transportation, he predicted the nation would come out of the present war predominant in air transportation.

$867,938,150 Invested in Chicago Area War Plants

Investment in new plants, additions to plants and current computations of some of the larger war plants in the Chicago area announced during March amounted to $24,070,000. According to the industrial department, Chicago Association of Commerce, the total figure for new industrial war plant facilities to date this year is $49,278,150.

In addition to announcements of new plants which hitherto have not been mentioned, there were some plant expansions under way in March whose estimates originally were too low.

Adding the figure for the first three months to the previous grand total of war plant investment in the Chicago area since beginning of the war effort, July 1, 1940, the total to date reaches the sum of $867,938,150.

FREIGHT . . .

Shippers Estimate Increase of 2.5% in Freight Carloadings

Freight carloadings in the second quarter of 1943 are expected to be 9,170,439 cars, 2.5 per cent above loadings in the same quarter in 1942 when they totaled 8,947,071, according to estimates compiled by thirteen Shippers' Advisory Boards on the 28 principal commodities.

Percentage gains expected are coal and coke, 5.2 per cent; manufactures and miscellaneous, 10.4 per cent; ore, 4.8 per cent, and machinery and boilers, 4.6 per cent. Food commodities show the greatest gains. Declines are anticipated as follows: Agricultural implements and vehicles other than automobiles, 35.6 per cent; cement, 20.9 per cent, and iron and steel, 5.7 per cent.

PERSONNEL . . .

New Appointments Announced In WPB Operations Office

Organization of the Office of Vice Chairman for Operations and appointments to key positions have been announced by WPB Operations Vice Chairman Donald D. Davis.

John Hall, who has been director, Construction and Utilities Bureau, becomes deputy vice chairman for Industry Operations, and Wade T. Childress, who has been deputy director general for Field Operations, will continue the same duties with the title of deputy vice chairman.

John P. Gregg, who was United States secretary, Combined Production and Resources Board, has been named assistant deputy vice chairman for Industry Operations, and James A. Folger will continue in his present position, assistant deputy vice chairman.

Four new top positions have been created in the Office of Operations Vice Chairman, as follows:

Scheduling officer, John Mohler; materials officer, Joseph E. Adams; orders officer, J. B. Walker; program implementation officer, John H. Martin.

Organization of most of the industry divisions under five bureaus in the Office of Operations Vice Chairman remains unchanged, and all bureau and division directors have been reappointed to the positions which they held under the Director General for Operations, except that James Auten, formerly deputy director, Construction and Utilities Bureau, is named director to succeed Mr. Hall.

The Shipbuilding Division and the Radio Division, which for a time reported to Executive Vice Chairman Charles E. Wilson, have been returned to the jurisdiction of the operations vice chairman and will report directly to the deputy vice chairman for Industry Operations. The Tools Division has also been returned to the Equipment Bureau.

The Government Division will hereafter report directly to the deputy vice chairman for Industry Operations, as will the Salvage and Conservation Divisions, the Concentration Division, the Mineral Resources Co-ordinating Division, the Procedures Division, the Office of Industry Advisory Committees, the Office of Product Assignments, and the Redistribution Division.

Replacement Orders for Rejected Steel Must Be Given Top Priority

REPLACEMENT orders for steel which has been rejected by the producer's customer as not meeting specifications are given priority over all other orders, regardless of their rating or CMP authorization unless specifically directed otherwise by WPB. This ruling has been issued by WPB in a letter to steel producers.

Steel producers are allowed to replace such material without extension of an additional allotment and they must give replacement tonnage preference on the production schedules.

If it is impossible to ship the replacement tonnage on time, the producer must notify the Steel Division, WPB. Rejected material must be used, WPB ruled, under applicable rules pertaining to this class of material; otherwise, disposal must be made with the advice of the Steel Division.

WPB's public statement made no mention of the recent Carnegie-Illinois case but instructions evidently fit situations which were reported during the investigations.

Warehouse Ruling Covers Merchant Steel Products

WPB has revoked the steel warehouse order M-21-b and has substituted three-part control over deliveries of merchant trade steel products in a new order, M-21-b-2, which is added to M-21-b-1 and CMP-4. (See also page 91.)

This permits warehouses to place orders for certain products up to a specified percentage of mill production set aside for warehouses under various Steel Division directives, such being classified as controlled materials orders.

Warehouses also may replace in stock an unlimited quantity of merchant trade products of the same type sold on authorized CMP orders during the prior 90 days or on AA-5 or higher ratings.

Orders for wire fence, bale ties, and similar items are not considered CMP and, therefore, mills are required to fill these only after CMP authorized orders for the same products in the same month

Rules on Iron and Steel Product Deliveries Clarified

To eliminate possible confusion resulting from the operation of the Controlled Materials Plan, certain formal changes in order M-21, governing deliveries of iron and steel products, have been made by WPB.

The order makes it clear that deliveries can be made on authorized controlled material orders, and that deliveries by distributors can be made in accordance with CMP Regulation No. 4.

Another change provides for the reporting of shipments wherever possible by CMP allotment numbers or symbols, in lieu of the group classifications formerly used.

WPB Issues Regulations for War Housing Construction

Procedures for the assignment of preference ratings and the allotment of materials for privately-financed war housing construction under the Controlled Materials Plan have been established by the War Production Board and the National Housing Agency.

Under CMP, authorization to obtain controlled materials will be handled by the various claimant agencies to whose jurisdiction the projects have been assigned. National Housing Agency, as claimant for the War Housing Program, will assign preference ratings and allot controlled materials in connection with the processing of applications for privately-financed housing construction.

Paving the way for establishment of these procedures, a new order, P-55-b, has been issued. Consumers of materials must file: PD-105, the application form used for residential construction; and PD-105A, which contains a materials list. They are then granted a P-55-b order, which authorizes the beginning of construction provided that only those materials are used which have been approved on the materials list. To obtain materials, consumers must submit to the National Housing Agency form CMP-H-1 requesting allotments and preference ratings.

Calcium Metal Is Placed Under Full Allocation

Calcium metal, a vital material for metallurgical uses, has been placed under allocation by the War Production Board through issuance of order M-303. Application for authorization to use or accept delivery of calcium metal in any month beginning with May must be filed with WPB and the supplier on PD-600 by the fifteenth of the preceding month.

A producer or distributor seeking authorization to make delivery of calcium metal must file application with WPB on form PD-601 by the twentieth of the month preceding that in which delivery is planned. Application for delivery in April must be filed as many days as possible in advance.

Calcium metal is defined as any product containing the element calcium not in chemical combination and in which any metallic constituents other than calcium do not constitute more than 15 per cent by weight.

Mill Orders Displaced Prior to March 22 Remain Valid

WPB has clarified Direction No. 1, under CMP Regulation No. 1, to indicate that it was not intended to be retroactive. This direction protects consumers of steel whose orders have been placed with mills from displacement in mill production schedules by others which have received allotment numbers under authorized production schedules.

"Purpose of the direction," Harold Boeschenstein, director of the CMP Division explained, "was to freeze the mill situation with respect to production schedules as of March 22, 1943. However, due to the use of the phrase 'on or before March 22' in the original text of Direction No. 1, some confusion was caused in steel mills."

Under the amendment of the direction, it is made clear that orders which were displaced in mill production schedules prior to March 22 need not be reinstated.

Grinding Rods Held To Be Controlled Material

H. G. Batcheller, director, WPB Steel Division, has notified steel producers that grinding rods fall within the definition of hot-rolled bars contained on page 29 of the general instructions on bills of materials issued Nov. 14 under the Controlled Materials Plan. Grinding rods, he said, are held to be a controlled material and not a Class B product.

PRP Units Provided Means To Obtain Production Supplies

WPB has amended Priorities Regulation No. 11-a to provide a means for assembly plants and other companies previously operating as PRP units to obtain needed production materials. Previously, such plants which did not require materials listed in Regulation 11 in their output had no procedure for getting these in the second quarter of 1943.

Dehydration of foods vital in saving precious cargo space. . . Process believed closely associated with future of vitamin enrichment. . . . Equipment needs offer postwar opportunities

TO WHAT extent will the vast food dehydration program now being set in motion influence food preparation after the war, and what will be the stake of metals in this market?

That is a question worthy of considerable study because of the business opportunities to a large number of manufacturers that are involved.

It can be stated at the start that many of the men who are interested in dehydration believe that some of the development work now going on will have permanent value. At the same time, nobody is making any firm prophecies.

They point out that just as canned food tastes differ from fresh food, so dehydrated food tastes differ from either canned or fresh food. They point out that the only reason for dehydrating vegetables and meat on a large scale is because of the critical situation in transportation which makes it mandatory to make the fullest use of every cubic foot of precious cargo space.

What can be done toward this objective can best be appreciated by citing the loss in the original weight by trimming and dehydrating. Out of three parts of sweet potatoes two parts are water. All the other vegetables in the program contain more water than sweet potatoes. White potatoes yield 3½ pounds of water for each pound of dehydrated product. Nineteen pounds of fresh cabbage yields one pound of dehydrated cabbage. Four pounds of boned, trimmed beef yields one pound of dehydrated beef.

Future of much dehydration now in effect depends upon a number of factors. There is a possibility that considerable food may be shipped by air after the war, in which event it might be desirable to eliminate water which can be replaced after the food reaches the consumer.

Another factor, mentioned above, is the extent to which people develop a taste for dehydrated food. Those interested already have used large numbers of persons as "guinea pigs" in trying out the products. Without having had any advance warning, large numbers of persons have eaten dinners at which only dehydrated vegetables, fruits and meat have been served. Many have expressed themselves as "pleased" with the meal.

In this connection it will be recalled that many processed foods that we now take for granted were a long time taking hold. Canned goods in general encountered a lot of opposition in the early days—particularly such foods as evaporated and condensed milk.

One fact that may help is that dehydrated food is not necessarily new. We have had dried fruits of many different kinds since time unknown. We have had dried beans, peas, corn. In recent years we have had big developments in powdered milk, powdered eggs, dried soup stock and many other foods. In other words, it would seem that if dehydrators turn out a product that tastes good when requisitioned and eaten, the public will accept it. There is no popular prejudice to overcome as was the case with canned goods.

Two other factors may have considerable bearing on the future of food dehydration. One is the recent disposi-

A SPECIAL REPORT TO INDUSTRY

FOOD DEHYDRATION

This is the first of a series of two articles on the potential use of metals in dehydrating foods for shipment abroad and the various processes involved before sanitary packaging meats and vegetables.

After washing, carrots are passed over revolving carborundum rolls which remove outer skin. They then are carried along on an endless conveyor belt between rows of women who cut off the ends and trim out defective spots

This machine can be improved!

THE HUMAN BODY, we've all been told, is the most perfect machine ever devised. Poets, doctors and engineers all agree on this point.

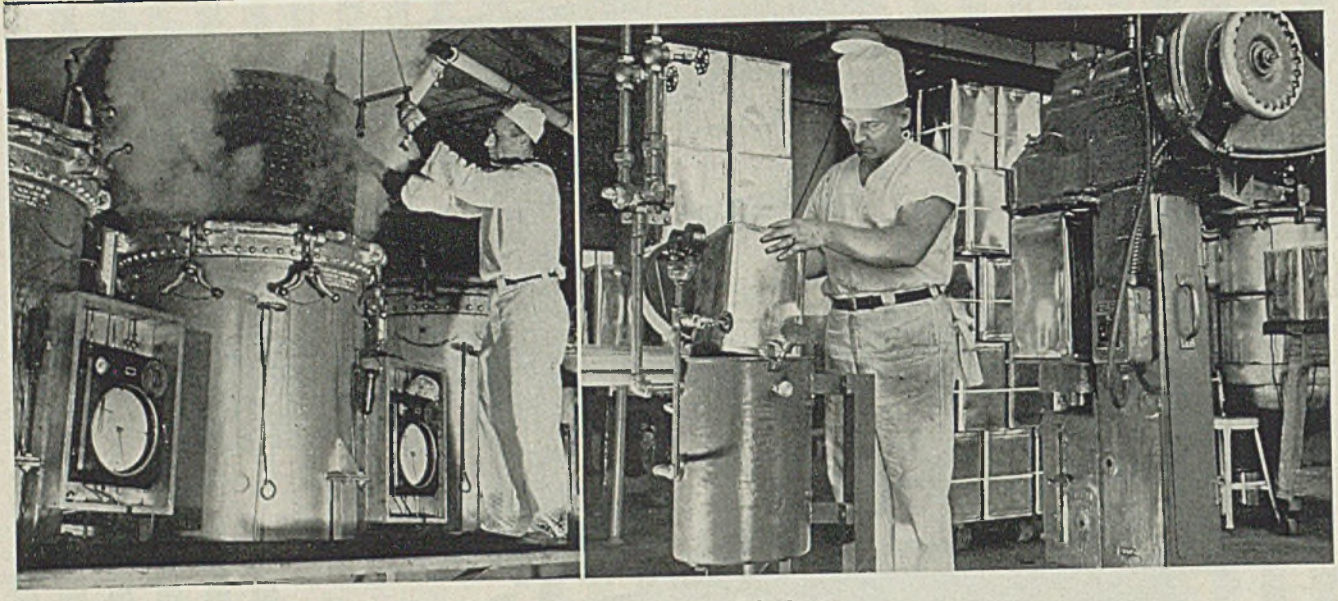
Yet even the human body is capable of change and improvement. Take life expectancy, for example. Less than 100 years ago it was 35 years...today, it is 63.3! And our soldiers today are 2 inches taller and 14 lbs. heavier than they were during the last war.

The important thing about these figures is this: No matter how highly developed a machine may be...no matter how miraculous its accomplishments may seem, never make the mistake of assuming it cannot be improved. Mistakes like this have caused the failure of more than one flourishing business!

The machine tool industry is busy today making machines to make the 45,000 parts of bombing planes, 40,000 parts for tanks, and the multiple parts and instruments for ships, cannon, rifles, torpedoes and shells. And as a result of wartime experience, even such highly developed machines as Cone Multiple Spindle Automatic Lathes will surely be improved.

Cone Automatics are now being used to help build instruments of war. But in the peace to come, they will again be dedicated to building a better, brighter world.

CONE Automatic Machine Company, Inc., Windsor, Vermont



Steam blanching equipment (left) used in this particular carrot dehydration operation. Carrots are loaded in a perforated steel basket and lowered into the steam chamber with the aid of a crane. The specially designed apparatus at right is used first for exhausting air from the filled carrot cans, then replacing it with inert carbon dioxide or nitrogen, and finally for sealing the cans

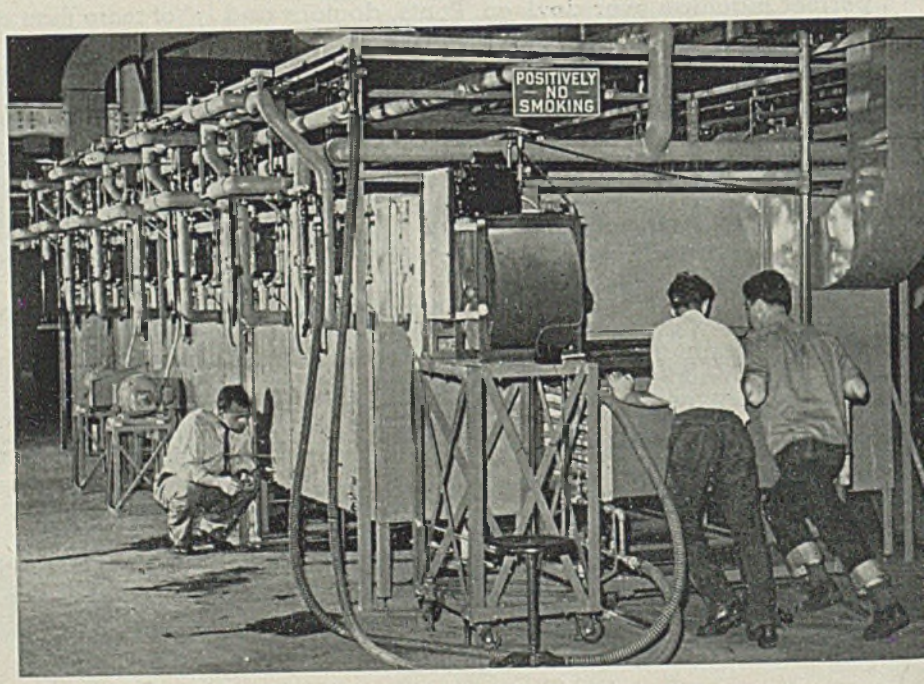
tion to add vitamins to such foods as bread and milk. Many food experts believe that this trend toward vitamin-enriched foods is only in its infancy. It has been found through agricultural research that a carrot grown in one field may contain only a fraction of the vitamin content of a carrot grown in an adjoining field. This also is true of spinach and other vegetables. There is the possibility, therefore, that dehydration may be found to have a close association with the future of vitamin enrichment. Manufacturers however, will do well to keep themselves informed of the progress in this direction in view of the business opportunities that may be created as a part of this program in the future.

The other factor is that research work being done as a part of our food program during the war probably will provide more information about human diet than ever before has been available. Many food experts, for example, long have believed that cancer and most other bodily ills spring from diet. Experiments have proved that malnutrition and deficiencies in diet actually do cause illnesses and death. At the same time a great deal remains to be learned as to just what food combinations actually will prevent bodily deterioration. Many studies now actively under way, aimed at keeping our people healthy despite the food shortage during the war, perhaps will bring answers of great significance to industry both during the war and in the future.

It will be recalled that during the first World War much shipping space was saved by dehydration. In fact shipments of dehydrated vegetables during that war totaled 8,905,158 pounds and included potatoes, onions, carrots, turnips and soup mixtures. These products did not become popular. They were of poor quality so that after 1919 the drying of vegetables declined rapidly.

There is no question but that a lot has been learned about dehydration of vegetables and meats as a result of the present war program. The product now being turned out is more palatable, on the average, after reconstitution, retains a large percentage of its original vitamins, and stores well in the special types of packaging devised. However, there still are many angles about which more should be known. These gaps rapidly are being filled in by research, particularly that of the Agricultural Research Administration through its Bureau of Agricultural and Industrial Chemistry and other agencies. Agricultural Experiment Stations also are participating in this work.

In order to operate successfully, a dehydration plant must be adequately equipped. Preparation of the food for dehydration is the first step. Preparing facilities depend in large measure on



After blanching a truckload of trays of shredded cabbage is pushed into a tunnel--type drier

the type of food being handled. In all plants there are facilities for an initial washing in water. At one plant carrots fresh from the field are dumped in a washer, then are peeled by passing them over revolving carborundum rolls. After peeling they are placed on an endless conveying belt between two rows of women who cut off the ends and trim the flaws.

A plant that specializes on dehydrating white potatoes likewise must have a washer system. It may be furnished with abrasive peeling machines. It also has an endless belt conveyor on both sides of which sit women who trim out eyes and bad spots and slice the potatoes in strips. It may also be equipped with ricers.

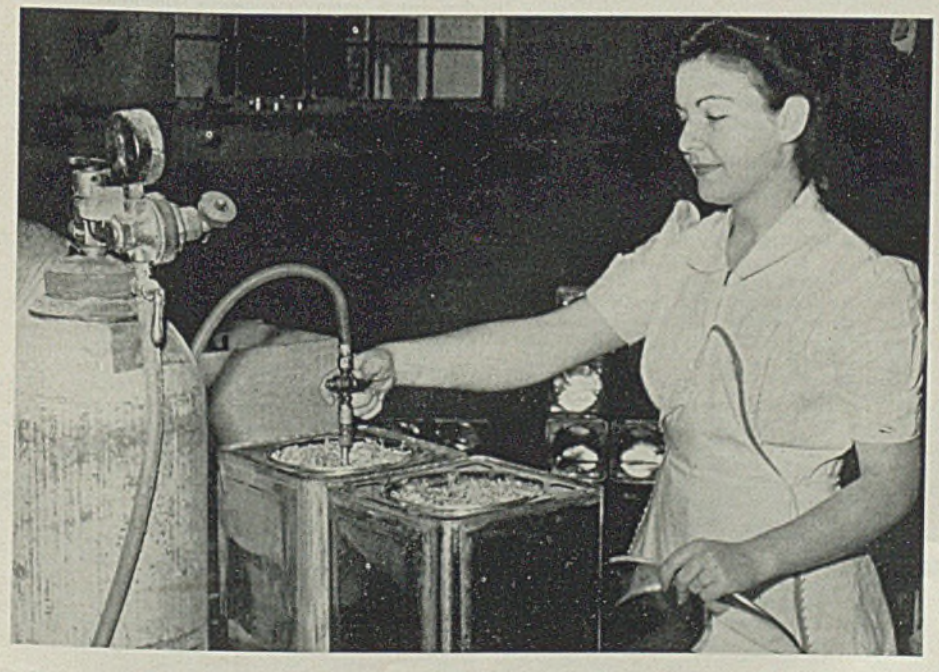
A plant that for months has processed 100 tons of raw cabbage per 24-hour day, is equipped first with the usual washing apparatus, then with specially designed machines for drilling out the cabbage cores. In addition there are slicing machines for reducing the cabbage to sizes suitable for drying.

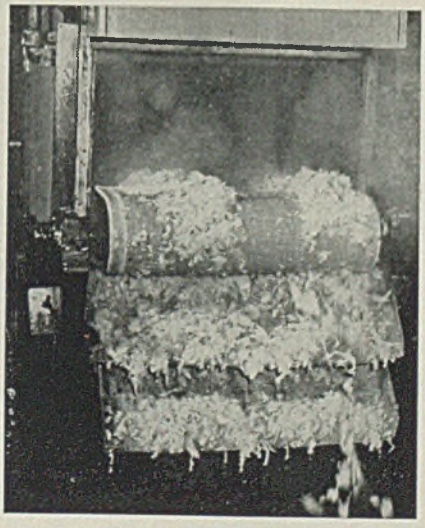
Other vegetables that are being successfully dehydrated, and for which the preparation facilities are of moderately specialized types, are rutabagas, sweet potatoes, onions, spinach, kale, chard, beet tops, mustard greens and beets.

The next operation after initial preparation in all instances is that known as "blanching", accomplished at a temperature of around 190 degrees Fahr. for most vegetables. This operation inactivates the enzymes, thus retarding deterioration of the food. There are several methods of blanching, steam or hot water being most commonly used. Preferred method appears to be that involving steam, inasmuch as it permits higher vitamin retention, also because water in some parts of the country contains salts in such excessive quantities that its direct use injuriously affects the product. Blanchers may be either batch or continuous in type.

After blanching, the food is transferred to the drying unit. This transfer operation requires certain equipment such as trays, conveyor belts, trucks, baskets and in some cases other items.

The second and concluding article will appear in the April 12 issue of STEEL.





Cabbages after being washed are decored with special drilling machines (top right), drillings being removed by conveyor belt

Center, after air in can has been exhausted and replaced with inert atmosphere, the can is hermetically sealed with the aid of a special machine

Lower right, after decoring and trimming away outer leaves, cabbages are shredded and passed through a steam blancher where enzymes are made inactive to prevent fermentation in transport and storage

Below, all cabbage dehydrated for our armed forces and for lend-lease shipment is packed in inert atmosphere, either carbon dioxide or nitrogen to prevent deterioration and loss of vitamin contents during shipment and storage

PRIORITIES–ALLOCATIONS–PRICES

Weekly summary of orders and regulations issued by WPB and OPA, supplementary to Priorities-Allocations-Prices Guide as published in Section II of STEEL, Dec. 14, 1942

E ORDERS

E-5-a: Gages and Precision Measuring Hand Tools, effective March 26, revoking order E-5. Restricts sales and deliveries to approved users, distributors, and approved employees; and after May 1 to purchase orders bearing preference ratings of A-9 or higher and accompanied by certification that they will not increase purchasers' inventories beyond a 30-day supply. Assigns to individual workers same rating as that assigned by CMP regulations to their employers for maintenance, repair and operating supplies.

L ORDERS

L-30-a (Amendment): Galvanized Ware and Non-Metal Coated Metal Articles, effective March 22. Permits manufacture of industrial funnels for use in distribution of petroleum up to 50 per cent of total produced in year ended June 30, 1941. Permits use in production of funnels: iron and steel in inventory on March 22 or obtained under Priorities Regulation No. 13; top cuts of steel; Bessemer processed steel; sheet mill seconds, rejects and wasters, 28-gauge and heavier; tin mill black plate rejects, 29- and 30-gauge; and iron and steel obtained from a warehouse as defined in M-21-b. Specifies dimensions as from 10 to 15 inches in diameter of bowl, by 9½ to 12½ inches in depth, and gauges as from 22 to 30. Permits sale of one- to 5-gallon cans for use in mines to facilitate lubrication of mobile machinery; for operating supplies on railroads and common carriers. Permits production of cans designed for use on tank trucks for petroleum distribution.

L-30-d (Amendment): Household Articles, effective March 26. Permits production of can openers up to 50 per cent of total for year ended June 30, 1941, plus amount required by the armed forces. Limits weight of each unit for civilian use to 12 ounces of metal. Permits use of metal hooks and wire in inventory in production of wooden or paper coat hangers. Exempts commercial type baking pans from restrictions of the order. Permits production of commercial type scoops up to 35 per cent of output in year ended June 30, 1941.

L-38 Amendment): Air Conditioning, Commercial Refrigerating Equipment, effective March 27. Restricts delivery of any new or used parts: to emergency service and to fill purchase orders bearing AA-4 or higher rating; to fill an authorized purchase order; to orders for direct use by the armed services. All replaced metal parts must be delivered to the supplier, producer or scrap dealer within 30 days. Application for authorization to purchase equipment must be made on PD-830 for industrial refrigeration or air conditioning equipment and on PD-831 for small commercial refrigeration equipment and machinery such as refrigerators and related equipment. Limits production of replacement parts to quantities not in excess of a producer's average monthly inventory of similar parts during the first quarter of 1941. Production of replacement parts may be scheduled as if purchase orders bore rating AA-1. Permits a dealer or producer to loan parts for emergency repair service for a period of 30 days unrestricted by the order.

L-143-a: Rubber Processing Machinery, Equipment, effective March 26. Revokes order L-143 as of April 9. Requires manufacturers and dealers in rubber processing machinery and equipment to file PD-553 by April 9, showing unfilled orders as of March 26. Prohibits production, rebuilding, reconditioning, delivery or acquisition without authorization of WPB following applications on PD-552 (revised).

L-144 (Amendment): Laboratory Equipment, effective March 24. Requires application on PD-620 for purchase of laboratory equipment for college military training programs, irrespective of the value of the items.

L-159 (Amendment): Plastics Molding Machinery, effective March 26. Places under allocation control following new or used parts or groups of parts for plastics molding machinery: cylinders, feed screws, straight heads, cross heads, jet attachments, temperature control units, and molds.

M ORDERS

M-11-L (Amendment): Zinc, issued March 23. Extends order until revoked. Expiration of order had been scheduled for March 31, 1943. Applications for allocations must be made on PD-735 before 15th of month preceding the calendar month in which delivery is wanted.

M-21-a (Amendment): Alloy Iron, Alloy Steel and Electric Furnace Carbon Steel, effective April 1. Requires each person melting alloy steel, including castings, to use alloy steel turnings in an amount not less than 8 per cent, including machine shop turnings in an amount not less than 4 per cent, of the total weight of alloy steel ingots and castings produced each month. Requires producers of stainless steel castings to use a certain percentage of chrome-bearing scrap.

M-21-b-1: Steel Warehouses and Dealers, effective April 1. Permits warehouses to deal only in those product groups and types of steel in which they dealt in the first quarter of 1941. Requires dealers to operate on a stock replacement basis. Establishes procedure for dealer purchases; orders for replacement of authorized sales must be certified by an endorsement provided by the order, which automatically makes the purchase an authorized controlled material order. Permits ear-marking of warehouse stocks for a particular claimant agency where such ear-marking is agreed upon by the Steel Division and claimant agency involved. Deliveries from such ear-marked stocks are to be made only in accordance with specific directions issued at time stock is earmarked.

M-59: Palm Oil, effective March 24. Replaced by Food Distribution Order No. 38, effective March 24. Transfers control to Food Distribution Administration. New order continues same restrictions as order M-59 on processing, delivery and use of palm oil but provides exemption from the restrictions for any person using less than 2000 pounds per quarter. Continues to restrict use to the manufacture of tin plate, terne plate, steel sheets, steel strip, and black plate and to processes yielding required percentages of glycerine.

M-193: Glycerine, replaced by Food Distribution Order No. 22, effective March 24. New order reduces permitted glycerine content of popular soaps to 4/5 of 1 per cent. Continues restrictions contained in order M-193 as amended.

M-255 (Amendment): Steel Shipping Drums, effective March 29. Directs users to apply for authorization to purchase new steel drums or parts on form PD-835. Prohibits manufacturers from selling, delivering, or using new steel drums and parts (except flanges, plugs, and cap seal) without specific authorization of WPB.

M-296: Ferrocolumbium, effective March 25. Permits use or delivery only with approval of WPB. Application for such approval must be made on forms PD-391 or PD-707. Applicants must report also on PD-805.

P ORDERS

P-73 (Amendment): Nonferrous Smelters and Refiners, effective March 24. Applications for maintenance, repair and operating supplies must be made directly to Mining Equipment Division of WPB. WPB will assign a serial number to each smelter or refiner who is entitled to receive priority assistance under provisions of P-73. Serial numbered producers must submit requirements on PD-760 for MRO supplies; written application for machinery and equipment. Forbids resale of material or equipment acquired under provisions of P-73 except to another smelter or refiner or with approval of Mining Equipment Division.

P-120 (Revocation): Aluminum, Magnesium Plants, effective April 1. Revokes order which had assigned preference ratings for acquisition of repair and maintenance materials by producers of aluminum and magnesium. These purchases now are made under CMP regulation No. 5.

PRICE REGULATIONS

Export Price Regulation (Amendment), effective April 2. Removes export maximum pricing provisions of revised price schedule No. 6 (Iron and Steel Products) and No. 49 (Resale of Iron or Steel Products) and combines them with certain changes under the Export Price Regulation. Exporters who are producers may charge the governing or emergency basing point prices; may add applicable extras and freight from basing point, or may use the f.a.s. port of exit prices of the U. S. Steel Export Co. in effect April 16, 1941. On Lend-Lease sales only, producers must use domestic ceiling prices established by Schedule 6, except that (1) export extras shall apply where there are no published or filed domestic extras: (2) inland transportation charges are to be computed at export rates where applicable; (3) where there is no established domestic ceiling price for the product, the producer may use the export ceiling price.

Warehousemen may use as his basic price his maximum domestic selling price for his city or free delivery area plus actual transportation costs to the point of exportation and other expenses incident to exportation. He may not add a premium on either export or lend-lease sales.

Export merchants who do not perform warehousing functions must use as his base price on both exports and lend-lease sales his supplier's current maximum price to him plus certain export expenses. On export sales he is also permitted to add a specified premium representing his overhead and selling expenses and his profit on the transaction.

Permits all types of exporters of iron and steel products who have shipped to the intended point of exportation to include in their selling prices the additional cost of effecting delivery at another point to which war exigencies have required diversion of the shipment. Prohibits addition of interest, financing charges, fees or commissions.

General Maximum Price Regulation (Amendments). Effective March 30, establishes maximum prices for aluminum sold by primary producers in pig form and are subject to discounts, quantity premiums, transportation allowances and other terms of sale in effect on sales of primary aluminum ingot during March, 1942. Maximum prices in cents per pound for unalloyed grades on the basis of average aluminum content are 13.00 for 97% minimum; 14.00, 99%; 14.50, 99.6%; 15.00, 99.7%; 16.00, 99.8%; 17.00, 99.85%; 24.00, 99.9%. Maximum prices for alloy grades with approximate composition are: 14.00, 80-20 Al-Cu; 15.00, 88-8-4 Al-Cu Ni; 14.00, 88-12 Al-Si; 14.00, 90-10 Al-Si; 14.50, 87.5-10-2.5 Al-Si-Cu; 14.00, 95-5 Al-Mn; 16.5, 90-10, Al-Ni; 16.00, 97.5-2.5 Al-Cr.

Effective March 30, establishes specific

maximum prices, uniform to all sellers at each producing point in the United States, for all grades of superphosphate.

No. 2 (Amendment): Aluminum Scrap and Secondary Aluminum Ingot, effective March 31. Permits secondary smelters in strictly defined instances to pay baling and briquetting premiums for 17S, 24S and 52S plant scrap and to add ½-cent a pound to their maximum prices for ingot made from the same scrap.

No. 41 (Amendment): Steel Castings, effective March 28. Authorizes foundries to add all transportation costs above 50 cents per 100 pounds to their maximum prices for castings. Permits foundries to sell castings in shipments of less than 100 pounds f.o.b. foundry, instead of delivered. Provides for price reductions amounting to about 25 per cent for cast armor hulls and hull sections for tanks and for some types of cast armor for the Navy. Restores maximum prices for bitts, bollards, chocks and cleats to levels of the individual producers on July 15, 1941, or, if not sold as of that date, to the prices in the Comprehensive Report of the Steel Founders' Society of America for the third quarter of 1941. Exempts from control castings whose production cost per order is estimated to be less than $100. Reassigns six types of ship and marine castings to schedules that give them the same maximum prices as the corresponding industrial castings.

No. 69 (Amendment): Primary Lead, effective April 3. Restores maximum prices for ingots and linked ingots that were reduced $5 per ton on Jan. 20 to their former level of $10 per ton over the maximum price for pig lead.

No. 188 (Amendments): Building Materials and Consumers' Goods. Effective March 23, permits manufacturers, wholesalers and retailers to increase maximum prices for 12 specified lines of finished silverware and other articles containing newly-mined domestic silver by 36 cents for each troy ounce of fine silver contained in the article.

Effective April 2, authorizes regional administrators of OPA to provide individual adjustments of maximum prices for makers of regionally-produced materials.

No. 230 (Corrected Order): Reusable Iron and Steel Pipe and Used Structural Pipe, issued March 25. Makes following corrections in order as amended Feb. 3: Under black pipe in Table I price of threaded and coupled pipe with 4¾ inches outside diameter and 7.1 pounds per foot weight for zone 1 is $24.10 per hundred pounds; prices are corrected for threaded and coupled pipe of various sizes and weights for zone 4; in division for galvanized pipe in Table I prices for plain ends are corrected; proper division is made between prices for steel casing and steel drive pipe in Table II.

No. 350: Packers' Tin Cans, effective March 31 in U. S. and May 15 in Alaska and Hawaii. Establishes specific prices for 90 per cent of the volume of packers' cans that are expected to be produced this year and provides a simple formula for pricing the remainder.

No. 351: Ferrous Forgings, effective March 31. Freezes all list prices in effect on Oct. 1, 1941, and provides that ceilings for ferrous forgings sold without list prices between Jan. 1, 1941, and Oct. 1, 1941, shall be prices of the items at their last contract of sale during that period. A new forging closely comparable to a forging which a producer agreed to sell during this period is priced on the basis of the difference in unit costs between the two forgings resulting from the change in specifications. The latter method may be used only if it was the manufacturer's practice on July 22, 1942, to calculate prices on the basis of price previously charged for comparable forgings.

No. 354: Copper Sulphate, effective March 29. Establishes maximum prices on the basis of $5 per hundredweight, f.o.b. works in bags or barrels, for shipment of 26,000 lbs. or more of 99% crystals.

WPB Exempts Certain Operators From CMP Inventory Restrictions

PETROLEUM operators, mining producers and utilities have been exempted from the inventory provisions of Controlled Materials Plan Regulation No. 2. As a result of this exemption these operations revert to limitations imposed in P-98-c, P-56, and U-1, respectively.

P-98-c, relating to production, transportation, refining, and marketing of petroleum, will continue to govern their operations in the future, due to the issuance of Inventory Direction No. 3 under CMP Regulation No. 2.

In the instance of mining producers, the CMP inventory direction is merely a conforming action, inasmuch as the provisions of P-56, as amended March 17, maintain its inventory provisions in effect, despite CMP Regulation No. 2. In this case, no producer may receive any delivery of material which would increase his inventory to an amount greater than the minimum necessary to sustain his current level of operations.

Electric power, natural and manufactured gas, water, and central steam heat suppliers, are exempted from the terms of CMP Regulation No. 2 and will continue to be governed by the inventory provisions of Utilities Order U-1. Under this order, no producer engaged in any of these activities may schedule for delivery to himself during a calendar quarter any material to be used for maintenance, repair and operating supplies, or for any other purpose other than authorized additions and expansions the aggregate dollar volume of which exceeds one-third of the aggregate dollar value of withdrawals of material of the same class from inventory during the last nine months of 1942. In addition it is also provided in the case of electric power producers that not more than 50 per cent of permitted deliveries of wire, cable and bus bar may be scheduled for delivery from a supplier other than another producer of electric power. In the case of producers of gas, water, central steam heat, and public sanitation, not more than 75 per cent of permitted scheduled deliveries of iron and steel pipe may be scheduled for delivery from other than another producer.

Copper Shipments to Steel Mills Restricted

H. O. King, director, WPB Copper Division, has notified all steel mills that after March 31 no authority is to be granted to receive copper, copper scrap or copper base alloy scrap for use in carbon steel as so classified by the American Iron and Steel Institute.

He also notified the mills that after March 31 no authority is to be granted to receive copper, copper scrap, or copper base alloy scrap for use in alloy steel as so classified by the institute unless such use is specifically approved by the WPB Steel Division.

Simplify Allotment of Controlled Materials in Some Construction

Simple plan for the allotment of controlled materials under CMP for certain types of construction costing less than $10,000 has been announced by WPB.

On March 4, WPB empowered regional officers to authorize the beginning of agricultural and many types of commercial construction costing less than $10,000. It is for construction started under this delegation of authority that the new procedure was established.

No application to a claimant agency for allotment of controlled materials is necessary for construction of this type. Under the procedure now set up, a simplified PD-200-C form applicable to these cases will be used. This form, which is an application for priority assistance or application to begin construction without priority assistance, requires submission of a materials list.

The materials it is proposed to use are listed and the forms are filed with the WPB district office. The forms then go to regional offices which make allotment of controlled materials and assign preference ratings on CMPL-127 forms. Attached to this form is a copy of the builder's PD-200-C showing the materials which have been approved.

The two claimant agencies having jurisdiction over this type of construction, the Office of Food Administrator and the Office of Civilian Supply, WPB, have authorized regional directors to make necessary allotments.

Ferrous Foundry Advisory Committee Established

An advisory committee for the ferrous foundry industry has been established by the War Production Board. Members are: William Given, American Brake Shoe Co., New York; H. A. Houston, United Engineering & Foundry Co., Pittsburgh.

WHO COUNTS THE COSTS of Keeping 'Em Rolling?

• The war-time achievement of the American railroads has astonished the entire nation. The operating officials did not have to worry about costs because twenty years of courageous preparation made it possible for them to provide the most economical transportation for our country at war.

They have accomplished the task with 20,000 fewer locomotives—at half a million fewer freight cars and approximately a hundred fewer locomotive shops than they had in 1918.

How? Because twenty years of planned progress found them with the best power—best cars—best tracks and best equipped shops in the world.

BULLARD Vertical Turret Lathes have played a big part in helping the railroads to "Keep 'em rolling" for a minimum cost. They will be found in practically every large locomotive shop handling 75% of all boring and turning jobs in 50% less time than the ordinary mills.

ARMY E NAVY

BULLARD

THE BULLARD COMPANY

By A. H. ALLEN Detroit Editor, STEEL

MIRRORS of MOTORDOM

Henry J. Kaiser retains Detroit contractor to develop modification of jeep, in co-operation with Tank-Automotive Center engineers. . . Manpower studies accelerated

DETROIT

NOW in process of development for the Tank-Automotive Center here is a new army vehicle of the jeep type, but embodying a number of important innovations adapting it to changing types of warfare being encountered in the field, particularly in the South Pacific. The design is being worked out by contractors retained by Henry J. Kaiser. These interests are all experienced automotive industry men and are directing a score or more of their own engineers, co-operating with the TAC in developing details of the design.

Where the vehicle will be built and in what quantities are questions only the future can answer, but the move has all the appearances of an entering wedge into the motor industry by the Kaiser interests, particularly when added consideration is given to the reported retention recently of John Tjaarda & Associates by the Kaiser Co., Tjaarda being a well-known body designer and stylist.

"Jeepette" To Be Lighter

Obviously little can be disclosed about the jeepette, since it is a new military project. However, a few deductions can be made from some of the generally known information about the development. In the first place, the limitations of air transport as far as weight is concerned would appear certainly to point to a vehicle with the same or near the same carrying capacity as the present jeep, or 4x4 reconnaissance-command car as is known technically, but with sharply reduced weight—say, 1000 pounds lighter, just to grab at a convenient figure.

One logical way to attack the matter of weight reduction in a vehicle which is already cut down just about as far as is conceivably possible is to switch to an air-cooled engine instead of the present 4-cylinder L-head design, with aluminum and magnesium replacing most of the present cast iron. Such a change would also permit some economies in overall dimensions and thus allow more of the vehicles to be loaded into a cargo airplane.

If you care to speculate on the possibility of producing such a light-weight job, you can get 5 to 1 odds here that it will be in production before the year is out. Who will build it is a point which is minimized by the project's sponsors. Automotive parts and equipment companies now in the business can supply most of the essential parts. About all that would be left is to set up some assembly facilities and no difficulty is looked for on this score.

With regard to engines, Continental Motors probably could supply all requirements, since Continental has built a wide variety of smaller radial engines, principally for aircraft.

There is little question but what the jeep has been the most popular and glamorous automotive development to come out of the present war. It has been extended from its original form to include an amphibian design and also an amphibian jeep trailer. A further step down the scale in weight and size would result in another revolutionary type of vehicle springing from the "know-how" of U. S. technicians.

Translating these military vehicles to postwar civilian uses is a favorite theme of such people as J. W. Frazer, president of Willys-Overland in Toledo, a principal builder of jeeps, and no one can say for certain that he is wrong. However, judged on 40 years' progress of the motor industry in this country the possibilities of a light-weight small-size car, even though well powered, are not too bright.

One thing sure at the moment is that the Kaiser interests are definitely in the Detroit automotive picture. Mr. Kaiser was here last week and gave rather cryptic interviews to the local papers in which he emphasized particularly the importance of maintaining a high level of production after the war so that there would be jobs for everyone.

Kaiser Spurs Associates

One of Mr. Kaiser's representatives here, associated with him for only a matter of months, maintains that he has never seen an executive with such a remarkable talent for getting things done and for spurring his associates on to accomplishing the impossible. This slant contrasts markedly with some earlier reports heard around Detroit about the West Coast tycoon.

In a series of meetings over the past week, 38 top executives and specialists of the auto industry have been mapping out a fact-finding program to get at the roots of manpower problems. Three manpower groups have been set up to specialize in different aspects of the program—manpower supply, headed by Herman L. Weckler, vice president and general manager, Chrysler Corp.; worker morale, headed by George T. Christopher, president of Packard; and manpower utilization, headed by W. F. Armstrong, vice president of Nash-Kelvinator.

Serving on Mr. Weckler's manpower supply committee are: R. W. Conder, Chrysler; H. W. Anderson, General Motors; R. G. Waldron, Hudson; C. E. Weiss, Packard; C. F. Ogden, Reo; Marvin Heidt, Bendix Aviation; Henry Roesch, Briggs; M. B. Lindquist, Murray Corp.; Ray Rausch, Ford; C. M. Young, L. A. Young Spring & Wire; and J. A. Sweeney, Kelsey-Hayes.

Mr. Christopher's committee on worker morale includes L. C. Almen, Fruehauf Trailer; Harry Bennett, Ford; C. O. Chestnut, McCord Radiator; E. A. Clark, Budd Wheel; Lon Fleener, White Motor; J. E. Garlent, Motor Wheel; W. S. Gundeck, Studebaker; George J. Kelday, International Harvester; W. O. McIntyre, Monroe Auto Equipment; C. J. Reese, Continental Motors; Don Rulo, Nash-Kelvinator; Charles Winegar, Chrysler; and an as-yet unnamed General Motors representative.

Executives Study Manpower Problems

Studying manpower utilization under chairmanship of W. F. Armstrong are G. E. Winter of Continental Motors; J. H. Gould, General Spring & Bumper; H. E. Blood, Norge; George Huth, Chrysler; R. H. Daisley, Eaton Mfg.; W. D. Robinson, Briggs; E. F. Waite, Ford; B. D. Kunkle, General Motors; R. J. Emmert, Yellow Truck & Coach; and Emmett Sheehan, United States Rubber.

A capacity crowd turned out to hear Paul G. Hoffman, president of Studebaker and chairman of the Committee for Economic Development, outline the purpose and organization of his postwar planning committee, as well as some of their preliminary thinking on the subject of postwar industry. Keynote of his 2-hour address was this: "If our free society is to be maintained, productive jobs—millions of them—must be made available in the shortest possible space of time after hostilities cease. The burden of providing those jobs will rest largely upon private industry."

Commenting upon possible employment levels, he said, "The best estimates indicate that if we achieve an employment level of approximately 58,000,000, with a normal work week, a satisfactory situation will prevail. . . . That spells out to 10,000,000 more peace-

time jobs than were available in 1940."

Pointing to the toughness of industry's assignment, he urged individual enterprises to start their postwar planning of products and marketing now, cautioning that the environment in the postwar period must be favorable to the expansion of enterprise.

In conclusion he observed that, "The prospect is agonizing—and hopeful and inspiring. It is hopeful because peace, when it comes, will find a huge pent-up need and desire for goods, and many billions of dollars of savings available to permit people to translate their desires into buying demand. Industry's problem will be to meet the demand, not to create it.

"The prospect is inspiring, because at the end of the war business will have its biggest—and perhaps its last big—chance to help put the better world for which we are now fighting on the healthy economic basis which will keep it better."

Chrysler Reports Progress

Chrysler has released a timetable of progress at its vast Dodge Chicago plant where 18-cylinder Wright engines will be built in quantities. It is as follows:

Feb. 27, 1942—Contract received from War Department to build aircraft engines.

April 16, 1942—Defense Plant Corp. contract received for building plant.

May 7, 1942—General contract let.

June 4, 1942—Ground broken for tool shop. Corporation executives go to aircraft engine manufacturing plants for preliminary training.

June 14, 1942—Administration and personnel buildings started.

July 1, 1942—Machining and assembly building started. First engine received by corporation for study.

July 13, 1942—Ground broken for main power house.

Aug. 1, 1942—Test cells, light and heavy forge shops and heat treat and die shop buildings under way.

Aug. 15, 1942—First dummy test cell developed. First lathes for tool shop arrive.

Aug. 24, 1942—Ground broken for aluminum and magnesium foundries.

Sept. 1, 1942—Oil and chip storage buildings and second power house begun.

Sept. 21, 1942—Propeller test building started.

Oct. 1, 1942—Executive personnel moves into administration building.

Oct. 10, 1942—Training classes begun for top supervision.

Oct. 23, 1942—Night and day construction force numbers 16,460.

Nov. 15, 1942—Assembly section of main building ready for occupancy.

Dec. 15, 1942—Production machinery begins to arrive.

Jan. 1, 1943—Roof completed on heat treat and die shop.

Jan. 14, 1943—Large sections of aluminum and magnesium foundries occupied.

Jan. 15, 1943—Framework for light and heavy forge shops completed. First foundry equipment received.

Feb. 14, 1943—First hammers for forge shops received.

Feb. 26, 1943—Roof completed on main building.

March 13, 1943—Total of 1800 production machines received.

March 16, 1943—First heat treat operations started. First aluminum castings poured.

March 25, 1943—Fifty per cent of required pilot line machinery received.

Speaking to directors of the corporation who met recently in Chicago for the first time, and inspected the new plant, K. T. Keller, president, said, "The Dodge Chicago plant is the largest war contract undertaken by Chrysler. It and one other war job of substantial magnitude—a secret weapon—are still in the tooling stage. All other war products are in production and current shipments have gone beyond the billion dollar annual rate."

The tour, over 400 acres of former prairie and through the aisles of the manufacturing and final assembly building, which covers 80 acres under one roof, was made in open automobiles. All of the corporation's war work, now flowing at an annual rate beyond $1,000,000,000, has reached high levels of production, he disclosed.

Directors who made the inspection were July S. Bach, Carl Breer, Wadill Catchings, George W. Davison, J. E. Fields, John A. Harford, chairman, B. E. Hutchinson, Nicholas Kelley, O. R. Skelton, Matthew S. Sloan, Harold E. Talbott, H. L. Weckler, Fred M. Zeder and President Keller.

U. S. Spending More Than All Other Belligerents

The United States this year will spend more for war purposes than all other belligerent nations, allies and enemies, combined, according to the New York State Economic Council. The council's statement is based on estimates of $100,000,000,000 expenditures by the United States. Germany is expected to spend $34,000,000,000; Great Britain, $21,330,000,000; Russia, $15,000,000,000; Japan, $7,000,000,000; Italy, $8,670,000,000.

Forged Projectile Nose Saves Steel, Time, Cost

N. J. Bardell, superintendent, Mid-West Forging & Mfg. Co., Chicago Heights, Ill., received on March 23 the *Chicago Tribune's* diamond studded pin award presented monthly to Chicago area war plant workers for notable achievement for his idea that resulted in an improved armor piercing 37-millimeter projectile.

This projectile, it is stated, conserves critical alloy steel, reduces labor and steel requirements, and reduces cost approximately 14 cents each. The idea was born several years ago when ordnance officials doubted that the plant could be fitted into a war program.

Among other items, the company made a fence post with a forged top—the ordinary method for putting tops on such poles was to drive a malleable casting into the tube forming the pole. Mr. Bardell devised a way to apply the forging principle used on the pole tops for making the 37-millimeter projectiles used by tank and antiaircraft guns. He made up several samples and, with J. L. Hench, president of the company, presented them to ordnance officials. Tests were made at two ordnance proving grounds and the results were said to amaze officials, for the projectiles were found to possess unusually high armor piercing qualities. Contracts followed.

With the method devised by Mr. Bardell, the projectile nose, or ojive, is squeezed, or compressed, into shape by forging-swaging machines, details of which operation may not be disclosed. With the conventional method, the nose was machined away with consequent loss of steel.

The method of compressing the steel grains in the nose, it is stated, accomplished something unexpected—a nose of great strength that gave it high armor piercing ability. This great strength made it possible to use a lower grade of steel than the high alloy grade commonly required for such projectiles. Thus, alloy steel is conserved for other uses. The method also reduced manpower requirements.

Mr. Bardell is the third person of Italian descent to win the *Chicago Tribune's* award. He arrived in Chicago Heights with his parents from Italy when he was 6 years old. He got as far as the eighth grade in school before going to work, but ability and initiative overcame his educational lack. He started with Mid-West Forging 21 years ago as a common worker and gradually rose to his present position as superintendent. He is 48 years old.

WING TIPS

Douglas Aircraft in production of C-47 "Skytrains" at new two-mile windowless plant in Oklahoma. . . Army officials inspect "breathing" wall that conserved critical materials

A LOOK behind the 17,000,000 brick in nearly two miles of "breathing" windowless walls enclosing the new Oklahoma City, Okla., plant of Douglas Aircraft Co. Inc. discloses C-47 "Skytrains" already in production on a site where cattle were grazing just a year ago.

As Army engineers made their official inspection tour marking acceptance of the plant from the Austin Co., Cleveland, which designed the building and managed the construction under AAF supervision, thousands of Douglas men and women already on the job for several months worked without interruption on a long line of transports and on the thousands of parts required to make them.

Executives of building equipment and contracting companies accompanied Army officers, Douglas and Austin officials, and newsmen on a tour, March 26, marking the first anniversary of ground-breaking.

When the Army Air Forces asked Austin engineers to design this new heavy aircraft manufacturing plant with the same controlled conditions provided in two earlier jobs, but with limited use of steel which made them possible, the idea of a "breathing" wall of masonry was born. Instead of using fiberglass and steel, which gave side walls and roofs of the other plants a high insulating value, the builder designed a revolutionary brick wall over 50 feet in height, which is ventilated through open vertical joints in one course near the top and in two courses waist high near the bottom of the outer brick work.

Shatter Resistant Wall

Hollow ventilating tile serves as a flue through which air circulates vertically between these open joints. The tile has a perforated back which allows the 4-inch blanket of rock wool insulation to "breath," thereby preventing condensation and keeping it permanently dry. The wool is held in place by lightweight trussed wall ties which hold the many layers of the wall together and make it shatter- resistant. They are the only steel in the entire wall. While only a fraction as thick, the wall has the same insulation value as an 80-inch solid brick wall and is the equal of the combination steel and fiberless type of construction. Roof is of "ferroglas" design for sound absorption, light reflection, as well as insulation.

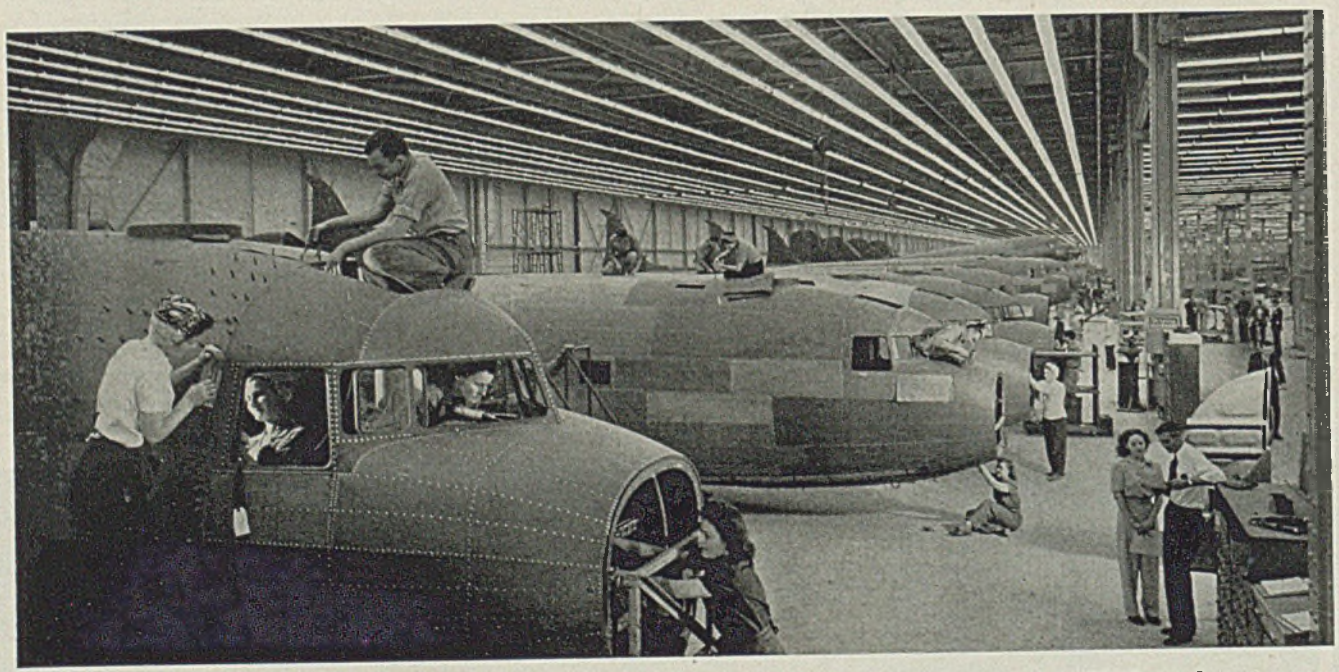
While the new plant provides the same working conditions and manufacturing facilities as the finest "controlled conditions" plant designed before the need for steel conservation became apparent, it has only half the steel required in earlier plants.

One hundred seventy tons of steel was saved, for instance, by the use of masonite instead of porcelain enamel in reflectors for more than 20 miles of continuous fluorescent lighting fixtures which have been equipped with a new double duty lighting mechanism (4-lamp, high power factor, 254-volt ballasts instead of 2-lamp ballasts), which saves an additional 30 tons of vital materials, mostly copper and aluminum.

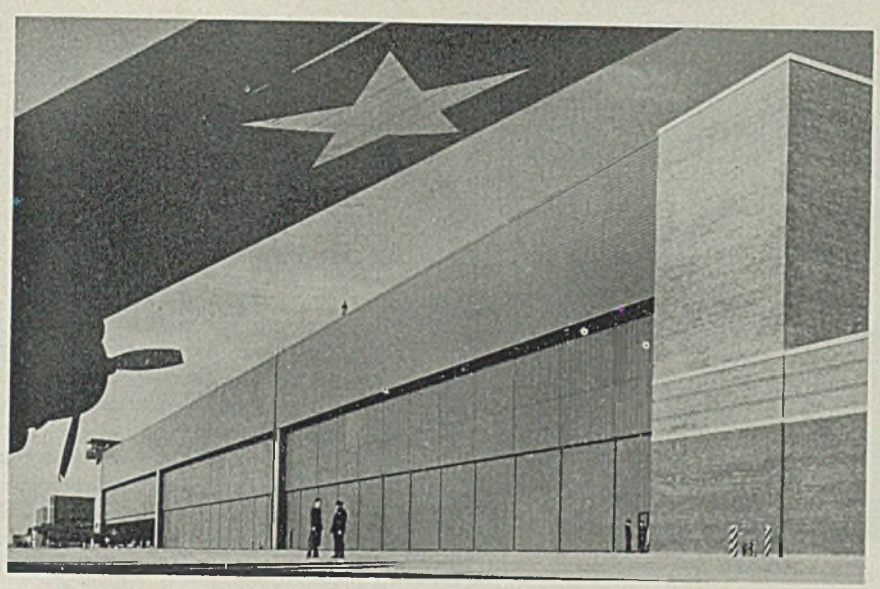
The nonmetallic reflectors have a synthetic enamel surface equal to porcelain in light reflection qualities. They carry a double row of 100-watt fluorescent lamps and are continuous in the huge assembly bay where sixteen unbroken strips provide uniform illumination of 55 footcandles. Mounted 40 feet above the floor, they are suspended from bar joists that rest on the monorail supports.

A white cement floor insures light reflection on the underside of wings and fuselages on the line. An inter-connecting monorail system, serving the entire plant, will permit the lifting of loads up to 20 tons. Turntables at junction points where subassembly bays open into the wide assembly area provide for transfers between any two locations.

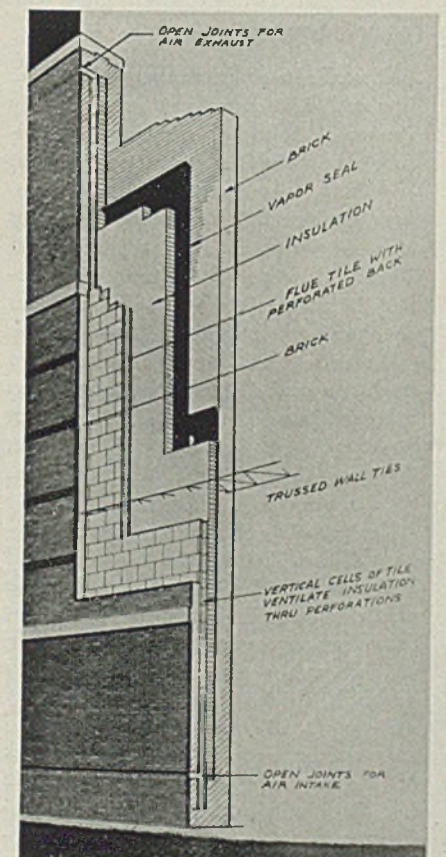
Built entirely of native brick, which was trucked from nearby yards without



About 200 tons of critical materials were conserved in lighting this new windowless aircraft plant in Oklahoma by using nonmetallic reflectors and 4-lamp instead of 2-lamp ballasts in the fluorescent lighting mechanism. A completely integrated manufacturing unit, the plant is now producing Skytrains, just a year after ground was broken



From under the wing of a cargo plane (above) is seen the large flight hangar with three telescoping turnover doors on either side. Clapboard siding used above the doors in these buildings is scarcely distinguishable from steel of the doors



Details of wall section, indicating how air is circulated within the wall is shown above. Trussed wall ties are the only steel in the design which is entirely new to industrial structures

tying up a single railroad car and would have represented more than 1400 carloads, the interior required a special paint suited for use on brick having a high alkaline content. It was found in a wax-fortified material which also gave the high side walls high light reflectivity and a resistance to dust which aids cleanliness. Interior walls are painted May green above a dark apple green dado.

Continuous bands of limestone and rough faced brick extend around all the structures making up this integrated plant, which includes a 700-foot administration building, a huge hangar, and a large paint shop capable of accommodating two fully assembled transport planes in individual spray booths.

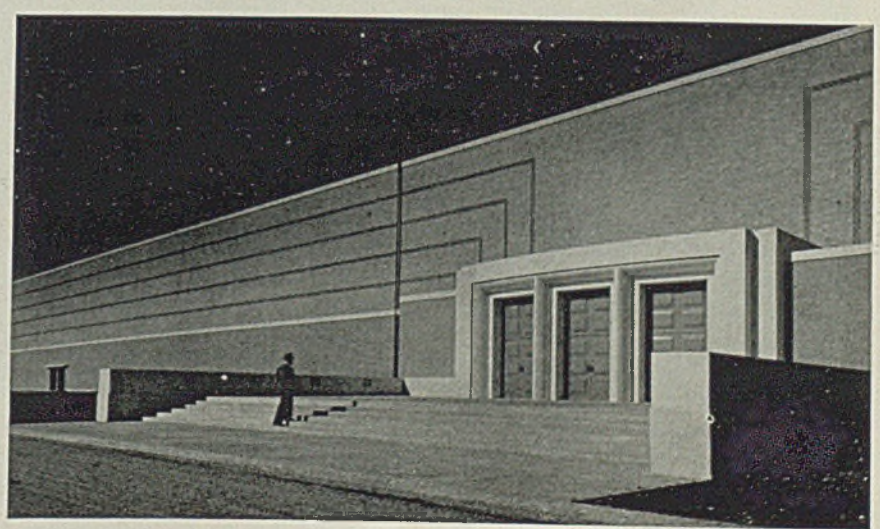
The main building houses under one roof all of the facilities essential for manufacture and assembly of large two-motor transport planes identical with those which played an important role in the invasion of North Africa and have supplied South Pacific bases with a continuous flow of ammunition, food and reinforcements.

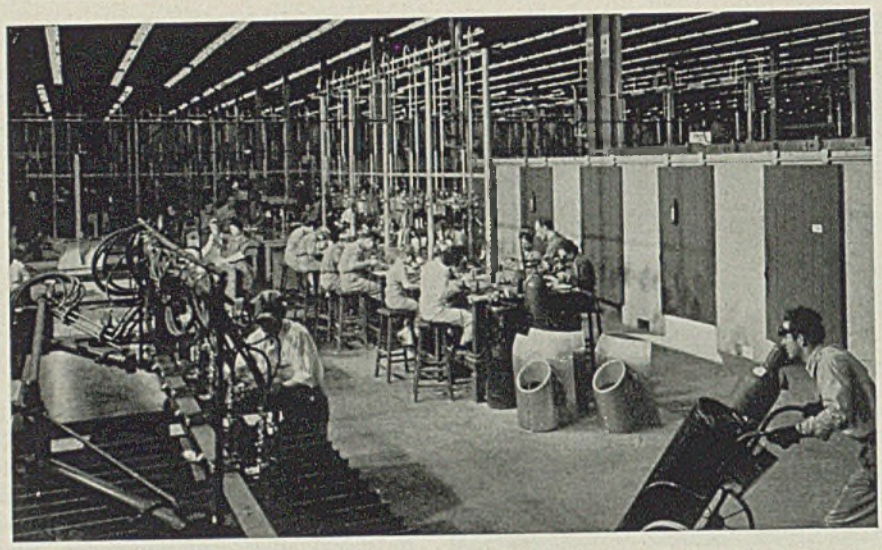
Cafeterias, first aid stations, and production offices are housed in two story lean-to structures at frequent intervals on all sides. A central kitchen, office cafeteria, and dining room, as well as a completely equipped medical department, with surgery, X-ray, and therapeutic treatment rooms, are located in the adjacent administration building. Buff glazed tile has been used throughout these and other employe service areas, while partitions in the offices are all of wood, also painted green.

The speed with which Douglas has moved into production in the new plant follows many months of planning and close co-operation between design, engineering, construction, and production organizations. With their first southwestern plant just going into operation on the assembly of bombers at Tulsa last year when this plant was authorized, Douglas immediately began to set up facilities for the training of men and women for this second plant in five strategic centers within a radius of 125 miles. At the same time was launched a comprehensive local training program in temporary manufacturing facilities set up in available industrial space.

When the first section of the plant was finished on Nov. 1, the personnel was ready to staff it, and steadily increasing forces of men and women have been recruited from farms, oil fields and nonessential businesses.

Imposing entrance (below) to administrative offices of the new Douglas plant in Oklahoma City. Limestone portal is the sole nonfunctional detail in the vast project which required 17,000,000 *common brick in its construction*





Special tile welding booths have been provided for electric arc welders. At center is a crew of bench welders, gas welding aluminum parts, and at left is a multiple-torch pantograph-type of gas cutting machine

Army officials and executives present for the tour of inspection included: Brig.-Gen. Ray G. Harris, Midwestern Procurement District, AAF, Wichita, Kan.; Col. Frank J. Wilson, district engineer, Tulsa; Major E. R. de Luccia, Office of the chief of engineers, Washington; F. W. Conant, vice president in charge of manufacturing, and A. E. Raymond, vice president in charge of engineering for Douglas Aircraft Co. Inc., Santa Monica; George A. Bryant, president; Albert S. Low, vice president for engineering and G. W. Plaisted, vice president for sales, Austin Co., Cleveland.

A. D. Engle was project manager in charge of design and construction management for Austin. Major E. A. Cornell, was the area engineer. C. C. Pearson is manager of the plant for Douglas and Major George T. Chadwell, is the AAF resident representative.

Plane Executive Cites Need For Supervisors in Industry

Citing the critical need for more supervisory and executive talent in industry and calling upon industry to bring together leadership aims of management and labor, C. W. Perelle, vice president, Consolidated Vultee Aircraft Corp., San Diego, Calif., told members of the Society for the Advancement of Management at a meeting in that city recently that about a year ago Consolidated Vultee had approximately 76 foremen, while today there are 1000 direct and indirect labor foremen.

Two reasons for shortage in supply of leaders were emphasized by Mr. Perelle. One was the sudden terrific expansion in production occasioned by war demands; the second a lack of foresightedness on the part of industry in the long-range development of leaders.

In addition to urging greater consideration to problems of developing adequate supervisory personnel, he pointed to the need for a more careful and thorough analysis of qualifications of potential leaders.

Ventilating ducts are provided in the cadmium plating section. Metal curtains extending 10 to 15 feet below the bottom chord of the trusses trap, process heat and gases exhausted directly to the outside through fans and blowers. Photos by courtesy of Austin Co.

Andrews Steel Co. Under New Management

New officers of the Andrews Steel Co., Newport, Ky., purchased recently by Norman B. Schreiber and associates, include Mr. Schreiber as president; J. S. Greenberg, vice president and secretary; Herbert W. Boal, who continues as vice president and treasurer, and Charles H. Stamm, former vice president in charge of sales who becomes vice president for sales and production.

Directors elected in the reorganization are Frederick L. Schuster, partner in Lehman Bros., New York investment bankers; I. J. Harvey Jr., president, Flintkote Co.; William K. Jacobs Jr., Mr. Boal and Mr. Schreiber.

Mr. Schreiber was a member of MacDonald Bros Inc. of Chicago, industrial engineers who had served prior to the sale in a consulting capacity to the Andrews management. Until November, he also was a member of the faculty of the Illinois Institute of Technology.

As previously reported in STEEL the new owners acquired all capital stock of the Andrews family. Founded in 1885 by Joseph A. and Albert L. Andrews under the name Globe Iron Roofing & Corrugating Co., management at the time of the reorganization was in the hands of the second and third generations of the founders, retiring officers being Albert K. Andrews, president; William N. Andrews and Joseph B. Andrews Jr., vice presidents, and Frank M. Andrews, secretary.

The name of Newport Rolling Mill was adopted for part of the establishment in 1890. The Andrews Steel Co. plant was built in 1908.

Construction of 400-Ton Custom Mill at Butte, Mont., Approved

BUREAU of Mines proposal to erect a 400-ton-a-day custom mill at Butte, Mont., to treat manganese ores produced by several mines in that area and thus provide more manganese, has been approved by the WPB Facility Review Committee.

Secretary of the Interior Ickes stated that the Domestic Manganese Co., prominent in the manganese field of Montana, has applied for a $250,000 loan from the Reconstruction Finance Corp. to construct the mill. The company proposes to utilize old milling equipment in the Butte area for the plant and to resume operation of its modern nodulizing plant at Butte to produce ferrograde manganese nodules for steel. About 12 pounds of manganese are required for every ton of steel produced.

Carrying the proposal to WPB, the bureau pointed out that in formulating the project its exploratory crews had drilled more than 10,000 feet of test holes, had taken hundreds of ore samples, and had tested the contemplated milling method. The bureau research revealed that the known reserves of carbonate manganese ore in four active mines in the Butte-Philipsburg area total about 175,000 tons of ore averaging 23 per cent manganese. When milled and nodulized, the ore averages from 51 to 59 per cent manganese.

Under the contemplated program, the ore delivered to the mill would be purchased by the Metals Reserve Co., which has been buying ore for stock-piling in the Butte-Philipsburg region. The Domestic Manganese Co. proposes to mill and modulize the stockpiled ore along with the newer ore produced by the mines.

Company officials informed the bureau that the milling plant could be constructed in about 90 days.

New Pacific Coast Tube Plant To Meet War Needs

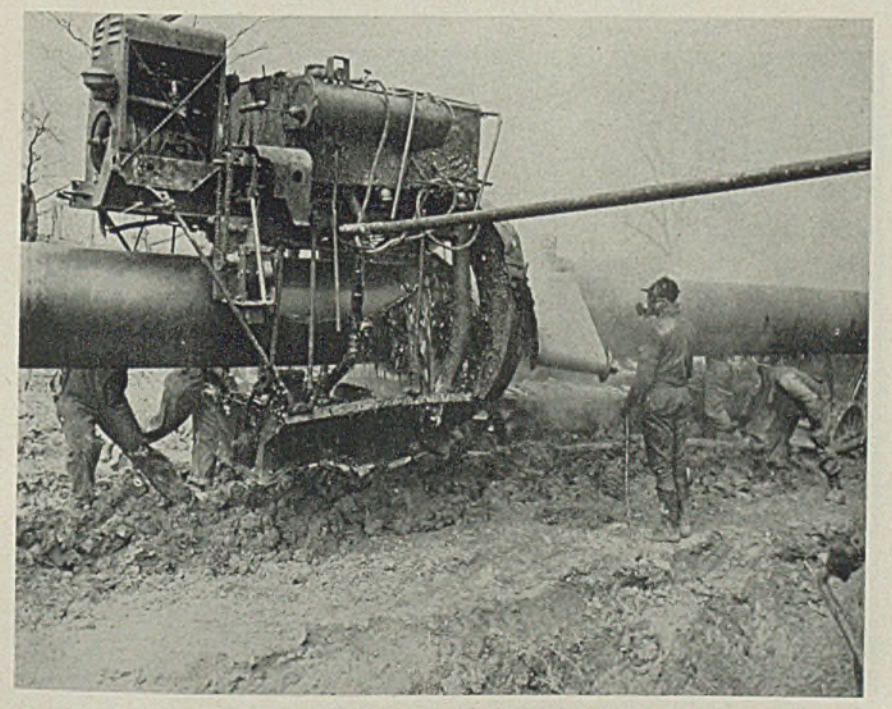
Construction has been started at Los Angeles on a plant to manufacture ferrous and alloy metal tubing to supply material to Pacific Coast consumers, mainly for airplane builders. Defense Plant Corp. is supplying funds for construction, cost being estimated at $1,750,000. Pacific Tube Co. has been organized to operate the plant, and will supply working capital and has an option to buy the plant at the end of the war.

F. G. Harmon, for 16 years assistant general manager of sales for the Columbia Steel Co., San Francisco, is executive vice president, in charge of production. Clarence A. Warden Sr., Philadelphia, is president and Clarence A. Warden Jr., is vice president and treasurer. R. H. Gabel, vice president in charge of engineering, has been production manager for Superior Tube Co., Norristown, Pa. Clarence H. Wallis will be plant superintendent. He has been superintendent of the cold-drawing department of National Tube Co., Elwood City plant, for 16 years of the 33 he has been with that company. Paul E. Kelly, of Superior Tube Co., will be secretary and assistant terasurer.

Plans are for completion of the plant in 90 days. Products will include cold-drawn seamless tubes of carbon and alloy steel from ½-inch to 4½-inches and electric welded tubing from ½-inch to 2 inches.

To meet the construction deadline several steel factory buildings are being moved from Texas and re-erected. Used machinery is being moved from various points.

"BIG INCH" PIPE GETS PROTECTIVE COATING



PIPE for the "Big Inch" line from Longview, Tex., to New Jersey is painted and wrapped in tar paper before being lowered into the trench. Each section of the 24-inch pipe is 49 feet long, weighs two tons. It is expected to be completed by July. NEA photo

War Plants, Equipment Authorized by DPC

Additional authorizations for new war plant facilities were made last week by Defense Plant Corp. DPC will retain title to the facilities which will be operated by the contractors. Figures are approximate, and include:

Arkansas Fuel Oil Co., Shreveport, La., to provide facilities at a plant in Louisiana costing $350,000.

Butcher & Hart Mfg. Co., Toledo, O., to provide equipment for a plant in Ohio at a cost of $60,000.

Commodity Credit Corp., Washington, to provide plant facilities in Wisconsin, Indiana and Iowa at an average of $350,000 each.

Wilbur B. Driver Co., Newark, N. J., to provide machinery and equipment for a plant in New Jersey, at a cost of $260,000.

Otis Elevator Co., New York, to provide plant facilities in New Jersey at a cost of $750,000.

Interstate Aircraft & Engineering Corp., El Segundo, Calif., to provide additional facilities at a plant in Illinois,

at a cost of $500,000 resulting in an overall commitment of $1,420,000.

Old Dixie Distilling Co. Inc., Falling Creek, Va., to provide facilities in Virginia, at a cost of $15,000.

S. F. Bowser & Co. Inc., Fort Wayne, Ind., to provide equipment at a plant in Indiana at a cost of $90,000.

Briggs Mfg. Co., Detroit, to provide additional equipment for plants in Michigan and Indiana at a cost of $1,700,000.

Ebaloy Foundries Inc., Rockford, Ill., to provide equipment for a plant in Illinois at a cost of $135,000.

James A. Hannah Inc., Chicago, to provide transportation facilities to be used in Illinois, Wisconsin, Indiana, Michigan and Iowa at a cost of $185,000.

Commodity Credit Corp., Washington, to provide plant facilities in Wisconsin at cost of $350,000.

Douglas Aircraft Co. Inc., Santa Monica, Calif., to provide additional plant space in California at a cost of $185,000, resulting in an overall commitment of $10,800,000.

Rohm & Haas Co., Philadelphia, to provide additional equipment at a plant in Tennessee at a cost of $50,000, resulting in an overall commitment of $2,890,000.

Ford Motor Co., Detroit, to provide additional facilities at a plant in Michigan, at a cost of $365,000, resulting in an overall commitment of $79,000,000.

Tycoon Tackle, Inc., Miami, Fla., to provide additional equipment and machinery at a plant in Florida at a cost of $14,000, resulting in an overall commitment of approximately $360,000.

Lear Avia Inc., Piqua, O., to provide additional equipment for a plant in Ohio at a cost of $50,000, resulting in an overall commitment of $650,000.

General Metals Corp., Los Angeles, to provide facilities at a plant in California at a cost of $172,000.

Commodity Credit Corp., Washington, to provide plant facilities at six locations in Iowa at an average cost of $331,000 each.

Commodity Credit Corp., Washington, for plant facilities four of which will be located in Illinois and four in Minnesota. Average cost of these facilities is $350,000 each.

Republic Steel Corp., Cleveland, to provide additional facilities at a plant in Connecticut at a cost of approximately $210,000, resulting in an overall commitment of $1,150,000.

Armstrong Cork Co., Lancaster, Pa., to provide additional equipment for a plant in Pennsylvania at a cost of approximately $30,000 resulting in an overall commitment of $1,100,000.

Bloomfield Mfg. Co., Chicago, to provide equipment at a plant in Illinois at a cost of $42,000.

Pacific Chain & Mfg. Co., Portland, Oreg., to provide plant facilities in Oregon at a cost of $200,000.

Jessop Steel Co., Washington, Pa., to provide additional facilities at a plant in Pennsylvania costing $240,000, resulting in an overall commitment of $1,600,000.

Luscombe Airplane Corp., West Trenton, N. J., to provide additional plant facilities in New Jersey at a cost of $50,000, resulting in an overall commitment of $200,000.

Corod Minerals Corp., Marion, Ky., to provide additional plant facilities in Kentucky at a cost of $70,000, resulting in an overall commitment of $215,000.

SUBSTITUTES

Steel Replaces Brass in 0.45-Caliber Ammunition

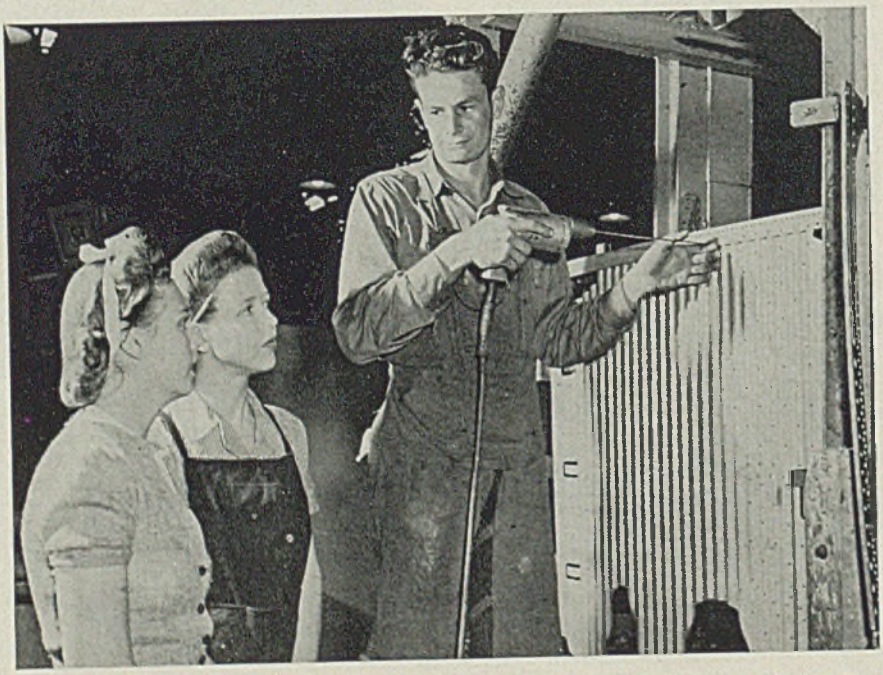
A newly developed method, which makes possible the substitution of steel for brass cases in 0.45-caliber ammunition, has been announced by the War Department. The manufacturing process, perfected by the Evansville Ordnance Plant working in conjunction with the Army's Frankford Arsenal, advances the Army's program for conservation of critical materials another step. A changeover from brass to steel for all types of fixed and semifixed artillery ammunition was completed the first of this year.

Saving in brass by the new process amounts to 1774 pounds for each 100,000 rounds of ammunition. The new cartridges with steel cases have been tested and accepted by the using services. Large-scale production is already under way. All plants making 0.45-caliber ammunition will adopt the steel cartridge case.

Eight months ago the Evansville plant was close to a shut-down because of the acute brass shortage. Brass, which expands with the explosion of the powder charge and then contracts, permitting the extraction of the cartridge, had been universally used. The successful institution of steel, removing a serious limitation on ammunition production, was accomplished in six months. In the same period the Frankford Arsenal perfected a steel copper plated jacket for the 0.45-caliber bullet which resulted in a saving of 780 pounds of gilding metal (90 per cent copper and 10 per cent zinc) for each 100,000 rounds.

An important saving also has been accomplished in ammunition packing boxes for 0.45-caliber ammunition. Formerly lined with terne plate, they now have a recently developed wax-dipped liner. By the elimination of solder, along with terne plate, an additional 7 pounds of tin for each 100,000 rounds is saved.

"DEAF MUTE BEST TEACHER"



DEAF mute teaches new girl employes how to build airplanes at the Vultee Aircraft plant, Downey, Calif. Company officials say new workers learn more quickly from the expressive gestures of mutes than from oral instructors. NEA photo

Zone Price Plan for Eastern Area To Be Inaugurated Soon by OPA

A MAJOR revision in the method of determining ceiling warehouse prices for heavy steel in the area from Maine to North Carolina is expected to be announced shortly by the Office of Price Administration. It is likely to become effective within a week after announcement.

To be known as Amendment 14 to Revised Price Schedule No. 49, it will establish dollars and cents ceiling prices for four zones on such products as sheets, bars, plates, strip and structural shapes in carbon, alloy and stainless grades. Within the next few months the plan probably will be extended throughout the United States.

This was revealed recently by E. L. Wyman, chief, Warehouse Unit, OPA, Washington, in a discussion which also covered features of the proposed Amendment No. 13 to the same schedule, to be issued shortly, and Amendment No. 12 which was issued March 1.

He spoke on a forum sponsored by the Steel Distributors Institute Inc., New York, at the Hotel Commodore, that city, March 29. Other speakers were A. Oram Fulton, assistant director, Steel Division, War Production Board, Washington; J. R. Stuart, chief, Warehouse Unit, WPB, Washington; J. R. Mills, chief, Metals Division, OPA, New York; and Lynn Eaton, assistant deputy director, WPB, New York; with Morton A. Shapiro, counsel of the institute, presiding. More than 500 were present, including many from outside the city.

Outlines Pricing Formula

Outlining Amendment 14, Mr. Wyman said that each of the four zones will represent the area customarily serviced by warehouses located therein and will be described in tables by state, and, where necessary, by county or other geographical unit. For each zone, he explained, there will be a zone price component index which will be a master table listing all of the elements of the ceiling price. Each part will have separate tables in which will be specifically listed in dollars and cents the exact charge or deductions which may be made.

The zone price component index will be used in determining the zone destination price, by which is meant the price at the buyer's destination located within a zone. It will consist, he said, of the price at the most favorable basing point (mill base price) plus freight from basing point to the buyer's destination, plus spread, and quantity, quality, merchandising, size, cutting and miscellaneous extras and deductions.

Sellers shipping from one zone to another will be permitted to charge the zone destination price for the zone into which they ship. Similarly, he added, sellers shipping from areas outside the four zones into a zone will be permitted to charge the zone destination price at the customer's destination.

Alternate Methods Provided

In these latter two cases, however, alternate pricing methods will be permitted which may be used at the seller's option. First, in shipping from one zone to another, the seller may use the zone destination price, as previously mentioned, or the zone shipping point price, by which is meant the price at a shipping point within a zone, plus freight to destination, minus a freight allowance at the rate of 15 cents per 100 pounds.

Secondly, when shipment is made from a "nonzoned" area into a zone, a seller may charge the destination zone price, as explained above, or the seller's country price at the city from which shipment is made plus freight from shipping point to destination, minus a freight allowance at the rate of 15 cents per 100 pounds.

Further, on shipments from a zone into the nonzoned area, the seller may charge his own zone shipping point price plus freight from shipping point to destination, minus a freight allowance of 15 cents per 100 pounds, or, at his option, the lowest combination price at destination.

Amendment 13, he said, will lead to several relatively minor changes. It will permit certain extras not previously allowed on NE steels, extras relating to stress relieving after cold working, aircraft quality and the extensometer test. These will be allowed, he explaned, because the new alloy steels are now being used by the aircraft industry. The proposed amendment will also permit an extra charge on NE steels when they are treated at an outside plant. The jobber in these cases will be permitted to charge his actual invoice cost for the treatment minus trucking charges, plus a profit margin of 30 cents per 100 pounds. This change is scheduled because there has been a considerable increase in the amount of material treated for jobbers at outside plants.

Asserting there is a huge amount of idle, frozen and excess steel estimated to run into hundreds of thousands of tons, Mr. Fulton urged jobbers to avail themselves as much as possible of these materials. Such steel will not affect their quotas and their interest will do much in getting it into war production and other essential uses. Too, it will be much to their advantage to get this idle material off the market before the war is over.

Where the steel is not usable in its present form, but by rerolling or reprocessing it can be used in war channels, the holder is paid by the government what is known as "limited cost", by which is meant the base price exclusive of freight charges for the primary form in which the material is bought, including analysis, size, shape, heat treatment, and finish extras. It does not include, he said, unverifiable extras, such as quantity, testing, packing or freight. The Steel Recovery Corp. finances the reprocessing and sells at the current market price, absorbing the loss.

A third type of transaction involves material useful only for remelting. In this case the government purchases at what is known as the "government price", which runs from 15 to 30 per cent discount from the "limited cost", the amount of discount increasing as the value of the material increases. While the holder suffers a discount from his cost, the price he receives is nevertheless as high as four, five or six times the value of the material if he sold it as scrap, which is its only possible use in the war effort.

WPB Revises Control Over Steel Warehouse Operations

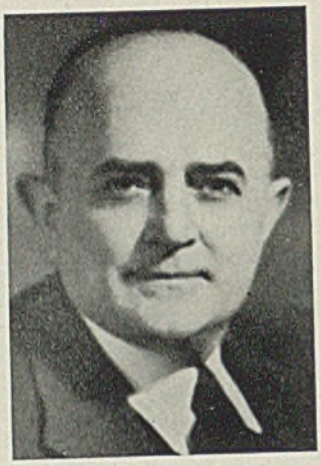
Steel warehouse order, M-21-b, is being split into three component parts. Deliveries of general steel products to warehouses and dealers are now governed by M-21-b-1, which was effective April 1; deliveries of pipe, wire products and other merchant trade products will be governed by a pending order; sales of these products are now controlled by CMP Regulation No. 4.

Purpose of order M-21-b-1 is to provide adequate warehouse stocks of general steel products so that small and emergency needs can be filled promptly, and also to guard against unnecessarily large accumulations of stocks by warehouses and dealers. The order divides distributors into two categories: Warehouses, which buy directly from steel

(*Please turn to Page* 178)

MEN of INDUSTRY

C. R. COX



G. L. DANNEHOWER

ROY B. ROSE

DR. C. M. SLACK

Charles R. Cox, the past two years executive vice president, National Tube Co., Pittsburgh, has been elected president of National Tube and of Tubular Alloy Steel Corp., United States Steel Corp. subsidiaries. He succeeds **Benjamin F. Harris,** who recently resigned and is now consultant to **Benjamin F. Fairless,** president of United States Steel, in connection with war activities. Associated with National Tube since 1934, Mr. Cox has served as general superintendent of the Ellwood works, and as vice president in charge of operations, with offices in Pittsburgh.

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Gilbert L. Dannehower has been appointed sales manager, Swiss American Gear Co., Jersey City, N. J. He will also manage sales of Cosa Corp., New York, exclusive importer of Swiss precision machinery. Mr. Dannehower has designed and manufactured machinery on which he holds several patents and for the past four years was associated with Walker-Turner Co. Inc., Plainfield, N. J.

—o—

George E. Hochgesang has resigned as foundry superintendent, Youngstown Foundry & Machine Co., Youngstown, O.

—o—

C. F. Langer has been appointed general superintendent of the strip mill, Republic Steel Corp., Cleveland, succeeding the late J. W. Hughes.

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Thomas J. Adams has become chief metallurgist, Columbia Steel Co., Torrance, Calif., succeeding the late John Disario.

—o—

E. B. Finegan, chief traffic officer, Chicago, Milwaukee, St. Paul & Pacific railroad, Chicago, has been elected president, Traffic Club of Chicago. **S. L. Felton,** general traffic manager, Acme Steel Co., Chicago, is the new first vice president.

—o—

Roy B. Rose has been named district manager for H. K. Porter Co. Inc., Pittsburgh, for the territory including eastern Pennsylvania, western New Jersey, Maryland and Delaware. He will be headquartered in Philadelphia where the company has opened offices in the Girard Trust building.

—o—

J. R. Sargent, formerly eastern district market development representative of Westinghouse Electric & Mfg. Co., has been appointed acting manager of the market development department. He succeeds **Donald C. Hooper,** who is on active duty in the United States Navy.

—o—

William T. Goss has been elected vice president, Goss Printing Press Co., Chicago. Associated with the company 18 years, Mr. Goss has specialized on sales in the midwestern territory for a number of years.

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George D. Keller has resigned as vice president, Studebaker Corp., South Bend, Ind. He has not announced his future plans.

—o—

Roy M. Smith, who joined Roller-Smith Co., Bethlehem, Pa., in August, 1942, as assistant chief engineer, has been promoted to chief engineer, succeeding **J. D. Wood,** resigned. Before joining Roller-Smith, Mr. Smith was engineering manager for the Wiring Device Division of Bryant Electric Co.

—o—

C. O. Hedner, manager, hoisting equipment section, Yale & Towne Mfg. Co., Philadelphia, has been elected chairman, Electric Hoist Manufacturers' Association, New York. **Sydney Buckley,** president and general manager, Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y., has been named vice chairman of the association.

—o—

Dr. Charles M. Slack has been appointed assistant director of research, Westinghouse Lamp Division, Westinghouse Electric & Mfg. Co., Bloomfield, N. J. After teaching physics at Columbia University for a year, Dr. Slack joined the research staff of the Lamp Division in 1927. He will direct experimental work on various lamp and electronic problems.

Dr. John W. Marden, the past 15 years assistant director of research, will assume charge of metals research, in addition to his present duties.

—o—

Allan S. Austin, secretary, Austin Co., Cleveland, and in 1938-39 managing director of Austin Engineers Builders Ltd. of England, has been commissioned a captain in the military government division of the Army. Mr. Austin has spent the past two years on magnesium and other chemical plant expansion programs for war production.

—o—

J. E. N. Hume, commercial vice president, General Electric Co., Schenectady, N. Y., announces the following have been appointed industrial electronics specialists to be located in G-E offices throughout the country: **I. C. Diefenderfer** and **D. C. Hierath,** New York; **J. F. Getz,** Philadelphia; **A. J. Moore,** Boston; **W. B. Frackelton,** Chicago; **L. E. Donahue,** Los Angeles; **J. A. Setter,** Denver; **I. F. Conrad,** St. Louis; **A. D. Boardman,** San Francisco; **L. B. Parsell,** Detroit; **L. R. Elder,** Portland, Oreg.; **Frank C. Neal Jr.,** Dallas, Tex.; **R. H. Jackson,** Atlanta,

Ga.; **K. H. Keller,** Cleveland; **R. C. Norris,** Cincinnati; **A. M. Dawson,** Pittsburgh; **B. Cogswell,** Buffalo; **L. F. Stone,** Newark, N. J.

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R. J. Rowen has been named manager of the Wheeling, W. Va., district of Air Reduction Sales Co. The past two years he has been assistant manager there and before that was assistant to general sales manager in New York.

—o—

Frank J. De Rewal, former research chemist for Foote Mineral Co., Philadelphia, has been appointed to the research staff of Battelle Memorial Institute, Columbus, O., and assigned to its division of nonferrous metallurgy.

—o—

Verne C. Parker has been advanced to advertising manager, Simonds Saw & Steel Co., Fitchburg, Mass. Mr. Parker serves also as advertising manager of Simonds Canada Saw Co. Ltd. Associated with Simonds since 1918 he was transferred to the advertising department a year later and worked as assistant to the late Roy D. Baldwin, who was advertising manager until his death in February.

—o—

Edward B. Morrow has been elected vice president, Hercules Powder Co., Wilmington, Del., and **Francis J. Kennerly** has been named to succeed Mr. Morrow as treasurer. Mr. Kennerly, heretofore assistant treasurer, will be succeeded by **Leslie W. Mason,** present comptroller.

—o—

Roy E. Kunde has been appointed to the newly created post of district traffic manager, Bethlehem Steel Co., Bethlehem, Pa. Mr. Kunde formerly was traffic representative of Bethlehem Supply Co., a subsidiary, at Tulsa, Okla., for three and one half years, and before that was assistant to district traffic manager of Bethlehem at Chicago for ten years.

—o—

Prof. F. C. Lea, D. Sc., has been elected president, Institution of Mechanical Engineers. Dr. Lea was professor of engineering at the University of Sheffield from 1924 to 1936 and on his retirement was appointed emeritus professor. He is a director of Messrs. Edgar Allen & Co.

—o—

W. M. Wood, Decatur, Ill., for 25 years president, Mississippi Valley Structural Steel Co., Melrose Park, Ill., has been elected chairman of the board. He has been succeeded as president by **R. D. Wood,** Chicago. W. M. Wood, one of the founders, served as treasurer and chief engineer until his election to the presidency in 1918. R. D. Wood, who succeeds his brother as president, joined the company in 1906, and the past 20 years has been a vice president.

R. J. ROWEN

VERNE C. PARKER

Officers re-elected include **G. A. Caldwell,** vice president, Decatur; **C. R. Dick,** vice president and treasurer, Decatur; **J. B. Butler,** vice president, St. Louis; and **F. W. Ives,** secretary, St. Louis.

—o—

Sidney R. Snow, since May, 1941, general superintendent of the Waukegan Works of American Steel & Wire Co., Waukegan, Ill., has been transferred to Cleveland as assistant to vice president in charge of operations. He will handle operating costs. **John R. Gaut** has been named general superintendent of the Waukegan Works, succeeding Mr. Snow. Heretofore Mr. Gaut has been assistant general superintendent at that plant.

—o—

R. H. Knipping has joined Power Specialty Co., Houston, Tex., and will soon take over the San Antonio, Austin, Corpus Christi territory. Power Specialty Co. is agent for Centrifix Corp., Cochrane Corp., Erie City Iron Works, Foster Engineering Co., Hays Corp., J. E. Lonergan Co., Lummus Co., R-S Products Corp., and Thomas C. Wilson Inc.

—o—

John L. Collyer, president, B. F. Goodrich Co., Akron, O., has been named a member of the National Industrial Information Committee governing board, as announced by **Alfred P. Sloan Jr.,** chairman of General Motors Corp. and chairman of the special industrial committee.

—o—

Harry F. Potter has been elected secretary, Crane Co., Chicago. Associated with the company 43 years, since 1931 he has been manager of branch houses, and is succeeded in that post by **James A. Dwyer,** manager of district No. 1. Mr. Dwyer will be assisted by **A. H. Prasse. David J. Molloy,** assistant manager of the New York branch, succeeds Mr. Dwyer as district manager, and will have general supervision of the main branches in Baltimore, Boston, New York, Philadelphia and Washington. He in turn is succeeded by **George P. Gregory Jr.** as assistant manager of the New York branch.

—o—

T. Spencer Shore, vice president and treasurer, General Tire & Rubber Co., Akron, O., has been elected a director, Eagle-Picher Lead Co., Cincinnati.

—o—

Charles Belknap, chairman of the executive committee and executive vice president, Monsanto Chemical Co., St. Louis, has been elected president, succeeding **Edgar Monsanto Queeny,** who has become chairman of the board. Mr. Belknap will continue as chairman of the executive committee.

—o—

R. A. Schoenfeld, vice president and sales manager, Wheelco Instruments Co., Chicago, announces the following additions to the sales and service staff: **Hugh Acock,** formerly in the Tulsa, Okla., territory, has been named Texas district manager, with headquarters in Houston. **C. H. Garrison** has been named Kansas City representative, territory including western counties of Missouri, while **Russell George** has been added to the company's Combustion Safeguard Division, with headquarters in Chicago.

—o—

Wilson F. Howard has been appointed representative in charge of the Connecticut district for the Machinery Division of Austin-Hastings Co. Inc.,

Cambridge, Mass. Mr. Howard formerly was shop manager of Jones & Lamson Machine Co., Springfield, Vt. He will be located at 1800 Park street, Hartford, Conn.

—o—

T. Laurence Strimple has been promoted to secretary, National Acme Co., Cleveland. Formerly assistant secretary and assistant treasurer, he succeeds **George J. Steinbicker,** who will continue as treasurer and also serve as a member of a newly created finance committee.

—o—

B. R. Kulp, chief engineer, Chicago & North Western railroad, Chicago, has been appointed chief engineer as well of the system's affiliated Chicago, St. Paul, Minneapolis & Omaha railroad. **R. R. Strother,** chief engineer of the Omaha, with offices in St. Paul, has been named assistant chief engineer of the North Western system, with headquarters in Chicago; **L. R. Lamport,** division engineer of the North Western Galena division, has become assistant to chief engineer; **E. C. Vandenburgh,** engineer of maintenance of the North Western, has become engineer of maintenance of the system; **A. E. Bechtelheimer,** engineer of bridges of the North Western, will serve in similar capacity for the system.

—o—

William J. Norman has been appointed assistant district manager of the Waverly plant of United States Steel Supply Co., Newark, N. J., and **Walter P. McGuire** has been named manager of the company's Philadelphia sales office. Mr. Norman, who has been a salesman for the company since December, 1939, was first employed by the United States Steel Corp. in 1912. Mr. McGuire has been employed as a salesman in the company's Waverly plant since April, 1933.

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Arthur M. Anderson, vice president, J. P. Morgan & Co. Inc., New York, has been elected a director and a member of the finance committee of the United States Steel Corp., succeeding the late J. P. Morgan.

—o—

Alexander C. Brown, Deputy Director of the Steel Division, WPB, has resigned and will return to his position as first vice president of Cleveland Cliffs Iron Co., Cleveland.

—o—

R. X. Raymond, a gear sales engineer, associated the past 15 years with D. O. James Mfg. Co., Chicago, is now in charge of the Minneapolis office, Fawkes building, 1645 Hennepin avenue.

OBITUARIES...

James A. Farrell, president of the United States Steel Corp. from 1911 until 1932, and for five decades an active figure in foreign trade, died in New York, March 28. He was 80.

Although he retired as operating head of the corporation 11 years ago, Mr. Farrell remained a director until his death. As a founder and chairman of the National Foreign Trade Council, he labored continuously for foreign trade policies that would insure world peace and break the barriers of preferential trading systems.

Long a proponent of Anglo-American trade agreements, he urged in 1940 the establishment of an economic front by United States and Great Britain to combat the totalitarian block. He often was referred to as "The Dean of Foreign Trade."

Mr. Farrell was the hero of one of America's great success stories. His father, a ship owner and captain, was lost at sea when young Farrell was 15. The lad obtained a job in a New Haven, Conn., wire mill, working the then common 12-hour day. After working hours, he studied at home. After 14 months in the mill he became a mechanic, and a few years later moved to Pittsburgh, center of the steel industry, and joined the Pittsburgh Wire Co. as a laborer.

He became foreman before he reached voting age, and at 26 was sales manager for the company. Four years later he was general manager of the whole organization. That was in the panic year of 1893 and buyers were not taking steel. While other steel men were waiting for the storm to pass, Mr. Farrell invaded the foreign field and sold half of the company's output abroad.

JAMES A. FARRELL

In 1899, the Pittsburgh Wire Co. was merged to form the American Steel & Wire Co. and Mr. Farrell became foreign sales manager. Two years later, the United States Steel Corp. was formed with American Steel & Wire as a subsidiary, and Mr. Farrell headed the foreign development division. In 1903, the United States Steel Products Co. was organized to co-ordinate the foreign activities of all the corporation's subsidiaries. Mr. Farrell was its first president.

As a leader in the steel industry, Mr. Farrell was active in the American Iron and Steel Institute, serving as a vice president and chairman of its committee on foreign relations. For several years, he was also chairman of the committee on foreign relations of the United States Chamber of Commerce.

He was awarded the first Gary Memorial Medal of the institute in 1929. Many other honors were bestowed upon him, including two decorations by the Vatican, honorary degrees by several universities, a commission in the French Legion of Honor and in the Order of the Crown of Italy.

—o—

Arthur T. Knoerzer, 45, vice president and general manager, Champion Corp., Hammond, Ind., died March 23, in that city.

—o—

John B. Goldsborough, 79, chairman of the board, Underpinning & Foundation Co., New York, died March 26 at Croton-on-Hudson, N. Y. He directed construction of numerous subway projects.

—o—

Edward J. Fleming, 72, president, Fleming Foundry Co., Springfield, Mass. died recently in Jacksonville, Fla.

—o—

Norton J. Bond, 55, for 23 years a member of the advertising department, Electric Storage Battery Co., Philadelphia, died March 15.

—o—

Patrick F. Tierney, superintendent of construction of the new Dodge-Chicago Division of Chrysler Corp., Chicago, died March 26, in that city.

—o—

William Berninger, traveling representative in Ohio, western Pennsylvania and central Indiana, A Leschen & Sons Rope Co., St. Louis, died March 4. He had been associated with the company since 1913.

Beauty salon and cosmetic canteen in a war plant! Such novel facilities are provided for the 3000 women workers of N. A. Woodworth Co., manufacturer of aircraft parts, Ferndale, Mich. A few of the women are shown (above) resting in the comfortable lounge room which seats 160

These women (right) receive beauty treatments at the plant immediately after working hours. Weekly cash credits are awarded to those with good attendance records, exchangeable for cosmetics

Lower left, young employes try out a new dance step during a recreation period

Lower right, powder rooms are equipped with comfortable chrome chairs, make-up mirrors, fluorescent lights and shelves for compacts and lipstick

RECORD TONNAGE CONTRIBUTED BY 176 LAKE SUPERIOR MINES

MINES shipping Lake Superior iron ore in 1942 numbered 176, compared with 165 in 1941. Largest shipments were made by the Sellers mine, 10,331,860 gross tons; second largest was the Hull-Rust with 9,089,295 tons. Mahoning mine held third position with 4,040,153 tons. These mines are in the Mesabi range. Only two mines outside the Mesabi shipped over 1,000,000 tons in 1942.

Missabe Mountain mine, which shipped 4,603,065 tons in 1941 and 4,330,739 tons in 1940, was not operated in 1942. The lease was surrendered to the state by the Oliver Mining Co., United States Steel Corp. subsidiary, at the end of 1941 and was purchased by the North Range Mining Co., Negaunee, Mich. The property has been rehabilitated and will resume shipments in 1943.

Total shipments from United States mines in 1942, as announced by the Lake Superior Iron Ore Association, Cleveland, were 93,008,726 tons, against 80,747,859 tons in 1941. In addition 486,666 tons was shipped from the Michipicoten range in Canada. Details of 1941 and 1942 shipments in gross tons by mines follow:

MESABI RANGE

Mine	1942	1941
Adams Spruce Group	4,114,771	3,477,580
Agnew	246,005	304,847
Alan	50,090	.....
Albany	530,722	807,949
Alice	200,885	85,430
Alice Fayal	.....	24,109
Alpena	1,845,951	6,601
Areturus	819,662	1,037,912
Argonne	613,930	371,773
Aromne	199,012	.....
Barbara	252,871	.....
Bennett	1,213,536	855,582
Biwabik	552,363	1,012,757
Bradford	19,300	46,695
Bray	92,855	143,249
Burt-Pool-Day	1,019,008	1,028,686
Canisteo	800,576	556,128
Canton (Biwabik Tresp.)	787	.....
Carol	53,345	150,238
Chatco	.....	81,838
Commodore	70,873	61,895
Coons	768	280,808
Corsica	793,031	706,478
Cyprus	15,504	.....
D'Autremont	383,754	.....
Dale	921	13,715
Danube	844,600	708,877
Douglas	186,505	.....
Draper	181,010	39,125
Dunwoody	413,875	201,772
Fayal	.....	11,203
Fayal No. 2	123,022	.....
Fraser	1,566,441	1,398,785
Galbraith	597,484	360,696
Genoa-Sparta	29,669	50,685
Gilbert (Schley Tresp.)	21,843	168,286
Godfrey (Burt)	568,226	450,903
Godfrey (Glen)	66,778	143,902
Grant	622,757	581,691
Greenway	196,262	290,518
Greenway Wash	75,339	.....
Gross-Marble	280,896	.....
Harrison	648,010	457,348
Harrison and Patrick concentrat.*	340,660	178,817
Hartley	433,186	.....
Hartley-Burt	22,280	237,842
Hawkins	562,530	507,331
Hill Annex	3,477,560	3,645,950
Hill Trumbull	1,338,415	1,254,576
Hoadley	7,613	63,747
Holman-Cliffs	1,028,143	939,947
Hull-Nelson	1,152,652	.....
Hull Rust	9,089,295	5,111,600
Iron Chief (Grant Tresp.)	42,914	.....
Jo-Ann	.....	7,604
Judd	167,108	142,664
Julia	.....	22,115
Kerr	127	.....
Kevin	1,310,079	937,458
La Rue	55,384	282,460
Lamberton	508	.....
Leonard-Burt	865,932	234,391
Leonard-Glen	759,103	.....
Leonidas	221,279	405,710
Lone Jack	61,098	.....
Lincoln	.....	804
Mahoning	4,046,153	4,040,388
Mahoning-Rust	21,336	.....
Majorca	469,258	151,467
Mesabi Chief	261,370	431,078
Minnewas	18	814,573
Minorca	16,750	21,533
Missabe Mountain	.....	4,603,065
Mississippi No. 1	247,489	.....
Moose	16,203	.....
Morris	1,496,671	1,722,808
Morrison	878,154	1,026,673
Niles (Douglas Tresp.)	8,096	.....
Norpac (Hull-Rust Tresp.)	136,024	.....
North Harrison	91,804	199,309
North Uno G.N.	2,037	.....
North Uno N.P.	84,265	43,401
Pacific	56,419	29,034
Patrick-Ann	43,300	143,050
Penobscot	960,960	532,441
Perkins Annex	.....	149,181
Pillsbury-Bradford Tresp.)	.....	49
Prindle	364,456	.....
Quinn	19,734	27,799
Reed	.....	3,084
Rouchleau	1,049,958	2,747
St. Paul-Day	312,240	190,964
Sargent	134,733	127,521
Sauntry	418,777	.....
Schley	884,630	263,137
Scranton	1,643,158	1,025,323
Sellers	10,331,860	10,098,342
Shenango	114,164	384,742
Sliver	73,146	71,191
Smith	4,241	4,876
South Uno G.N.	.....	3,659
South Uno N.P.	.....	13,055
Stein	353,513	378,687
Stephens (Pacific Tresp.)	.....	3,715
Stevenson	144,682	167,232
Susquehanna	1,011,593	876,787
Union	10,355	72,095
Virginia	413,819	316,819
Wabigon	706,470	278,238
Wacootah	422,021	371,258
Walker	183,996	51,014
Warren	715,402	416,340
Webb	770,893	717,082
Wisstar	.....	9,463
York	110,816	93,461
Total	70,280,087	59,772,543

*Tonnage not allocated to individual mines.

MENOMINEE RANGE

Mine	1942	1941
Baltic	5,959	7,924
Bates	185,888	158,173
Bengal	521,961	397,645
Bela	3,947	18,998
Bradley	40,554	40,334
Buck	501,499	323,625
Cuff	.....	10,774
Davidson Group	335,933	318,624
Fogarty	12,722	39,851
Globe-Cornell	50,192	63,791
Globe-Cuff	14,113	.....
Hiawatha No. 1	355,014	298,696
Hiawatha No. 2	283,093	230,984
Homer	324,787	316,316
James	450,148	318,008
Mastodon	21,607	.....
Matilda	2,825	3,399
Penn Mines	875,562	881,693
Ravenna-Prickett	66,528	91,774
Rogers	38,951	55,950
Tobin-Columbia	348,067	232,240
Virgil	193,470	275,562
Wauseca	142,155	47,002
Zimmerman	155,459	.....
Total	4,930,434	4,131,363

MARQUETTE RANGE

Mine	1942	1941
Archibald	29,009	.....
Athens	672,225	659,451
Blueberry	326,049	340,279
Cambria-Jackson	327,733	316,257
Champion	58,305	106,928
Cliffs Shaft	747,564	638,246
Gardner-Macknaw	.....	43,866
Greenwood	121,809	94,565
Lake Superior Holmes	151,288	217,114
Lloyd	580,857	457,023
Maas	901,698	877,807
Mary Charlotte	357,439	281,887
Morris	396,772	334,264
Negaunee	1,091,729	1,051,006
Princeton	123,193	12,476
Richmond	234,153	236,585
Stephenson	.....	37,694
Tilden	241,537	292,443
Volunteer	179,371	255,600
Total	6,540,731	6,254,391

GOGEBIC RANGE

Mine	1942	1941
Anvil	281,636	303,053
Cary	433,511	340,772
Eureka-Asteroid	720,473	638,702
Geneva	310,723	62,183
Ironton	.....	181,273
Keweenaw	186,881	398,764
Montreal	1,112,443	1,141,641
Newport	576,679	649,357
Palms	147,391	33,100
Penokee Group	611,241	605,297
Plymouth	689,250	607,169
Puritan	.....	50,055
Sunday Lake	576,672	611,515
Wakefield	201,127	228,070
West Davis	389,867	450,428
Total	6,237,894	6,301,379

CUYUNA RANGE

Mine	1942	1941
Alstead Group	141,513	237,358
Armour No. 1	251,903	208,399
Evergreen	254,301	175,888
Huntington	86,123	59,292
Hopkins	40,628	.....
Louise	261,367	211,029
Mahnomen	644,543	484,211
Maroco	104,155	3,922
Merritt Group	138,127	126,712
Northland	.....	4,575
Pennington	159,717	122,091
Portsmouth	.....	169,527
Sagamore	508,823	451,236
South Hillcrest	176	.....
Portsmouth	250,103	.....
Wearne	194,053	186,802
Total	3,035,532	2,441,042

VERMILION RANGE

Mine	1942	1941
North Chandler	58,229	172,421
Pioneer	574,239	543,470
Savoy	.....	4,101
Sibley	223,446	194,473
Soudan	257,948	187,674
South Chandler	47,638	.....
Zenith	763,377	744,955
Total	1,924,877	1,847,094

Mine	1942	1941
Fillmore County, Minn.		
Weebing	59,171	.....
Michipicoten range		
Helen	486,666	.....
GRAND TOTAL	93,495,392	80,747,859

Shipping Season May Open April 15; Costs Are Increased

DESPITE a later opening of the Great Lakes shipping season this year, fleet operators anticipate no great difficulty in achieving the goal of 95,000,000 tons of iron ore. Fleet capacity will be increased materially by the 16 Maritime Commission freighters which will be placed in service during the season and by the four comparatively new Pittsburgh Steamship Co. vessels which will be in service throughout the season.

Shippers expect the season will open about the middle of April, or possibly a little later, depending on temperature and winds. Last year the first boats were loaded at the upper lakes on March 23, earliest in history. During March, 792,000 tons were moved, and in April, 7,789,182 tons.

For the 50 years preceding 1940, average opening date of upper lake transportation was April 21. In many of these years, of course, there was no pressure for an early opening and vessel operators waited until weather conditions were entirely favorable for fleet movement.

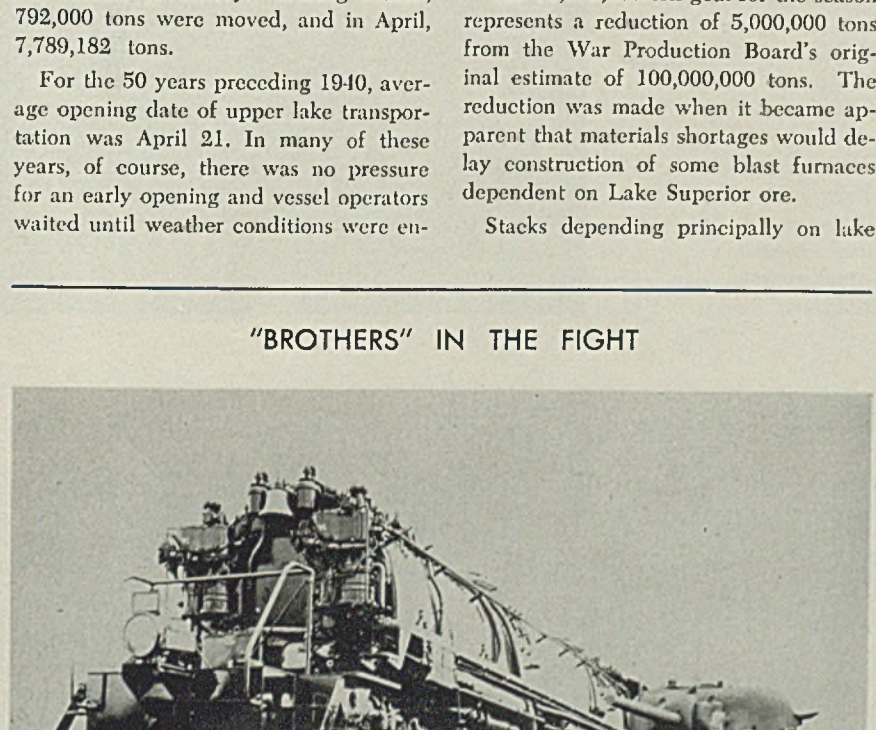
Necessity for moving 95,000,000 tons this year will cause the fleet to start as early as possible. It is expected there will be periodic delays due to anchor ice at various ports, and ice breakers already have moved to clear these. At Buffalo, tugs last week were unable to make much progress in the harbor and around the breakwall. The car ferry ST. MARY has been ordered out to attempt to clear the straits of Mackinac. Two Great Lakes Towing Co. tugs are breaking ice out of Port Inland and the tug ROEN and a Coast Guard cutter are working out of Escanaba.

The 95,000,000-ton goal for the season represents a reduction of 5,000,000 tons from the War Production Board's original estimate of 100,000,000 tons. The reduction was made when it became apparent that materials shortages would delay construction of some blast furnaces dependent on Lake Superior ore.

Stacks depending principally on lake ore scheduled to be brought into operation this year include: Carnegie-Illinois Steel Corp., one at Gary, Ind., and two at Braddock, Pa.; Bethlehem Steel Co., one at Lackawanna, N. Y.; Inland Steel Co., two at Chicago; Republic Steel Corp., one at Chicago and one at Cleveland; Pittsburgh Steel Co., one at Monessen, Pa., American Steel & Wire Co., one at Duluth. Some of these already have been lighted.

Iron ore prices for the 1943 season have not yet been established by the Office of Price Administration. Shipping costs will be increased this year by the transportation tax and by higher wage rates for seamen, and many shippers believe an increase in ore prices should be allowed.

"BROTHERS" IN THE FIGHT



BOTH helping Uncle Sam to victory, this giant locomotive and General Grant tank are products of the Baldwin Locomotive Works, Eddystone, Pa. The locomotive is operated by the Duluth, Missabe & Iron Range Railway, hauling iron ore from the northern Minnesota ranges to provide the steel for tanks, ships and munitions of war. It has 140,000 pounds tractive power and weighs more than 1,000,000 pounds, with its tender. It is claimed to be capable of pulling more pay load than any other steam locomotive in the world. NEA

Escanaba Urges Ore Dock Building Be Completed

Immediate completion of ore docks at Escanaba, Mich., as an additional facility in meeting the increased tonnage of Lake Superior iron ore to be transported in 1943 is urged by the Chamber of Commerce of that city. The project was initiated in the summer of 1942 as an alternate route in case of damage to the locks at Sault Ste. Marie, ore to be carried by rail to Escanaba and loaded into carriers for transport to lower lake ports.

The chamber has sent a letter to persons in authority in Washington stating that the quantity of critical material required to complete the docks would not exceed the tonnage for one ore carrier and the cost would be negligible in view of the benefits. Completion of these facilities, with docks already in service, is claimed to provide for movement of 40,000,000 tons of ore annually.

Original plans for this work were on the basis of an emergency measure in case of stoppage at the Soo, but the Escanaba chamber urges it as a valuable adjunct to the normal movement through the locks.

Form Ship Hardware Company

To provide sufficient marine hardware for Canada's shipbuilding industry, Keating Forging & Foundry Ltd. has been formed as a subsidiary of Keating Sons Ltd., 335 Bourgeois street, Montreal. A plant is under way on Lachine canal, said to be the only modern plant in the Dominion planned and equipped for complete production of hardware for ships. A forge shop 90 x 150 feet is under construction and the entire plant is planned to be completed this year. The working force will be 1500 persons.

Truscon Steel Co., Youngstown, O., receives the "E" burgee. Left to right, holding the pennant: W. W. Kelley, works manager, and J. Lewis, chairman, shop committee, Local 404, IAM-AFL. At extreme left is Lieut. Col. T. H. Eickhoff, chief of industrial service, Cleveland Ordnance District, who presented the award

Caterpillar Tractor Co., Peoria, Ill., presentation was attended by 25,000 persons. Holding the flag are, left to right: L. B. Neumiller, Caterpillar president; Brig. Gen. David McCoach, Army; Capt. E. A. Lofquist, Navy; Marritt Miles, "typical employe"

"M" award by the Maritime Commission was received by Federal Shipbuilding & Dry Dock Co., Kearny, N. J., for outstanding production. Holding the banner are, left to right: Gordon G. Holbrook, works manager; Nathan Levin, labor spokesman for the labor management committee; and Rear Admiral Howard Vickery

Armed Services Cite Metalworking Companies

Joint Army-Navy "E" awards for outstanding production of war materials were announced last week for the following metalworking companies:

Allis-Chalmers Mfg. Co., West Allis works and electric control plant, Milwaukee.
American Blower Corp., Columbus, O.
Arms-Franklin Corp., Franklin, Pa.
Arrowhead Electric Co., Duluth, Minn.
Carpenter & Paterson Inc., Medford, Mass.
Chicago Flexible Shaft Co., Chicago.
Crawford Mfg. Co., Kansas City, Mo.
Denver Steel & Iron Works Co., Denver.
Diamond Hill Machine Shop, Cos Cob, Conn.
Duval Engineering & Contracting Co., George D. Auchter Co., and Batson-Cook Co., Naval Air Station, Jasksonville, Fla.
Eaton Metal Products Co., Denver.
Exeter Brass Works, Exeter, N. H.
Foxboro Co., Foxboro, Mass.
Fred. S. Gichner Iron Works Inc., Washington.
Fyr-Fyter Co., Dayton, O.
Gear Grinding Machine Co., Detroit.
Goode Construction Corp., Blythe Brothers Co., Harrison-Wright Co., Marine Barracks, New River, N. C.
C. L. Gougler Machine Co., Kent, O.
Hammond Brass Works, Hammond, Ind.
Herman Machine & Tool Co., Tallmadge, O.
Horst Mfg. Co., Detroit.
International Telephone & Radio Laboratories, New York; Great River, Long Island, N. Y.; and Telegraph Hill, Keyport, N. J.
Irwin's Yacht Works, Red Bank, N. J.

Jeffersonville Boat & Machine Co., Jeffersonville, Ind.
Thomas Laughlin Co., Portland, Me.
Lawson Machine & Tool Co., Malden, Mass.
Los Angeles Contracting Co. and O. W. Karn, Naval Operating Base, San Diego, Calif.
Manning, Maxwell & Moore Inc., Bridgeport, Conn., and Boston.
Depot of Supplies, U. S. Marine Corps, Philadelphia.
Merrill-Stevens Drydock Co., Miami, Fla.
National Rubber Machinery Co., Clifton, N. J.
Oilgear Co., Milwaukee.
Pacific Marine Supply Co., Seattle.
Wm. Powell Co., Cincinnati.
Purdy & Henderson Inc., F. H. McGraw & Co., Naval Air Station, Bermuda.
Ray-O-Vac Co., Madison, Wis.
Robbins & Myers Inc., Springfield and Piqua, O.
Rockford Machine Tool Co., Rockford, Ill.
George D. Roper Corp., Rockford, Ill.
Sanderson & Porter, Pine Bluff Arsenal, Pine Bluff, Ark.
Sarco Mfg. Corp., Bethlehem, Pa.
Shartle Bros. Machine Co., Middletown, O.
Sivyer Steel Castings Co., Milwaukee.
Sterling Engine Co., Buffalo.
T. Stuart & Son Co., Naval Ammunition Depot, Hingham, Massachusetts.
Thompson Pipe & Steel Co., Denver.
Thordarson Electric Mfg. Co., Chicago.
Union Steel Products Co., Albion, Mich.
Hamilton Standard Propellers Division, United Aircraft Corp., Norwich, Conn.
Walz & Krenzer Inc., Rochester, N. Y.
Waterbury Tool Division of Vickers Inc., Waterbury, Conn.
Wheland Co., Chattanooga, Tenn.
Whiting Corp., Harvey, Ill.
Wollaston Brass & Aluminum Foundry, North Quincy, Mass.
Wright's Automatic Machinery Co., Durham, N. C.

19,000,000 Deadweight Tons of Merchant Vessels Goal for 1943

UNITED STATES shipbuilders have broken every world record for volume shipbuilding, according to the Maritime Commission's annual report issued last week.

The industry has not only fulfilled the 1942 mandate of President Franklin D. Roosevelt for 8,000,000 tons of shipping, but has exceeded the presidential directive by a considerable amount.

Meantime, American shipbuilding gives promise that it will be able to more than double, before the end of 1943, its record of more than 8,000,000 deadweight tons during the fiscal year of 1942 and up to Dec. 31, 1942. Subsequent to the report, the Maritime Commission has announced that the shipbuilding goal for 1943 has been currently set at nearly 19,000,000 deadweight tons, and adds that this can be stepped up to 20,000,000 deadweight tons—the present shipyard capacity—if materials and supplies are available.

Admiral Emory S. Land, commission chairman, disclosed that a total of 8,090,800 deadweight tons of merchant shipping were placed in service in 1942. But this total did not include some 800 smaller craft and other vessels delivered to the armed services. He revealed that 746 Victory Fleet ships were delivered by Dec. 31, 1942. These included 542 Liberty-type vessels, 62 tankers, 5 ore carriers, 62 long range C-type ships, 55 cargo carriers for the British, 5 coastwise ships, and 15 special type craft.

Just how production was stepped up, once the American shipbuilding industry got into its war stride, is made evident in the report. Under a war pressure tempo, monthly production is shown to have been stepped up to 713,900 tons in June, 1942, and further to 1,200,000 deadweight tons in December, 1942. This production peak beat all previous ship construction records. The former top record was made in September, 1919, when 618,886 tons were delivered by American shipyards.

A principal factor contributing to the 1942 shipbuilding record was the inauguration of the Liberty ship plan of a simplified design. This permitted mass production methods and made it possible to use prefabricated parts and replace the old method of plate riveting with modern plate welding.

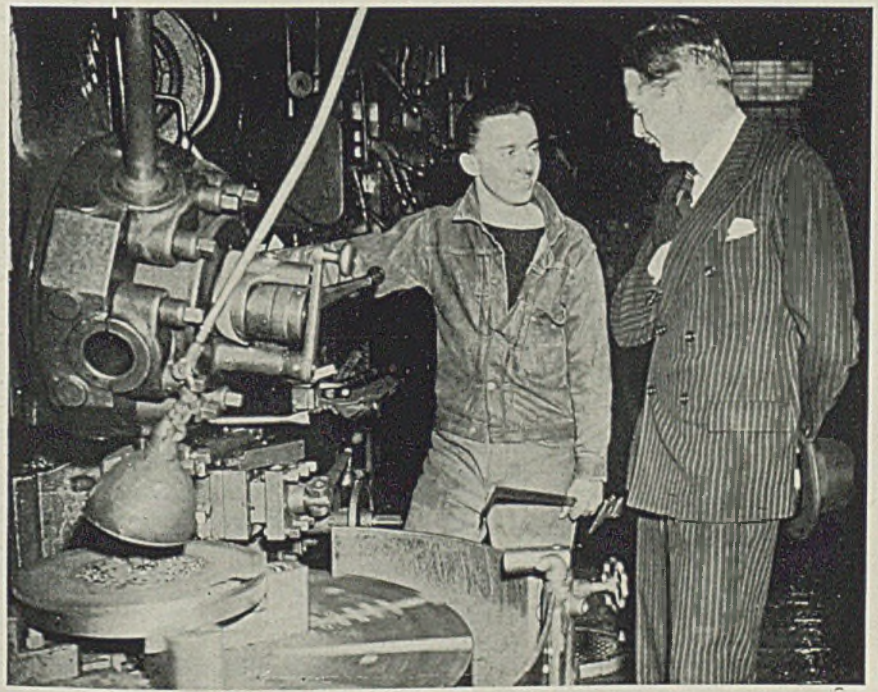
Other factors which aided in expediting the building program were standardization of parts, centralized purchasing of materials for the shipyards, and the excellent morale maintained between management and labor.

Some idea of what this vast material problem has been can be seen by the fact that more than 800 plants situated in 32 states are supplying material for Victory Fleet construction. The "spread-work plan" for the utilizing of many small plants was inaugurated by the commission early in 1941, far in advance of Pearl Harbor.

When the commission took over the job of rebuilding the merchant marine in 1937 there were only 10 American shipyards with 46 ways capable of building ships 400 feet or over, and half of these yards were being used for naval construction.

Ninety per cent of those who are now employed in ship construction had to be trained before they were employable. The total maritime shipyard personnel is now estimated to be well over half a million men and women. The commission now has in operation more than 60 shipyards turning out oceangoing cargo ships from more than 300 ways.

BRITISH FOREIGN MINISTER VISITS SHIPYARD



BRITISH Foreign Minister Anthony Eden, right, stops for a chat with Worker J. P. Pond in an East coast Navy yard. Mr. Eden is visiting a number of American military and naval establishments. NEA photo

National Steel Expansions Financed with Own Funds

Extensive additions to productive facilities of National Steel Corp., Pittsburgh, required to broaden the company's service in the war program, have been provided in the last few years from its own capital and without recourse to supplementary financing from outside sources. Despite expenditures in 1942 alone of over $12,000,000 for new construction and improvements to plant and equipment, National's annual report shows an increase in working capital of $6,189,018.

E. T. Weir, chairman, in a letter to stockholders accompanying the report, pointed out that the addition of three electrolytic tin plate coating lines was of major importance in this program. One of these lines is now in operation while the other two are to be completed by July. Additions to pig iron and metallurgical coke capacity, he said, have been found most beneficial. Coal reserves were enlarged during the year by purchases of considerable acreage in Pennsylvania and Kentucky.

Record-Breaking Year

All-time high records in production, sales, payrolls and taxes were recorded during the year. Although demand for steel pushed company's sales to a total of $219,851,175, 10 per cent over preceding year, increased taxes and operating expenses restricted earnings to $5.41 per share.

Earnings for 1942, after all charges including a reserve of $2,000,000 for contingencies and postwar adjustments, amounted to $11,929,867, as compared with $17,102,350 for 1941. Dividends of $3.00 per share were paid in 1942, and the balance of earnings, $5,330,-963.93, was transferred to earned surplus.

Taxes amounted to $36,682,487, or $16.63 per share of stock, more than three times the earnings per share, and equivalent to $1,741.15 for each of the company's 21,068 employes. Largest item of taxation was the $30,300,000 set aside for federal taxes on income. This was net after deduction of a postwar refund credit of $2,075,000. Taxes increased $10,697,044 over 1941.

Total payrolls were more than 12 per cent greater than in the preceding year. The average wage per employe was $2,-503.48.

Company's debt was reduced by payment of $3,000,000 in serial notes.

"Although war contracts are subject to renegotiation," Mr. Weir said, "conferences have not proceeded to the point where any prediction can be made as to the effect of such renegotiation on the statement of earnings. We do not regard our earnings as excessive in relation to our volume of business, and renegotiation should not affect our statement greatly."

Superior Steel Corp.

Since November, 1942, Superior Steel Corp., Carnegie, Pa., has made available to 22 competitive companies its process for manufacturing a copper-alloy clad steel for ammunition components. This contribution to the war effort was disclosed in company's annual report by Frank R. Frost, president.

Net profit for 1942 was $978,184, equal to $8.63 a share, against $653,358, or $5.77 a share, in 1941. Federal and state income taxes amounted to $310,-000. After $260,800 debt retirement credit and $60,000 postwar credit, excess profits tax totaled $2,910,000. In 1941 these taxes amounted to $1,400,000.

Calling attention to the dividend of 30 cents paid April 1, first payment in nearly 17 years, Mr. Frost stated that by comparison with 1926, the company is stronger financially, its antiquated plant has been replaced with modern facilities and products are more diversified.

Superior's total sales in 1942 were $17,298,736, 29 per cent over 1941. Sales of copper-alloy clad steel made up approximately 60 per cent of the total.

Universal-Cyclops Steel Corp.

Net income of Universal-Cyclops Steel Corp., Bridgeville, Pa., in 1942 totaled $2,128,545, or $4.26 a share, after provision of $6,008,000 for state and federal income and excess profits taxes and deduction of $612,000 postwar credit. In 1941 company's net was $1,753,043, or $3.51 a share. Officials point out that because of the uncertainties involved, effect of renegotiation of war contracts on company's position cannot be determined at present.

Follansbee Steel Corp.

Thirteen per cent increase in net profit over 1941 was shown by Follansbee Steel Corp., Pittsburgh, in 1942. Last year's net, $511,711, was equal to $1.76 on common shares and compares with $445,964, or $1.46 a share, in previous year. Provision for federal income tax was $352,300 against $227,500 in prior period; general taxes totaled $262,712; amortization and depreciation, $683,821. Net sales in 1942 amounted to $15,188,-456, decrease of $241,689 from 1941.

All members of the Follansbee board of directors were re-elected at the annual meeting March 25 in Pittsburgh.

American Rolling Mill Co.

Charles R. Hook, president, American Rolling Mill Co., Middletown, O., has announced that renegotiation of government contracts, still pending, is delaying the closing of company's books for 1942. He stated that net earnings for the year, as shown by tentative audited reports, were approximately $7,700,000 after taxes and reserve for contingencies, without giving effect to such sum, if any, as may be payable to the government as a result of renegotiation and may not be charged against reserve for contingencies. Net profit for 1941 was $11,-228,475.

Copperweld Steel Co.

Copperweld Steel Co., Glassport, Pa., reported net income for 1942 as $1,144,-489, exclusive of net credit adjustments of prior years, equal to $2.01 a share on common. Including $124,045 net adjustments of prior years, net income transferred to surplus account was $1,268,564, or $2.25 a share. Net profit for 1941 totaled $1,460,790.

Steel Co. of Canada Ltd.

Steel Co. of Canada Ltd., Montreal, Que., last year had net profit of $4,805,-938 after income taxes, equal to $6.68 a share on combined 7 per cent cumulative preferred stock and no-par ordinary stock. This compares with $4,-439,732, or $6.17 a share on combined stocks in 1941. Depreciation, including special depreciation for war plant and equipment, amounted to $4,597,243, against $4,742,022 in preceding year. Provision for income and excess profits taxes, including refundable portion, was $8,362,904, against $3,520,000 a year earlier.

Timken Roller Bearing Co.

Timken Roller Bearing Co., Canton, O., reported 1942 net income as $6,475,-262, after provision of $16,000,000 for refund to government under contract renegotiation, proceedings on which are partially completed. Earnings are equal to $2.68 a share, compared with $3.92 a share on net income of $9,476,839 in 1941.

New business booked by General Electric Co., Schenectady, N. Y., in 1942 amounted to $2,003,039,023, a 77 per cent increase over total 1941 orders, according to Gerard Swope, president.

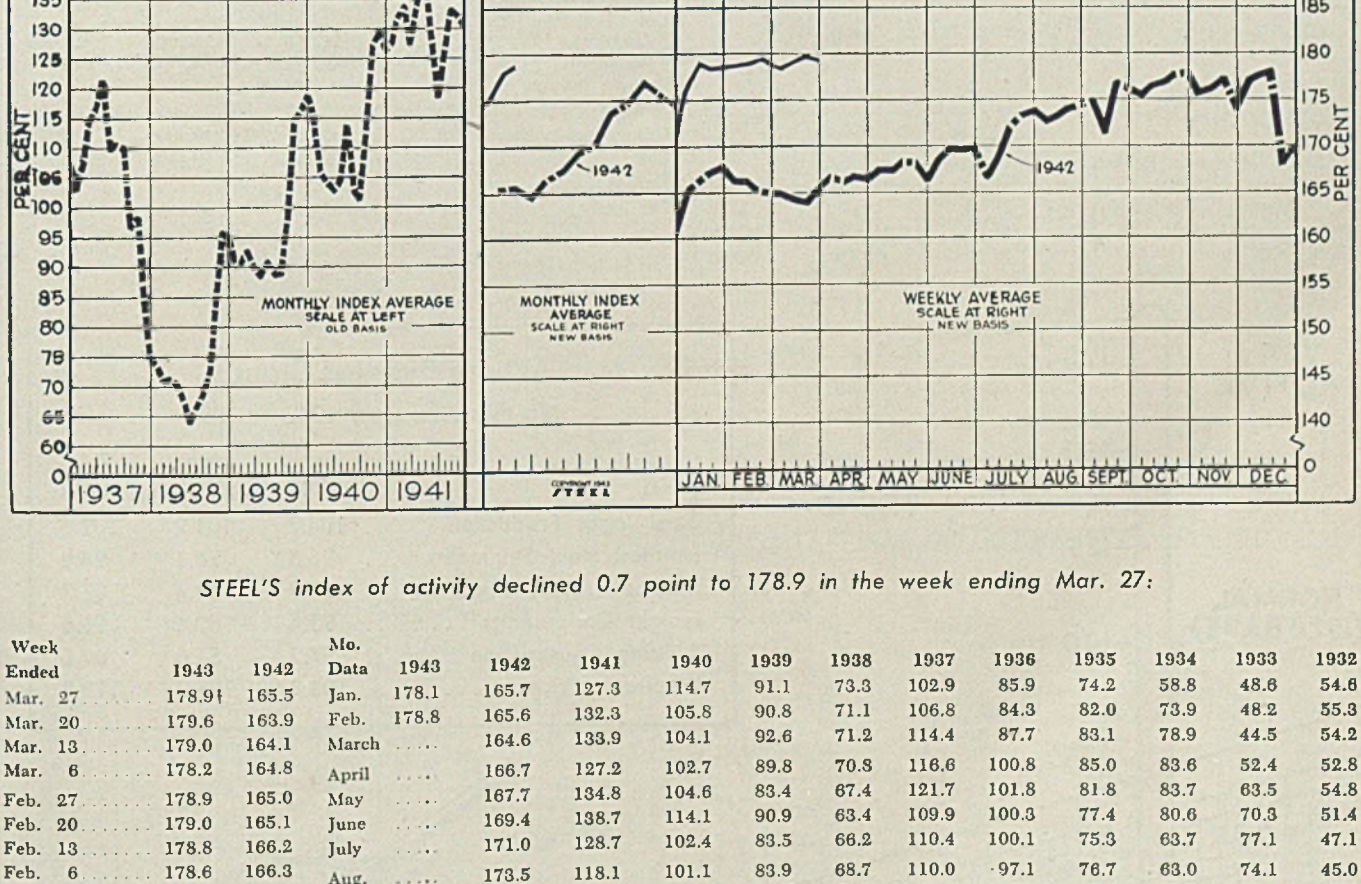
Industrial Volume Continues To Grow

INDUSTRIAL output continued to increase in the first three weeks of March as essential industries held or enlarged their gains recorded in February. Production of planes, tanks, ships, ammunition and parts is generally meeting the objectives laid down by the armed services, sparked by war expenditures which averaged $224,000,000 a day in the first half of this month. This accelerated pace is reflected in at least one important index which rose in February to 203 per cent of the 1935-39 average from 199 the month before.

Indicating the extent of improvement in steel and metalworking industries in the past eight weeks, STEEL's index of activity advanced to 179.6 on March 20 from 178.1 on Jan. 23, an increase of 1.5 points. This compares with an index figure of 163.9 on March 21, 1942, and a decline from the corresponding week in January last year of 3.5 points. Weekly ingot output last month was 1,720,970 tons, against 1,672,403 in January and 1,631,278 tons in February, 1942. Finished steel shipments rose 5600 tons in the latest month.

In the week ending March 27 the national steel rate edged down ½ point from the top rate of 99.5 maintained by the industry since mid-February with only one ½-point break during the period ending March 13. Decreased activity was attributed to need for furnace repairs. A year ago the rate was 97.5 per cent of capacity.

Electrical energy distributed by the power industry for the period closed March 27 totaled 3,928,170,000 kilowatt hours, compared with 3,345,502,000 kilowatts in the like 1942 week and 3,892,796,000 a month ago. Gain over the 1942 week is 17.4 per cent. Barring the usual seasonal factors tending to decrease consumption, the trend in power use since the first of the year, when distribution totaled 3,779,993,000 kilowatts, is definitely up. Output



STEEL'S index of activity declined 0.7 point to 178.9 in the week ending Mar. 27:

Week Ended	1943	1942
Mar. 27	178.9†	165.5
Mar. 20	179.6	163.9
Mar. 13	179.0	164.1
Mar. 6	178.2	164.8
Feb. 27	178.9	165.0
Feb. 20	179.0	165.1
Feb. 13	178.8	166.2
Feb. 6	178.6	166.3
Jan. 30	178.6	167.9
Jan. 23	178.1	167.4
Jan. 16	178.9	166.6

†Preliminary.

Mo. Data	1943	1942	1941	1940	1939	1938	1937	1936	1935	1934	1933	1932
Jan.	178.1	165.7	127.3	114.7	91.1	73.3	102.9	85.9	74.2	58.8	48.6	54.6
Feb.	178.8	165.6	132.3	105.8	90.8	71.1	106.8	84.3	82.0	73.9	48.2	55.3
March	.....	164.6	133.9	104.1	92.6	71.2	114.4	87.7	83.1	78.9	44.5	54.2
April	.....	166.7	127.2	102.7	89.8	70.8	116.6	100.8	85.0	83.6	52.4	52.8
May	.....	167.7	134.8	104.6	83.4	67.4	121.7	101.8	81.8	83.7	63.5	54.8
June	.....	169.4	138.7	114.1	90.9	63.4	109.9	100.3	77.4	80.6	70.3	51.4
July	.....	171.0	128.7	102.4	83.5	66.2	110.4	100.1	75.3	63.7	77.1	47.1
Aug.	.....	173.5	118.1	101.1	83.9	68.7	110.0	97.1	76.7	63.0	74.1	45.0
Sept.	.....	174.8	126.4	113.5	98.0	72.5	96.8	86.7	69.7	56.9	68.0	46.5
Oct.	.....	176.9	133.1	127.8	114.9	83.6	98.1	94.8	77.0	56.4	63.1	48.4
Nov.	.....	175.8	132.2	129.5	116.2	95.9	84.1	106.4	88.1	54.9	52.8	47.5
Dec.	.....	174.1	130.2	126.3	118.9	95.1	74.7	107.6	88.2	58.9	54.0	46.2

Note: Weekly and monthly indexes for 1942 and 1943 have been adjusted to offset the forced curtailment in automobile production and to more accurately reflect expanding steel production

March 20 was 17.6 per cent over the corresponding week of last year, while total for March 13 was 17.5 per cent higher.

Construction contracts awarded in 37 states during February were valued at $393,517,000, increase of $42,856 over the January total but still more than 9 per cent below the $433,557,000 reported in February, 1942.

Coal output rose sharply in February with the adoption of the six-day work week in the mines. Production, 48,920,000 tons, was at the highest level in many years, with operations in bituminous and anthracite fields raised to last summer's high point. January production was 47,029,000 tons and output in February, 1942, 43,840,000. Daily average output is close to 2,100,000 tons.

New order index for foundry equipment stood at 399.5 last month, contrasting with 429.8 in the preceding period and 567.9 in the second month of 1942. Gear sales index rose to 303, from 268 in January.

BUSINESS BAROMETER

Financial Indicators

	Feb., 1943	Jan., 1943	Feb., 1942
30 Industrial Stocks*	$127.40	$121.52	$107.28
20 Rail Stocks*	29.80	28.57	27.85
15 Utilities*	16.87	15.57	13.83
Average Price of all listed bonds (N.Y.S.E.)	$97.79	$97.47	$95.13
Bank Clearings daily average (000 omitted)	$1,394,432	$1,334,170	$1,153,651
Commercial Paper, interest rate (4-6 months)	0.67	0.67	0.56
Com'l loans (000 omitted)†	$9,643,000	$9,738,000	$11,374,000
Federal Reserve ratio (per cent)	77.4	77.3	90.6
Capital flotations (000 omitted) New Capital	$57,900,000	$6,670,000	$123,775,000
Refunding	$44,406,000	$169,750,000	$56,508,000
Federal gross debt (millions of dollars)	$114,024	$111,069	$62,434
Railroad earnings†	$105,304,000	$170,851,000	$63,966,000
Stock sales, New York Stock Exchange	24,434,080	18,032,142	7,925,761

*Dow-Jones series. †January, December, January, respectively.
‡Leading member banks Federal Reserve System.

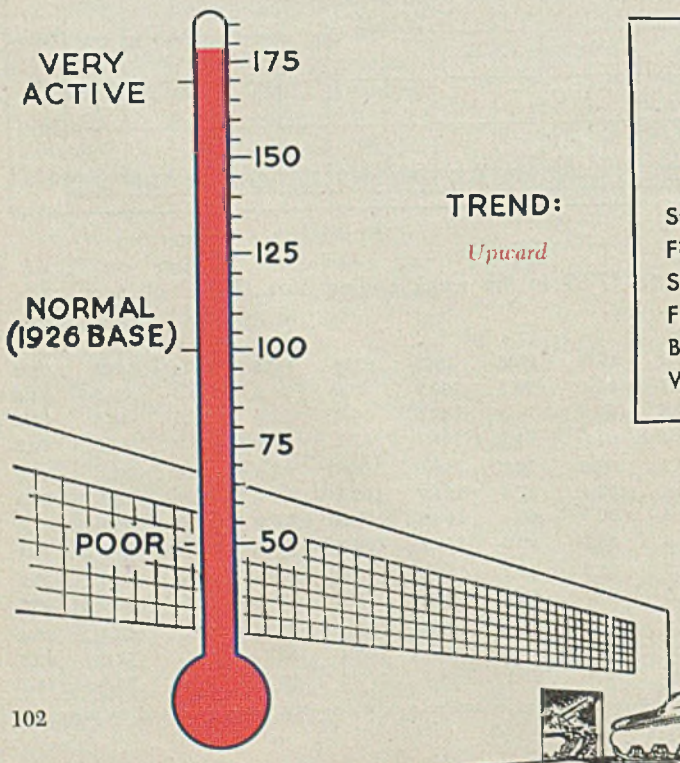
Commodity Prices

STEEL's composite finished steel price average	$56.73	$56.73	$56.73
U. S. Bureau of Labor's Index	102.5	101.9	96.7
Wheat, cash (bushel)	$1.59	$1.325	$1.293
Corn, cash (bushel)	$1.17	$1.10	$0.98

Industrial Indicators

	Feb., 1943	Jan., 1943	Feb., 1942
Commerce Dept.'s Mfgs. Index†			
Orders	239.0*	255.0	268.0
Shipments	226.0*	242.0	184.0
Inventories	177.5*	177.6	161.9
Industrial Production Index (Federal Reserve Board)	203*	199	172
Iron and Steel Scrap consumption (tons)	5,031,000*	4,753,000	4,276,000
Gear Sales Index	303	268	353
Foundry equipment new order index	399.5	429.8	567.9
Finished steel shipments (net tons)	1,691,592	1,685,992	1,616,587
Ingot output (average weekly; net tons)	1,720,970	1,672,403	1,631,278
Dodge bldg. awards in 37 states ($ Valuation)	$393,517,000	$350,661,000	$433,557,000
Fabricated structural steel shipments (Tons)	104,836	105,832	153,732
Coal output, tons	48,920,000	47,029,000	43,840,000
Coke Production (Daily Av.) Beehive†	21,386	22,000	21,650
By-Product†	174,044	173,174	168,508
Business failures; number†	458	506	962
Business failures; liabilities†	$5,515,000	$6,950,000	$9,916,000
Cement production, bbls.†	12,560,000	14,090,000	10,183,000
Cotton consumption, bales	878,154	915,479	892,288
Freight Car Awards	0	0	11,725
Car loadings (weekly av.)	766,500	727,450	780,750

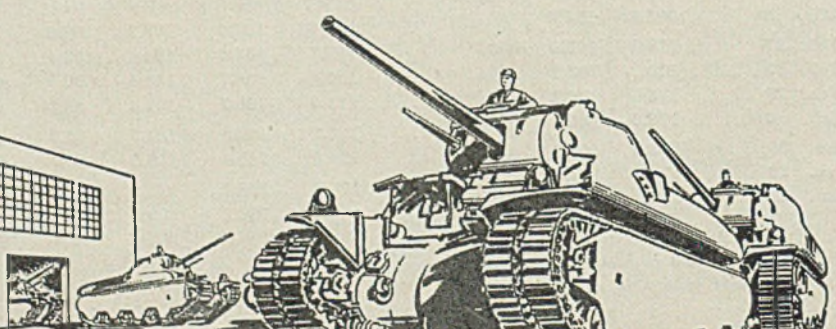
†January, December, January, respectively. *Preliminary.



Where Business Stands

Monthly Averages, 1942 = 100

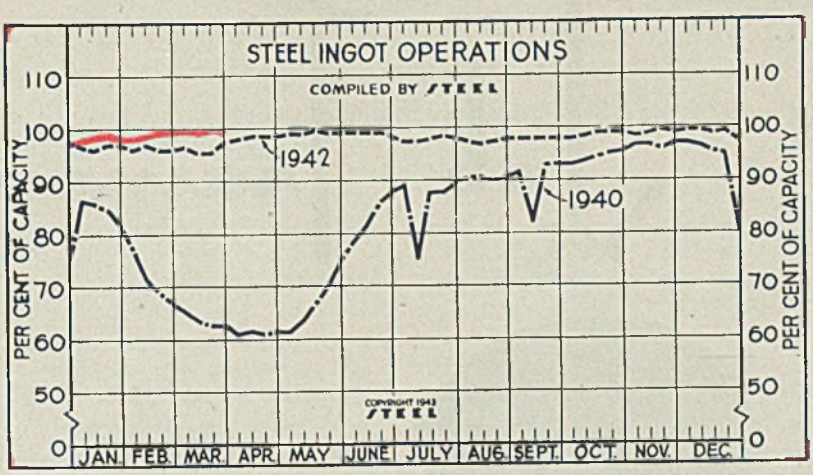
	Feb., 1943	Jan., 1943	Feb., 1942
Steel Ingot Production	104.2	101.2	102.6
Finished Steel Shipments	96.5	96.1	94.8
Structural Steel Shipments	61.9	62.4	87.7
Freight Carloadings	93.4	88.6	96.0
Building Construction	57.2	51.0	86.6
Wholesale Prices	103.8	103.2	110.8

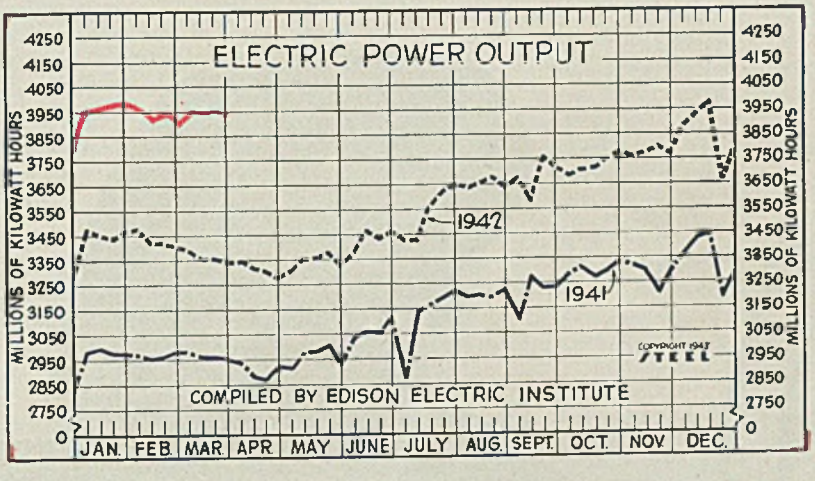


Steel Ingot Operations

(Per Cent)

Week ended	1943	1942	1941	1940
Mar. 27	99.0	97.5	99.5	61.0
Mar. 20	99.5	95.5	99.5	62.5
Mar. 13	99.0	95.5	98.5	62.5
Mar. 6	99.5	96.5	97.5	63.5
Feb. 27	99.5	96.0	96.5	65.5
Feb. 20	99.5	96.0	94.5	67.0
Feb. 13	99.0	97.0	96.5	69.0
Feb. 6	98.5	96.0	97.0	71.0
Jan. 30	98.5	97.0	97.0	76.5
Jan. 23	99.0	97.0	95.5	81.5
Jan. 16	99.0	96.0	94.5	84.5
Jan. 9	97.5	96.5	93.0	86.0
Jan. 2	97.5	97.5	92.5	86.5
Week ended	**1942**	**1941**	**1940**	**1939**
Dec. 26	99.0	93.5	80.0	75.5
Dec. 19	99.0	97.5	95.0	90.5





Electric Power Output

(Million KWH)

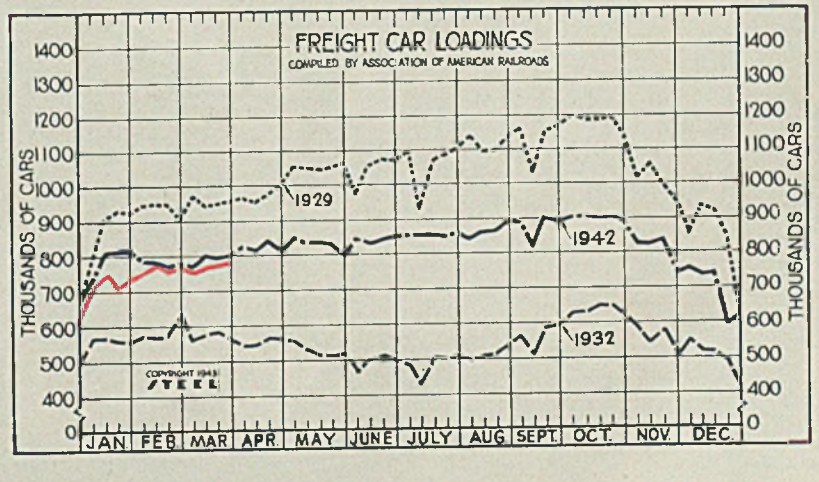
Week ended	1943	1942	1941	1940
Mar. 27	3,928	3,345	2,802	2,422
Mar. 20	3,947	3,357	2,809	2,424
Mar. 13	3,945	3,357	2,818	2,460
Mar. 6	3,946	3,392	2,835	2,464
Feb. 27	3,893	3,410	2,825	2,479
Feb. 20	3,949	3,424	2,820	2,455
Feb. 13	3,939	3,422	2,810	2,476
Feb. 6	3,960	3,475	2,824	2,523
Jan. 30	3,977	3,468	2,830	2,541
Jan. 23	3,974	3,440	2,980	2,661
Jan. 16	3,952	3,450	2,996	2,674
Jan. 9	3,953	3,473	2,985	2,688
Jan. 2	3,780	3,289	2,831	2,558
Week ended	**1942**	**1941**	**1940**	**1939**
Dec. 26	3,656	3,234	2,757	2,465
Dec. 19	3,976	3,449	3,052	2,712
Dec. 12	3,938	3,431	3,004	2,674

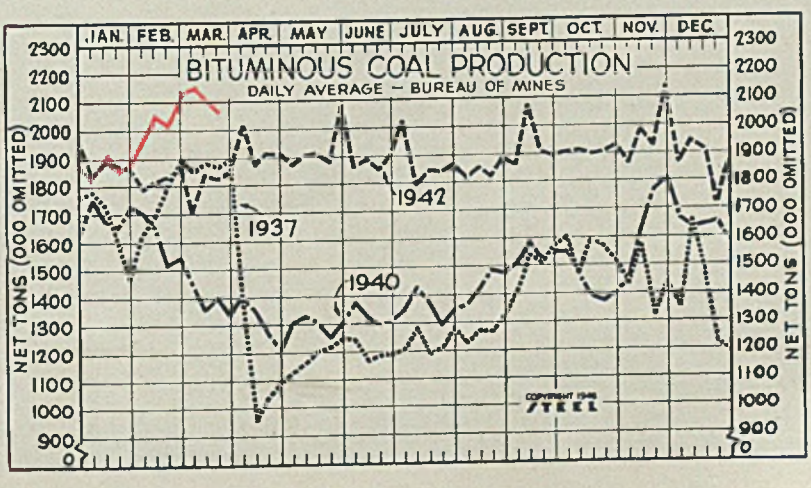
Freight Car Loadings

(1000 Cars)

Week ended	1943	1942	1941	1940
Mar. 27	774†	805	792	628
Mar. 20	768	797	768	620
Mar. 13	769	799	758	619
Mar. 6	748	771	742	621
Feb. 27	783	781	757	634
Feb. 20	752	775	678	595
Feb. 13	765	783	721	608
Feb. 6	755	784	710	627
Jan. 30	735	816	714	657
Jan. 23	709	818	711	649
Jan. 16	755	811	703	646
Jan. 9	716	737	712	668
Jan. 2	621	674	614	592
Week ended	**1942**	**1941**	**1940**	**1939**
Dec. 26	592	607	545	550

†Preliminary.





Bituminous Coal Production

Daily Average

Net Tons (000 omitted)

Week ended	1943	1942	1941	1937
Mar. 20	2,060†	1,825	1,879	1,871
Mar. 13	2,100	1,842	1,844	1,883
Mar. 6	2,125	1,693	1,791	1,851
Feb. 27	2,113	1,878	1,736	1,897
Feb. 20	2,027	1,833	1,736	1,807
Feb. 13	2,033	1,817	1,736	1,696
Feb. 6	1,980	1,793	1,683	1,634
Jan. 30	1,900	1,866	1,684	1,466
Jan. 23	1,867	1,886	1,656	1,605
Jan. 16	1,929	1,883	1,609	1,731
Jan. 9	1,883	1,842	1,691	1,780
Jan. 2	1,860	1,960	1,762	1,764

†Preliminary.

Job Training in the

By JAMES G. LEACH
Supervisor Shop Training
Small Motor Division
Westinghouse Electric & Mfg. Co.
Lima, O.

Above—Filling out enrollment sheet and job card as new employe begins training

Right—New employes listen to instructor explain manufacturing operations, step by step, using motion pictures as a visual aid. Slides are also utilized

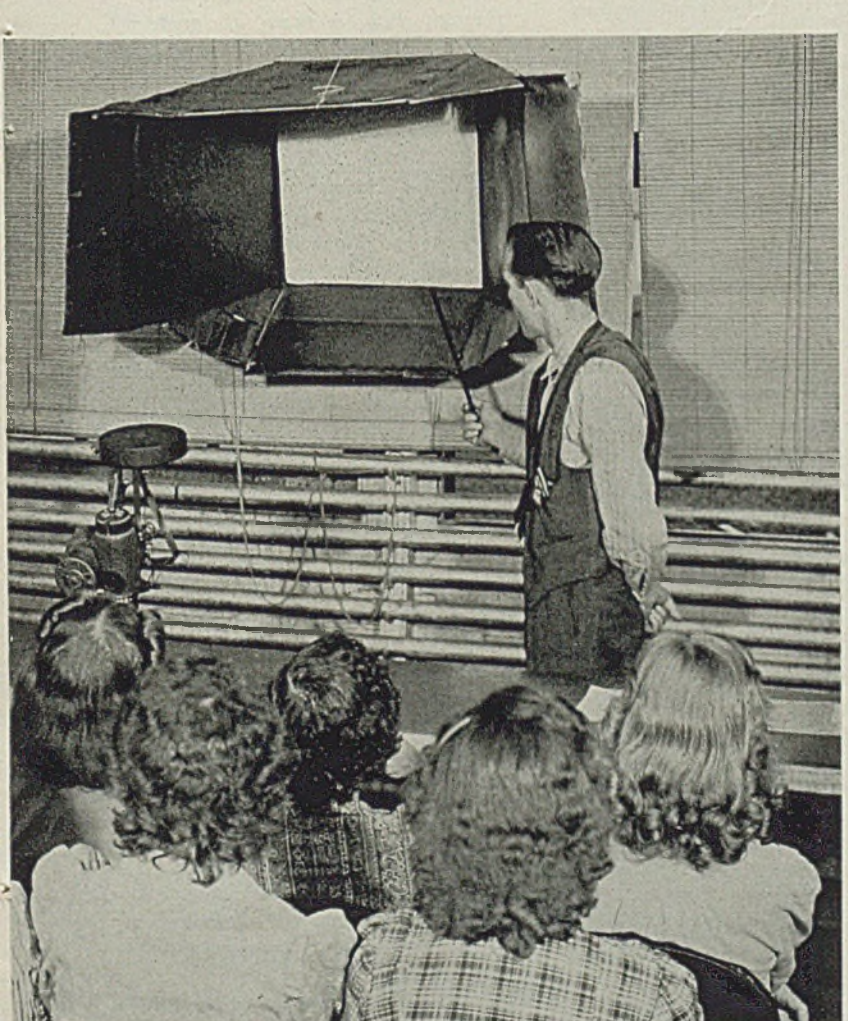
Shop

Explaining the whole manufacturing operation, details of product and the like proves extremely helpful in orienting new employes. Movies and slides are used to illustrate talks detailing correct production methods, establish desired methods firmly in worker's mind

WHEN IT BECAME evident that standard apparatus must drop from production lines and something new in the small motor field take its place, this division of Westinghouse, like many others, was faced with the problem of re-training the old employes and training hundreds of new ones in half the time that it would ordinarily take.

When it became necessary to add a large number of new employes and step up production in the manufacturing of a new type apparatus, many different methods of instruction were tried but were found to be not as effective as the present method, which costs less, has complete follow-up and decreases rejects per operator. This particular setup enables supervision to test and try a new employe as to adaptability, good housekeeping, motion analysis, safety, etc., before placing him on production. It also shows up special techniques or inherent aptitudes which would not be brought out without basic training. It creates personal incentive and develops a questioning attitude. It establishes uniform methods and causes operators to be more receptive to new ideas. All these are vital.

It establishes a sincere realization of the individual's contribution to the war effort. It creates a more desirable atmosphere among workers, especially women. Past experience has taught us that most of our troubles were caused, not by lack of instructions, but by lack of the proper follow-up of instructions. Therefore, we searched for a method of instruction which would give us a complete followup from the time a new employe has passed his physical examination until he is a 100 per cent efficient operator, at which time he takes his place alongside an experienced operator and is able to keep an established rate of efficiency with less fatigue than the employe who has not received basic instructions.



Method of Presentation of Basic Training: When a foreman in charge of a particular department deems it necessary to add a new operator, he makes out a requisition and instead of placing it directly with the employment office, it is sent first to the training school, where a record of it is made, and then it is turned over to the employment office. It may be possible for the supervisor of training to fill the job with an experienced or newly trained operator within a few hours.

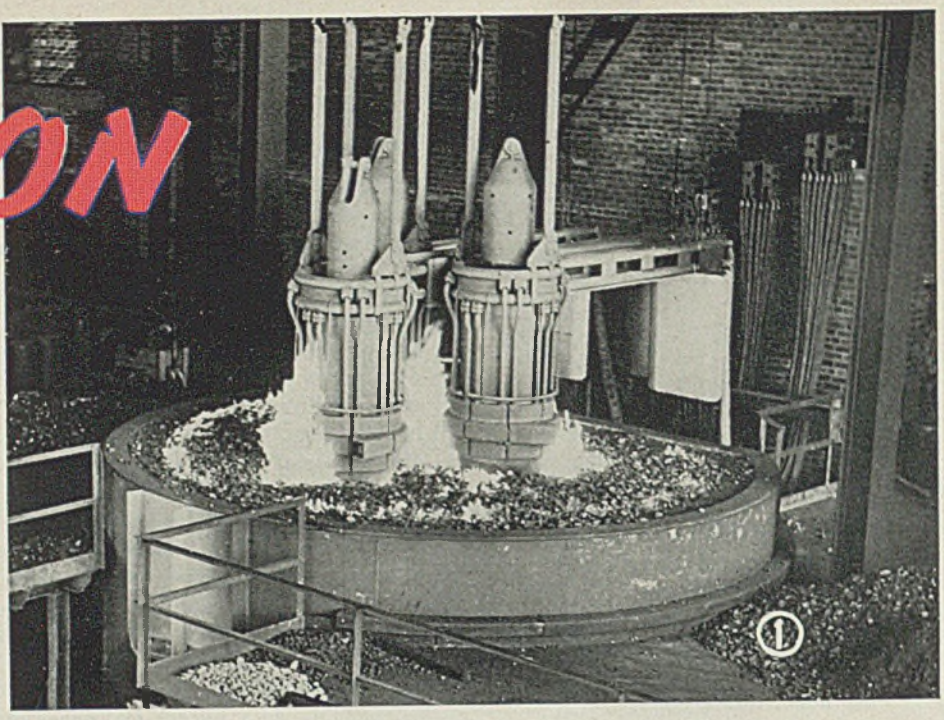
Through this system, it is possible to schedule the number of new people that it will require to accommodate future increases in production or vacancies established by predetermined percentages of quits over any given period. This decreases the stress upon the employment department and keeps the flow of new employes evenly distributed. As soon as the industrial relations department has completed its hiring records with the new employe, he is turned over to the training school. There he is required to fill out a special form, listing all of the different types of work that he may have done in the past years. This gives the supervisor of training a clearer and more comprehensive picture in placing the individual on the type of work for which he is suited or best qualified.

It has been proved in many cases that the average person, when making out an application at the employment office, does not state more than one or two elements of past experience. Therefore, this method is employed to bring out the hidden facts. For example, a new girl was brought in as a winder, who had formerly worked as a waitress for 5 years. Upon close questioning it was found that prior to this she had operated an automatic riveting machine. The supervisor of training was aware

(*Please turn to Page* 141)

CARBON

A Refractory Material



By FRANK J. VOSBURGH
Manager, New Products Division
National Carbon Co. Inc.
New York

Fig. 1—Ferroalloy furnace in the shop of the Broken Hill Proprietary Co. Ltd., Newcastle, New South Wales, Australia

Fig. 2—Chart showing the thermal conductivity of refractory materials

Fig. 3 — Temperature gradient through two sections of grade CB-4 carbon

Fig. 4 — Temperature gradient through grade "S" carbon backed by Carbocell, a porous carbon stock

Fig. 5 — Temperature gradient through grade AGX graphite backed by Carbocell, a porous carbon stock

Fig. 6—Chart showing the mean specific heats of refractory materials

Fig 7—Comparative linear expansion curves of refractory materials

WEBSTER defines refractory as, "Resisting ordinary treatment; difficult to fuse, reduce, draw out or the like;. as a refractory ore or metal".

Accordingly carbon might well be considered a refractory material. The writer was much surprised however, when looking through a comprehensive book on refractories, to find in it almost no references to carbon and graphite as refractories.

This seemed a strange situation for though carbon and graphite are undoubtedly much better known in other than the refractory field of application, that is, as electrodes in various types of electric furnaces, as brushes in electrical equipment, as projectors in the motion picture industry, still the manufacture of carbon and graphite for purposes that can well be classified as refractory, runs into the million pounds per year. Without carbon there would be no aluminum; ferroalloys for the most part would be nonexistent, as would of course, materials requiring ferroalloys such as stainless steel and the various tool steels, and many chemical and electrochemical processes would be seriously affected.

As a material to resist high temperature, carbon is second to none for it does not melt but volatizes at 3925 degrees Cent. + K (6634 degrees Fahr.), and even at 2000 degrees Cent. (3632 degrees Fahr.) its strength under compression is about the same at room temperature. Against chemical attack too, carbon is highly resistant and there are few chemicals that attack it. The physical properties and characteristics of carbon and graphite are compared in Table I. The graphite referred to is that artificial graphite sold under the trademark "Acheson". It is produced in the electric furnace according to a process patented by Dr. E. G. Acheson, and should not be confused with natural graphite which is found and mined in many places through the world.

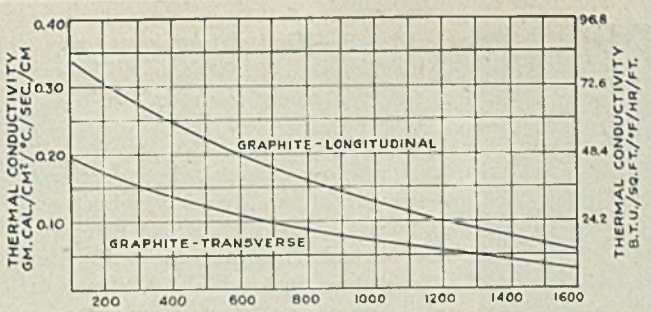
Thermal conductivity of the various types of refractories is compared in Fig. 2. Longitudinal data is by Physical Society, London; the ceramic data is from *Transactions*, Electrochemical Society, vol. 1 (1926), p. 125; carbon and graphite data intercalated by author. The chart brings out one point clearly, that is that the thermal conductivity factors of all the usual refractories increase as the temperature increases, but the factors for carbon and graphite materials such as are used for refractory purposes, decrease under similar conditions. This fact was brought out in a paper presented before the A.I.M.E. by Dr. M. R. Hatfield and the writer, and published in *Metals Technology*, September 1941.[2] The data from that paper were tabulated as shown in Table II.

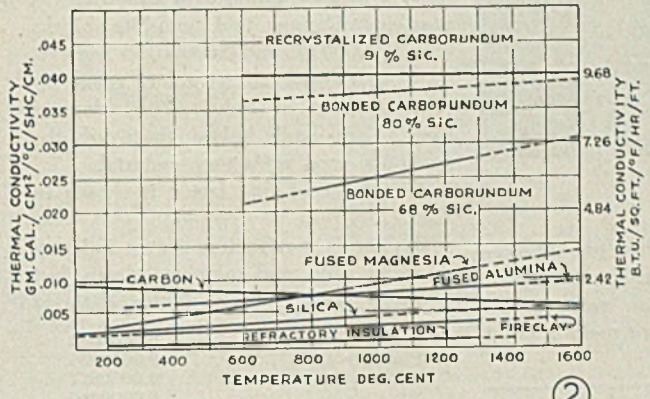
The tabulation compares several grades of carbon; CB-4 was from a carbon block such as would be used for lining a ferroalloy furnace; S-grade was stock similar to that in large carbon electrodes; graphite was taken from a large electric furnace graphite electrode; "Carbocelli"†, porous carbon, was specially processed low-density (apparent density about 1.0) carbon material primarily designed for use in filtration, aeration, and diffusion applications; and, coke particles were coke screened through 1-inch mesh with the dust removed—a good cheap inactive insulating material. (experimental data indicate thermal conductivity values directly applicable only to grades of stock specified. Manufacturers produce other grades of carbon and graphite with widely varying characteristics.)

The graphs (Figs. 3, 4 and 5) show the temperature gradients through three combinations of grades of carbonaceous material arranged for the experiment to simulate a furnace wall having two carbon blocks, each 12 inches thick, followed by 4 inches of granulated coke as insulation between the heat source and the steel plate representing the furnace shell.

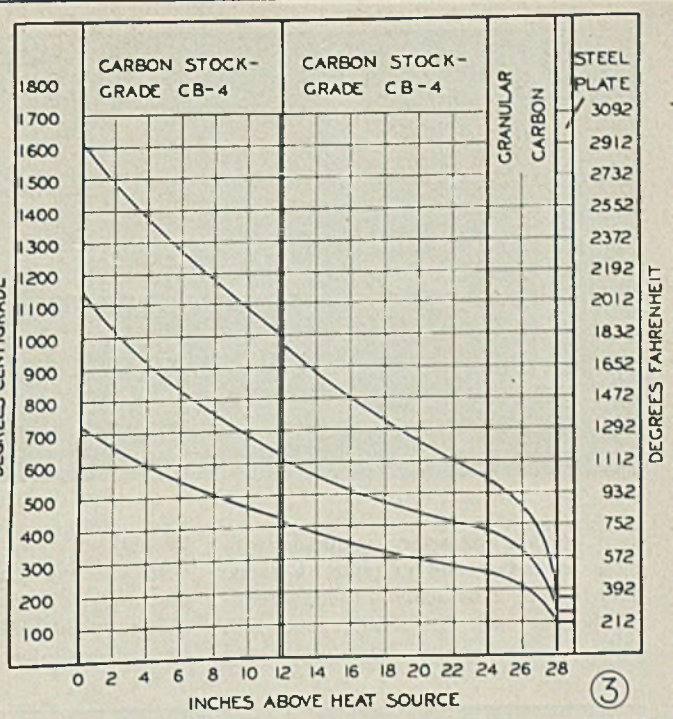
A graph (Fig. 6) compares the mean specific heats of several of the generally

†Trade mark of National Carbon Co. Inc.

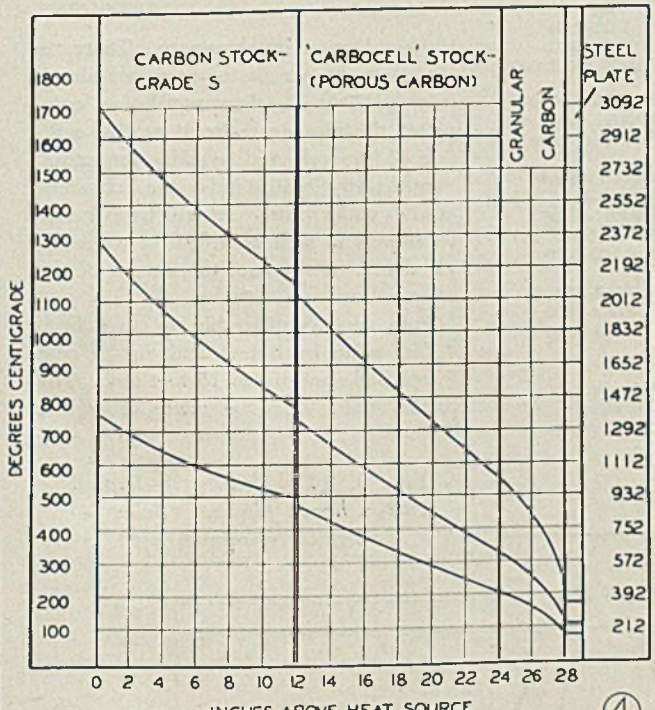

THERMAL CONDUCTIVITY GM.CAL./CM²/°C./SEC./CM
THERMAL CONDUCTIVITY B.T.U./SQ.FT./°F/HR/FT.
GRAPHITE - LONGITUDINAL
GRAPHITE - TRANSVERSE


THERMAL CONDUCTIVITY GM.CAL./CM²/°C/SHC/CM.
THERMAL CONDUCTIVITY B.T.U./SQ.FT./°F/HR/FT.
RECRYSTALIZED CARBORUNDUM 91% SiC.
BONDED CARBORUNDUM 80% SiC.
BONDED CARBORUNDUM 68% SiC.
FUSED MAGNESIA
FUSED ALUMINA
CARBON
SILICA
REFRACTORY INSULATION
FIRECLAY
TEMPERATURE DEG. CENT

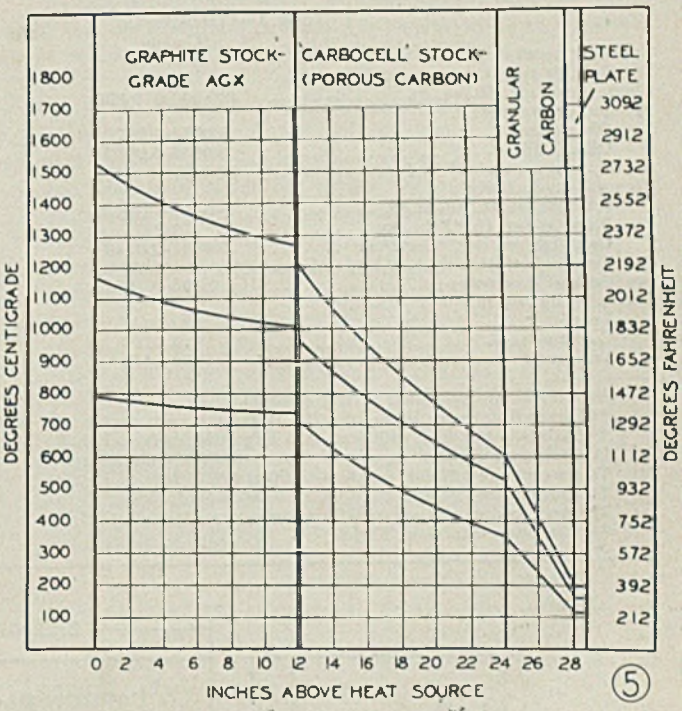
②


CARBON STOCK- GRADE CB-4
CARBON STOCK- GRADE CB-4
GRANULAR CARBON
STEEL PLATE
DEGREES CENTIGRADE
DEGREES FAHRENHEIT
INCHES ABOVE HEAT SOURCE

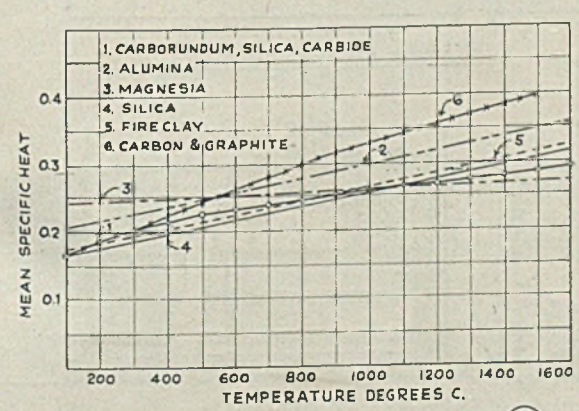
③


CARBON STOCK- GRADE S
'CARBOCELL' STOCK- (POROUS CARBON)
GRANULAR CARBON
STEEL PLATE
DEGREES CENTIGRADE
DEGREES FAHRENHEIT
INCHES ABOVE HEAT SOURCE

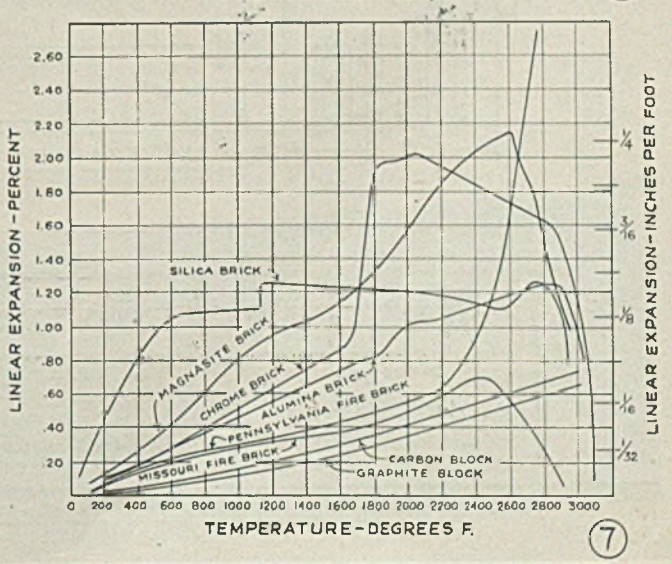
④


GRAPHITE STOCK- GRADE AGX
'CARBOCELL' STOCK- (POROUS CARBON)
GRANULAR CARBON
STEEL PLATE
DEGREES CENTIGRADE
DEGREES FAHRENHEIT
INCHES ABOVE HEAT SOURCE

⑤


1. CARBORUNDUM, SILICA, CARBIDE
2. ALUMINA
3. MAGNESIA
4. SILICA
5. FIRE CLAY
6. CARBON & GRAPHITE
MEAN SPECIFIC HEAT
TEMPERATURE DEGREES C.

⑥


LINEAR EXPANSION - PERCENT
LINEAR EXPANSION - INCHES PER FOOT
SILICA BRICK
MAGNASITE BRICK
CHROME BRICK
ALUMINA BRICK
PENNSYLVANIA FIRE BRICK
MISSOURI FIRE BRICK
CARBON BLOCK
GRAPHITE BLOCK
TEMPERATURE - DEGREES F.

⑦

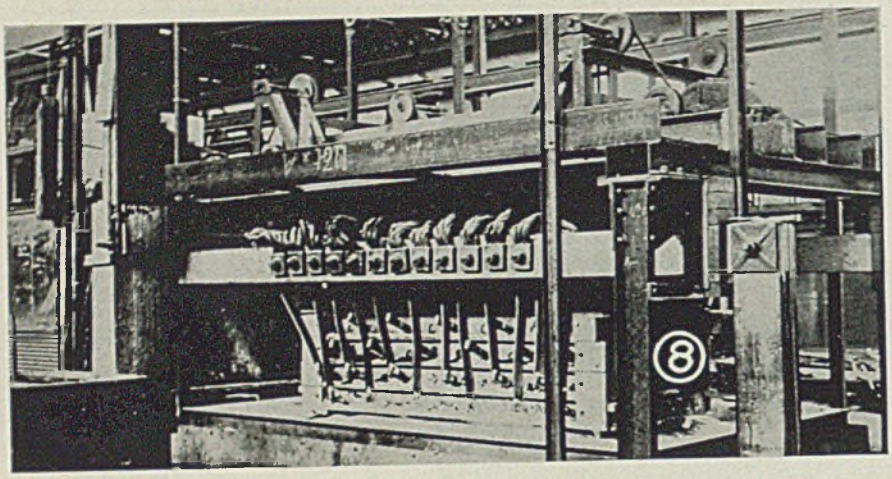


Fig. 8 — Typical aluminum pot which uses a 23,000-ampere Soderberg electrode

used ceramic refractory materials with those of carbon and graphite. Ceramic data is from *Transactions,* Electrochemical Society, vol. L (1926), page 127; carbon and graphite data intercalated by author.

In selecting a refractory two properties always are given consideration, first, melting point and second, mean coefficient of expansion. A high melting point is a primary essential, but does not necessarily give a high-duty refractory.[3] Carbon does not melt at any temperature but volatilizes at 3925 + K. Also a refractory material should have as small a mean coefficient of expansion as possible. Carbon and graphite blocks with 0.00000188 and 0.00000153 respectively for the normal refractory range up to 3000 degrees Fahr. (1649 degrees Cent.) are well below those of the generally used refractory material.

The effect of this factor is shown in Fig. 7.

Carbon as a refractory serves industry in many ways and in many places, but nowhere does it serve better than in the production of aluminum. There, in the electrolytic cells, or so-called aluminum pots, the carbon pot lining completes the electrical circuit as the cathode of the cell and, equally important, satisfactorily withstands the chemical attack under fairly severe temperature conditions as well as a deal of mechanical abuse. Of course, the anodes of the cell are carbon electrodes.

Pots vary considerably in size, from 4 feet wide by 6 feet long up to cells 7 feet wide and up to 15 feet long. The carbon lining may be made of carbon

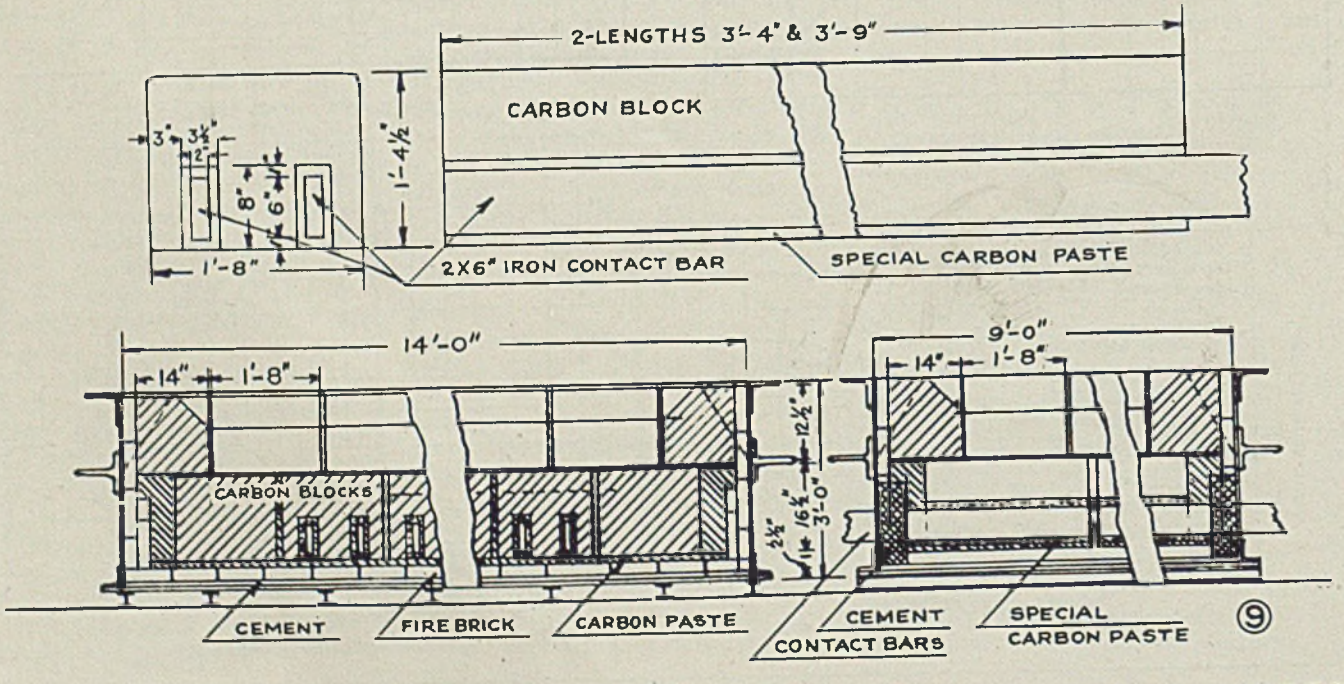
	Coefficient of Expansion
Silicon carbide	0.0000042
Fire clay (Av.)	0.0000051
Alumina	0.0000077
Silica	0.0000083
Chrome	0.0000114
Magnesite	0.0000147

Table I—Comparison of Carbon[1] and Graphite[1]

	Carbon[1]	Graphite[1]
Apparent density°	1.52-1.57	1.53-1.56
Weight°, lbs./cu. ft.	95-98	95.6—97.5
Elastic modulus°, lb./sq. in.	430,000-940,000	670,000-1,400,000
Specific resistance°°:		
Ohms inches	0.0013-0.0026	0.00036-0.00040
Ohm CMS	0.0033-0.0066	0.00091-0.00102
K—Thermal expansion°	12-15 (see note)	5-12 (see note)
Thermal conductivity°:		
B.t.u./hr./sq. ft./°Fahr./ft.	1-6 (see note)	70-94 (see note)
B.t.u./hr./sq. ft./°Fahr./in.	12-72	840-1128
Gram-cal/sec/cm²/°Cent./cm	0.0041-0.0248	0.287-0.467
Temp. at which oxidation begins in air	350° C. (662° F.)	450° C. (842° F.)
Specific heat (see note)	0.168-0.387	0.165-0.40
Strength°, lbs./sq. in.:		
Tensile	400-840	440-870
Compressive	1910-4100	3180-5100
Transverse	750-1670	1490-2980

[1]References are presented at end of article.
°Characteristics vary with size—the larger the cross section the lower the factor.
°°Characteristics vary with size—the larger the cross section the higher the factor.
Coefficient of thermal expansion varies with the temperature.
To temperature t °Fahr. $= (K + 0.0039\ t\ °F.)\ 10^{-1}$.
To temperature t °Cent. $= (1.8K + 0.007\ t\ °C.)\ 10^{-1}$.
Thermal conductivity varies with temperature—See chart Fig. 2.
Specific heat—See chart Fig. 6.

Fig. 9. (Top drawing)—Typical carbon hearth blocks. (Below)—Typical aluminum pot



Here's help to Avoid Delays in Production

"TROUBLE SHOOTING" Common Causes of Premature Tool Failure

Today, more than ever before, sound knowledge of "trouble shooting" is one of the essential requirements for getting the most out of your tool making facilities. Under all-out production, every care must be taken to get tools that will not fail prematurely and cause waste of skilled tool making time and interruptions in schedules. Discussed below are a few tips on "trouble shooting" that may be of help in your tool room.

Hardening Cracks—If a tool cracks in hardening, and there is nothing suspicious about the steel or the design, look at the nature of the crack. If the crack penetrates deeply—and does not parallel the length of the original bar—or if the crack shatters the piece, it may be due to one of two causes—too high a hardening heat, or placing a hard tool in a hot furnace.

In connection with this last cause, sometimes a tool does not come from the hardening just as the hardener wants it. He decides to reharden the job and throws it back into a hot furnace. This is a terrible strain on the hard tool and is likely to cause a shattered type of cracking. Since these tools cracked while still in the hardening furnace, the faces of the fracture will contain furnace scale. This definitely indicates that the tool either cracked on the first hardening—or cracked when placed in the furnace for the second hardening. Figure 1 shows the pieces of a tool that cracked in the furnace when an attempt was made to reharden it.

FIG. 1

Soft Spots—After a tool has failed, the trouble can sometimes be traced to accidental soft spots that occurred in the *wrong place*. This is the time to investigate them and take steps to either eliminate them—or to chase them back where they will do no harm.

A prolific cause for "thumb nail" checks in chipping chisels (Fig. 2) is a soft spot occurring on the bit a short distance back from the cutting edge. The crack encloses the soft spot. The cure for this trouble is to switch to a brine quench, whereupon the soft spot will disappear—and with it, the thumb nail check.

FIG. 2

Spalling—Hardening cracks that might be described as "spalling" or shelling off of corners and edges, are generally due to too low a hardening heat or to non-uniform hardening heat.

The first cause can usually be distinguished from the second by the fact that there are likely to be soft areas on the underheated portions of the tool. A tool that has been non-uniformly heated may come out hard all over or it may contain soft spots. Fig. 3 illustrates a carbon steel reamer that was hardened from a lead pot and the extreme end spalled off in quenching. This tool was not in the lead long enough for the entire tool to become uniformly heated and only the end actually got through the critical far enough to properly harden. In order to demonstrate the lack of hardness on the body of the reamer, it was sawed part way with a hack saw and then broken the rest of the way. The *spalled end*, the *"bald-headed fracture,"* and the *soft body*—all point to non-uniform underheating.

FIG. 3

FIG. 4

Figure 4 is another example of "spalled" fracture from non-uniform heating. This is an oil-hardening tool steel. One corner has spalled off and the other has cracked. While the holes appear to have played a part in the failure, they are not the prime cause. This tool was soft on the flat faces which had not been hot enough, and was file hard on the spalled corners—a clear case of non-uniform underheating.

These tips on "trouble shooting" were taken from Chapter 18 of "Tool Steel Simplified". They are only a small part of the usable information contained in one chapter of the book. Other chapters discuss every phase of tool making—heat treating, quenching, furnace atmospheres, testing, etc. Put all this helpful information to work for you—right in your tool room. Order copies for the tool room men you want to train, for those you want to up-grade to better jobs.

THE CARPENTER STEEL COMPANY, 139 BERN STREET, READING, PENNSYLVANIA

"TOOL STEEL SIMPLIFIED"

315 pages **105 illustrations**

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Carpenter MATCHED TOOL STEELS

blocks formed, baked to 1000 degrees Cent. (1832 degrees Fahr.), and then machined to fit the heavily reinforced iron pot with its installed current conductors, or the lining may be carbon paste tamped into the pot and around the current conductors while hot and plastic, and then baked into a monolithic lining by the heat developed in the cell by the electrolytic process. In either case the mass is the same, consisting of calcined anthracite coal particles, calcined petroleum coke flour mixed with tar or pitch to make a homogeneous mass which will bake out with a minimum of cracks, with good apparent density and the desired electrical resistivity. This refractory use of carbon is enormous, for one cell may require up to 25,000 pounds of carbon lining which will have to be completely replaced within one or two years. For every 100 pounds of aluminum produced, from 50 to 75 pounds of electrodes and around 7½ pounds of carbon lining are needed.

Table II—Thermal Conductivities of Furnace-Lining Stock

Material	Temperature range deg. Fahr.	Data source	Heat flow through length of test column, B.t.u. per hr. per sq. ft.	Transverse thermal conductivity K, B.t.u. per sq. ft. per hr. per deg. Fahr. per ft.
CB-4 grade carbon	Room			2
	1000-1800	Fig. 3	1120	1.4
	1800-3000	Fig. 3	1120	1.0
S grade carbon	Room			3
	2000-3100	Fig. 4	1170	1.2
Graphite	Room			45
	2400-2700	Fig. 5	1255	2.7
"Carbocell" (porous carbon stock)	Room			1
	1100-2000	Fig. 4	1170	1.1
	1100-2200	Fig. 5	1255	1.1
Coke particles	400-1100	Figs. 3-5	1120-1255	0.55

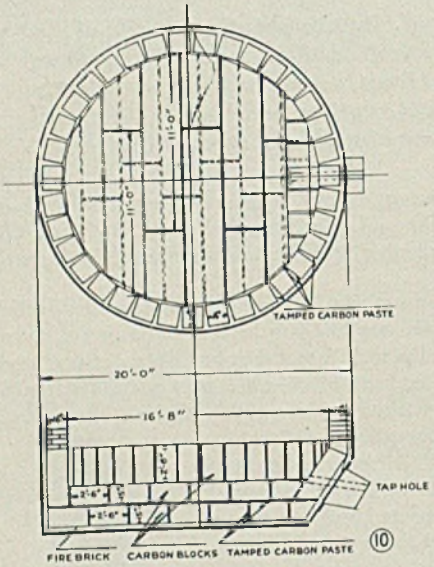


Fig. 10—Typical open-top ferroalloy furnace, carbon lined

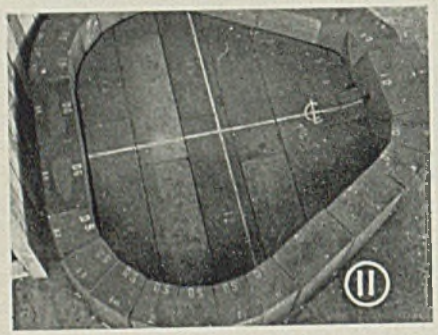


Fig. 11—Assembly of hearth and wall blocks for small ferroalloy furnace

The drawing (Fig. 9) is typical of modern aluminum pots. The carbon hearth blocks run crosswise of the furnace in two sections from the shell inwards meeting at the center in a row of paste filled staggered joints. The joints between the blocks are 2 inches or so wide, wide enough so that the carbon paste filling the joint can be rammed in easily and thoroughly by hand, or with air gun rammers. In such small volumes the carbon paste bakes-in in a satisfactory manner with good density, free from cracks, and bonds the blocks together in a solid mass. Special highly conductive paste is rammed into the slots in the blocks and around the iron-current conductors. The low walls above the hearth may be carbon blocks as shown or may be carbon paste tamped into wooden forms and baked-in as the furnace heats up in service.

Table III—Heat Conductivity of Various Materials

Material	B.t.u./sq.ft./°F./hr./ft.	
Copper	224	†32° Fahr.
Aluminum	75-131	† (Room temp.)
Brass (Red)	93	† (Room temp.)
"Karbate" No. 2 (Graphite base)	75	200° Fahr.
Admiralty	65	† (Room temp.)
Tantalum	32	† (Room temp.)
High-silicon cast iron	31	† (Room temp.)
Steel, 1% carbon	26	°64° Fahr.
Chemical lead	20	†32-212° Fahr.
Antimony lead	17-20	†32-212° Fahr.
18-8	7.3-17.0	†32-212° Fahr.
Nickel chromium (17% Ni., 13% Cr.)	8.5	† (Room temp.)
"Karbate" No. 1 (Carbon base)	3	100° Fahr.
Boro-silicate glass	0.63	°86-167° Fahr.
Chemical stoneware	0.83	†
Fire clay brick	0.6-0.74	°932° Fahr.

†International critical tables.

°"Heat Transmission"—(McAdams, 1933) p. 314.

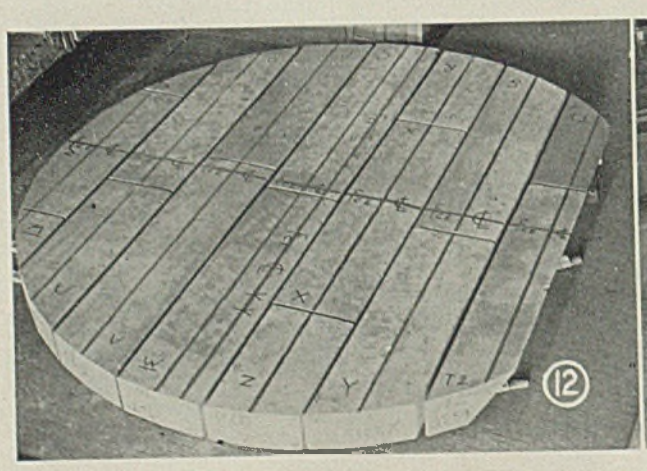
‡*Chemical & Metallurgical Engineering*, Nov. 1938, pp. 633-659.

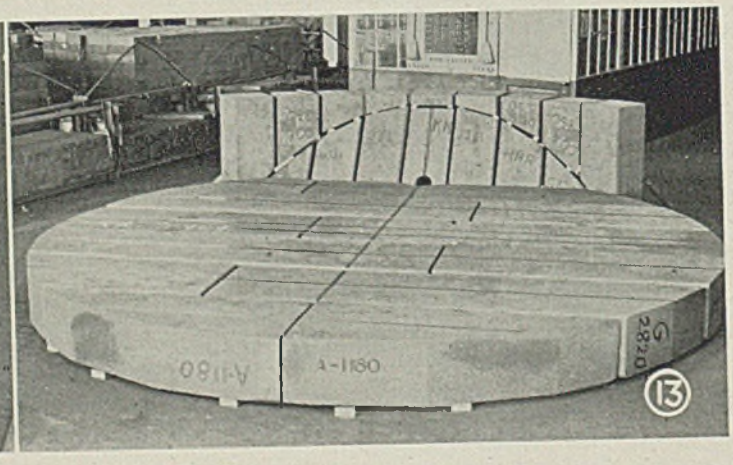
Monolithic pot linings are cheaper than prebaked ones, but have several disadvantages. It is difficult, for one thing, to bake-in so large a mass of carbon paste without having shrinkage cracks develop which can make considerable trouble by causing metal leak-

(*Please turn to Page* 145)

Fig. 12—Lower layer hearth blocks, 15 x 30 inches by up to 10 feet long, for ferroalloy furnace

Fig. 13—Second layer of hearth blocks and beginning of wall blocks near taphole





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(Concluded from March 8 Issue)

FATIGUE of STEELS

. . . . as influenced by design and internal stresses

By J. O. ALMEN, Mechanical Engineering Dept.
Research Laboratories Section
General Motors Corp., Detroit

PERHAPS the most generally misunderstood of all machine elements are the several classifications of gears. As ordinarily designed there is only one thing certain about gears and that is that they will not function as intended by the designer. When laying out a set of gears on the drafting board the mating gear teeth are represented by parallel straight lines, but no matter how carefully the gears are cut and heat treated the mating teeth will never again be parallel except by accident, and then only through a small load range.

The nature of the contact between two mating gear teeth is influenced (1) by the elastic characteristics of the housing in which they are contained, (2) by the elastic characteristics of bearings by which they are supported (3) by the elastic characteristics of the shafts upon which they are mounted, (4) by the elastic characteristics of the gears themselves, (5) by the accumulated dimensional errors in all the supporting parts as well as the errors in the cutting of the gears, and (6) by the necessary and accidental clearances in the supporting parts.

The result of all this is that it is virtually impossible for the parallelism between mating teeth as visioned by the designer to exist in practice. If it should chance that two mating gear teeth are parallel at some load they cannot be parallel at any other load because the elastic deflections of some of the supporting parts are not linear with respect to the load.

As ordinarily designed the load on gear teeth is never uniformly distributed over the length of the teeth but is always concentrated toward one end of the teeth. This localization of the load is shown in Fig. 10, which is a record of the contact impressions of gear teeth under load in a commercial gear box. Load localization cannot often be seen by examination of a gear that has been in service because, usually, each tooth of each gear makes contact with all of the teeth in the mating gear, and therefore the summation of all contacts under all load conditions will be seen by the examiner.

The illustration Fig. 9, however, is of a gear which failed in service. This gear was "rescued" while on its way to the metallurgical department to find what was wrong with the material to cause the fatigue failure. Note that the failed tooth is broken at one end, which, incidentally, is typical of almost all failed gear teeth.

An adjoining unbroken tooth shown in Fig. 10 testifies that failure occurred because only a small part of the tooth was actually supporting the load in spite of the generous tooth length that was provided by the designer. This gear would have been just as durable had it been designed to one-fifth the tooth width actually provided. *Clearly this is a mechanical and not a metallurgical problem.* The real trouble was inadequate support of the gears and other mechanical errors.

It may be argued fairly that this is an unusually severe case and not typical of gear fatigue. But actually the most unusual thing about it was that it could be diagnosed before it was cut into sections and the evidence etched away.

In case of fatigue failure of mating helical gear teeth of equal strength, fatigue will always occur in the tooth loaded on its acute angled end because the section is weaker at this end. Mating helical gears should be offset so contact cannot occur on the acute angled end by any mode of deflection. This is possible only where the torque is constant in direction.

The conventional approach to studies of fatigue of metals is through laboratory tests on several arbitrary forms of fatigue specimens. During the many years such tests have been made, a vast amount of fatigue data have been accumulated. These data have enabled us to formulate somewhat generalized "laws" on the behavior of various specimens subjected to repetitive stresses of several kinds.

All gear teeth should be designed to afford a degree of tolerance for deflections, machining errors and warpage as has long been standard practice in spiral bevel, hypoid and in some spur and helical gears. This is accomplished by curving the teeth in such manner centerline of the gear width and thus as to concentrate the load near the avoid load concentration at the weaker extreme ends of the teeth.

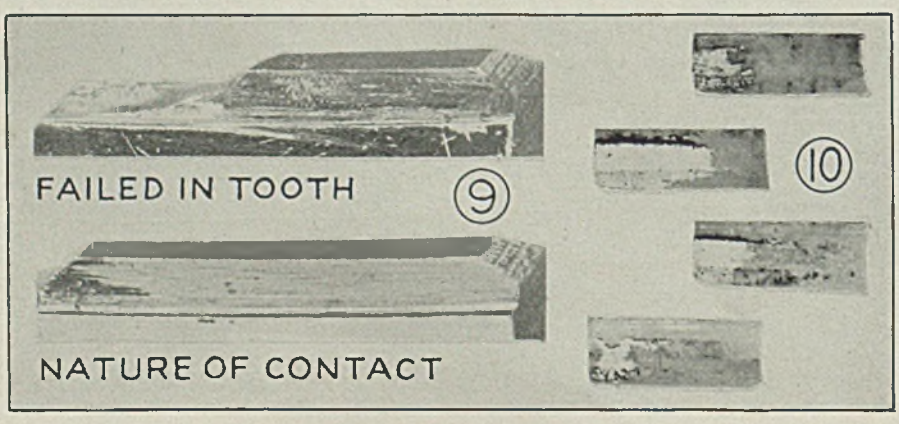
The statement made earlier that there is no practical difference, from the standpoint of fatigue, between the various alloy steels must be amended when these steels are formed into gears because warpage is one of the many errors resulting in high fatigue vulnerability of gear teeth. However, the fatigue vulnerability due to nonuniform warpage can also be reduced by design, as has been described.

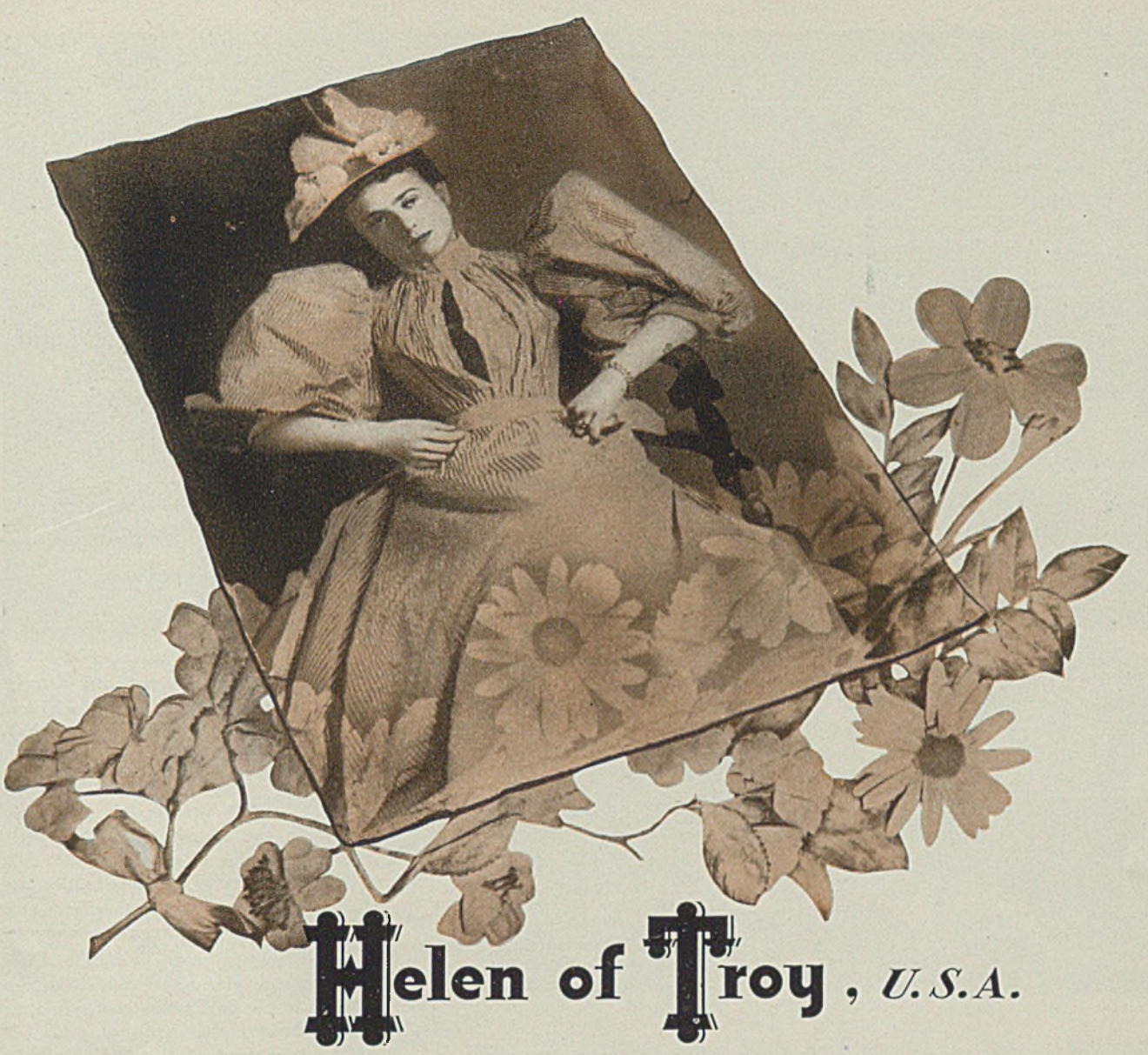
The pitting of gear teeth is a form of fatigue induced by compression loads on the contacting tooth surfaces. The magnitude of the compression stress varies with relative curvature of the contacting teeth in accordance with the Hertz formula; it varies with the degree of load concentration at the ends of the teeth and with the applied load. The load that can be carried varies with the hardness and, therefore, with the strength of the material, with the temperature and with the manner in which the lubricant is applied.

Design factors effective in reducing the load concentration at the ends of the teeth also reduce the compressive

(*Please turn to Page* 146)

Fig. 9—Record of contact impressions of gear teeth under load in a commercial gearbox, indicating localization of load. Fig. 10—Gear teeth which failed in service because only a part of each tooth was supporting load; a mechanical and not a metallurgical problem





Helen of Troy, *U.S.A.*

This was in truth the face that launched a thousand American ships. She was so beautiful, so serene . . . and so damned uncomfortable!

Not alone from the bustles and the corsets and the voluminous billows of tent cloth. Daily her life was besieged with the drudgery and the discomforts of the Gilded Age: The flat iron, the wood stove, the wash tub and the carpet beater, gaslight and the coal grate, horsecars and hansom cabs. But all these things have changed . . . miraculously and wonderfully changed.

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For today the world is changing faster than ever before, and the first 5 years after this war will be equal to any 25 years of the past. Because this is true, we at Jones & Lamson have an important story to tell.

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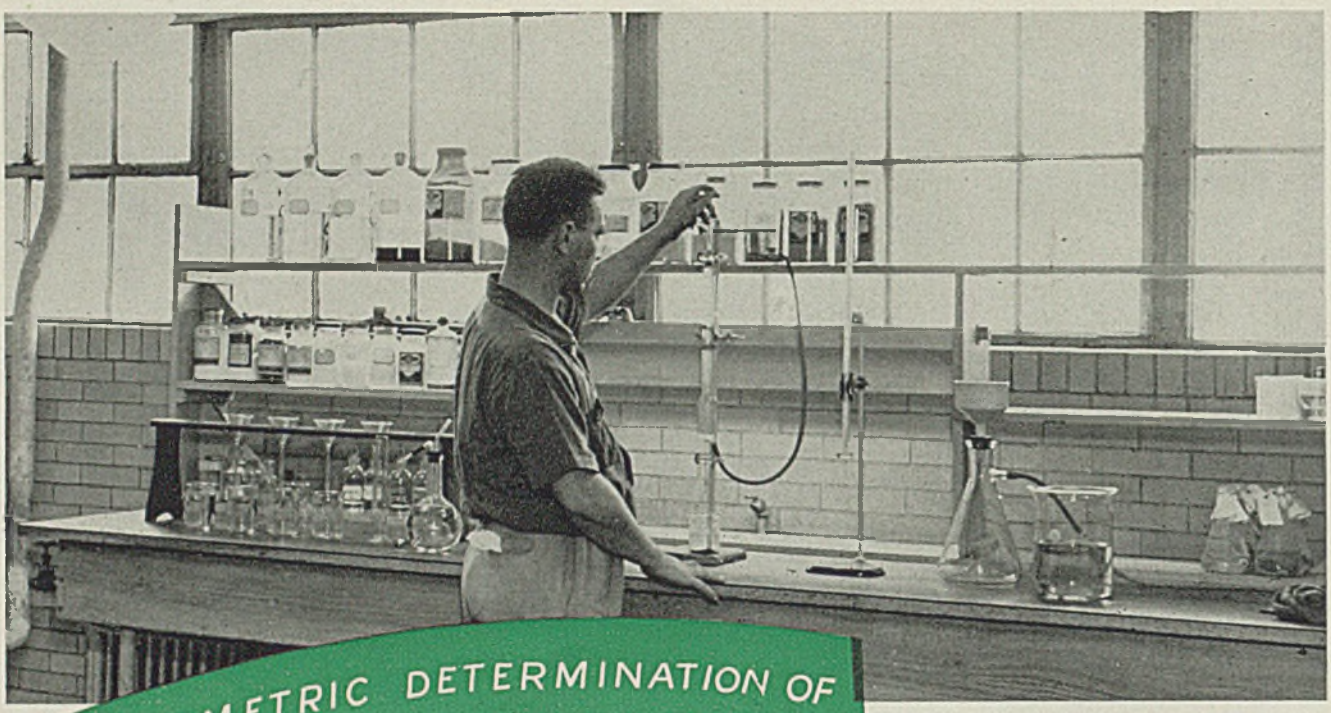


COLORIMETRIC DETERMINATION OF Boron in Steel USING QUINALIZARIN REACTION

An experienced chemist can determine the percentage of boron in 15 to 20 samples of steel in eight hours by the colorimetric method

By G. A. RUDOLPH and L. C. FLICKINGER
Youngstown Sheet & Tube Co.
Youngstown, O.

ADDITION of minute quantities of boron to steel in order to improve hardenability has urged the metallurgical chemist to produce an analytical procedure for the determination of boron accurate to plus or minus 0.0005 per cent. Since, in the average steel plant laboratory, duplication of analytical results in the second decimal place is considered good practice, except for phosphorus and sulphur, it can readily be seen the common laboratory practices involving gravimetric and volumetric procedures are inadequate.

Careful adherence to details for the determination of boron as set forth in the distillation-titration method[1], and modifications thereof failed in our hands to give acceptable results. This method is time consuming and requires the use in part of boron free glassware.

A search of the literature[2,3] revealed that boron in minute quantities produces a characteristic blue color with quinalizarin (1, 2, 5, 8—Tetrahydroxy-anthraquinone) in a medium of strong sulphuric acid (93 per cent by weight).

None of the ordinary elements cause any interference with the reaction, except on rare occasions manganese is found in the insoluble portion, the oxide of which, in the presence of concentrated sulphuric acid, produces oxygen which destroys the color of the quinalizarin. The addition of a small amount of sodium sulphite prevents this interference. Oxidizing substances such as dichromates and nitrates destroy the pink color of the reagent. The chromates or dichromates formed during the fusion of the insoluble portion of the steel have been investigated by the authors using steels having up to 1 per cent chromium, 1.50 per cent nickel and 0.50 per cent molybdenum. No interference was detected by these elements.

A careful analyst using the same reagents for his samples as he uses to make his standards can readily detect 0.0002 per cent boron in either the soluble or insoluble portion of the steel, giving an accuracy, or duplication of results less than 0.0005 per cent total boron in the sample.

Ordinary glassware is used. The authors use bacteria culture tubes for dissolving the sample, pyrex or plain glass funnels for filtering and 125 milliliter flint glass oil sample bottles for comparison. No contamination from any of this glassware has been encountered.

It is necessary for the analyst to have his glassware clean and dry since any dilution of the final strength of sulphuric acid influences the depth of color. A sufficient amount of the 98.5 per cent sulphuric acid and quinalizarin reagent should be made to provide a supply to last two or three months. The standard colors last almost indefinitely if kept tightly stoppered, but should be remade whenever a new supply of the 98.5 per cent sulphuric is prepared.

An experienced analyst can determine boron in 15 to 20 samples of steel in eight hours by this method.

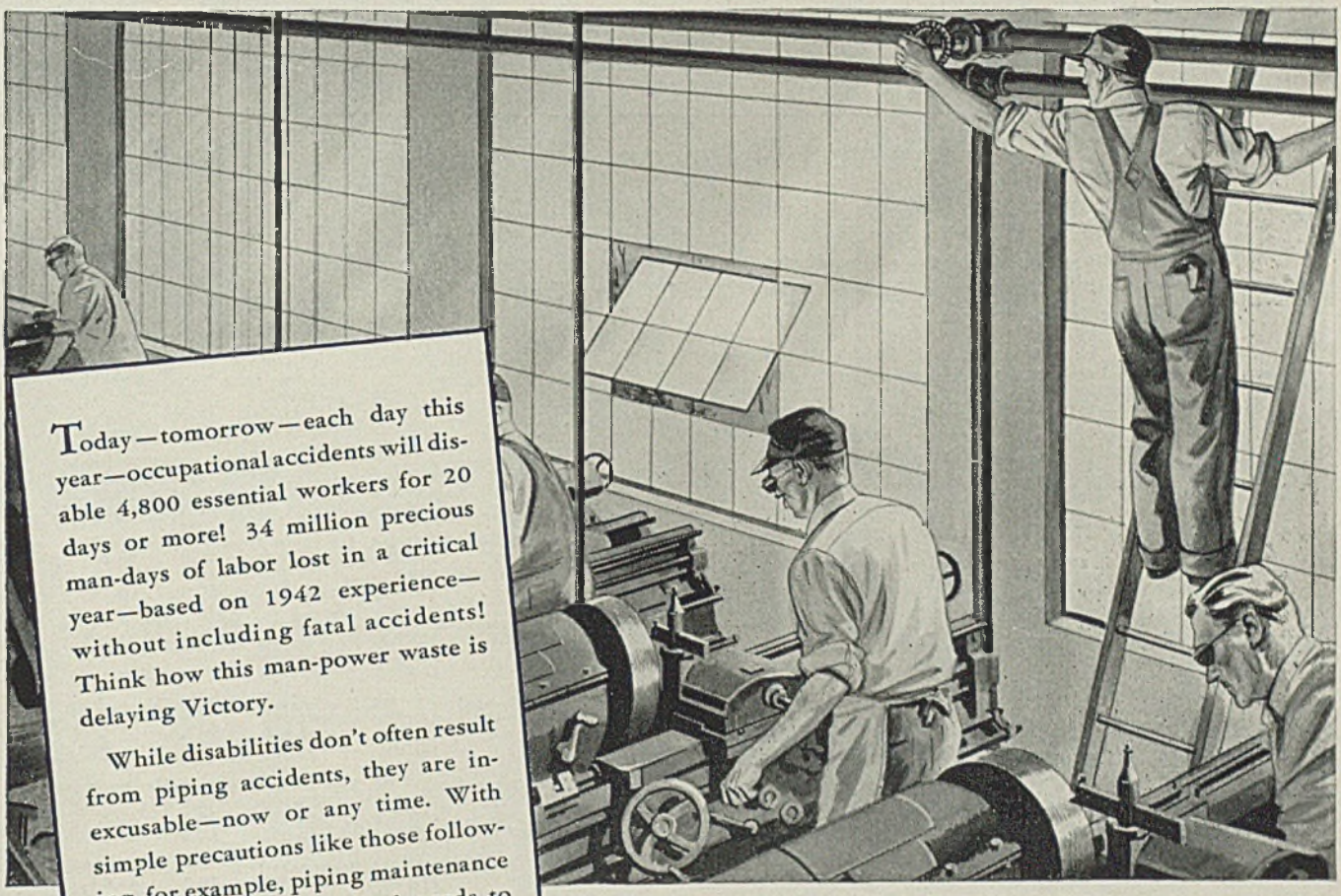
Reagents

Sulphuric Acid (98.5 per cent by weight)—To 1200 milliliters of ordinary concentrated sulphuric acid (specific gravity 1.84, 95.5 per cent) add 600 milliliters fuming sulphuric acid 20 per cent, mix well and allow to cool. This should be kept tightly stoppered while not being used. Store in a glass stoppered bottle.

Quinalizarin Solution—Dissolve 0.01 gram of quinalizarin (E. K. Co. 2787) in 100 milliliter of strong sulphuric acid made by slowly adding 9 volumes of 98.5 per cent by weight sulphuric acid

(*Please turn to Page* 131)

4800 WORKERS WILL BE HURT TODAY



Today—tomorrow—each day this year—occupational accidents will disable 4,800 essential workers for 20 days or more! 34 million precious man-days of labor lost in a critical year—based on 1942 experience—without including fatal accidents! Think how this man-power waste is delaying Victory.

While disabilities don't often result from piping accidents, they are inexcusable—now or any time. With simple precautions like those following, for example, piping maintenance men can help lessen the hazards to American workers now when they're most needed on the job.

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1. Don't install valves where getting at them means exposure to danger.
2. Support lines firmly to prevent loosening at joints.
3. Identify valves so they can be quickly operated in emergencies
4. Install relief valves where there is danger of sudden built-up pressures.
5. Inspect sprinkler system control valves regularly. Keep them open always.

The safety hints given here are from "Piping Pointers" Bulletins—a Crane service aiding piping men in hundreds of plants in doing more to help win the war. Giving many "*do's and don'ts*" and "*rights and wrongs*" on keeping pipe lines at peak efficiency—conserving critical metals—and speeding piping jobs, these bulletins, based on Crane's 87-year leadership in flow-control engineering, are especially valuable for training new maintenance men. Copies free on request from your Crane Representative or by writing to: Crane Co., 836 South Michigan Avenue, Chicago, Illinois.

"PIPING POINTERS" BULLETINS—FREE TO ANY PLANT

ARMY NAVY

CRANE VALVES

High Inertia Generators Designed To Save Copper

High inertia electric generators usually require large diameter rotors since inertia is proportional to the square of the radius. Large diameter rotors call for large amounts of copper. Confronted with the problem of providing generators of high flywheel effect for an aluminum plant, engineers at Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., solved the problem by using extra-heavy rotor construction.

First it was decided to reduce the rotor diameter, but this normally required a length of 17 inches. By adopting the extra heavy rotor it was possible to cut the length to about 13½ inches.

Thus the inertia was obtained with steel and the copper requirements were held to a minimum at the same time.

The design saved nearly 1000 pounds of copper on each of eighteen 2250-kilowatt generators. The machines are driven by diesel engines and without high-inertia generation in the pulsation of the reciprocating engines would be reflected in the voltage. This is said to have an adverse effect on the electrolytic cells where aluminum is deposited.

Ryerson Data on NE Steels

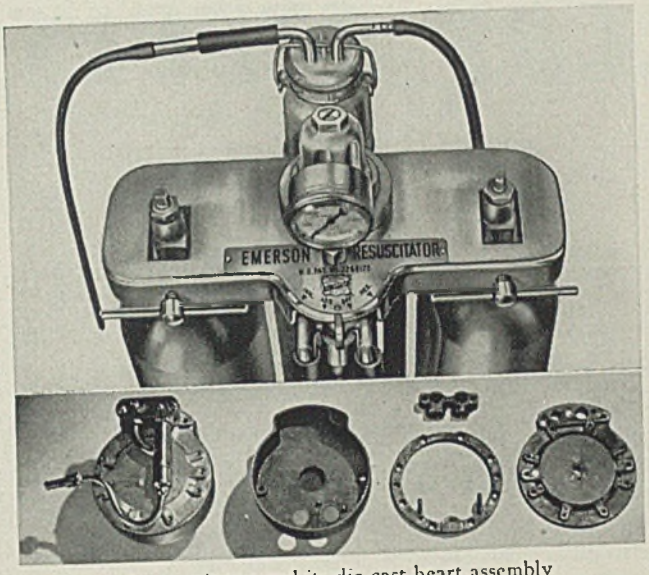
SUPPLEMENTING the data presented in the article, "Facts and Figures for Practical Use of NE (National Emergency) Steels", appearing on p. 76 of the March 29 issue of STEEL is this table giving the physical properties of typical high-hardening steels. This information could not be included in the March 29 issue because of space limitations but is presented here because of its importance.

TABLE IX—Physical Properties of HIGH HARDENING NE Steels

(All samples oil quenched from 1550° F. and drawn as indicated, except NE-8442 which were first normalized at 1600° F.; and NE-9440, 9442, both normalized at 1800° F.)

Steel No.	Draw Temp.	Tensile Strength P.S.I.	Yield Point P.S.I.	% Elong. in 2"	% Red. of Area	Brinell Hardness
	Treated in 1" Rd. Specimens from center position					
NE-8442	800° F.	195,525	171,800	13.2	42.0	401
	1000° F.	168,225	146,000	16.1	56.0	363
	1200° F.	127,750	109,525	20.6	60.1	277
	Treated in 3" Rd. Specimens from ½ radius position					
NE-8442	800° F.	181,300	151,300	13.6	45.1	375
	1000° F.	150,875	130,500	17.2	48.1	321
	1200° F.	126,800	105,225	21.0	60.2	277
	Treated in 2" Rd. Specimens from ½ radius position					
NE-8442	800° F.	167,525	135,525	14.1	45.7	352
	1000° F.	131,225	116,000	18.1	52.3	302
	1200° F.	123,500	103,750	21.1	60.1	269
	Treated in 1" Rd. Specimens from center position					
NE-8739	800° F.	198,875	175,875	14.8	48.5	401
	1000° F.	160,750	147,225	17.1	52.3	341
	1200° F.	124,225	111,500	23.0	62.6	269
	Treated in 2" Rd. Specimens from ½ radius position					
NE-8739	800° F.	170,525	148,225	15.3	50.2	363
	1000° F.	148,225	123,500	18.7	56.1	331
	1200° F.	120,875	99,750	23.0	62.8	262
	Treated in 3" Rd. Specimens from ½ radius position					
NE-8739	800° F.	148,000	128,000	18.1	56.3	321
	1000° F.	131,500	116,250	18.6	57.3	285
	1200° F.	108,750	95,225	23.2	63.1	229
	Treated in 1" Rd. Specimens from center position					
NE-8949	800° F.	227,750	201,500	10.2	40.3	461
	1000° F.	191,725	171,825	11.3	44.2	415
	1200° F.	144,500	127,225	18.3	54.6	331
	Treated in 2" Rd. Specimens from ½ radius position					
NE-8949	800° F.	192,875	158,225	11.6	44.1	401
	1000° F.	159,225	137,500	15.9	47.3	341
	1200° F.	136,000	116,225	18.8	55.2	302
	Treated in 3" Rd. Specimens from ½ radius position					
NE-8949	800° F.	180,525	145,625	13.1	41.1	388
	1000° F.	151,500	135,225	16.3	49.4	331
	1200° F.	128,750	118,500	19.1	56.3	311
NE-8744	Annealed Condition	101,425	50,175	23.1	46.1	212
	Treated in 1" Rd. Specimens from center position					
NE-8744	800° F.	207,225	183,425	14.1	47.3	415
	1000° F.	170,250	156,750	16.7	51.7	363
	1200° F.	131,125	115,825	22.9	62.4	285
	Treated in 2" Rd. Specimens from ½ radius position					
NE-8744	800° F.	168,750	143,500	17.1	52.3	352
	1000° F.	146,850	129,500	18.3	53.5	311
	1200° F.	118,000	102,225	23.1	63.1	241
	Treated in 3" Rd. Specimens from ½ radius position					
NE-8744	800° F.	159,225	141,500	17.6	53.1	341
	1000° F.	140,725	122,225	18.5	54.1	302
	1200° F.	116,875	100,825	23.3	63.0	241
NE-8749	Annealed Condition	106,850	53,225	22.8	45.2	223
	Treated in 1" Rd. Specimens from center position					
NE-8749	800° F.	217,525	197,525	11.8	41.2	444
	1000° F.	177,850	163,850	14.9	46.8	363
	1200° F.	138,300	125,525	21.0	59.1	302
	Treated in 2" Rd. Specimens from ½ radius position					
NE-8749	800° F.	189,500	150,825	12.7	41.8	415
	1000° F.	152,750	135,225	16.1	48.2	331
	1200° F.	126,250	105,250	21.6	60.3	277
	Treated in 3" Rd. Specimens from ½ radius position					
NE-8749	800° F.	179,225	143,875	13.2	42.3	401
	1000° F.	147,000	121,225	17.0	49.4	321
	1200° F.	120,125	96,875	22.1	61.5	262
	Treated in 1" Rd. Specimens from center position					
NE-9440	800° F.	199,500	179,500	12.5	43.4	401
	1000° F.	156,500	144,225	16.0	53.4	331
	1200° F.	126,750	108,500	21.5	62.4	269
	Treated in 2" Rd. Specimens from ½ radius position					
NE-9440	800° F.	158,225	121,500	13.9	53.2	341
	1000° F.	142,525	116,875	16.1	54.6	293
	1200° F.	116,875	101,500	20.8	63.1	255
	Treated in 3" Rd. Specimens from ½ radius position					
NE-9440	800° F.	155,500	119,725	14.1	53.1	341
	1000° F.	140,675	115,825	16.8	54.8	302
	1200° F.	114,325	100,225	21.9	63.4	241
	Treated in 1" Rd. Specimens from ½ radius position					
NE-9450	800° F.	225,500	201,225	11.6	41.1	461
	1000° F.	168,725	153,250	12.9	45.2	375
	1200° F.	146,750	127,500	18.6	53.2	311
	Treated in 2" Rd. Specimens from ½ radius position					
NE-9450	800° F.	186,325	158,500	12.2	45.2	388
	1000° F.	160,500	141,225	13.5	47.7	341
	1200° F.	132,225	112,675	18.9	55.3	311
	Treated in 3" Rd. Specimens from ½ radius position					
NE-9450	800° F.	178,500	142,300	13.3	46.3	375
	1000° F.	143,225	122,875	19.1	57.1	302
	1200° F.	125,500	98,225	22.3	62.3	285
	Treated in 1" Rd. Specimens from center position					
NE-9540	800° F.	212,850	192,500	11.5	47.8	444
	1000° F.	168,000	151,000	15.0	50.6	363
	1200° F.	136,000	121,500	17.5	53.4	293
	Treated in 2" Rd. Specimens from ½ radius position					
NE-9540	800° F.	205,815	189,500	12.3	47.2	429
	1000° F.	166,000	149,000	14.5	50.6	363
	1200° F.	132,500	119,750	18.1	54.6	285
	Treated in 3" Rd. Specimens from ½ radius position					
NE-9540	800° F.	198,750	185,600	12.8	49.1	415
	1000° F.	160,000	144,000	14.6	50.8	352
	1200° F.	128,700	112,500	18.3	55.2	277
	Treated in 1" Rd. Specimens from ½ radius position					
NE-9442	800° F.	201,850	180,225	12.3	43.2	415
	1000° F.	154,750	140,750	15.8	52.9	331
	1200° F.	132,800	112,225	20.9	61.8	285
	Treated in 2" Rd. Specimens from ½ radius position					
NE-9442	800° F.	160,325	122,000	13.7	48.2	341
	1000° F.	144,225	117,225	15.8	53.6	311
	1200° F.	118,500	103,200	21.2	63.1	262
	Treated in 3" Rd. Specimens from ½ radius position					
NE-9442	800° F.	149,750	118,750	15.2	52.3	321
	1000° F.	138,225	112,500	16.1	54.5	293
	1200° F.	115,500	99,625	22.0	63.7	255
	Treated in 1" Rd. Specimens from ½ radius position					
NE-9445	800° F.	221,500	198,750	11.8	42.3	444
	1000° F.	165,225	148,250	13.1	45.8	352
	1200° F.	142,750	121,000	19.1	54.3	302
	Treated in 2" Rd. Specimens from ½ radius position					
NE-9445	800° F.	182,500	152,125	12.6	44.2	375
	1000° F.	157,000	138,275	13.7	47.8	331
	1200° F.	133,500	112,250	18.9	55.8	293
	Treated in 3" Rd. Specimens from ½ radius position					
NE-9445	800° F.	175,200	142,800	13.1	45.8	375
	1000° F.	141,225	120,500	19.3	57.6	311
	1200° F.	120,285	101,500	23.1	62.4	262

A DIE CAST HEART FOR MECHANICAL LUNGS



A resuscitator and its die cast heart assembly

Each of the many models of resuscitation units produced by a prominent manufacturer is equipped with an assembly of four zinc alloy die castings which constitute the "heart" of the breathing mechanism.

These castings, illustrated above, have a number of advantages over parts produced by other means. Their dimensional accuracy assures a "tight" assembly, they are complex in design to minimize machining and assembling costs, and they are tough enough to take abnormal abuse.

The latter point is important when one considers that these mechanical lungs are now seeing service with our armed forces in the field, as well as in civilian hospitals. The particular unit shown above can be converted — by a simple adjustment — into a resuscitator, an aspirator (drawing off throat secretions) or an inhalator.

QUESTIONS & ANSWERS ON DIE CASTINGS

What is a die casting? What is the rate of production in die casting? What shapes are possible in die casting? Is the die casting process applicable only to mass production?

If you want the answers to these questions, or if you have other questions on the subject of die castings, write for a copy of the booklet "Zinc Alloy Die Casting," just off the press.

Send for your copy now

THE New Jersey zinc° ALLOY POT

FOR VICTORY BUY UNITED STATES WAR SAVINGS BONDS STAMPS

A publication issued for many years by The New Jersey Zinc Company to report on trends and accomplishments in the field of die castings. Title Reg. U. S. Pat. Off.

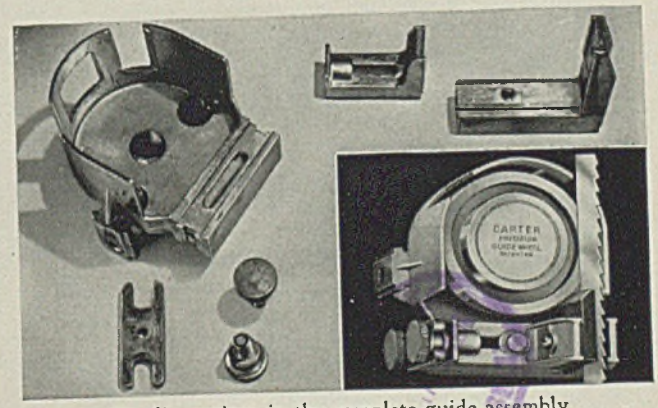
STEEL MAGAZINE EDITION **No. 8**

ALL-DIE CAST BAND SAW GUIDE

The versatility of zinc alloy die castings is clearly illustrated in the band saw guide assembly shown below. Everything is die cast except the guide wheel and a few screws. The manufacturer says:

"The design is such that had this been made in the usual way from rough castings and machined, the cost would have been prohibitive and the assembly would have been heavy and cumbersome. By die casting these parts the guide is very compact and very strong, but accurate for the work it has to do."

This guide can be assembled either right or left hand for use on any band saw above or below the table. It will operate on saws with a blade speed up to two or three miles per minute. A wide variety of war work is now being turned out with the use of this guide in shipyards, aircraft plants and other war industries.



Six die castings in the complete guide assembly

Hardenability in Evaluating Physical Properties of . . . .

NE (National Emergency) ALLOY STEELS

For information on development of NE steels and their properties, see STEEL, Feb. 9, 1942, p. 70; March 16, p. 72; June 8, p. 66; June 15, p. 66; July 13, p. 80; July 20, p. 86; Aug. 3, p. 70; Aug. 17, p. 40; Aug. 31, p. 41, p. 76; Sept. 7, p. 78; Oct. 19, p. 66; Nov. 9, p. 96; Dec. 28, p. 27; Jan. 25, 1943, p. 84; Feb. 22, p. 102; March 1, p. 94; March 8, p. 90; March 15, p. 94; March 22, p. 78; March 29, p. 76.

For reports from users of NE steels, see Nov. 16, 1942, p. 106; Nov. 23, p. 90; Nov. 30, p. 62; Dec. 7, p. 112; Dec. 14, p. 99; Dec. 21, p. 70; Jan. 11, 1943, p. 60; Jan. 18, p. 66; Feb. 1, p. 100; March 8, p. 109; March 15, p. 96; March 29, p. 72.

For latest revised list of NE ALLOY steels, see March 1, p. 98.

For list of NE CARBON steels, see March 8, p. 90.

For list of AMS (Aeronautical Materials Specifications) steels, see Sept. 7, 1942, p. 78.

For details of WD (War Department) steels and complete listing, see Feb. 8, 1943, p. 80.

By C. NILSON
Chief Metallurgist
And
A. W. HERBENAR
Technical Metallurgist

ABUNDANT metallurgical information collected through years of experience in both the manufacture and application of steels now enables us to predict certain generalized effects of several elements on the physical properties of steel. While the quantitative data in regard to factors affecting the physical properties of steels is not as good as the qualitative data, our knowledge is sufficient to permit us to predict the general characteristics which will be inherent in a steel either as a result of its composition or mode of processing.

The most recent major contribution in the field of metallurgy is the standardization of the end-quenched hardenability test. Such standard hardenability data may be advantageously used for the comparative selection of steels.

After designing the NE steels to meet the composition limits of alloying elements specified by the War Production Board, it became essential to select a means of evaluating these new compositions in terms of their physical properties so as to provide a means of determining the adaptability of the newly proposed compositions as substitute alloys. In view of the excessive time which would be required in obtaining data on standard tensile and other physical property tests on all alternate compositions, together with the pronounced variation in results which might be expected due to difference in heat-treat procedure, it was decided that comparison of standard end-quench hardenability data would serve as an adequate guide.

The advantages gained in the selection of the hardenability test as a comparative means of selecting the NE steels cannot be over emphasized, for it is generally conceded that physical properties such as tensile strength, yield point and ductility are closely related to hardness. The work of Janitzky and Baeyertz on SAE steels shows that definite relationships between tensile strength, yield point and ductility as a function of the hardness can be obtained regardless of the chemical composition of the alloys. Likewise, similar relationships may be expected from the NE steels which are also of the intermediate alloy class. It must be remembered that regardless of the composition, steels showing the same hardness, produced by tempering after hardening, will have the same tensile strength and yield point, providing the original quenched structure is substantially martensitic or fully hardened.

It is the purpose here to present a general treatment of hardenability, its affecting factors and the interpretation of hardenability results, and furthermore, to illustrate the use of hardenability data in the evaluation of physical properties of steels.

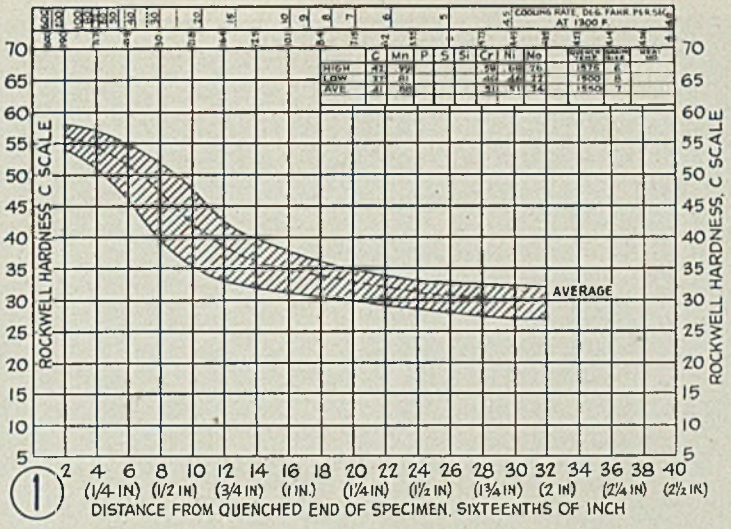
Hardenability: The term hardenability refers to the ability of a steel, when quenched from its proper hardening temperature, to develop a definite hardness on the interia. In more technical terms, the hardenability of a steel is a measure of the extent of retardation of the austenite to ferrite and pearlite transforma-

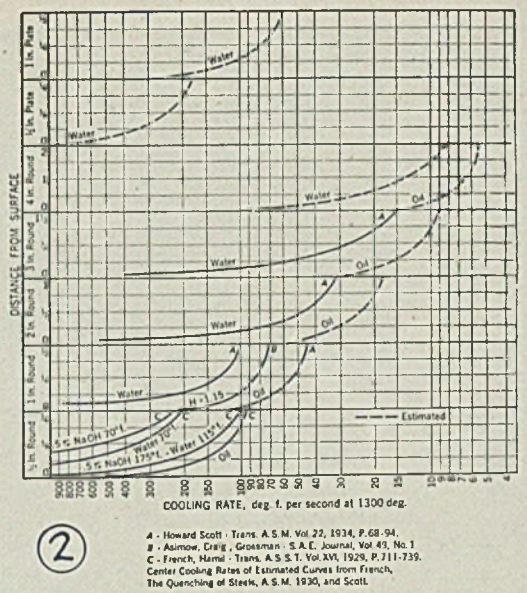
(*Please turn to Page* 150)

From a paper presented before the artillery committee of the Automotive Council for War Production at the United States Naval Ordnance plant operated by Hudson Motor Car Co., Center Line, Mich., Jan. 14, 1943.

TABLE I—Hardenability Test Results

Location Point	Cooling Velocity @ 1300°F. °F/sec.	Distance from water cooled end (in ")	R/C Hardness (high)	R/C Hardness (low)	R/C Hardness (average)
		1-Inch Round			
Surface	120	4/32	58.0	53.0	56.0
1/8"	68	9/32	66.5	49.5	54.0
1/4"	54	11/32	55.5	47.0	53.0
3/8"	48	12/32	54.5	45.0	51.0
1/2"	45	13/32	54.5	44 0	49.5
		2-Inch Round			
Surface	58	11/32	55.5	47.5	52.5
1/4"	30	16/32	52.0	39.5	47.0
1/2"	24	18/32	50.0	37.0	44.5
3/4"	19	21/32	46.5	34.5	41.5
1"	18	22/32	45.0	34.0	40.0
		3-Inch Round			
Surface	30	16/32	52.0	39.5	47.5
3/8"	16	24/32	42.5	33.0	38.5
3/4"	12	28/32	40.0	32.0	36.5
1 1/8"	10	30/32	39.0	31.5	35.5
1 1/2"	9	33/32	37.5	31.0	34.5
		4-Inch Round			
Surface	15	24/32	42.5	33.0	38.5
1/2"	8	36/32	36.5	30.5	34.0
1"	6.5	40/32	35.5	30.0	33.0
1 1/2"	5.5	48/32	33.0	28.5	31.5
2"	5.0	64/32	32.0	27.0	30.0





A - Howard Scott - Trans. A.S.M. Vol 22, 1934, P.68-94.
B - Asimow, Craig, Grossman - S.A.E. Journal, Vol 49, No. 1
C - French, Hamil - Trans. A.S.S.T. Vol XVI, 1929, P.711-739.
Center Cooling Rates of Estimated Curves from French, The Quenching of Steels, A.S.M. 1930, and Scott.

Fig. 1—Tentative hardenability band for 10 heats, 13 tests, of NE-8739

Fig. 2—Chart for using the hardness-cooling rate curve to predict hardness U-curves in various size rounds when oil or water quenched

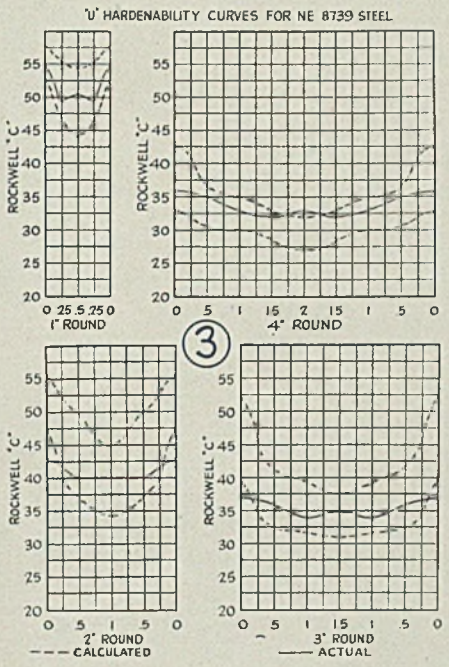


Fig. 3—Hardenability curves of the U-type for NE-8739 steel

Fig. 4—Relationship between brinell hardness and tensile strength of NE-8000 series steels, normal expectancy

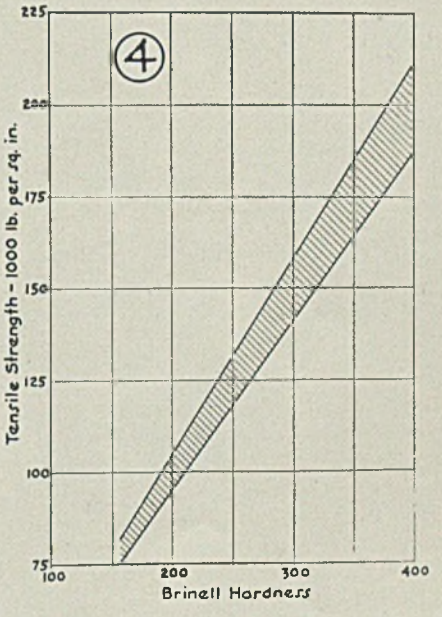
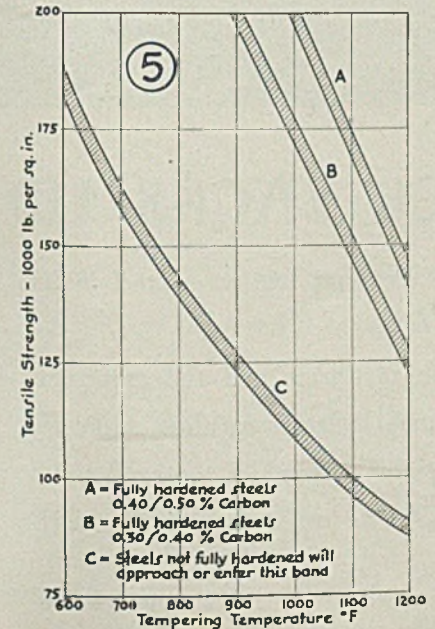
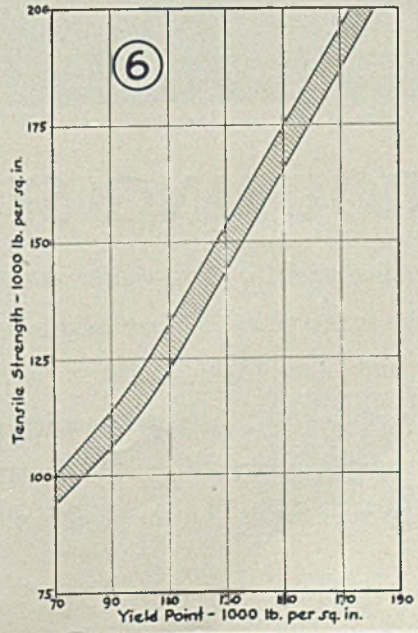


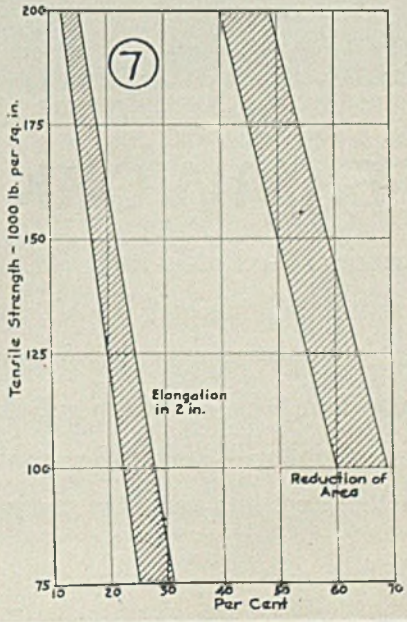
Fig. 5—Relationship between tensile strength and tempering temperature for NE-8000 steels, normal expectancy

Fig. 6—Relationship between tensile strength and yield point for NE-8000 series steels, normal expectancy

Fig. 7—Relationship between tensile strength, reduction of area and elongation for the NE-8000 series steels, normal expectancy







TEAMWORK POURING STEEL BACKS UP

America's steel mills today are producing steel for war at the all-time high rate of 95 million tons a year. This averages enough steel in one second's time to make four jeeps — a dozen gun-shields.

In the illustration you see a skilled crew pouring molten steel into man-high molds to become ingots — unit measure of steel production — steel in its first solid form.

The men on the platforms and the cranemen maneuvering the huge ladles from aloft, make up real All-American teams, typical of those all along the steel front of 650,000 workers who are employ-

STYLE AND STEEL

Hair-dos to heel heights — Preference for type of dress by women war workers is revealed in survey conducted by *Pittsburgh Sun-Telegraph's* fashion editor Toni Drake. Women working in war plants (including J&L) of three major industries told what they wear on the job and during hours away from work. Most prefer coiffures long enough to be adaptable to many styles. A large percentage prefer dresses to slacks for wear on the job although slacks are required in many instances because of type of work. Low heel shoes and stockings are favored by a large majority. For off-the-job dress 84.6 percent voted high heels; stockings are favored by 98.4 percent. Rayon crepe is the leading selection of fabrics for dresses. Most girls pay between $5 and $10 for date frocks. Many have fur coats. Results of survey also reveal girls in industry know more than average about correct complexion care.

Coquettish War Stamps. A style for the duration, having its nation-wide debut this Spring, is a series of corsages made of war stamps designed by leading American stylists and creators of fashions. The U. S. Treasury Department plans to bring out new designs from time to time and thereby establish a continuing fashion vogue. Corsages for women and boutonnieres for men contain 9 ten-cent stamps, are sold without profit.

Washington's gunsmith for his Virginia regiment, before the Revolution, Scotch John Fraser, whom Washington met on one of his expeditions to the "Forks of the Ohio" (Pittsburgh), attempted to produce iron from native ores as early as 1749.

For record steel plate production in war, thank American motor vehicle industry and other manufacturers of peace-time articles and domestic appliances made of steel sheets. Their demand for long, wide, easily workable sheets of steel led to invention and development in America of modern strip-sheet continuous rolling mills that used to turn out auto-body and refrigerator sheets at the rate of 100 yds. in 10 seconds. As war threatened, these great mills were quickly converted by ingenuity of American steel industry into astonishing producers of war-steel plates for ships, guns, tanks, army trucks, railroad cars, commando barges, light navy fighting craft and countless other priceless war-time applications not otherwise possible to produce without dangerous delay.

20 men in a row, representing a total of 514 years of service at J&L, were seated on stage at the recent presentation ceremonies of the Army-Navy "E" production award to the Aliquippa Works of the Jones & Laughlin Steel Corporation. This row of men was made up of superintendents of the various departments of the works and a veteran employe from each of these departments.

Typical metal parts shop-coated with rust-inhibiting wax for protection and appearance. Black items have been coated with pigment-bearing wax which has good hiding power

Rust-Inhibiting WAX COATINGS

. . . . provide effective protection to metal surfaces. Hard, dry finish combines excellent appearance with rust resistance and low cost of application; well suited as shop coat to protect finished parts or work in process

SPECIAL rust-inhibiting wax emulsions are now quite widely used for final finishing of a great variety of metal surfaces to provide an attractive protective finish that has the additional quality of dryness not found in oil finishes. They also are extremely effective as shop coatings to protect the surface of semi-finished or completely finished parts during the time that may lapse before they are assembled into the finished product. Since such wax emulsions produce a hard, dry, protective finish, they combine excellent appearance with rust resistance and low cost of application.

These wax finishes are suitable for metal articles and parts of all kinds. They provide good coverage and in the case of pigmented black waxes, good hiding power. Too, they dry fast. They are easily applied by conventional dip or spray methods, either directly over the metal or over painted or plated surfaces.

The use of waxes as rust inhibitors has been greatly accelerated by the war. This, of course, is due to the fact that materials for the usual electro-plated coatings are practically unobtainable. Of course rust-inhibiting waxes cannot be classified as permanent rust inhibitors but they do serve the highly useful purpose of providing treated or untreated metal surfaces with a substantial degree of protection against rust and corrosion.

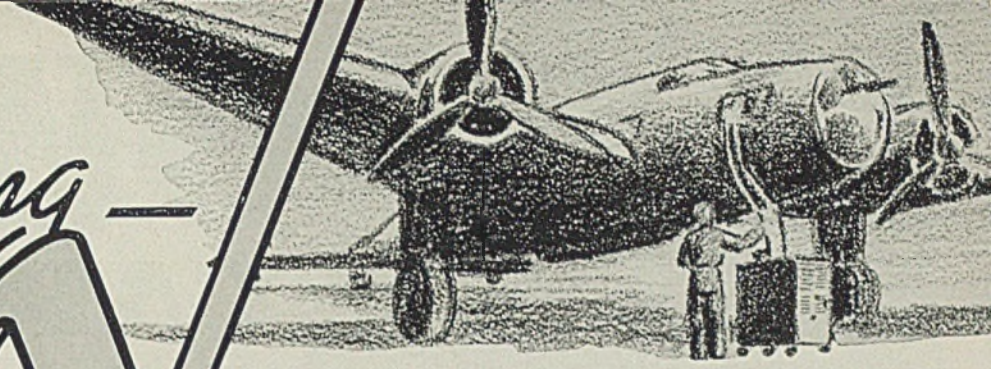
Wax itself is protective, inert, dense and highly resistane to corrosion. It remains effective for a considerable length of time. Naturally, the exact degree of protection depends on the size and nature of the metal surface as well as the service conditions to which it is subjected. Rust-inhibiting wax coatings are available in a clear finish, black and a number of special types.

Unlike oils or greases, rust-inhibiting wax coatings produce a protective, rust-inhibiting finish that is completely dry to the touch. This particular characteristic has been responsible for the wide use of such finishes on many metal surfaces, both interior and exterior. Rust-inhibiting waxes have an advantage over all finishes for shop coatings in that they provide a dry thin film which cannot be removed easily by handling or by contact with paperboard or other absorbent materials. Thus the wax finish remains on the surface and can usually be depended upon to give longer protection than an oil. However, the initial resistance of waxes under some conditions may not be as high as that of some oils.

In one corrosion test, two brackets were tested for a 24-hour period in

(*Please turn to Page* 155)

By WALTER BRIDGEMAN
Industrial Wax Division
S. C. Johnson & Son Inc.
Racine, Wis.



for checking — V

HYDRAULICS

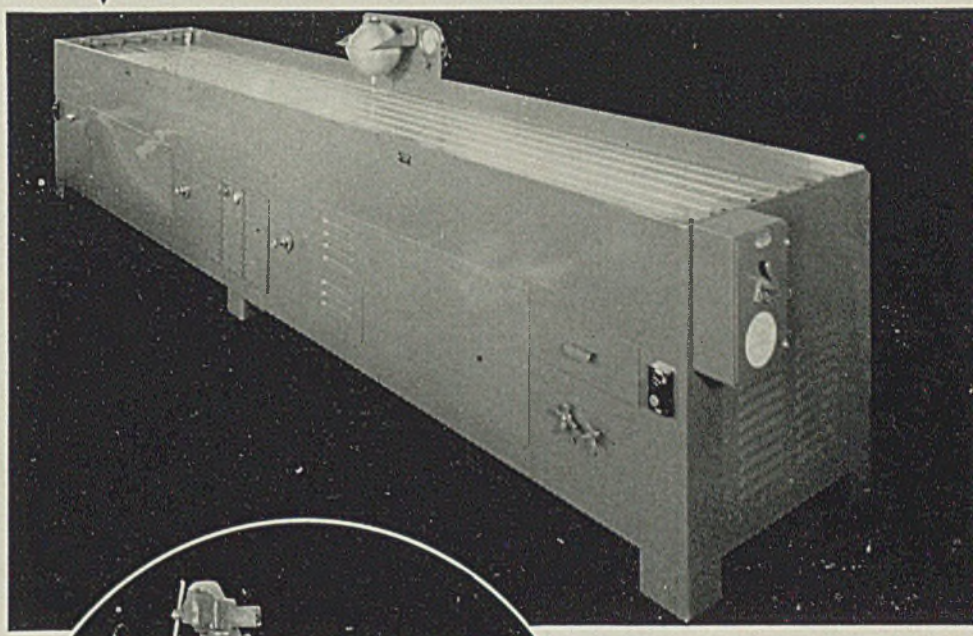
BEFORE & AFTER ASSEMBLY

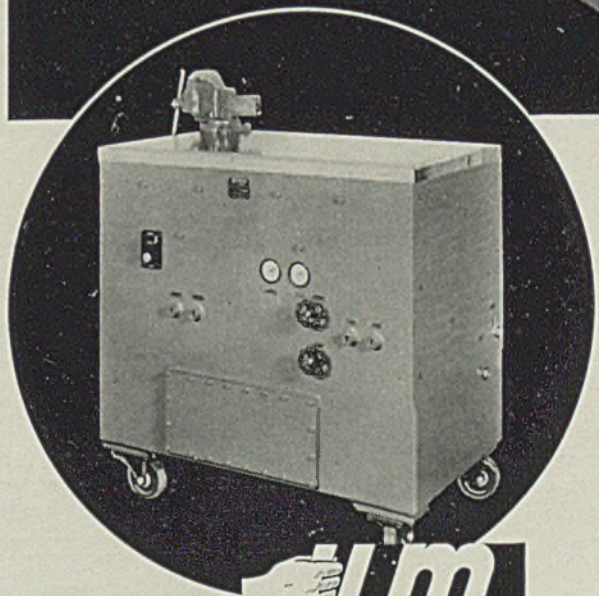
Besides the two models illustrated—there are many other "HY-MAC" test units for various purposes in the field of aircraft. Here is a brief description of a few others:

T-103 Stationary Hydraulic High Pressure Tube Tester—primarily designed for testing flexible tubing but also used for checking short sections of plain metal tubing . . . as many sections as required may be tested at a time . . . the Hydraulic Pump is capable of a 1000 lb. per square inch pressure that may be built up to a 10,000 lb. per square inch pressure by means of a built-in intensifier.

T-104 Water Pressure Test for Aircraft Cylinder Heads. . . . Heads are clamped into position on a trunnion that may be rotated for inspection. It is operated by a Hydraulic power plant capable of producing 1000 lb. per square inch, which is supplemented by a high pressure hand pump or intensifiers to accomplish whatever pressure is required. All of the mechanism is enclosed.

Send for complete information regarding "HY-MAC" HYDRAULIC TEST EQUIPMENT.





T-102 Principally used for checking aircraft tubing this stationary Hydraulic Test Bench with a variable test pressure ranging from 0 up to 10,000 lbs. per square inch and a variable delivery pumping unit 0-12 gal. per minute—is used to test anything in the line of hydraulic equipment before its assembly into aircraft.

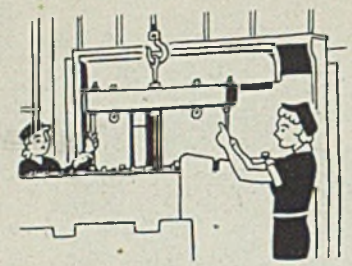
T-101 Portable Hydraulic Test Bench is used for pre-flight checking of the hydraulic circuits of planes—for checking all of the hydraulic functions without running the airplane engines. It may also be equipped with a gasoline engine driven pump for field testing.

HYDRAULIC MACHINERY, INC.

12825 FORD ROAD • DEARBORN, MICH.

Hy-Mac

HYDRAULIC MACHINERY



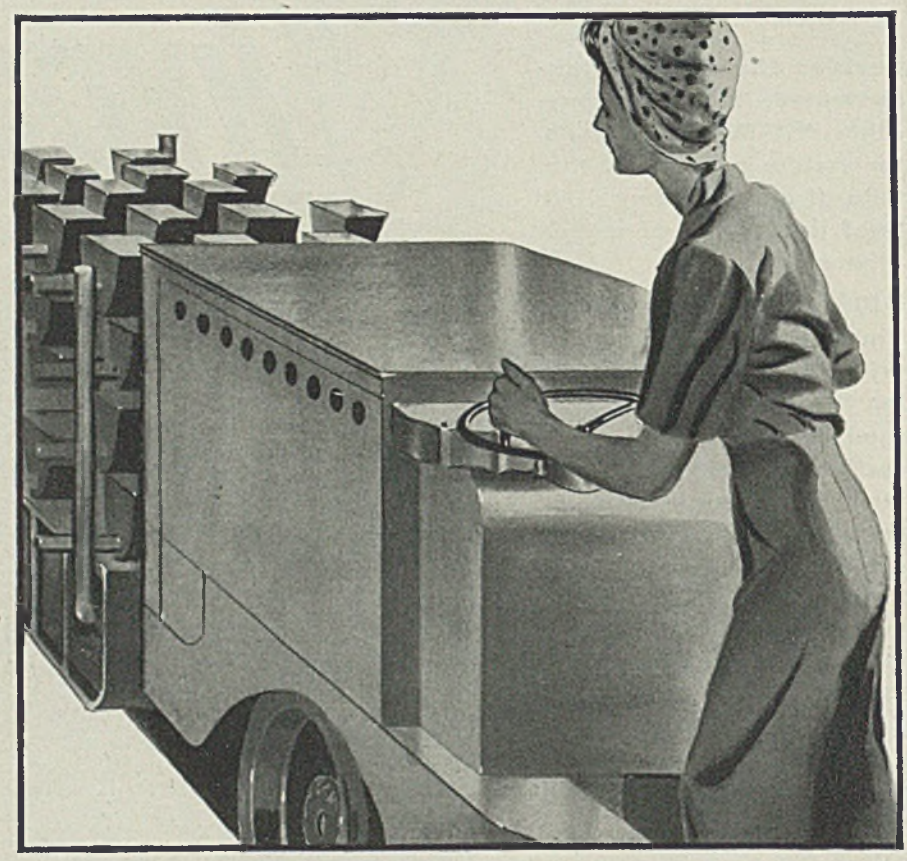
Girls Can Do It. Can women operate battery industrial trucks? Can they charge and exchange the batteries? Do they make good operators? The February issue of Storage Battery Power contains an article describing the experience of one plant with women truck operators. If you have not received a copy, ask for one.

24 Truck Hours Daily. Using three 8-hour batteries or, preferably two 12-hour batteries and exchanging them at corresponding intervals gives you a truck that will operate 24-hours a day with no truck time out for charging or watering of batteries. That's done while the batteries are out of the truck. And alkaline batteries are easy to exchange because of their light weight.

Road-Time. Railroads have no more freight cars in number than during the last war, but are getting double the use out of them. *Quicker loading* and *unloading* and *fuller loads* thanks to lift and fork trucks which permit pallet and skid shipping are part of the reason. More freight cars would be on the road more time if identical pallet and skid systems were in use. Consignor and consignee can get together to standardize shipping procedure—save money for themselves—and help the war effort.

Edison Storage Battery Division
Thomas A. Edison, Inc.
WEST ORANGE, N. J.

POWER TO CARRY ON



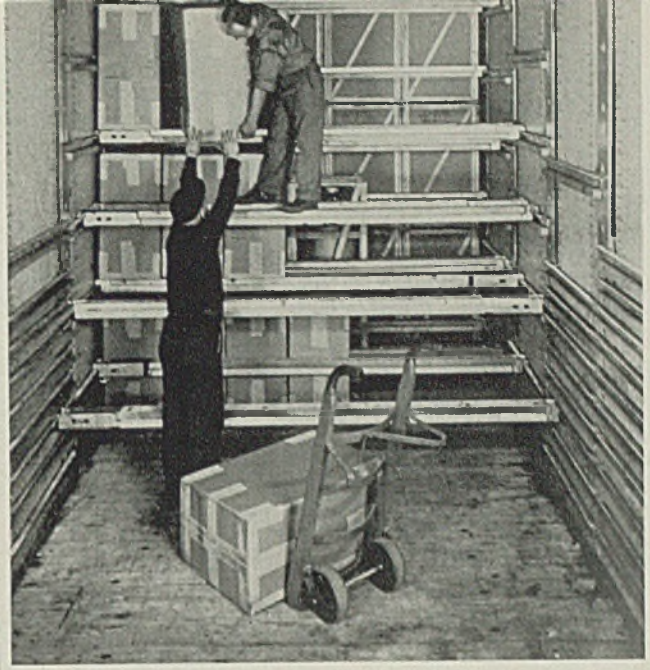
"It's the power unit best suited to the war production job." Here you have the answer to the preference for material handling trucks equipped with alkaline batteries. First, *fewer* trucks can do *more* work where storage batteries provide the motive power. There's no time off duty for repairs, "spare" trucks don't have to be on hand for emergencies and each truck can operate 24 hours out of 24. Second, you can use a battery truck *anywhere*—in freight cars, elevators—it can even be made explosion-proof.

And, the advantages of alkaline batteries in such trucks are quite clear. They can be charged in 6 to 7 hours and require no periodic equalizing charges, thus permitting maximum use of charging circuits. Where d-c shop lines are available they can be charged direct from the lines by the use of control panels only. But most important of all, alkaline batteries are dependable—they are not subject to unexpected sudden failure.

INDUSTRY NEEDS THE DEPENDABILITY OF

Edison Alkaline BATTERIES

—INCREASED PAYLOADS —DECREASED SHIPPING DAMAGE



. . . . . result from use of loader-equipped freight cars

By E. S. EVANS
President
Evans Products Co.
Detroit

THE CURRENT serious shortage in freight cars can be alleviated in three ways, despite the order limiting construction of new cars—by loading all cars to capacity, by reducing the time they spend in terminals and by eliminating duplicate shipments necessitated by damages sustained by original load. Figures show that cars spend more than five times as much time in terminals as they do on the road, and they are usually loaded only to about two-thirds capacity.

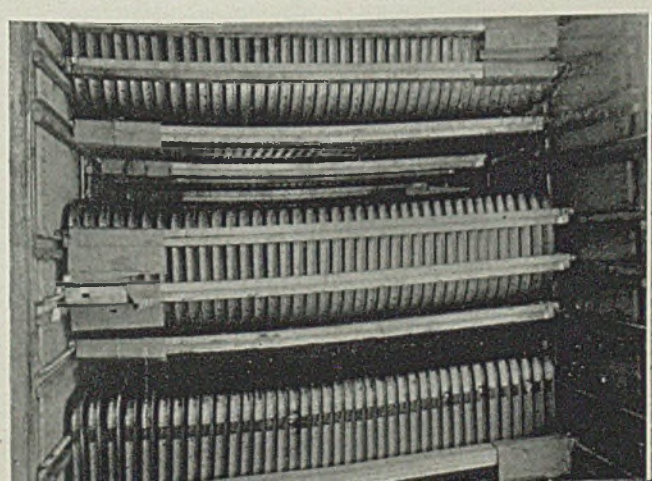
One device which strikes at the root of all three of these evils, the Utility loader of the Evans Products Co., Detroit, can be installed inside any box car—old or new, steel or wood, single or double sheathed. As can be seen in Fig. 1, it consists of cross beams supported by a steel framework attached to the car walls. These cross beams, adjustable to ½-inch intervals vertically and horizontally, provide for multiple-deck loading to utilize the entire space inside the freight car from floor to roof, brace the load securely in position with no slack and protect light or fragile commodities. They also make convenient platforms for workmen to stand on when loading above their heads, as shown in Fig. 1.

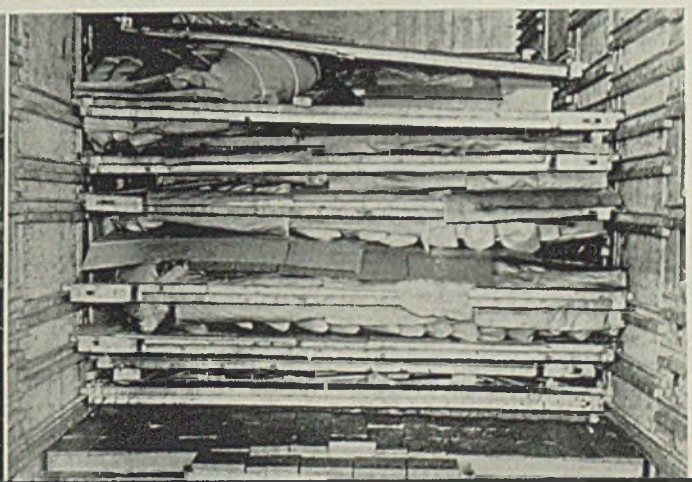
Increasing the Payload: In 1937 the

Fig. 1. (Above)—Loading method utilizes cross beams supported by steel framework which allows loads to be packed to prevent horizontal and vertical movement during shipment

Fig. 2. (Left, below)—Loads like these automobile doors can be tiered to the roof, affording an increase in payload per freight car of from 20 to over 200 per cent

Fig. 3. (Right)—L.C.L. loads are handled equally well by the Utility loader as shown here. Note cartons on floor held in place by cross beams





average weight of a box carload was 16.5 tons. In 108 carloads handled in Utility loader cars in commercial revenue service on which figures are available, the average weight was 24 tons per carload in spite of the fact that these were all "problem" loads with bad case histories due to damage sustained or other difficulties. This average was based on more than 30 different commodities. On these same 30 commodities in unequipped cars the average load was 18 tons. The increase per carload due to floor-to-roof and end-to-end loading made possible by the loader was actually 6 tons, or an increase of 7½ tons over the calculated average for the United States on the 1937 figures. Thus the loader increases the payload approximately 33 1/3 per cent, and every 100,000 cars equipped with the Utility loader will be equivalent in payload capacity to 133,000 box cars.

The Office of Defense Transportation has ordered that all cars with L.C.L. (less than carload) shipments be loaded to its practical weight or cubic capacity. The loader permits this heavier loading both for commercial and military freight. However, despite strict orders to double or triple deck loads, there are many products which cannot be so loaded in an ordinary box car because of the fragility of the commodity, its peculiar shape or other reasons and the heavy expense of multiple decking such loads safely. The crushing weakness of cartons and crates in many instances makes it impossible for shippers to make even a minimum load. However, the Utility loader permits tiering fragile loads safely to utilize all available space, and to transport them without damage.

Airplane parts, storage batteries, certain farm implements, automobile sheet metal parts, enameled stoves, glassware, transformers, and many other products which cannot be multiple-decked safely in ordinary box cars have been tiered to the roof without damage by the Utility loader, resulting in increases in payload ranging from 20 to over 200 per cent. Fig. 2 shows automobile doors tiered from floor to roof in a loader-equipped car.

Fig. 4—This tool engaging the teeth in the rack permits tightening load securely to prevent loads from becoming loose and hammering upon themselves. Thus the loader prevents the cause of most shipping damages

Damage Elimination: Second only in importance as a war measure to increased loading to capacity is the elimination of damage and delays incident thereto. Every piece of merchandise damaged takes away from the war effort valuable labor and manufacturing facilities. It is a loss to the railroad, a loss to the receiver and, more important still, necessitates using railroad equipment for replacement. A large percentage of damages today are preventable damages, and this is particularly true of box carloads. The Utility loader has been found to eliminate 98 per cent of damage in transit.

In the so-called "light weight commodities", total loss and damage in 1937 was $9,336,928. This type of damage can be eliminated almost entirely by use of this loader. Ninety per cent of the damage accruing in transit in ordinary box cars is due to slack in the load. Tests made in loading automobiles using chocks or loading blocks for retaining the automobiles in position demonstrated that where the loading blocks were fastened to the floor ½-inch away from the tires, the strain exerted on the bracing was 400 per cent greater than where the loading blocks were fastened tightly against the tires. This semi-rigid loading and elimination of slack is the basic principle of the Utility loader as far as damage elimination is concerned.

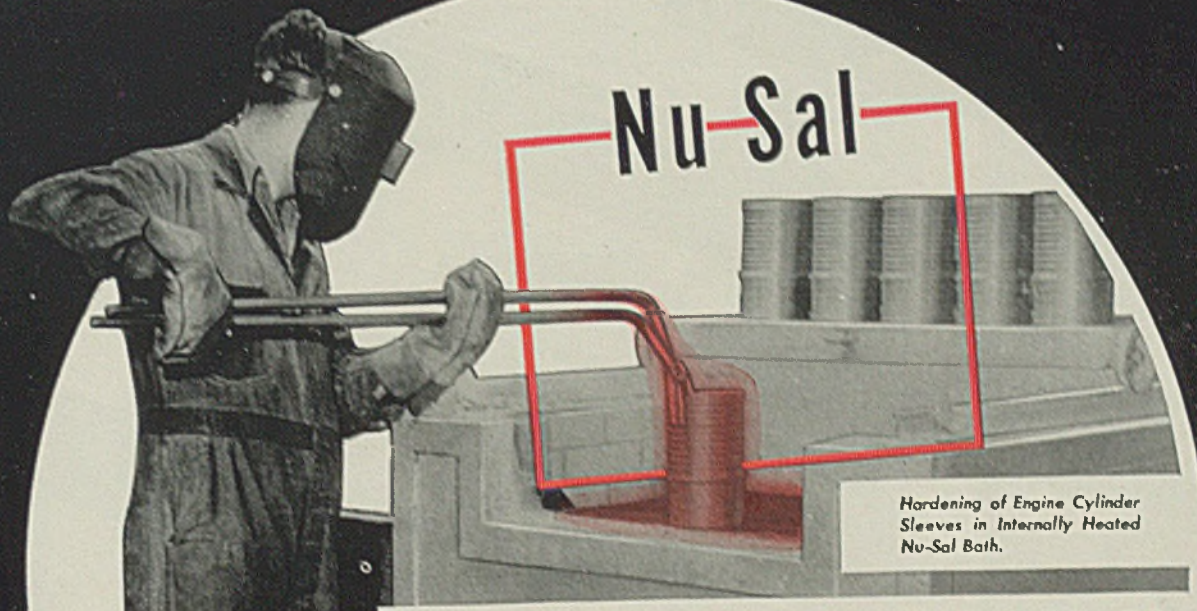
The elimination of slack through the use of a "persuader" to tighten the load unit by unit as shown in Fig. 4 prevents the loaded commodities from hammering on themselves. This eliminates the progressive damage occuring when any part of the load fails because of inadequate or improper crating or assembly, which creates slack throughout the entire load in an ordinary box car. Any slippage during transit of the automobile doors in Fig. 2 would have caused serious damage to their fragile edges. However, the cross supporting them from below and bracing them from the sides allowed no loosening or play and gave them perfect protection.

Slack is a frequent cause of damage in L.C.L. shipments, which constitutes a large proportion of all box car loadings. About 45 per cent of United States Army shipments are less than carload. This type of shipment has always offered great difficulties, even prior to government orders for heavier loading. The bracing and bulkheading which are necessary in the conventional box car are often so applied that when part of the load is removed at an intermediate destination, the rest of the load is loosened and suffers damage in consequence. The loader permits each carload to be divided easily into separate compartments consigned to various consignees. Each compartment remains tight to its own destination, which helps prevent the misdelivery of goods, also.

Fig. 3 shows an L.C.L. load of various automobile repair parts of all sizes and shapes upon arrival at its destination. Note that the cartons on the floor are held firmly in place by crossbeams,

(*Please turn to Page* 159)

Scale Free Work *without* CARBURIZATION OR DECARBURIZATION!



Hardening of Engine Cylinder Sleeves in Internally Heated Nu-Sal Bath.

★ A patented chloride base salt, with M.P. 1230° F.—WR. 1650° F.—Wt./cu. ft.—125 lb. Packed in 200 lb. drums or 450 lb. barrels. When used with Park Rectifier at rate of approximately ¼% of bath weight per 24 hour day, to remove oxide impurities, which are easily removed daily from "sludge" formed at bottom of bath, this non-fuming salt produces scale free work *without* carburization or decarburization. Products can be oil or water quenched, with perfect solubility after quench. To reduce surface heat losses by bath radiation, etc., it is sometimes advisable to use Park Kase Carbon as a cover for top of bath. This will not burn up readily, and provides more economical operation. Salt operates in pressed, cast steel, treated alloy containers, or internally heated pots. RECTIFIER NO. 1—Powder—50-100 lb. drums. PARK KASE CARBON POWDER—50-100 lb. drums. Write today for bulletin No. 100.

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PARK CHEMICAL CO.

DETROIT . . . MICHIGAN

● Liquid and Solid Carburizers ☆ Cyanide, Neutral and High Speed Steel Salts ☆ Lead Pot Carbon ☆ Charcoal ☆ Coke ☆ No Carb. ☆ Carbon Preventer ☆ Quenching and Tempering Oils ☆ Drawing Salts ☆ Metal Cleaners ☆ Liquid Grain Cement

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"TIPPING" Cutting Tools

. . . . saves important alloying materials

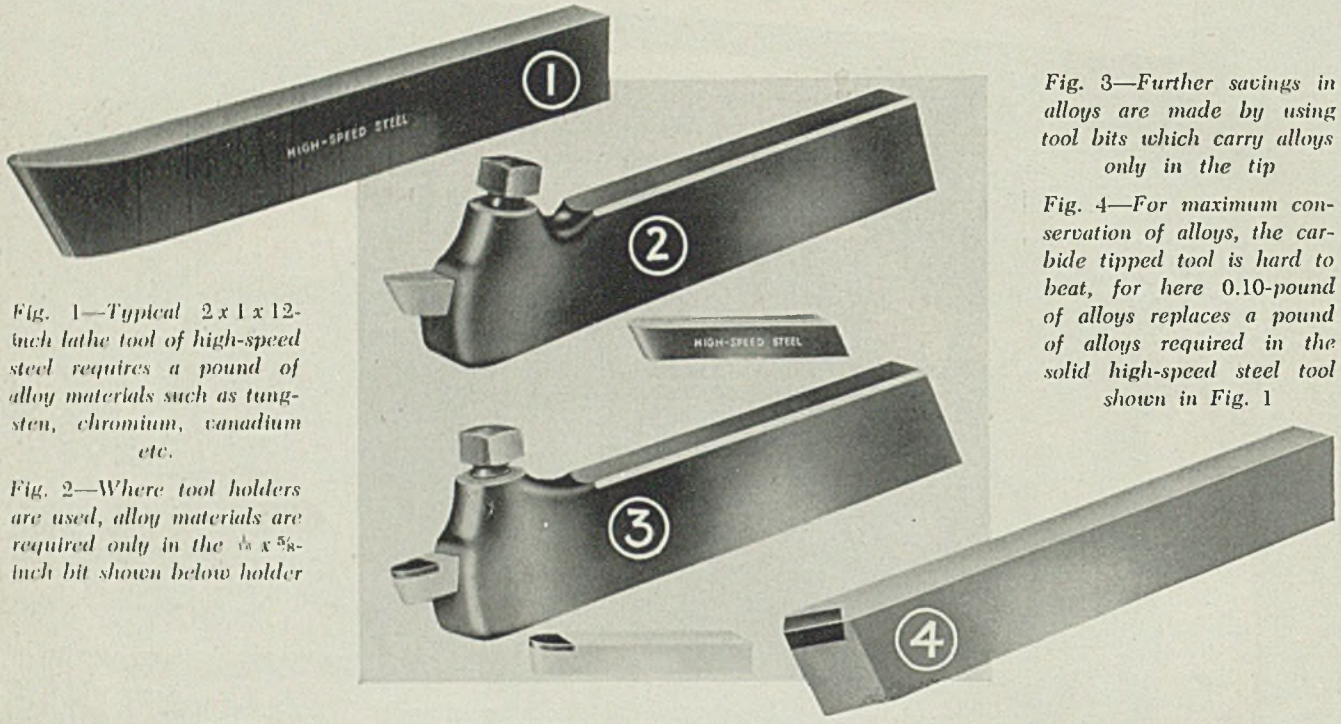


Fig. 1—Typical 2 x 1 x 12-inch lathe tool of high-speed steel requires a pound of alloy materials such as tungsten, chromium, vanadium etc.

Fig. 2—Where tool holders are used, alloy materials are required only in the ⅝ x ⅝-inch bit shown below holder

Fig. 3—Further savings in alloys are made by using tool bits which carry alloys only in the tip

Fig. 4—For maximum conservation of alloys, the carbide tipped tool is hard to beat, for here 0.10-pound of alloys replaces a pound of alloys required in the solid high-speed steel tool shown in Fig. 1

WAR PRODUCTION problems relate largely to tooling. Tools are required to work at high speeds with a minimum of interruption. Going beyond this, it is essential to make maximum use of materials available in this country and a minimum use of materials which must be imported or of which there is only a limited supply.

It is fortunate that developments in new types of tool materials in the past ten years have made it possible for us to meet nearly all our tool requirements with available domestic resources of the rare and expensive metals that inevitably go into tool manufacture.

But there are definite limits beyond which it is inadvisable to go in the reduction of the alloy content. For example, excessive reduction of alloys in high-speed tool steels may result in less work per tool and hence the use of more tools with a greater ultimate consumption of alloys. The recently announced control of analyses and manufacture of these steels under War Production Board order M-21-H has established practical, efficient limits and hence further conservation through changes in composition is unlikely.

There is, however, another and effective way to reduce the consumption of valuable alloy elements, namely by eliminating these alloys from the shanks of tools and confining their use of the tips where they form the working or cutting edges.

For years, tool makers have welded shanks of ordinary steel to the high-speed steel in twist drills, reamers and similar tools. Cutter makers have accomplished the same result in inserted blade milling cutters. But in too many places today the shanks of lathe tools, planer tools, shaper tools and tools for automatic and special machines are made with solid high-speed steel shanks.

By D. G. CLARK
Vice President
Firth-Sterling Steel Co.
McKeesport, Pa.

As an example of the waste of alloys in a solid high-speed steel tool, examine the typical 2 x 1 x 12-inch lathe tool shown in Fig. 1. The alloy materials used to give tools their necessary cutting properties are of course diffused throughout the material. In the illustration the tool has been shaded to indicate this diffusion and proportion of alloy.

In this tool, 7 pounds of high-speed steel are used, requires 1 pound of alloys (tungsten, chromium, vanadium and molybdenum) even in the molybdenum grades favored by the War Production Board and 1½ pounds of alloys in the high-tungsten 18-4-1 types. Obviously the alloy in the shank of the tool is of no immediate value. Although some of the alloy in the shank end of the tool will eventually become the cutting edge as the tool is ground back, it may not be so used for months, and hence is lost for present requirements.

The usual way to eliminate this waste has been to use toolholders. Where this is done, the toolholder bit is really a tip, and thus a saving in alloys is immediate. While a 2 x 1 x 12-inch solid tool contains a pound of alloys, a ⅝-inch square high-speed steel bit used in the corresponding 2 x 1-inch holder contains only a little over an ounce of alloys. Fig. 2 illustrates the comparative amount of alloys needed—none in the holder and only a little in the bit.

Later, additional bits must be bought but the postponement of purchasing

(*Please turn to Page* 159)

How will *YOU* Answer This Big Question?

So the question is: *"What technical improvements in manufacturing methods, developed in war work elsewhere, could be adapted to our peacetime operations?"*

ALTER EGO: That's it—one of the questions being asked industrialists by the new Committee for Economic Development, urging PLANNING NOW for post-war business.

Well, here's one answer that I've found "elsewhere". This shipyard has boosted the speed of 3/8" fillet welds from 30 ft. per hour to 65 ft. with the "Fleet-Fillet" Technique. We can apply this 111% speed increase to our *peacetime operations* — to cut costs of our products.

ALTER EGO: That's what we want—*lower costs*. But we also want to *improve our designs* so we'll advance on the two fronts on which the Battle for Business will be fought—COSTS and PRODUCT QUALITY.

Let's look to Lincoln for the welding knowledge to put AND KEEP our costs and quality ahead of competition.

Ask your inner self: "What welding improvements 'DEVELOPED IN WAR WORK ELSEWHERE' can profitably be applied to our peacetime operations?"

THE LINCOLN ELECTRIC COMPANY
CLEVELAND, OHIO

Photo Courtesy Consolidated Steel Corp.

WANTED!

200 WELDING OPERATORS IN 10 DAYS

TANK TREAD SHOES, are now welded on assembly lines by women using Westinghouse a-c welders. Treads are positioned in jigs by helpers and swung into welding booths where 24 inches of downhand welding are applied to each.

"We found the answer in untrained women . . . and A-C WELDERS," *says Chief Electrician of Large War Plant*

"Production-line welding in 10 days by women operators who never struck an arc before? A few days ago we would have thought it impossible. *Today, it's a fact!*"

So states this official, who has supervised the training of more than 600 women welders, for producing tank tread shoes on seven continuous production assembly lines. The average woman worker quickly learns how to strike an arc and run short beads—from then on she practices, practices, practices welding tank tread shoes. Usually in ten days she is ready for actual production welding (work must pass bend tests)—where her initial work is carefully supervised by her instructor.

"One of the biggest factors that has made it possible—and successful," says this electrical engineer, "has been the use of a-c welders. We bought them originally because they were immediately available, although we had always used d-c.

"We found, however, that the freedom from arc blow made it much easier to develop qualified operators. Weld quality is excellent. Most important, we've had literally no maintenance in nearly a year of 24-hour-a-day average operation."

★ ★ ★

The 275 Westinghouse a-c 500-ampere welders in operation at this plant are just a few of the many Westinghouse welders that are solving problems of availability, ease of operation and freedom from maintenance for many war plants. Ask for booklet B-3136. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

J-21269

Westinghouse A-C WELDERS

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Boron in Steel

(*Continued from Page* 114)

to 1 volume of water. Store in a glass stoppered bottle.

Standard Boric Acid Solutions—Dissolve 2.8578 grams of boric acid in 1000 milliliters of distilled water. This solution contains 0.5-miligram of boron per milliliter and serves as the primary (A) base stock solution. Prepare a second (B) stock solution containing 0.01-milligram of boron per milliliter by diluting 20 milliliters to (A) stock solution to 1000 milliliters with distilled water and a third (C) stock solution containing 0.001-milligram of boron per milliliter by diluting 100 milliliters of the second (B) stock solution to 1000 milliliters.

Dilute Sulphuric Acid (1-4)—To 400 milliliters of distilled water slowly add 100 milliliters of concentrated sulphuric acid, specific gravity 1.84. When cool dilute to 500 milliliters. Store in a glass stoppered bottle.

Apparatus

Test tubes 17 centimeters long with inside diameter 1.8 centimeters marked with a file at 10 milliliters.

Air Condensers—Glass tubes 3 millimeters inside diameter about 70 centimeters long, each fitted on one end with a No. 3 one-hole rubber stopper to fit the test tubes.

Bottle for developing the color of standards and samples. Preferably glass stoppered having at least 50-milliliter capacity with inside diameter of 3 centimeters. The final solution in these bottles will have a depth approximately the same as the diameter.

After these standards are measured into dry comparison bottles, 20 milliliters of the 98.5 per cent sulphuric acid are added slowly and stoppered. When cool, 1.0 milliliters of the quinalizarin solution from pipette is added, the solution mixed by gently swirling and stoppered tightly. After 15 minutes, the colors become fully developed and are ready for use. They are permanent if kept stoppered to prevent absorption of water.

One-gram portions of Bureau of Standard sample No. 55-a or other boron-free steel are weighed into seven dry, marked test tubes and treated as indicated in Table II.

The standard represented in Table II will be completed as described in the analytical procedure.

Procedure

One gram of the steel to be tested is placed in a marked test tube, 8 milliliters of H_2SO_4 (1-4) are added and the test tube stoppered with an air condenser, and placed in a beaker of hot water. When all action ceases, remove the test tube and cool with running water. Disconnect the air condenser, wash down the inside with two 0.5-milliliter portions of water, collecting these washings in the test tube. Dilute to the 10-milliliter mark with distilled water, mix thoroughly and filter through a close, dry, 9-centimeter paper, collecting the filtrate in a dry, small beaker or test tube. Reserve. This filtrate contains the boron which is soluble in H_2SO_4 (1-4).

Replace the beaker or test tube with another and wash the paper with distilled water then with dilute H_2SO_4 (1-20) and finally with water to remove all acid. Discard the washings. After all washings have drained from the paper, scatter 0.5-gram of Na_2CO_3 on the inside of the paper. Place in a small platinum crucible (about 10 to 15-milliliter capacity; a crucible used for volatile matter in coal will suffice), and ignite at a low temperature. When the paper is all or nearly all burned off, increase the temperature and fuse the

(*Please turn to Page* 149)

TABLE I—Standards for boron in H_2SO_4 (1-4) *insoluble* portions of steel

Number of Sample	Boron in colored standards, in mg.	Distilled water, in ml.	Boron "B" & "C" solutions in ml.	% Boron in sample using 0.2-g aliquot
1	0.0000	2.00	0.00	Nil
2	0.0010	1.00	1.00 (C)	0.0005
3	0.0020	0.00	2.00 (C)	0.0010
4	0.0030	1.70	0.30 (B)	0.0015
5	0.0040	1.60	0.40 (B)	0.0020
6	0.0050	1.50	0.50 (B)	0.0025
7	0.0060	1.40	0.60 (B)	0.0030

TABLE II—Standards for boron in H_2SO_4 (1-4) *soluble* portion of steel

Number of Sample	Boron in 1 gram sample, in mg.	Concentrated H_2SO_4 acid, sp. gr. 1.84, in ml.	Boron "B" & "C" solution, in ml.	Distilled Water in ml.	% Boron in sample using 0.2-g aliquot
1	0.0000	1.5	0.00	6.50	Nil
2	0.0050	1.5	5.00 (C)	1.50	0.0005
3	0.0100	1.5	1.00 (B)	5.50	0.0010
4	0.0150	1.5	1.50 (B)	5.00	0.0015
5	0.0200	1.5	2.00 (B)	4.50	0.0020
6	0.0250	1.5	2.50 (B)	4.00	0.0025
7	0.0300	1.5	3.00 (B)	3.50	0.0030

Reflector Latch

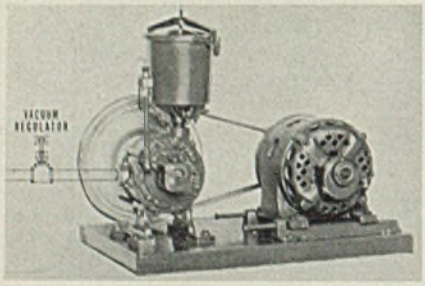
Sylvania Electric Products Inc., Lighting Division, Salem, Mass., reports a new Captive latch—a powerful spring-type fastening that holds the reflectors

of its line of composition reflector fluorescent fixtures securely to the top housing.

Easy to operate, the latch requires only a quarter turn to remove the reflector, it is said. No tools are needed and, since the latch is an integral part of the top housing, it cannot become loose and drop out. The latch is inconspicuous in its position between the lamps and in no way affects the appearance or efficiency of the reflecting surface.

Vacuum Creator

Leiman Bros. Inc., AC145 Christie street, Newark, N. J., reports a vacuum creating outfit for testing all sorts of delicate instruments. Its vacuum may be adjusted to any degree desired as also can be the pressure. The outfit is offered



furnished with full automatic controls and automatic lubrication. The machine is a slow running unit, exceedingly quiet in operation the company states.

Press Type Welders

Pier Equipment Mfg. Co., Benton Harbor, Mich., announces addition of series P-50 and P-100 automatic air-operated press type welders to its electric welder line. These, it is reported, are designed for high speed precision projection and general spot resistance welding of sheet and structural steel assemblies, wire and nonferrous metals. They are equipped with double-acting air cylinder and control valves to provide smooth speedy action.

Pressures depend on the size of cylinders and range from 800 to 4000 pounds readily adjustable by means of a regulating valve. Die platens with T slots hold projection welding dies, while for the spot welding operation each welder is supplied with two 2½-inch diameter by 8-inch copper horns machined to accommodate 1¼-inch water-cooled electrode holders either at right angles or in offset position. Standard throat depths are 12 and 24 inches.

The series P-50, shown in the accompanying illustration, is built in two trans-

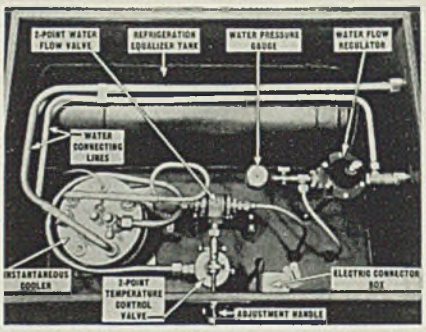
former capacities, 30 and 50 kilovolt-ampere and the P-100 in 75, 100 and 150 kilovolt-ampere. The P-50s are supplied with either 4 or 5-inch cylinders with 6 and 8-inch for the P-100 s NEMA types 1, 2 and 3 controls of welding timing and sequence are available, making almost limitless combinations of operations possible.

Refrigerating Unit

Temprite Products Corp., 45 Piquette avenue, Detroit, recently introduced a model 555-PD refrigerating unit for use in obtaining good X-ray prints of war material being X-rayed for flaw detection and inspection.

To take X-ray film photographs on a production basis, the company points out, extremely accurate limits must be maintained on three major points: Immersion time; solution strength and solution temperature. While the first two are at the discretion of the equipment operator, the third depends entirely upon conditions under which the equipment is used and may vary from day to day or hour to hour.

Lack of uniformity in "solution temperature" may nullify the first two factors and result in unsatisfactory prints. To eliminate this variable hazard, the unit illustrated circulates large quantities of controlled temperature water (at the recommended 65 degrees) around the



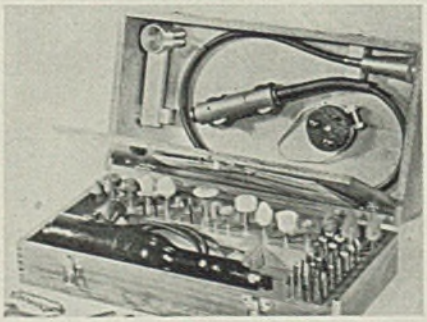
processing solution containers in the development tank. At the same time, according to the company, a large volume of clean controlled temperature water for washing the film or plates is always available because all used water is drained off and not recirculated.

A feature of the unit is that the waste water contacts the fresh water inlet coil, thus pre-cooling it and permitting the use of much smaller refrigeration equipment on high capacity installations. A simple adjusting handle on the outside of the cabinet can lower the water temperature of 65 degrees to 45 degrees for quick cooling in event fresh chemicals are dissolved in high temperature water or the system has been shut down for a considerable period.

Hand Tools

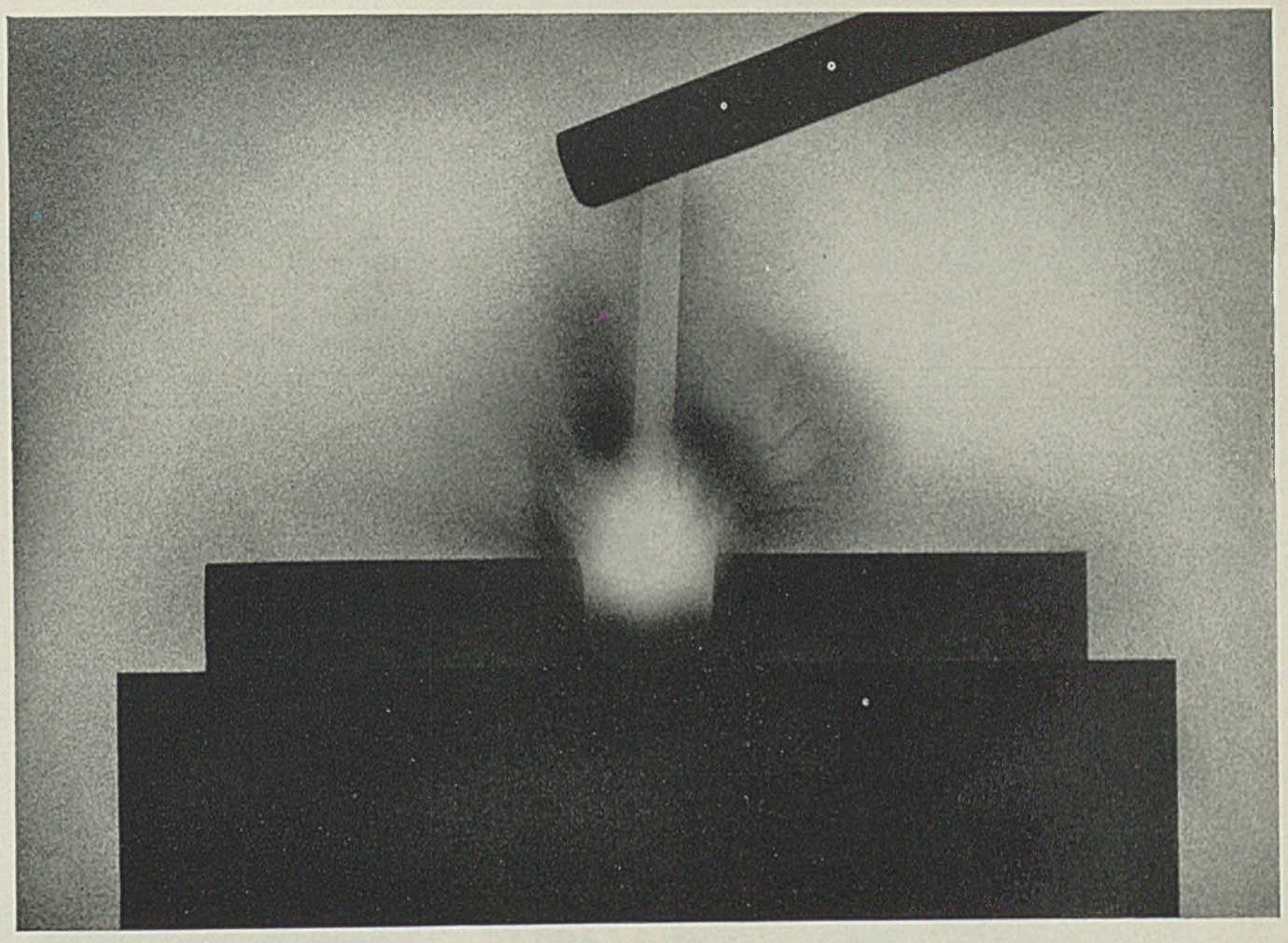
Precise Products Corp., Racine, Wis., announces two new developments in the line of hand tools—a new power shop tool, and a Coolflex flexible shaft attachment. One is used to aid the other in their versatile applications.

The shop tool runs 35,000 revolu-



tions per minute. At full load it develops 1/6 horsepower. With this power it can be used for touching up transmission gears, regrinding lathe centers, as an internal grinder in a lathe and for grinding radius to specification.

The tool features a plastic case, is



IN MAKING PLUG WELDS AND BOSSES CHANGE RODS BEFORE METAL AND SLAG COOL

BY USING the proper technique in making plug welds and bosses, it is possible to deposit a minimum of weld metal and save time besides. *It is not necessary to clean slag between layers. Burn the rod right down to the stub-end and start the new electrode quickly before metal and slag cool.* ¶ In spite of a nearly 80% increase in 1942 electrode production over 1941, the demand still exceeds the capacity of the industry to produce and every precaution for saving electrodes must be taken. ¶ We will gladly send you, without charge, reprints of the series of advertisements on this vital subject for posting in your welding department.

METAL & THERMIT CORPORATION

Specialists in welding for nearly 40 years. Manufacturers of Murex Electrodes for arc welding and of Thermit for repair and fabrication of heavy parts.

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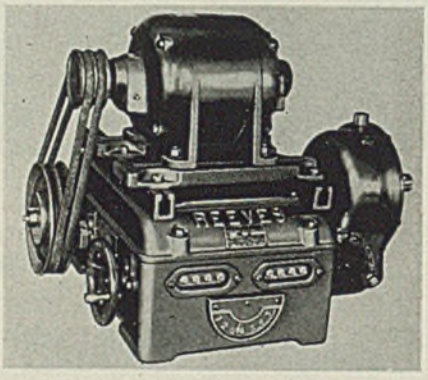
modernized and light in weight. Its motorshaft is supported by four oversize bearings—these being sealed. Other features include rubber coupling, new overload switch, automatic brush stop and eight-point grip collet.

The Coolflex flexible shaft attachment is merely an extended arm of the tool. It is ideal for working in cramped quarters. It is equipped with a small fan that takes in cool air through the handle of the handpiece, and blows it right over the working tool. The handpiece simply can't get hot. The attachment spindle runs in two oversize, ball bearings that are sealed from the outside, and equipped with large lubricant chambers.

Reducer Transmission

Reeves Pulley Co., Columbus, Ind., is offering a new reducer-type transmission which consists of a combination variable speed mechanism and gear reducer in single compact unit. Advantage of the drive, it is said, is far less mounting space is needed to obtain the lower range of



speeds which formerly required the use of auxiliary speed reducing equipment.

The transmission is offered in two enclosed designs—horizontal and vertical. These may be mounted in any position. Each is made in a wide range of speeds and in capacities from 1 to 7½ horsepower inclusive.

The transmission in various sizes produces ratios of speed variation from 2:1 through 12:1 and the reduction gears provide ratios up to and including 6.9:1. Speed changes can be made either manually or by mechanical or hydraulic methods, if desired.

Reduction gears are mounted on the variable shaft of the transmission, latter serving as the input shaft for the reducer unit. The gear reduction unit, which is integral with the transmission, is designed for severe torque demands of variable speed service. Shafts of the reducer proper are mounted on heavy ball radial bearings. All rotating parts in the reducer are splash lubricated. Three oil

IT'S GOOD SCRAP...

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Jeffrey can show you how to reduce alloy, ferrous or non-ferrous, "Hay" to one-third of original volume . . . remove oil and cutting compounds . . . handle it by conveyor system .. meet today's demand for speed and space.

Long coils of segregated metal turnings need not be a tough salvage problem . . . when crushed to shoveling size they bring better price . . . save two out of three railroad cars.

Besides metal turnings crushers, Jeffrey can furnish a complete handling system . . . conveyors, feeders, bins, elevators . . . designed specifically for your plant.

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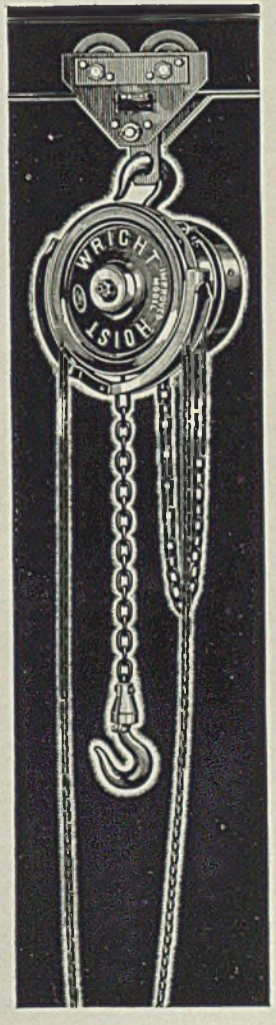
WATCH LOAD HOOK!



WRIGHT HOISTS are built to carry more than their rated capacities, but like other well-made pieces of mechanical equipment they should *not* be overloaded. Overloading is dangerous to men and imposes excessive strain on the hoist. Certainly, this is no time to take chances with either men or machines.

Watch the load hook. Wright load hooks are drop-forged from special steel which, when subjected to overloading, give visible warning by opening slowly. When the load hook has started to open, look to the top hook too, for while it is stronger than the bottom hook, it also may be reaching a danger point. When hooks show the effect of overloading, replace them immediately with new ones. Remember: repair parts are both easier and cheaper to get than a complete new hoist.

Send today for a free Crane Signal Chart. This chart (36" x 24") illustrates the various crane signals—and the use of the Wright system of crane signals will speed crane operation and promote safety. Write for your chart today.

WRIGHT MANUFACTURING DIVISION

York, Pa., Chicago, San Francisco, New York

AMERICAN CHAIN & CABLE COMPANY, INC.

BRIDGEPORT, CONNECTICUT

ACCO *In Business for Your Safety*

NAVY FLYING OVER THE WRIGHT HOIST PLANT

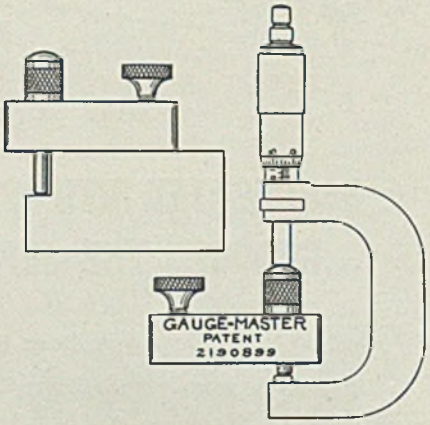
plugs are provided, one for determining the oil level, one for filling and one for draining the oil.

The transmission in either horizontal or vertical design may be equipped for individual motor drive with the use of a motor base.

Gage for Depth Measuring

Beale & Arnold Mfg. Co. Inc., 111 Glenwood avenue, Minneapolis, announces a Gauge Master for precision depth measuring. It is intended for use with a 2-inch micrometer to determine quickly and accurately depths which heretofore could only be taken with a depth micrometer.

The unit, it is reported, can be used anywhere a depth micrometer is used and in many places where it is impossible to use a depth "mike" because of the long barrel.



All parts of the gage are hardened. Surface coming in contact with the work is ground accurately to make depth measuring possible and accurate. It is equipped with two pins; each pin having a ½-inch movement. With the pins any depth from zero up can be measured. In using the gage, place it on the work as shown above, loosen lock screw to allow pin to seat itself, set lock screw and measure with 2-inch "mike" as indicated above. The micrometer reading then is the exact depth.

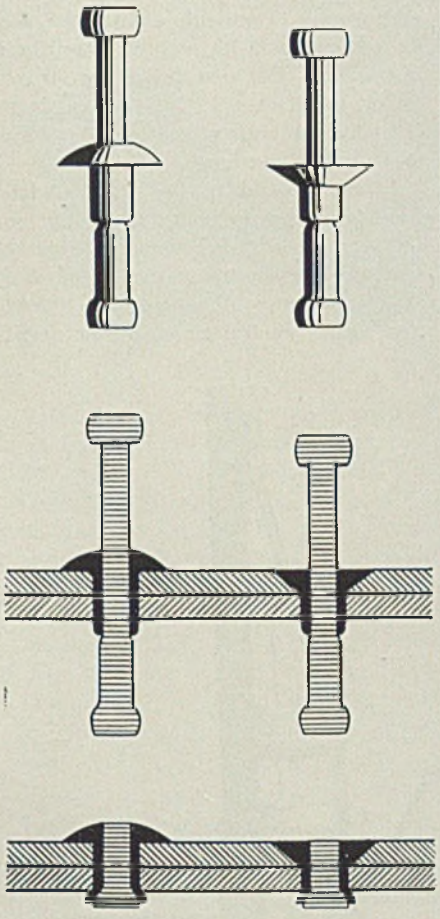
Blind Rivets

Cherry Rivet Co., 213 Winston street, Los Angeles, reports development of Cherry blind rivets designed primarily as a production speed-up for difficult riveting jobs.

Due to the uniformity of their head formation and shank expansion and the clinching action secured, these units are being used extensively in speeding up aircraft production it is said. They can be applied rapidly in places where it is almost impossible to use a conventional rivet. Standard drilling and dimpling

tools are used to apply them.

Only special tool required is the gun which is used to pull the stem or mandril with sufficient force to head the rivet on the blind side and break the stem. As the mandril is pulled through



the rivet a tulip head is formed on the blind side and the pieces being riveted are securely clinched together.

Illustration shows before and after application. Use of the rivets in building pressure tight cabins proved highly successful, the company stated.

Thyratron Tube

General Electric Electronics Department, Schenectady, N. Y., announces a new lightweight thyratron tube designed for applications where weight and space must be considered.

Designated as the GL-502, the new tube is a little over 2½ inches long, weighs about 2 ounces, is inert-gas-filled and of all-metal construction. It can be used in connection with industrial welding and any general control equipment.

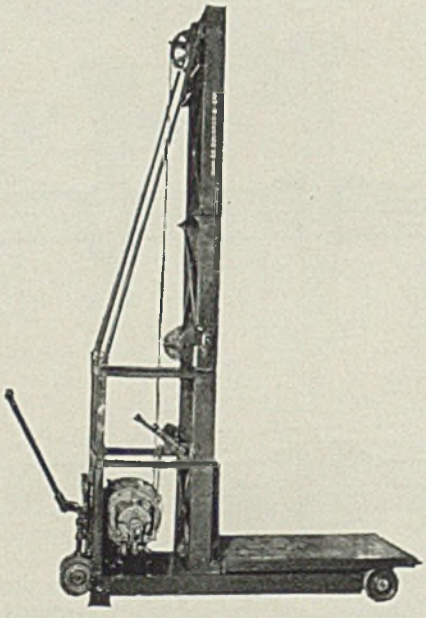
The grid-anode capacitance is low enough so that the new tube is relatively unaffected by line-voltage surges. It has a maximum peak inverse anode voltage rating of 1300 volts, instantaneous current rating of 500 milliamperes, and an average current rating of 100 milliam-

peres. The cathode is quick heating and is rated at 6.3 volts, 0.6 ampere.

Air Powered Stacker

Lewis-Shepard Sales Corp., Watertown, Mass., is offering a new air powered stacker, a portable elevator for use in connection with various hazardous operations. Powered by a rugged air motor, the stacker will operate efficiently at the same air pressure and volume as industrial overhead air hoists.

Precise control of the stacker platform is at the operator's finger tips so that any speed of lifting or lowering between the maximum top speed and zero is instantly obtainable. A "dead man" cable control stops the air motor



and stacker platform the instant the operator removes his hand from either one of the dual, holdover controls.

"Cable" control runs the full height of the stacker and is standard equipment. Units are offered in same speeds and capacities as the standard line of electric powered stackers; also in standard hinged and telescopic types for safety.

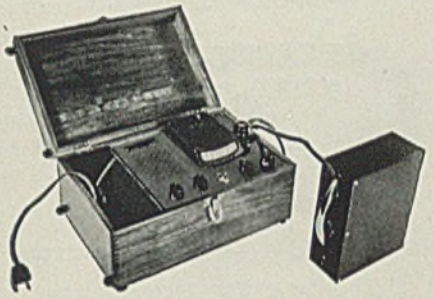
Glossmeter

Photovolt Corp., 95 Madison avenue, New York, announces a new photoelectric glossmeter for measuring specular gloss of paints and varnishes, ceramics, paper and machined or polished surfaces. It is particularly suited to register changes in specular gloss as a result of age, wear, abrasion, exposure to moisture, heat, light, vapors or sprays.

The unit comprises the instrument proper and the search unit which is connected to it by a flexible cable. The search unit may be placed on the sam-

ple to be tested. Or, the unit may be positioned with the opening pointing upwards so that the sample is placed on top of it. Samples can be of any size and may be measured in rapid succession.

The instrument is portable and is available in two models. Model 650 is op-

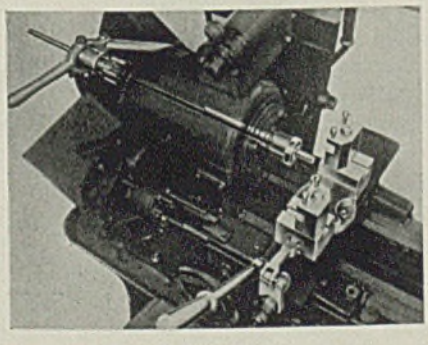


erated by dry-cell batteries housed in the instrument casing; model 660 is built for operation from 105-125 volt, 50-60 cycles alternating current, and also can be furnished for operation from a storage battery. Both models can be provided with extra search units for diffused reflection. The instruments are self-contained and built into a portable housing with cover and carrying strap. Operation is simple and convenient, and requires no training on the part of the user.

Lathe Accessories

Kessler Aero Products Co., 211 West Palm avenue, Burbank, Calif., is offering two new accessories that are claimed to convert most small and medium size engine lathes into the speed range of hand production screw machines.

The first—the quick-acting collet closing attachment handles accurate duplicate work on bar and tubing stock from



1/32-inch up to and including ½-inch diameter by chucking and releasing work while the lathe is running.

The lever-type cross slide used in conjunction with the collet closer permits forming and fast cut-off. Both attachments may be easily assembled without

machine work or interference with the normal operation of the lathe.

Industrial Goggles

Kimball Safety Products Co., 7314 Wade Park avenue, Cleveland, is offering a new type Looks industrial goggle patterned much after those of an aviators' in size and shape. This de-

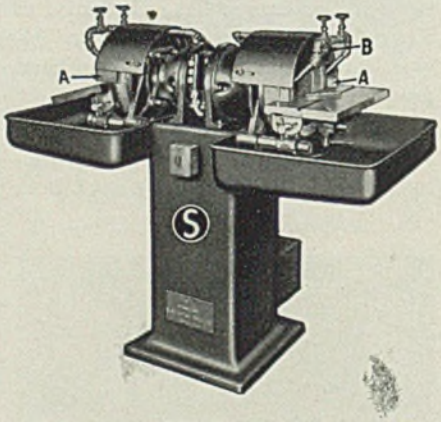
sign is said to provide unobstructed vision.

Lenses are of sheet cellulose acetate 0.040-inch thick—giving considerable shock resistance and at the same time keeping the weight to the very minimum. The goggles feature a large area of indirect ventilation. They are designed to fit over the wearer's spectacles.

Carbide Tool Grinders

Standard Electrical Tool Co., Dept. B-21, 2488 River road, Cincinnati, is offering a redesigned carbide tool grinder which now incorporates the latest features in construction. It is powered by a 3-horsepower, 1150 revolution per minute motor.

Unit's spindle ends are each equipped



with heavy steel backing plate for mounting cup type grinding wheels.

The new construction incorporates a rigid mounting for the work table at each side. The table is graduated and permits a 5-degree adjustment toward the wheel and 30-degree angle away from it. Each wheel is protected by a guard of special construction with an adjustable splash guard, latter being adjustable by means of a hand screw. Design of the machine permits optional use for either dry or wet grinding.

Job Training

(*Continued from Page* 105)

that in several days there would be an opening for a rivet machine operator so this new operator was immediately assigned to the riveting operation, saving training hours and automatically increasing production.

After the enrollment has been completed, the new employe receives a lecture on the particular type of apparatus on which he will work. It has been found that starting with a completed unit and explaining its purpose, what tests it is required to stand, the qualities of workmanship, the conditions under which the apparatus must operate, and in general the requirements of the finished product, tends to create a desire to learn more about the component parts. While the instructor still has the new person's questioning attitude aroused, he immediately starts with the first operation and works back, step by step, operation for operation, until he has completed the assembly of all the component parts. To aid in this discussion, the employe is given a complete set of written instructions. A moving picture based on the complete instructions is also used. While doing this, the instructor explains the importance of simple operations, which the new person might fail to realize if he did not know how essential it is in the completed unit.

Operations Explained Carefully

The instructor, who is also trained in motion economy and time study, points out during the lecture the reasons for performing the operation in a certain way, such as placement and use of hand tools, arrangement of the work bench, good housekeeping in general, safety rules and regulations. Also at this time the operator is shown a "job card," which is made up of the following items: Quality, good housekeeping, safety, adaptability, quantity, mental aptitude, etc., each of which carries a certain number of credits, based upon its importance.

After this general lecture, the new employe is then turned over to an individual instructor who is a specialist in specific operations and who has had special training in "instruction of new people" as prepared by the War Production Board. Once again the moving picture is brought back into use. This time to describe the technique or knack of operations, which enables the individual instructor to instruct a greater number of people at one time.

As the new employe starts his operation, his performance is watched very

closely by individual instructors and is periodically checked by the supervising instructor. This is done simply and easily through the use of the "enrollment sheet" and what is called the "standard training specification," and the "job card." The specification sheet has been arrived at by taking the maximum number of weeks allowed for the so-called "learning period" and changing them into the minimum and maximum hours. In so doing, the records show an average decrease over old training period from 14 to 8 weeks and with fewer rejects per new employe.

This specification makes it possible to check the performance of the average new employe to the hour, instead of week. This is of great value, for if the new employe does not perform accordingly, there is evidence that something is wrong. It might be adaptability, it might indicate signs of poor follow-up on the part of the instructors, or it might be the mental attitude of the person. Whatever the cause, it acts as an alarm to the supervisor of training.

The Job Card: Each new employe receives a "job card" at the time of his enrollment in the school. It shows the number of operations that are to be satisfactorily completed each day and is periodically checked by the instructor to whom they have been assigned. It also carries all the items of the grading sheet. If the records show that the new employe is not progressing according to schedule, the head instructor takes personal charge of the individual case, analyzing it very carefully to determine what has caused the failure.

This may be done by questioning the new employe in regards to special techniques of performing the operations. In many instances, the personal record, which is kept by the instructor, may be of value, as each instructor has been trained in dealing with "human relations" which makes it possible for him to analyze conditions which might exist. After it has been established that the new employe has had every advantage of instruction on this particular operation, it is considered a matter of adaptability; so he is then reassigned to another job. This has three advantages: It establishes a more efficient working force. It creates good will toward supervision. It carries with it a higher standard of morale.

Using these methods, it was found that from some 400 new employes who were given this type of basic training, 32 were changed to different operations when they had reached the maximum allowed hours on their first assignment and were not up to schedule. Out of the 32, only 4 completely failed, 7 were given another assignment of which but 2 completely failed.

It is interesting to note at this point, although 6 completely failed, the remaining 26 reached maximum efficiency after reassignment with lower percentage of rejects and in less time than the average new employe under old training methods. This, of course, is attributed to the fact that they all had received basic training and in general realized the importance of all operations pertaining to the finished apparatus. After the general lecture, each new employe must fill out questionnaire on each subject as presented.

Basic Training for Key People: A similar basic method has been used to train inspectors and group leaders in company policy, leadership, interpretation of production orders, motion economy, planning and scheduling of daily operations, instructing of new people, interpretation of drawings, electrical specifications and diagrams. Visual inspection and testing of windings and inspection standards, etc. Each subject is then followed up with a questionnaire.

Use of Motion Pictures and Slide Films: Advantages of using motion pictures to instruct the different operations are:

—It creates interest of the new employe, partly due to human curiosity.

—It establishes in the mind of the new employe a uniform method of performing the operation.

—It gives the manufacturing engineer and the time study man a chance to perfect the method of performing the operations before presenting them to the new employe.

—The use of all tools and equipment can be brought out much more clearly while being explained by a trained instructor in a classroom under much more favorable conditions than exist on the production line where there is noise and much confusion for the new person. "*Hearing is many times deceiving, but seeing is believing.*"

—Each operator views all of the operations from the *correct position*.

—Through the use of motion pictures the new operator learns quickly how to operate unfamiliar machines.

—A complete set of sound slide film on job instructor training equipment is used as a refresher for foremen and instructors.

It has been proved many times that the best tool of teaching is the use of some repetitive method. Therefore, the film "loop" is used in showing many difficult operations, repeating the operation over and over before the eyes of the trainee.

It is also possible, when using the speed-controlled low-wattage type projector, to stop the operation at the most important point for the new employe to study. It can be used to demonstrate good housekeeping, the proper placement and arrangement of tools and materials. It is a means of bringing before the new employe *hidden methods*. When an operation has been selected and properly photographed and shown to the new employe with each technique of performing the operation explained by a trained instructor, the chances for mistakes are few.

Use of Slide Film and Sound Equipment: Through the additional use of sound and slide-film equipment, scheduled classes are held periodically on foremen-employe relations, inducting the new employe and results of training. It gives management the chance to train foremen or key people in the planning of safety, improving production methods, motion analysis, planning job instructions, without having long drawn-out conferences or maintaining a large staff of technical instructors. Through the use of motion pictures, the foreman learns how to get the best from his men.

Planning and Scheduling Training Classes for Foremen, Assistant Foremen,

Chief Production Clerks: If the training program for the new employe or for any other operator is to be successful, it must be well supported by supervisors in the shop who have received training in inducting the new employe. Therefore, a training program for the foremen, assistant foremen and chief production clerks is scheduled under the shop training program. The instruction and lectures are given by the supervisors of different departments which are as follows:

—Quality Control, by a member of supervising staff of quality control

—Motion Analysis, by a member of supervising staff of time study

—Human Engineering, by a member of industrial relations staff

—Job Instructor Training, by an authorized instructor assigned by the Training Within Industry Office.

As soon as a group receives its instructions on all subjects, a new group is selected with a new member of each department presenting their particular subject to the new group. At the end of each session, each member of the class is given a questionnaire to fill out covering in detail each subject. These are carefully gone over and analyzed.

It is here decided whether there is anyone who should attend another class or if they all have a complete understanding of the subjects as presented. This system has two advantages:

It helps to develop executive material while doing a job of training for the shop. It has been our experience that, regardless of how elaborate or how simple a training program is to be, it must first be well planned and scheduled and *followed through* in some form of practical examination, if it is to be successful.

Equipment Used: All equipment is bought by the company and is maintained and operated by certain individuals in several departments, such as time study, training school and industrial relations.

This method of analyzing the operations and taking pictures is quite broad, as it establishes the correct sequence of operation and gives the new employe a chance to visualize motion economy.

Slide and film on many different subjects can be purchased or rented. Many times during the making of a picture, extra motions or foreign elements are detected that would not be detected otherwise. This is, of course, why moving pictures are used to such a great extent by motion analysis men. This method of training new employes has proved very successful in several departments and is now being extended to all other operations on winding and assembly. We feel that this method will be of great value in training women to operate machines and do other work now being performed by men who will be called to the Army.

If every industrial plant in America today had those lost hours and lost pieces of material that are wasted due to a "poorly trained operator" getting started on the job before he is ready, we would have "Much More—Much Earlier" for our fighting men instead of "Too Little—Too Late."

"The Welding of Piping" Book Offered by Airco

"The Welding of Piping" is the title of a 16-page illustrated treatise prepared by Air Reduction Co.'s applied engineering department. It consists of a periodical series of articles covering various types of ferrous and nonferrous piping, their dimensions, fabrication, and estimates of welding and labor costs.

Copies may be procured on request from the company's offices, 60 East Forty-second street, New York.

Carbon—Refractory

(*Concluded from Page 110*)

age. Carbon paste shrinks up to 2 per cent in baking into the solid block, while preformed blocks after baking to 1000 degrees Cent. (1832 degrees Fahr.) shrink little thereafter. Also tamping in large masses of hot carbon paste is an unattractive job for the fumes are most unpleasant to breathe, the men should wear masks, and the volatile pitch vapors frequently burn the exposed skin of the workman. Again, as the carbon mass bakes out the pitch vapors fill the cell room and prove highly disagreeable.

Different kinds of carbon are used for different purposes dependent on the usage, but they are all treated about the same in installation. The paste is heated up in some sort of a metal box or pan placed over a coke or gas fire which can be controlled to some extent. The temperature of the paste must be watched carefully, for it must be hot enough to bond well to the blocks but if it is too hot, too much of the volatile constituents will be driven off and the paste will be dry and brittle and will not even stick together. The usual range of temperature is 100 to 140 degrees Cent. (100 to 284 degrees Fahr.) depending on the type and amount of bond. Only small quantities of the paste should be heated up at a time and the surfaces to be bonded should be painted with tar before the paste is rammed against them. Fig. 8 shows a modern aluminum pot in an European plant, having a single Soderberg electrode covering practically the whole top of the pot.

Second in amount of carbon used for refractory purposes are the various types of ferroalloy furnaces, ferrosilicon, ferromanganese, etc., some calcium carbide furnaces and all furnaces producing phosphorus, ferrophosphorus, and phosphoric acid electrically. Such furnaces vary in size from a few hundred horsepower to 25,000, and from a pot not much bigger than a good size watering trough to a shell 25 feet diameter and 8 to 15 feet deep. The first such usage of carbon was in the pot in which the first calcium carbide was produced at Spray, N. C. in 1896, and year by year has increased until its volume has reached important proportions.

While some aluminum pots have linings tamped in and baked in place, practically without exception furnaces of the ferroalloy type are lined with preformed and furnace-baked blocks cut or otherwise shaped to conform to the furnace dimensions. Such furnaces may be of relatively simple form, round, square, or rectangular, or in some cases may become complicated and involved, at least in the original design. In general it should be said that the simpler the design the better. Also, the larger the blocks and the fewer the joints, the less the chances are for leakage, runouts, and trouble.

Such linings can be laid-up in two ways, one with all surfaces machined so that all joints are practically carbon block to carbon block, an expensive method not generally necessary, but preferred by some operators in spite of the cost. A special graphite cement in a thin layer is used between the blocks. The second method using wide joints is like that described in connection with the aluminum pots and involves much less machining, and is consequently a little cheaper. Figs. 12, and 11 show the blocks for a ferroalloy furnace lining laid out on the assembly floor for checking.

(*Concluded in next weeks issue*)

References

[1]"Carbon and Graphite" by F. J. Vosburgh, *Chemical and Metallurgical Engineering*, Nov. 1938, and table same date and Oct. 1940.

[2]"Temperature Gradients Through Composition Carbon Columns and their Application to Blast Furnace Linings" by F. J. Vosburgh and M. R. Hatfield, *Metals Technology*, Sept. 1941.

[3]"Thermal Expansion of Refractories" by F. H. Norton, Journal of the American Ceramic Society, Dec. 1925.

Fatigue of Steel

(*Continued from Page* 112)

stress. Relative curvature and, therefore, compressive stress can be varied by the choice of pressure angle. In general, little is to be gained by designing wide-face gears except the doubtful satisfaction of dealing with smaller stress numbers.

In high-speed gears, pitting may occur when gears are transmitting no load. This is sometimes seen in the reverse idler gear of automobile transmissions. Although this form of transmission trouble is rare and occurs only when other conditions, such as hardness, are unfavorable, it serves to emphasize the part played by the lubricant in promoting fatigue. A reverse idler running submerged in oil will trap the oil between the gear teeth and if the clearances are small will induce extremely high surface pressures.

Engineers are familiar with the high temperature generated in gear boxes when too generously supplied with oil, but this is not always interpreted as a fatigue hazard. High-speed gears should be lubricated by jets of low-viscosity oil directed at the teeth as they are coming out of mesh, not on the incoming side. This form of lubrication will wash away the heat of friction while it is still on the surfaces of the teeth and will prevent excess oil from reaching the contacting teeth providing the sump is dry.

There is evidence indicating that oil further contributes to pitting fatigue by entering surface fissures where, under hydrostatic pressure, the fissures are extended until pieces are lifted out of the surfaces of the teeth.

The Road Ahead: There is still some distance to go before designers and producers of light-weight dynamically loaded machines can make full use of structural materials. They must learn they cannot tell the machine parts what to do but rather must do as they are told by the machine parts. The rate at which progress develops will, in large part, depend upon the accuracy of interpretation of the complaints made by the machine elements. These complaints are not easily interpreted because they are often made in terms not understood.

These things we know: Steel, under most laboratory conditions of repetitive stress, has a fairly well defined limit of stress, known as the fatigue endurance limit, below which it will endure for an infinite number of stress cycles. Also, the fatigue endurance limit of steel is roughly proportional to the ultimate strength of the material but the proportionality varies with the range of the applied stress. Under certain other test conditions, steel does not have a fatigue limit. Rough surfaces, notches, section changes and other discontinuities are detrimental to fatigue strength.

The preferred laboratory fatigue test specimen is carefully prepared to avoid all surface imperfections, abrupt section changes, internal stresses, and other stress raisers. This is considered necessary because the investigator is usually interested in the properties of the material undergoing test, and he naturally seeks to eliminate all factors that would tend to obscure these inherent properties. There can be no objection to this procedure as it refers to the test specimens, but the data thus obtained have little bearing on the fatigue characteristics of machine parts made from the same material and given the same heat treatment in which surface irregularities, abrupt changes in section and internal stresses are almost always present.

In presenting such fatigue data, the metallurgist may be likened to the seed catalog artist who paints the beautiful flower pictures that so arouse our gardening instincts every spring. The engineer is the gardner who hopefully plants the seeds and who reaps the disappointments of labors. The failure of the

garden is usually not the fault of the seeds. The catalog pictures are intended to show what can be accomplished under favorable conditions, and the artist should not be blamed for the poor garden soil, frost, drouth and the scores of other things that make the average garden look so unlike the catalog pictures. Similar disappointments are met when we attempt to apply the data from laboratory fatigue test on ideal specimens to the design of machine parts, more particularly for machines in which efficient use must be made of material under dynamic loading.

In the design of machines and equipment for heavy duty, where the number of units produced is small, the present practice of designing to large factors of safety is justified because the expense involved in preparing designs to approach the exact requirements would far exceed the savings in weight and material.

The same economic considerations that justify overdesign in low production volume equipment designs of low weight and high stress in many machine parts where weight is all important, as in airplanes or in large production volume machines such as automobiles, where both weight and cost must be considered. Obviously, the dynamically loaded parts of such machine should be designed with accurate knowledge of their fatigue strength.

When we try to apply quantitatively the accumulated laboratory fatigue data to such problems, we find that they are almost useless. Published data on fatigue assume (1) that stress can be determined, (2) that laboratory test specimens are representative of a material when that material is formed into a machine part, (3) that the amount and nature of the applied load are known, (4) that load variations occur in an orderly and predictable manner, (5) that representative fatigue curves can be constructed from a dozen or less specimens and (6) that machine parts must be stressed below the fatigue limit to be successful. These assumptions are not justified in practical design.

Stress Cannot Be Calculated: From the data on internal stresses that have been discussed, we may reasonably have some misgivings about the reliability of stress calculation. From experience with practical machine parts we can only conclude that stress calculation by textbook methods is wholly inadequate until we generously temper calculated results with experience.

For example, crankshafts can be stressed by the usual methods of calculation to 20,000 pounds per square inch; connecting rods are stressed to 40,000 pounds per square inch; valve springs to 90,000 pounds per square inch; disk clutch springs to 180,000 pounds per square inch, while another form of disk spring supports, by calculation, 600,000 pounds per square inch. Obviously some of these stress values are ridiculous, but the formulas used in each case conform to the "laws" of mechanics. The actual stress in crankshafts is probably several times 20,000 pounds per square inch, while the 600,000 pounds per square inch in the disk spring is not reached because of yielding in local highly stressed regions.

The unreliability of stress calculations has almost been forgotten by seasoned designers because they no longer take the numerical values of their stress calculations literally. Instead, they have learned by experience that, by the usual methods of calculation, the numerical values have different meanings for different machine parts—that is, somewhat rough empirical correction factors are applied.

Extensometer of Doubtful Value: There is a growing interest in various devices employed to make direct measurement of stress, such as photoelasticity, brittle lacquers, extensometers, and similar instrumentation, in the belief

that these devices will provide accurate stress data. The accuracy of stress data from such measurements is usually greater than can be obtained from the most involved mathematical analysis, but that they are far from reliable can easily be shown by fatigue tests. Two specimens of identical material, heat treatment and dimensions will show identical stress when measured by photoelasticity or by extensometer, yet these specimens may vary widely in fatigue strength depending upon minute differences in surface finish or internal stresses.

Since internal stresses are often desirable and are frequently unavoidable due to processing operations such as machining, heat treating, straightening or grinding, as has been discussed, and since surface finishes vary all the way from rough forgings to lapped or honed surfaces, there is little reason to expect accuracy from extensometer readings and even less for photoelastic tests since the specimens for this test must be free from internal stresses and must be made of another material.

Photoelastic and extensometer readings are measures of elasticity in which the changes in dimensions are the statistical average of all the material involved in the measurement. Fatigue tests provide a strength measure of the weakest portion of the material involved, usually at the surface, even though it be submicroscopic in size. Obviously, we cannot expect agreement between fatigue measures of stress and the stress readings obtained from elastic measurements.

Even if stress could be determined, the fatigue data from laboratory specimens could not be used because machine parts cannot be finished with the care and exactness that is given laboratory specimens. Abrupt section changes cannot be avoided, high internal stresses are often present as a result of processing or because of local heating as from bearing friction, surfaces are subject to bruises and to corrosion of various kinds. These effects cannot be evaluated in terms of stress raisers in controlled laboratory specimens.

Operating Loads Rarely Known: In the kind of machines under discussion, the dynamic loads are rarely constant for any appreciable time but vary up and down the load scale in unpredictable manner. Only a small percentage of the total number of stress cycles are at maximum load, and this percentage will not be the same in the hands of any two operators. This brings up the question of damage by overstress and recovery by understress as has been observed by several investigators in tests of laboratory fatigue specimens. No doubt such effects occur also in dynamically loaded machine parts, but how are such laboratory data to be applied to machine parts when the schedule of overload and underload is beyond control?

This apparently hopeless situation is not, however, as hopeless as it seems. We have done a reasonably satisfactory job in the past without worrying too much about the shortcomings of the methods used. We may be certain that we will do better in the future as more experience is gained, and it is in the accumulation and organization of this experience that we can best serve the needs of the future. It is probable that fatigue studies will play increasingly important parts in future designs; but these studies will be based on fatigue tests of actual, full-scale machine parts instead of on laboratory specimens.

Fatigue Tests on Machine Parts: Fatigue tests of full-scale machine parts have been made by many laboratories for a long time, but since these tests have usually been made for the purpose of comparing one material, design or process with another material, design or process, the tests have been run at arbitray constant loads without thought to the fatigue curve characteristics and often without adequate correlation with service

requirements. Because of this procedure, we have made little use of the vast quantities of such fatigue data now locked in our files insofar as establishing a basis for evalulating material, design or process for future use is concerned.

In the few cases where fatigue data on machine parts have been properly organized, we find they reveal astonishing amounts of fundamental information about the many variables present in machine elements, many of which are not even qualitatively revealed by ideal laboratory fatigue specimens.

Fatigue data are mortality data, and it is just as absurd to expect that reliable acturial tables can be constructed from mortality data on a half dozen individuals as to expect reliable comparisons from fatigue tests on a half-dozen machine parts. When enough machine parts are tested at constant load and plotted in the manner of the well known mortality curve for human life expectancy, we find remarkable similarity to human mortality experience.

Insufficient Test Data: Reliable life comparison of machine parts demands a large number of tests unless the life difference is great. It is obvious from the mortality charts that, on the basis of a few tests, the poorer design, material or process may rate higher than the better design, material or process. Yet nowhere in the literature do we find fatigue data approaching even the minimum requirements of reliability. The reason is largely that most investigators in this field, particularly in work on steel, assume we have no interest in data at any stress except the stress at which the specimen will endure indefinitely.

In practical fatigue testing of machine parts, it should be obvious that comparisons of material, design or processing cannot be made unless the tests are run to failure and the comparisons are made on the number of stress cycles each will endure. This is true whether or not the part being tested is required to withstand in service a large number of stress reversals at maximum load such as a crankshaft or a relatively small number of stress reversals at maximum load, such as chassis springs.

Boron in Steel

(*Concluded from Page* 131)

residue 15 to 20 minutes. Allow to cool and add 5 milliliter distilled water, then slowly add dropwise H_2SO_4 (1-1) until all is dissolved and the solution is slightly acid. Avoid an excess of more than four or five drops. Transfer to a marked test tube and rinse the crucible with two 1-milliliter portions of water, add approximately 0.02-gram Na_2SO_3, cool and dilute to the 10 milliliter mark and mix well. This solution contains the boron which is insoluble in H_2SO_4 (1-4).

Pipette 2.0 milliliter aliquote of each of the two foregoing prepared portions into dry comparison bottles. Slowly add 20 milliliters of 98.5 per cent H_2SO_4 to each, stopper, cool and then add 1.0 milliliter of the quinalizarin solution from pipette, stopper and mix by swirling gently. The salts formed in the bottle containing the acid soluble portion will settle sufficiently for comparison after standing for an hour (preferably over night) while the color produced in the acid insoluble portion may be compared after standing 15 minutes since no salts are precipitated.

By starting smaller samples than 1.0 gram and/or by using smaller aliquots, greater percentages of boron may be determined.

References

[1]Hague & Bright, National Bureau of Standards, Research Paper No. 21, page 125, 1938.

[2]Berger, K. C. and Truog, E., *Industrial and Engineering Chemistry*, analytical edition, Oct. 15, 1939, pages 540-545.

[3]Smith, G. S., *The Analyst*, volume 60, page 735, 1935.

NE Alloy Steels

(Continued from Page 118)

tion at increased cooling rates from the hardening temperature. That cooling rate which just results in complete transformation of austenite to martensite is known as the critical cooling rate.

For a given type of quench, the rate of cooling at the center of a small section size may be equal to, or in excess of the critical cooling rate under which condition a fully martensitic quenched structure would be obtained corresponding to a fully hardened condition. If on the other hand the section was so large that the cooling rate at the center was less than the critical cooling rate, then only that portion of austenite on the periphery would be transformed to martensite while the center would be transformed to pearlite, a relatively coarse mixture of carbide and ferrite, and would merge into the hardened martensite zone.

Therefore, a steel that has not been thorough hardened will not exhibit the superior properties of a fully hardened steel when tempered after quenching. The reason for superior properties in a fully hardened steel is attributed to the refinement of carbide precipitation which is effected through the decomposition of martensite on tempering.

Factors Affecting the Hardenability of Steels. The hardenability of any steel is dependent to the greatest extent on intensive factors related mainly to inherent properties of the steel and to a lesser extent on extensive factor which are mainly dependent on the method of heat treatment.

Intensive Factors: The intensive factors controlling the degree of hardenability of steels can be classified as these which directly affect the chemical analysis and those which, as a result of the method of processing, tend to show a pronounced effect on the hardenability characteristics.

Chemical Composition: The hardenability of a steel is mainly controlled by its chemical composition, the most important hardening element being carbon. As the carbon content of the steel increases, therefore, the greater will be its hardenability. Hardenability is not, however, entirely controlled by the carbon content, for other elements such as manganese, silicon, nickel, chromium, vanadium, molybdenum, tungsten, phosphorus, sulphur, etc. possess the property of lowering the critical cooling rate, although not all are effective to the same degree and therefore, permit the steel to harden to greater depths.

The influence of the alloying elements in lowering the critical cooling rate is probably four fold: One, they change the distribution and size of carbides in the ferrite matrix by reason of volume differences; two, they change the properties of the ferrite by dissolving in it; three, they change the quality or type of carbide as compared with cementite; and four they decrease the rates of diffusion which in turn decrease the rates of transformation.

The amount of any element which will decrease the critical cooling velocity is dependent of the extent of its action in regards to the above listed effects. The solid solution elements such as aluminum, nickel, silicon, phosphorus, sulphur and copper mainly lower the critical cooling rate by virtue of decreased diffusion, while the carbide forming elements such as molybdenum, chromium, vanadium and tungsten form stabilized carbides, the precipitation of which from austenite is more sluggish. Manganese acts in both ways, since under certain conditions it tends to be a strong carbide former as well as solid solution element.

In view of this fact, all elements have been assigned a hardenability factor which in a sense is a measurement of its effect in lowering the critical cooling rate. The hardenability factors for

elements commonly found in steel are as follows:

Carbon	.30
Manganese	.8
Phosphorus	.40
Sulphur	.10
Silicon	.5
Nickel	.4
Chromium	.5
Molybdenum	.16
Vanadium	.20
Copper	.4

Method of Processing: The hardenability of steel is somewhat affected by the manufacturing process, namely in regard to the melting practice and mill practice.

Melting Practice: Variation in the hardenability of a steel can be attributed to the melting procedure, since such factors as the deoxidation practice, grain size, nonmetallics and unspecified impurities do, under certain circumstances, materially effect large deviations from expectant hardenability results.

Deoxidation Practice: It has long been known that heats of identical composition might possess different hardenability characteristics by virtue of variations in deoxidation of the heats of steel. The deoxidation of a heat by means of aluminum may give lower hardenability than a similar heat which has been killed by silicon even though the grain size of both heats is identical. The effectiveness of the use of deoxidizers on hardenability has been indicated by the use of special alloyed deoxidizers such as "Grainal" or "Silicaz." The recently published report on special alloy addition agents, see STEEL, March 15, p. 94, shows that special alloyed deoxidizers containing aluminum, calcium, manganese, silicon with small additions of powerful deoxidizers such as boron, zirconium and titanium increase the hardenability of high manganese steels from one to five times. In view of this new method of increasing the hardenability and reserving critical alloys, it will not be surprising to find such applications on steels in the near future.

Grain Size: Although grain size control is mainly the result of the deoxidation process, the general statement that increased grain size results in increased hardenability steel holds true. This results from the fact that nucleation for the austenite transformation preferentially starts at the grain boundaries, therefore, the less grain boundaries present, the greater the retardation by virtue of insufficient nucleation.

Nonmetallics: Nonmetallics such as oxides, sulphides, silicates or aluminates may either act as inhibitors of nucleation and thus increase the hardenability or they may serve as nuclei for the transformation, in which case they would tend to decrease the hardenability.

Unspecified Impurities: In many alloys, the presence of residuals or distinctly harmful alloys is seldom reported. The presence of small amounts of chromium, nickel, molybdenum and copper as well as arsenic, tin, phosphorus and sulphur are seldom reported although the latter elements usually deemed harmful, even though present in small quantities, may exert a powerful influence on the hardenability as well as physical properties of steel. This may be analagous to residuals from alloyed deoxidizers which materially affect the hardening characteristics of steels.

Mill Practice: Although the effect of mill practice on the hardenability characteristics of a heat of steel is not pronounced, such factors as ingot size, discard, and amount of hot work might materially effect abnormal hardenability.

Ingot size is a predominating factor in controlling segregation. The larger the ingot size, the lower the freezing rate with greater resultant segregation and therefore, an equivalent variation

in the hardenability from bottom to the top of the ingot.

The amount of discard on blooms and billets controls the segregation reminent from the ingot. The greater the discard the more uniformity in hardenability on billets from a single ingot.

The primary purpose of hot working steel is to break up all segregation or ingot patterns so as to insure uniform composition. The higher the temperature and the greater the working, the more uniform the hardening characteristics.

There are several indications that banding, especially predominate in high manganese steels contributed toward increased hardenability.

Extensive Factors: It has been pointed out that the main control in varying the critical cooling rate and therefore the hardenability of a steel is invested in the intensive hardenability factors. However, the extensive factors such as pretreatment, and quenching procedure have a marked influence, since these factors affect the means of attaining the critical cooling rate.

Treatment Prior to Hardening: The more homogeneous the structure prior to hardening, the greater and more uniform the hardenability of the steel. The employment of a high-temperature prenormalizing or annealing treatment prior to hardening produces maximum hardenability.

Quenching Procedure: The attachment of desired hardness can only be achieved by proper quenching procedures. Where the alloy content is insufficient to achieve the critical cooling rate, steps must be taken to provide quenching media with greater coolant power.

The higher the quenching temperature, the greater the homogenizing effect during austenizing and greater the hardenability.

The type of quenching media determines the maximum cooling velocity which is attainable. For extremely high cooling velocity it is necessary to resort to 5 per cent sodium-oxygen-hydrogen solutions, however, where the amount of alloying necessitates very low critical cooling rates, oils of various viscosities may be used. This effect is shown in curves of Fig. 2.

The temperature of the quenching media controls the viscosity. The viscosity in turn is inversely proportional to the cooling power. Therefore increased rates of cooling may be attained by heated quenching media.

Means of Comparing Hardenability Data: Hardenability characteristics of steel can be compared in several ways. A relative indication of the hardenability merits can be calculated by means of a summation of hardenability factors of elements predominant in the chemical composition. It must, however, be strongly emphasized that this comparison number is not an absolute criterion of the hardenability, since combinations of alloys will in some respects affect the hardenability factors of each other.

The second means of comparing hardenability data is by actual end-quench hardenability tests which correlate absolute hardness as a function of measured cooling velocity.

Hardenability Levels: The hardenability level of any steel can be calculated in terms of its comparison number. For example, the hardenability heats of NE-8739 steel shown in Fig. 1 can be calculated in the following manner:

NE-8739 (Low)

% Content X 100	Hardening Factor	Value
C — 37	30	1110
Mn — 81	8	648
P — 3	40	120
S — 3	10	30
Si — 30	5	150
Ni — 46	4	184
Cr — 46	5	230

Mo — 22	16	352
Comparison Number		2824

NE-8739 (High)

% Content X 100	Hardening Factor	Value
C — 42	30	1260
Mn — 99	8	992
P — 3	40	120
S — 3	10	30
Si — 30	5	150
Ni — 58	4	232
Cr — 68	5	340
Mo — 26	16	416
Comparison Number		3340

It can readily be seen that the comparison number indicates the higher alloy heat of NE-8739 to have a greater hardenability. The mean specified composition of NE-8739 shows a comparison number of 3064.

End-Quench Hardenability Data: This method of measuring hardenability, more commonly known as the Jominy test, consists of water quenching on end of a 1-inch diameter cylinder of the steel under closely controlled test conditions. The properly prepared and heated bar is placed into a fixture and subjected to quenching by a controlled flow of water. In this way, a definite cooling rate corresponding to a given hardness along the length of the test cylinder is obtained. Fig. 1 shows the range of end-quench hardenability data obtained on NE-8739.

Conversion of Hardenability Data: Standard end-quench hardenability data, if available, can be used very advantageously to approximate the depth of hardening on any given section size, as well as to evaluate certain physical properties which might be obtained on tempering, providing the section under consideration represents a fully hardened condition.

Calculation of U-Curves: The depth of hardening on any section size can be ascertained by using as reference the cooling curve data in Fig. 2 and end-quench hardenability data. For illustration, we have selected the hardenability data of the low and high heats of NE-8739 as shown in Fig. 1 and compared them with data actually taken at this plant employing an average type of oil quench. The analysis of the NE-8739 used for actual depth of hardness determinations was as follows: Carbon, 0.38 per cent; manganese, 0.86; phosphorus, 0.025; sulphur, 0.018; silicon, 0.32; nickel, 0.49; chromium, 0.51; molybdenum, 0.24.

Table I shows the sequence of calculations made in obtaining depth of hardness curves for various section sizes. Column 1 represents arbitrarily selected reference points for the various section sizes. Column 2 shows the cooling velocity at 1300 degrees Fahr. at the various selected points as obtained from the cooling rate curve in Fig. 2. Column 3 represents the position on the end-quench hardenability test which has an equivalent cooling rate to that shown in column 2. This may be read directly from the curves in Fig. 1. Columns 4, 5 and 6 represent the hardness values as read from the hardenability curve at the points of equivalent cooling velocity.

Fig. 3 shows the calculated data and actual data plotted as depth of hardness curves. It can be noted that within limits of calculation and experimentation the actual curves lie well in the region of hardness characteristic of the low and high hardenability heats of NE-8739.

Evaluation of Physical Properties: The physical properties of NE steels can be evaluated to surprisingly great accuracy providing the section sizes to which the physical properties refer have been fully hardened prior to tempering. For illustrative purposes, the evaluated physical properties of NE-8739 as characterized by their depth of hardness curves can be compared with actual quenched and

tempered physical data on a heat of NE-8739 taken by our laboratory.

Tensile Strength: It is evident that the maximum section size of NE-8739 which will fully harden, employing average quenching conditions is a 1-inch round. Therefore, supposing a 1-inch maximum section size part is quenched and drawn to 300 brinell. The tensile strength corresponding to this hardness as read from Fig. 4 will be 150,000 pounds per square inch. The drawing temperature as read from Curve B in Fig. 5 will be 1100 degrees Fahr.

The yield point corresponding to 150,000 pounds per square inch tensile strength is 130,000 pounds per square inch as read from Fig. 6.

The ductility characteristics as measured by the elongation and reduction of area can also be read from Fig. 7. For 150,000 pounds per square inch the curves show an elongation of 19 per cent and a reduction of area of 54 per cent.

A comparison of evaluated and actual physical properties can now be made. Comparing respective actual and calculated values, we have: Hardness—302 against 300 brinell; tensile strength—148,500 against 150,000 pounds per square inch; elongation—16 against 19 per cent; reduction of area—57 against 55 per cent.

It can be emphasized that the applicability of the physical property curves to the newly proposed NE-9400, 9500 and 9600 series is perfectly justified providing the added stipulation of the fully hardened requirement is adhered to.

General Characteristics of NE Steels: Generally speaking, the selection of NE substitutes must be made in accordance with the specific needs of every individual case where substitution is necessary. However, there are certain general characteristics evident in these steels which might be considered in their application:

—Alloys of low hardenability, with exception of carburizing grades include: NE-1330, 1335, 1340, 8630, 8635, 8637, 9430, 9435, 9437, 9630, 9637, 9642. Due to the limited amount of alloy content as well as possible variations in carbon, precautions should be taken to attain the maximum cooling velocities in heat treat procedure in order to obtain desired hardenabilities. Drastic quenching media should not be resorted to, in view of high manganese contents. Added cooling velocities should be attained by temperature and circulation control of the quenching oil.

—Alloys of medium hardenability include: NE-1345, 1350, 8640, 8642, 8645, 8650, 9255, 9260, 9262, 9445, 9450, 9645, 9650. Representative and consistent hardening results can only be obtained by precautionary methods in heat treat practice.

—Alloys of high hardenability include: NE-8442, 9537, 9540, 9542, 9550. The hardenability of the steels is comparable with the deeper hardening SAE steels. Therefore, heat treat practice should not deviate appreciably from that used for the SAE steels.

—In the case of SAE steels, the intensive hardenability factors were more prominent in determining the hardening characteristics of steels, while in the case of the NE steels the extensive hardenability factors are of equal importance.

—The tempering temperatures of fully hardened NE steels, for a given hardness, are generally slightly lower than for corresponding SAE steels due to limitations on carbide stabilizing elements.

—The impact properties of quenched and tempered structures of the NE steels, both at room temperature and subcritical temperatures, are equivalent to those obtained in SAE compositions, impact strength being primarily a function of hardness and carbon content. Added impact resistance such as was afforded through the presence of nickel in the SAE steels is somewhat equalized by the

presence of manganese and silicon which on their action as solid solution elements, similar to nickel, increase the toughness of ferrite.

—The machinability of NE steels is equivalent to, or better than a majority of SAE compositions of the same category. The contributing factors being attributed to decreased toughness of the matrix as well as better breakdown during annealing due to limited amount of carbide stabilizing elements. An example may be cited where the isothermal annealing of SAE X-4340 resulted in a brinell hardness of 196 to 212, while a similar cycle on NE-8949 resulted in a brinell hardness of 174 to 187.

—The high manganese occasionally found in the NE steels might result in bad surface conditions and decarburization as a result of forging practice.

—The strong deoxidation tendencies of manganese and silicon may result in excessive banding in steels containing appreciable amounts of these elements. Banding tends to produce abnormal headening and as a result marked distortion during heat treatment.

—Although the carburizing characteristics of some of the NE steels such as NE-8720 are comparable to the standard SAE-2315 and SAE-4615, it must be remembered that steels of this series especially high in manganese are subject to extremely brittle cases and grain growth tendencies in the core. Steels with high silicon content tend to retard carburization due to its strong graphitizing action.

Wax Coatings

(*Continued from Page* 122)

a salt spray chamber according to ASTM specifications. Both brackets were Parkerized. In addition, one of them was given a coating of Johnson's rust-inhibiting wax No. 1569.

After the test the bracket which was not waxed showed definite pitting and corrosion while the bracket with the wax finish was completely free from pitting or blemishes of any kind.

In one of the most interesting tests conducted recently, ordnance parts finished with Parkerized Lubrite were coated with oil. Other identical parts received a rust inhibiting wax coating instead of oil. It was found that the wax not only gave better protection to the parts but materially improved the performance of the equipment. The reason was that the wax provides a dry lubrication, so cannot "gum" up parts under severe weather conditions. Wax always hardens quickly upon application.

Being dry it is not "soaked away" by contact with absorbent materials and so retains its protective properties for a considerable period of time. Also, dirt does not cling to the dry wax finish.

The desirability of a wax finish from the appearance standpoint is well known because the fine, satiny wax luster has depth of beauty and very good "eye appeal". A wax finish does not show fingermarks.

While wax finishes may be buffed to a high luster, they also can be designed to produce a dull lusterless finish where that type of surface is desired. For instance a black rust-inhibiting wax is used to give added protection to bayonets and also to reduce light reflection. These waxes are also being used successfully over Parkerized ordnance items such as gun parts and Springfield rifle clips.

In most instances these rust inhibiting waxes are used over surfaces which have been Parkerized, Bonderized or treated in some similar manner. However, there are a good many instances where these finishes are used directly over bare steel as shop coatings. For example, one well-known manufacturer of clutches applies the wax directly over bare steel on clutch plate disks. Also, a manufacturer of tractor parts is ap-

plying it directly over the steel in the shop.

One of the largest uses at present is on steel kitchen utensils such as frying pans and similar items produced for the Quartermaster Department.

The question has been asked: "How about metals other than steel?" As a matter of fact, considerable work has been done in applying wax finishes to other metals. For example, the use of wax coatings to prevent the corrosion of certain magnesium alloys now has been approved by the Navy. It also has been discovered that wax coatings may be used satisfactorily on wire in place of zinc.

Now that the supply of tin is limited, the use of wax is of increasing value in providing additional protection to the present tinplate and terne plate so that these materials may be used for the shipment of canned goods to our fighting forces abroad.

Low cost is also a feature of wax finishes for their high coverage makes them extremely economical to use. While exact coverage is determined by the nature of the surface and size of the article as well as the method of application, finishing costs are invariably low

Rust-inhibiting waxes may be applied in a number of different ways. Probably the most common method is by dipping the parts to be coated in the wax and then drying by any conventional method or possibly by centrifuging. A spray gun may also be used. As a matter of fact, on a large object like a machine tool, the wax may be brushed or wiped on easily.

The application of the rust-inhibiting wax coating can be easily worked into the regular production layout without requiring extra equipment or any radical changes in the procedure. The smaller parts are generally placed in a wire basket and immersed in the wax tank followed by centrifuging to eliminate excess wax. Larger pieces of work may be dipped individually or placed in racks, subsequently being air dried or force dried.

Rust-inhibiting wax finishes come ready to use and do not require dilution. They are applied at room temperature without heating. To accelerate drying time, the work may be arranged so that a current of warm air may be passed over it, or infra-red lamps may be used to speed the drying.

Rust-inhibiting wax coatings are often applied by spray methods. Any standard spray gun equipment may be employed. The gun should be fitted with a high capacity air cap and low capacity fluid tip.

Air pressure should be about 4 to 50 pounds at the nozzle. The fluid control is adjusted so as to allow a minimum of wax to enter the gun.

In spraying, the wax should be applied by making several passes back and forth across the work in a spray pattern that will insure a thin, even coat. When too heavy a coat is applied, sags and runs invariably result.

Due to recent developments in wax finishes, it is quite certain that the use of rust inhibiting waxes as a shop coat will continue to expand as manufacturers become better acquainted with them.

Substitutes Steel for Aluminum Product

Steel spray-gun syphon feed cover and one quart cups are now being furnished by Master Mfg. Co., Chicago, in place of those of spun aluminum. According to the company, the C3 style cover and can is best furnished on direct prime government orders. It is often difficult to keep a stock of them on hand for the rank and file of industrial orders although the priority be high.

COPPER ALLOY BULLETIN

REPORTING NEWS AND TECHNICAL DEVELOPMENTS OF COPPER AND COPPER-BASE ALLOYS

Prepared Each Month by the Bridgeport Brass Co. "Bridgeport" *Headquarters for BRASS, BRONZE and COPPER*

Bronze Welding is Helpful in Keeping Equipment Running

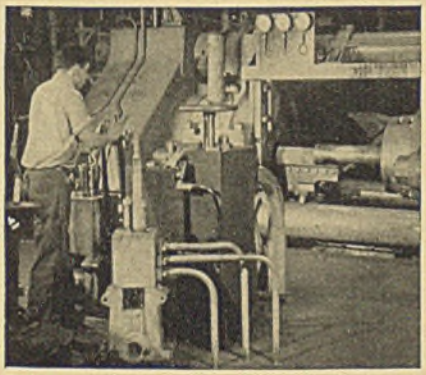
With replacements for broken or worn machine parts frequently difficult to obtain on short notice, bronze welding takes on added importance as a maintenance tool.

For example, bronze welding can be used to good advantage in building up worn surfaces on pistons, shafts, and bushings, broken or worn gear teeth, stripped threads, and many other machine parts that are subject to damage in service. The deposited bronze can be readily machined to correct shape and dimensions.

The bronze welding process is readily adapted to cast iron and steel. Because of the relatively low melting point of the bronze rod compared with the iron or steel, it is not necessary to preheat the entire part to a high temperature in order to obtain a satisfactory weld.

Memos on Brass—No. 37

Where ease of hot working is essential, the copper-zinc alloys containing about 60% copper have outstanding advantages. At room temperatures, such alloys are somewhat harder and less ductile than the alloys with higher copper contents, but at elevated temperatures they have excellent working properties.



This giant extrusion press at Bridgeport is particularly adapted to the extrusion, in rod form, of the more refractory, corrosion-resisting copper alloys required in large quantities for many war applications.

High-Temperature Strength of Duronze III is Shown by Tests

Alloy Retains its Superior Physical Properties with Only Minor Variations up to Temperatures of 300° C

The behavior of metals and their alloys at elevated temperatures is a matter of extreme importance in evaluating materials for many applications, such as oil refining and food manufacturing equipment and parts for valves and internal combustion engines. A series of tests recently conducted by Bridgeport indicates that Duronze III is outstanding in its retention of these properties at elevated temperatures.

The test procedure was as follows: Duronze III annealed rod, ½ inch in diameter, was prepared in the form of tensile tests pieces machined down to .300 inch diameter at the test section. The ends were threaded and screwed into steel extensions which were attached to the jaws of a tensile testing machine. A tubular resistance furnace, 12 inches long by 1 inch inside diameter, completely surrounded the 8-inch long sample. The sample was heated in the furnace chamber for one hour at the required temperature, and was held there throughout the tensile testing operation.

Results of Tests

Tensile tests were made at 20, 124, 196, 300, 350, 400, 500, and 600 degrees C. The per cent elongation in 2 inches and the per cent contraction of area were also determined from the cold broken pieces at the conclusion of the tests.

Results of these tests are graphically indicated in Fig. 1. It will be noted that up to 300° C. the loss in tensile strength is only about 4½%. The per cent elongation dropped slightly at the lower temperatures, but at 300° it again rose to its original value. The contraction of area is the same at 300° as at room temperature.

Beyond 300° Duronze III loses its tensile strength at a fairly definite rate. The ductility, after reaching a minimum at 400°, is largely restored at 500°. This explains the good hot working properties of Duronze III at still higher temperatures.

In contrast to Duronze III's retention of its physical properties at elevated temperatures, such materials as copper, commercial bronze, and yellow brass begin to lose much of their tensile strength between 150° and 200° C. The advantages of Duronze III are especially marked, in view of the fact that the tensile strength of Duronze III at *room* temperatures is considerably superior to that of brass and most bronzes.

Hot Working Properties

The excellent hot working properties of Duronze III, as indicated by the restoration of its ductility at temperatures above 500° C., are brought out also by the results of the hot hammer tests summarized in Fig. 2.

In these tests, slugs of Duronze III, ½ inch in diameter by ¾ inch high, were heated to various temperatures and then subjected to the blow of a falling weight equivalent to 200 foot-pounds. As indicated by the reduction in height of the slug, Duronze III shows definite softening at about 600° C., and this effect rapidly becomes more pronounced as the temperature rises. A 50% reduction in height is obtained at about 700° C. These data are borne out by practical experience, which indicates that the best forging temperatures for Duronze III range from 700° to 750° C.

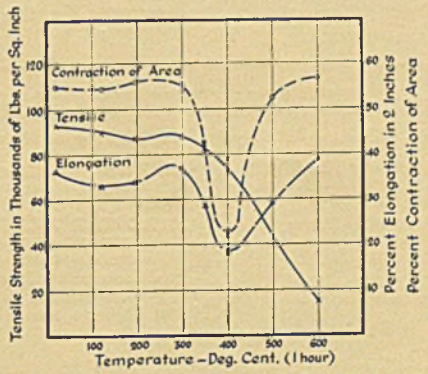


Fig. 1. Tensile strength, per cent elongation, and per cent contraction of area of Duronze III at elevated temperatures.

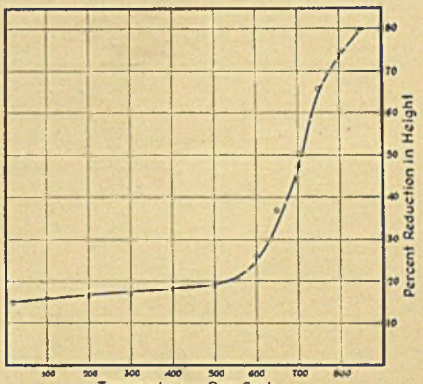


Fig. 2. Hot hammer tests on Duronze III

CAUSES OF CORROSION

This article, the first of two dealing with impingement corrosion, is the sixth in a series of discussions by C. L. Bulow, research chemist at Bridgeport Brass.

IMPINGEMENT CORROSION

Frequently certain types of the thicker corrosion films are formed, which when locally broken or removed favor the formation of a metal-ion concentration cell. That is, the oxygen concentration type of cell which has been discussed in previous articles in this series changes over into the metal-ion concentration cell.

This change frequently takes place in condenser tubes when an impinging stream of entrained gases wears through the corrosion scale and gains access to the pit beneath. When this occurs, the corrosion products in the pit are swept out, exposing the corroded metal free from corrosion products. The impinging stream then corrodes the metal by the removal of metal-ions. Gradually the shape of the original pit or pits changes over into the clean, almond- or crescent-shaped type characteristic of impingement attack. The pit is undercut on the upstream side and sometimes with a noticeable tail pointing downstream, as shown in Fig. 1.

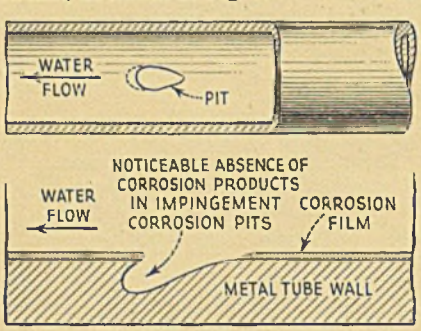


FIG. 1

Frequently a series of pits of this impingement type will overlap, giving a serrated profile when a longitudinal section of a condenser tube is examined (Fig. 2).

The impingement type of corrosion is clearly indicated in the flattened section of condenser tubing illustrated below. Note the bright, clear appearance of the corroded metal.

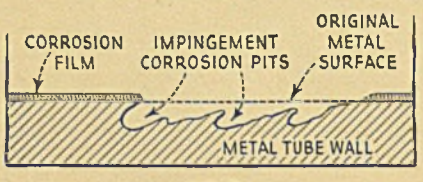


FIG. 2

The reactions involved in the metal-ion concentration cell can be illustrated as shown in Fig. 3.

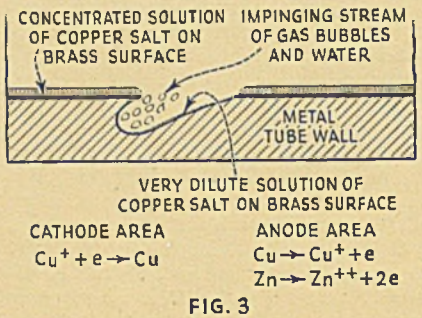


FIG. 3

The copper dissolving in the anodic area yields copper-ions and electrons, and since the anodic solution is constantly being changed, the concentration of copper compounds in this area has no tendency to increase.

Effect in Cathodic Area

In the cathodic area, the copper compounds are being reduced to metallic copper, resulting in crystalline deposits of copper beneath the corrosion products or scale. Since copper corrosion products from a previous reaction are being reduced, it frequently means that as the reaction proceeds, the difference between the two areas drops. However, as long as this difference exists, the cell remains in operation, the area of low metal-ion concentration being corroded most rapidly. This cell is reversible and it is for this reason that a slight change in water velocity or point of impingement the cell may return to the oxygen concentration type.

(The subject of impingement corrosion and its causes will be continued in the next issue.)

NEW DEVELOPMENTS

Salvaging of parts made of brass, bronze, or copper, in which broken pieces of taps and drills have become embedded, is reported to be possible through the aid of a new acid mixture. According to the manufacturer, the parts with the embedded tool pieces are immersed in a bath of the acid diluted with water and then heated. It is claimed that the tool pieces can be completely eaten away by this procedure, without harmful effects to the brass, bronze, or copper. **(No. 430)**

Milling cutters are said to consist of tungsten carbide tips bonded to a cast body with shock-resisting, chatter-dampening characteristics that facilitate smooth cutting of brass and other metals. **(No. 431)**

Flag Terminals are said to be designed to meet the need for stacking a series of parallel terminal connections on a single stud without loss of space. Terminals are of the solderless type, designed for either right or left hand installation, and are made of pure copper, electro-tinned. Wire size range is from No. 22 to No. 10. **(No. 432)**

A hole-cutting tool is designed for use in electric drills, lathes, or other machines accommodating Morse-taper or straight-shanked tools, it is reported. Tool is made in six sizes, for cutting holes ranging from ¾ to 4½ inches in diameter. **(No. 433)**

A marking machine for tube and bar stock is provided with rollers so that it can be moved along the stock. According to the maker, it is self-inking and easy to operate. Ink is distributed by a built-in fountain and roller. **(No. 434)**

Solderless connectors for welding cable are said to provide ease and speed of shop or field use, full protection of cables, and a high degree of safety. Conductivity of the fitting is said to be higher than that of the cable for which it is designed. A heavy-duty insulation sleeve is provided. **(No. 435)**

A portable cleaner is said to take any type of metal parts and assemblies, and to be adaptable to the use of any cleaning solvent or compound, hot or cold. Machine is equipped with a strainer for filtering metal chips and other solid foreign matter; a packless pump powered by a ¼-horsepower electric motor; and a 1,000-watt electric heating element, thermostatically controlled at 100 degrees F. **(No. 436)**

A rotary brush is designed for removing insulation from very fine copper wires without damaging the copper. Brush has an extremely soft surface, according to the maker. **(No. 437)**

This column lists items manufactured or developed by many different sources, and does not mean that any items have been tested or are endorsed by the Bridgeport Brass Company. We will gladly refer readers to the manufacturer or other sources for further information.

Increased Pay Loads

(*Continued from Page* 126)

the ½-inch intervals to which the cross beams are adjustable permitting the elimination of all slack. The upper tiers rest on other cross beams, thus preventing damage to the lower tiers.

The Utility loader also holds the load so compactly that vertical vibration cannot cause units of the load to bounce up and down independently, a condition which has proved disastrous in the past and is one of the major problems of the damage claim agent. When the load is held compactly, it dampens out vibration.

Recently in the shipment of bombs it was discovered that if the load consisted of only one layer of bombs on the floor of the freight car, harmonics or vertical vibration were brought up to a point where in at least one instance the car floors were smashed and the bombs fell through. *When these bomb loads were made two or three times heavier,* vertical vibration was eliminated to an extent that insured safe carriage.

Claims Keep Going Up

The year 1940 showed an increase of 11 per cent in damage claims. Since then claims have progressively risen until in the first 6 months of 1942 the increase was 46.4 per cent of that of 1941.

Unfamiliarity with the new commodities now being manufactured by industrial plants converted to war work, the increasing scarcity and flimsiness of packing materials and heavier loadings have added to the traffic manager's problems. Use of inexperienced men on loading docks, lack of proper bracing material, rush to get loads on their way —these have all contributed toward dangerously loose and shifting loads. These same conditions and the "wild" loads resulting have increased the damage to freight cars and railroad property, in certain instances even causing freight cars to roll over, endangering lives as well as property.

The Utility loader stabilizes the load, preventing this type of damage. The importance of this feature is indicated by the following remarks made by transportation director Joseph B. Eastman to railroads and shippers:

"The effect of adequate protection of freight in transport is of incalculable importance to the nation . . .

"Every article that is destroyed means that much transportation effort, that many car days, that many pounds of our motive power have been wasted . . .

". . . . from now on *an unnecessary loss or damage is a blow in behalf of the enemy.*"

(*Continued Next Week*)

Tipping Tools

(*Concluded from Page* 128)

saves alloys now and there is also a saving on each resharpening because, when the bit is ground back, only a 1/16-inch thickness of an area ⅝-inch square is removed instead of a 1/16 thickness of an area measuring 2 x 1-inch. Thus on every regrinding of the solid tool, five times as much alloy is lost by grinding away as is lost from the toolholder bit.

There are places, however, where a toolholder cannot be used satisfactorily because of lack of space in setup, lack of rigidity or heat conductivity. In these instances the practice of welding or brazing a small piece of cutting material (high-speed steel, alloy composition or sintered carbide) on a shank of ordinary steel saves all the scarce alloys otherwise wasted in a solid high-speed steel shank.

Where a *welded* high-speed steel tip is preferred, it happens, fortunately, that the heat or temperature used in welding

a piece of high-speed steel is about the same as the temperature used for hardening it so that the two operations—welding and hardening—can be done at one time. The melting or flow point of a welding material such as "Cinch Cement" is about 2250 degrees Fahr. so that it works well on the tungsten types of high-speed like 18-4-1 and the cobalt types. It is also being successfully used on the 6-6 and 6-5-4 types of tungsten-molybdenum high-speed steel. But on these, greater care is required because the recommended hardening heat is just at the flow point and overheating should be avoided. On the higher molybdenum types of high-speed steel, where a hardening heat below 2250 degrees Fahr. is recommended, this method of welding tips presents difficulties and the brazing method is preferable to welding.

There is another method of tipping where a braze or solder having a melting point of around 1000 degrees Fahr. is used. The high-speed steel tip is first hardened and then brazed or soldered to the shank. In this case the brazing temperature must be closely controlled to avoid softening the hardened tip which will occur if heated above the secondary hardness temperature. This low heat method is of more interest in connection with carbides than with high-speed steel.

The best way to conserve scarce alloys is, of course, through the use of sintered carbides where ever they can be used. The rapid development of the mechanized German war machine was accomplished through the wide spread use of tools tipped with sintered carbides. Tungsten carbides and their modifications with tantalum and titanium are now being used for machining almost every kind of material used in our own war program.

There are, however, some plants where the officials do not appreciate the present situation in the price of carbides or the recent improvements in quality. Some years ago, they may have decided it did not pay to use carbide at $1.00 per gram, and now do not realize that at 5 cents a gram it costs less to equip many machines with carbide tools than with high-speed steel tools.

Fig. 4 shows a 2 x 1-inch tool with a ⅜ x ½ x 1-inch carbide tip which would have cost about $50 a few years ago. The tip alone, which is shaded, weighs 45 grams (1/10 pound of alloys) and then cost $45. Today, this same tip can be had for $1.85 and in a better carbide.

This tool, if made of high-speed steel, requires $4.00 worth of steel to which must be added the cost of shaping, hardening and grinding that very conservatively would amount to at least $2.00, making the cost of the finished tool $6.00

The finished carbide tipped tool sells for $5.65 and will remove metal faster than high-speed steel, give a better finish and more accurate work. Although the same use of tipped tools is now saving tons of scarce alloys by keeping them out of the shanks of tools, the wider use of super high-speed steels, hard alloy compositions and sintered carbides in the form of tips should be encouraged.

Radio Energy Used To Fire Explosive Rivets

Radio frequency energy now is used to detonate explosive rivets and speed production of aircraft, E. I. du Pont de Nemours & Co., Wilmington, Del. announced recently.

The radio unit assures instant control of temperature in the firing tip, eliminating time consumed in heating an electric riveting iron to operating degrees and in frequent changes from one tip temperature to another. This method, the company reports, is adaptable only to large scale production.

Explosive rivets were introduced two years ago, breaking a bad bottleneck in fastening airplane sections where riveters could work from only one side. They are installed at a rate of 15 to 20 a minute.

The rivet has a high explosive secreted in a cavity at the end of the shank. Heat applied to the rivet head detonates the charge. The explosion expands the charged end of the shank, forming a "blind" head and setting the rivet.

Engineers of Radio Corp. of America and of Du Pont developed the radio unit, which consists of an oscillator together with a specially prepared applicator to concentrate current directly into the rivet head. As current is induced in the head, the heat it creates fires the charge. Radio energy not only gives instant temperature control but prolongs indefinitely the life of the firing tip, it is said.

Former Steel Lockers Now of Fiberboard

Pressed hard fiberboard is being substituted for steel by Sanymetal Products Co. Inc., Cleveland, in the fabrication of locker compartments. Although not waterproof, the fiberboard is moisture resisting, due to its hard compressed form; and while it cannot be considered fireproof, it is so slow to burn that it offers almost as much protection as steel, the company reports.

Rabbeted parts or connections reinforced on the inside by the use of angle braces, add rigidity and strength to each structure.

MEETINGS . . .

Electric Metal Makers Guild To Meet in Chicago May 1

Melting foremen, melters, and first and second helpers on electric furnaces will have an opportunity to discuss electric furnace steelmaking problems in special sessions of the Electric Metal Makers Guild sectional meeting, Hotel Morrison, Chicago, May 1.

The guild is admitting these men, even though they are not members, to its sectional meetings as a training aid because of the increasing growth of electric furnace capacity in this country.

Two separate conferences, one on ingots and one on castings, will meet during the day followed by a joint session in the evening.

Round table discussions will follow the special group meetings. Leading the quiz section on castings will be Fred J. Blaney, Ohio Steel Foundries, Springfield, O.; Alfred Gierach, American Manganese Steel Co.; Martin McDonough, National Malleable & Steel Castings Co.; George Messenger, Kensington Steel Co.; James C. Sweitzer, Sivyer Steel Castings Co.; and Ray Wilcox, Detroit Steel Castings Co.

The panel on ingot discussion will be comprised of J. E. Arthur, Crucible Steel Co. of America, Pittsburgh; W. M. Farnsworth, Republic Steel Co., Canton, O.; L. S. Fry, Joslyn Mfg. Co., Fort Wayne, Ind.; Harold Phelps, Rotary Electric Steel Co., Detroit; Joseph Scott, Driver Harris Co., Harrison, N. J., and Harry Walther, Timken Steel & Tube Co., Canton.

Universities To Participate In Midwest Power Conference

Subjects pertaining to production, distribution and utilization of power under wartime conditions will feature Midwest Power Conference, Palmer House, Chicago, April 8-9. The conference is sponsored by Illinois Institute of Technology with co-operation of nine universities in the Middle West and eight Chicago district engineering societies.

Nine technical sessions are scheduled. Among special highlights will be an address on "Company Organization of Manpower," by L. H. Hill, vice president, Allis-Chalmers Mfg. Co., Milwaukee, at luncheon on the first day, and another on "Logistics, the Science of Survival," by Col. James L. Walsh, New York, chairman, War Production Committee,

American Society of Mechanical Engineers, at an "All-Engineers" dinner on evening of that day.

—o—

American Gear Manufacturers Association—Twenty-seventh annual meeting will be held at Westchester Country Club, Rye, N. Y., May 17-19.

—o—

National District Heating Association—The 34th annual meeting will be held in Hotel Schenley, Pittsburgh, June 9-10. Twelve technical committees will report and 28 papers will be presented on the war problems. John F. Collins Jr., 827 N. Euclid avenue, Pittsburgh, is secretary-treasurer.

Wire Association Elects Carl E. Johnson President

Directors of the Wire Association, at their annual meeting in New York on March 27, elected Carl E. Johnson, superintendent of Bethlehem Steel Co.'s rod and wire mills at Sparrows Point, Md., president for the forthcoming year. Other new officers are D. D. Buchanan, manager of operations, Union Drawn Steel division, Republic Steel Corp., Massillon, O., vice president of the steel dision; E. W. Clark, mechanical engineer, wire and cable section, General Electric Co., Schenectady, N. Y., vice president of the nonferrous division; Richard E. Brown, publisher of *Wire & Wire Products*, Stamford, Conn., executive secretary.

Plans were laid for the 1943 convention which will be held this year in conjunction with the National Metal Congress and the American Society for Metals, Chicago, Oct. 18-22.

General Motors Makes Own Cutting Tools

(*Concluded from Page* 71)

tor Co. Hot nitric acid is used to dissolve the copper brazing material between the tip and the shank, time of immersion varying between 30 minutes and 1 hour, depending upon the size of the tool. Handling of hot nitric acid involves many hazards, however, and the process is not recommended for small shops seeking to reclaim such tool tips.

Where carbide tips are silver soldered to tool shanks, it is possible to remove them easily with a torch, since the melting point of silver is well below that of copper.

Another unusual development Ternstedt engineers have conceived is known as a tapping arbor with interchangeable cutters. The arbor is, in effect, a holder into which a series of cutters is set. They must be so exact that cutters made for one arbor, or holder, heretofore could not be used in another holder.

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CMP Allotments in Full Force by Middle of April

Orders now promised not to be superseded until then. . . Deliveries show little change. . . Pig iron position easier. . . Zone plan for warehouse prices being prepared

DEMAND
Some shift in war needs.

PRODUCTION
Up ½-point to 99½ per cent.

PRICES
New plan for warehouse ceilings.

STEEL consumers whose orders already have been placed with mills will be protected from displacement of such orders in mill schedules by direction No. 1 under CMP regulation No. 1.

This provides that orders promised for second quarter delivery shall not be displaced, in absence of specific directions to the contrary, by any order, including authorized CMP orders, received before April 15. In effect this declares a moratorium until April 15 on CMP allotment numbers which could be accepted only by displacing orders already promised for delivery.

This is causing some confusion in delivery promises and nothing definite can be done before mid-month, when orders not certified by CMP will be superseded by those which are. Producers will not know exactly where they stand until CMP acts on orders not now certified. Some producers have received such a large number of certified orders for second quarter that their schedules probably will not be much dislocated, but at present they are unable to make definite delivery promises.

• • •

War Production Board officials are preparing for third quarter CMP allotments. Claimant agencies must report by April 15 their needs for third quarter. The steel requirements committee must report total needs to the overall WPB requirements board by May 1 and allotments will be announced May 15. This follows the same plan as for second quarter.

Broadly appraised, the delivery situation is little changed. Bars are most difficult of carbon steel products to obtain, especially in large sizes. Whatever the final effect of direction No. 1 it appears late May is about the best that can be counted on by a buyer at this time under a CMP allotment number. In cold-drawn bars the situation is even tighter, with late June about the earliest. Sheets are not far behind hot-rolled carbon bars and shapes appear tighter than recently, due to further curtailment of ingots for this purpose.

Steelmaking operations last week at 99½ per cent regained the ½-point lost the week before, production being resumed after a slight flood in the Cincinnati district and a brief strike in eastern Pennsylvania. Chicago advanced ½-point to 99½ per cent, Cleveland 1 point to 93, Cincinnati 11 points to 91, New England 5 points to 100 and eastern Pennsylvania 2 points to 95. Youngstown presented the only decline, 1 point to 97 per cent, as two open hearths were taken out for repairs. Rates were unchanged at Pittsburgh, 101 per cent; Wheeling, 88½; Buffalo, 90½; St. Louis, 93; Birmingham, 100; Detroit, 94.

No hardship is being felt as to scrap supply but in many instances receipts are less than consumption and reserves are being used. This causes apprehension for the summer situation. With farmers busy in their fields country collections have fallen off materially. Borings continue to clog the market in spite of WPB directions for use of a percentage in furnace mixtures. Remote scrap is not being accepted freely, buyers objecting to the higher freight charges and preferring material originating nearer home.

• • •

Pig iron is currently in good supply and April allotments in some instances were more generous than in recent months. In some cases melters have reduced their requests, indicating a decline in their orders. The situation promises to tighten in the next few months as numerous blast furnace stacks are showing effects of hard driving and must go down for relining. Already this effect is shown in a few units being blown out. WPB has allowed accumulation of reserves at stacks scheduled for relining, to tide over the idle period. New furnaces are coming into the picture slowly as construction is delayed by inability to obtain materials promptly. A large new stack at Bethlehem's Lackawanna plant is scheduled to start this month.

A new plan for pricing warehouse steel is about to be announced by Office of Price Administration in amendment No. 14 to revised price schedule No. 49. It will set up four zones, from Maine to North Carolina, in which dollars and cents prices will be established. The plan later may be extended to cover the entire country. Provisions are made for prices on shipments between zoned and unzoned areas. Ceiling prices probably will not be materially altered as present prices in the zones have been taken into account in formulating schedules.

Composite average prices of steel and iron products are steady at ceilings in the absence of changes by the Office of Price Administration. Finished steel composite is $56.73, semifinished $36, steelmaking pig iron $23.05 and steelmaking scrap $19.17.

COMPOSITE MARKET AVERAGES

	Apr. 3	Mar. 27	Mar. 20	One Month Ago Mar., 1943	Three Months Ago Jan., 1943	One Year Ago Apr., 1942	Five Years Ago Apr., 1938
Finished Steel	$56.73	$56.73	$56.73	$56.73	$56.73	$56.73	$62.00
Semifinished Steel	36.00	36.00	36.00	36.00	36.00	36.00	40.00
Steelmaking Pig Iron	23.05	23.05	23.05	23.05	23.05	23.05	23.02
Steelmaking Scrap	19.17	19.17	19.17	19.17	19.17	19.17	12.60

Finished Steel Composite:—Average of industry-wide prices on sheets, strip, bars, plates, shapes, wire, nails, tin plate, standard and line pipe. Semifinished Steel Composite:—Average of industry-wide prices on billets, slabs, sheet bars, skelp and wire rods. Steelmaking Pig Iron Composite:—Average of basic pig iron prices at Bethlehem, Birmingham, Buffalo, Chicago, Cleveland, Neville Island, Granite City and Youngstown. Steelworks Scrap Composite:—Average of No. 1 heavy melting steel prices at Pittsburgh, Chicago and eastern Pennsylvania.

COMPARISON OF PRICES

Representative Market Figures for Current Week; Average for Last Month, Three Months and One Year Ago

Finished Material

	April 3, 1943	March 1943	Jan. 1943	April, 1942
Steel bars, Pittsburgh	2.15c	2.15c	2.15c	2.15c
Steel bars, Chicago	2.15	2.15	2.15	2.15
Steel bars, Philadelphia	2.49	2.49	2.49	2.49
Shapes, Pittsburgh	2.10	2.10	2.10	2.10
Shapes, Philadelphia	2.22	2.22	2.22	2.22
Shapes, Chicago	2.10	2.10	2.10	2.10
Plates, Pittsburgh	2.10	2.10	2.10	2.10
Plates, Philadelphia	2.15	2.15	2.15	2.15
Plates, Chicago	2.10	2.10	2.10	2.10
Sheets, hot-rolled, Pittsburgh	2.10	2.10	2.10	2.10
Sheets, cold-rolled, Pittsburgh	3.05	3.05	3.05	3.05
Sheets, No. 24 galv., Pittsburgh	3.50	3.50	3.50	3.50
Sheets, hot-rolled, Gary	2.10	2.10	2.10	2.10
Sheets, cold-rolled, Gary	3.05	3.05	3.05	3.05
Sheets, No. 24 galv., Gary	3.50	3.50	3.50	3.50
Bright bess., basic wire, Pittsburgh	2.60	2.60	2.60	2.60
Tin plate, per base box, Pittsburgh	$5.00	$5.00	$5.00	$5.00
Wire nails, Pittsburgh	2.55	2.55	2.55	2.55

Semifinished Material

Sheet bars, Pittsburgh, Chicago	$34.00	$34.00	$34.00	$34.00
Slabs, Pittsburgh, Chicago	34.00	34.00	34.00	34.00
Rerolling billets, Pittsburgh	34.00	34.00	34.00	34.00
Wire rods No. 5 to ⅜-inch, Pitts.	2.00	2.00	2.00	2.00

Pig Iron

	April 3, 1943	March 1943	Jan. 1943	April, 1942
Bessemer, del. Pittsburgh	$25.19	$25.19	$25.19	$25.19
Basic, Valley	23.50	23.50	23.50	23.50
Basic, eastern, del. Philadelphia	25.39	25.39	25.39	25.39
No. 2 fdry., del. Pgh., N.&S. Sides	24.69	24.69	24.69	24.69
No. 2 foundry, Chicago	24.00	24.00	24.00	24.00
Southern No. 2, Birmingham	20.38	20.38	20.38	20.38
Southern No. 2, del. Cincinnati	24.30	24.30	24.30	24.06
No. 2X, del. Phila. (differ. av.)	26.265	26.265	26.265	26.265
Malleable, Valley	24.00	24.00	24.00	24.00
Malleable, Chicago	24.00	24.00	24.00	24.00
Lake Sup., charcoal, del. Chicago	31.54	31.54	31.54	31.54
Gray forge, del. Pittsburgh	24.19	24.19	24.19	24.19
Ferromanganese, del. Pittsburgh	140.65	140.65	140.65	125.63

Scrap

Heavy melting steel, Pittsburgh	$20.00	$20.00	$20.00	$20.00
Heavy melt. steel, No. 2, E. Pa.	18.75	18.75	18.75	18.75
Heavy melting steel, Chicago	18.75	18.75	18.75	18.75
Rails for rolling, Chicago	22.25	22.25	22.25	22.25
No. 1 cast, Chicago	20.00	20.00	20.00	20.00

Coke

Connellsville, furnace, ovens	$6.50	$6.00	$6.00	$6.00
Connellsville, foundry, ovens	7.25	7.25	7.25	7.25
Chicago, by-product fdry., del.	12.25	12.25	12.25	12.25

STEEL, IRON, RAW MATERIAL, FUEL AND METALS PRIECS

Following are maximum prices established by OPA Schedule No. 6 issued April 16, 1941, revised June 20, 1941 and Feb. 4, 1942. The schedule covers all iron or steel ingots, all semifinished iron or steel products, all finished hot-rolled, cold-rolled iron or steel products and any iron or steel product which is further finished by galvanizing, plating, coating, drawing, extruding, etc., although only principal established basing points for selected products are named specifically. All seconds and off-grade products also are covered. Exceptions applying to individual companies are noted in the table. Federal tax on freight charges, effective Dec. 1, 1942, not included in following prices.

Semifinished Steel

Gross ton basis except wire rods, skelp.

Carbon Steel Ingots: F.o.b. mill base, rerolling qual., stand. analysis, $31.00.
(Empire Sheet & Tin Plate Co., Mansfield, O., may quote carbon steel ingots at $33 gross ton, f.o.b. mill.)

Alloy Steel Ingots: Pittsburgh, uncropped, $45.00.

Rerolling Billets, Slabs: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Sparrows Point, Birmingham, Youngstown, $34.00; Detroit, del. $36.25; Duluth (bil.) $36.00.
(Andrews Steel Co., carbon slabs $41; Continental Steel Corp., billets $34, Kokomo, to Acme Steel Co.; Northwestern Steel & Wire Co., $41, Sterling, Ill.; Laclede Steel Co. $34, Alton or Madison, Ill.; Wheeling Steel Corp. $36 base, billets for lend-lease, $34, Portsmouth, O., on slabs on WPB directives.)

Forging Quality Billets: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham, Youngstown, $40.00; Detroit, del. $42.25; Duluth, $42.00.
(Andrews Steel Co. may quote carbon forging billets $50 gross ton at established basing points.)

Open Hearth Shell Steel: Pittsburgh, Chicago, base 1000 tons one size and section: 3-12 in., $52.00; 12-18 in., $54.00; 18 in. and over, $56.00.

Alloy Billets, Slabs, Blooms: Pittsburgh, Chicago, Buffalo, Bethlehem, Canton, Massillon, $54.00.

Sheet Bars: Pittsburgh, Chicago, Cleveland, Buffalo, Canton, Sparrows Point, Youngstown, $34. (Wheeling Steel Corp. $37 on lend-lease sheet bars, $38 Portsmouth, O., on WPB directives; Empire Sheet & Tin Plate Co., Mansfield, O., carbon sheet bars, $39, f.o.b. mill.)

Skelp: Pittsburgh, Chicago, Sparrows Pt., Youngstown, Coatesville, lb., $1.90.

Wire Rods: Pittsburgh, Chicago, Cleveland, Birmingham, No. 5—9/32 in., inclusive, per 100 lbs., $2.00.
Do., over 9/32—47/64-in., incl., $2.15. Worcester add $0.10; Galveston, $0.27. Pacific Coast $0.50 on water shipment.

Bars

Hot-Rolled Carbon Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham, base 20 tons one size, 2.15c; Duluth, base 2.25c; Detroit, del. 2.27c; New York del. 2.51c; Phila. del. 2.49c; Gulf Ports, dock 2.52c, all-rail 2.59c; Pac. ports, dock 2.80c. (Phoenix Iron Co., Phoenixville, Pa., may quote 2.35c at established basing points. Joslyn Mfg. Co. may quote 2.35c, Chicago base. Calumet Steel Division, Borg Warner Corp., may quote 2.35c, Chicago base, on bars produced in its 8-inch mill.)

Rail Steel Bars: Same prices as for hot-rolled carbon bars except base is 5 tons.

(Sweet's Steel Co., Williamsport, Pa., may quote rail steel merchant bars 2.33c f.o.b. mill.)

Hot-Rolled Alloy Bars: Pittsburgh, Chicago, Canton, Massillon, Buffalo, Bethlehem, base 20 tons one size, 2.70c; Detroit, del., 2.82c.

(Texas Steel Co. may use Chicago base price as maximum f.o.b. Fort Worth, Tex., price on sales outside Texas, Oklahoma.)

AISI Series	(*Basic O-H)	AISI Series	(*Basic O-H)
1300	$0.10	4100 (.15-.25 Mo)	0.55
		(.20-.30 Mo)	0.60
2300	1.70	4340	1.70
2500	2.55	4600	1.20
3000	0.50	4800	2.15
3100	0.70	5100	0.35
3200	1.35	5130 or 5152	0.45
3400	3.20	6120 or 6152	0.95
4000	0.45-0.55	6145 or 6150	1.20

*Add 0.25 for acid open-hearth; 0.50 electric.

Cold-Finished Carbon Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, base 20,000-39,999 lbs., 2.65c; Detroit 2.70.

Cold-Finished Alloy Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, base 3.35c; Detroit, del. 3.47c.

Turned, Ground Shafting: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, base (not including turning, grinding, polishing extras) 2.65c; Detroit 2.72c.

Reinforcing Bars (New Billet): Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Sparrows Point, Buffalo, Youngstown, base 2.15c; Detroit del. 2.27c; Gulf ports, dock 2.52c, all-rail 2.61c; Pacific ports, dock 2.80c, all-rail 3.27c.

Reinforcing Bars (Rail Steel): Pittsburgh, Chicago, Gary, Cleveland, Birmingham, base 2.15c; Detroit, del. 2.27c; Gulf ports, dock 2.52c, all-rail 2.61c; Pacific ports, dock 2.80c, all-rail 3.25c.
(Sweet's Steel Co., Williamsport, Pa., may quote rail steel reinforcing bars 2.33c, f.o.b. mill.)

Iron Bars: Single refined, Pitts. 4.40c, double refined 5.40c; Pittsburgh, staybolt, 5.75c; Terre Haute, common, 2.15c.

Sheets, Strip

Hot-Rolled Sheets: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Buffalo, Youngstown, Sparrows Pt., Middletown, base 2.10c; Granite City, base 2.20c; Detroit del. 2.22c; Phila. del. 2.28c; New York del., 2.35c; Pacific ports 2.65c.
(Andrews Steel Co. may quote hot-rolled sheets for shipment to Detroit and the Detroit area on the Middletown, O. base.)

Cold-Rolled Sheets: Pittsburgh, Chicago, Cleveland, Gary, Buffalo, Youngstown, Middletown, base, 3.05c; Granite City, base 3.15c; Detroit del. 3.17c; New York del. 3.41c; Phila. del. 3.39c; Pacific ports 3.70c.

Galvanized Sheets, No. 24: Pittsburgh, Chicago, Gary, Birmingham, Buffalo, Youngstown, Sparrows Point, Middletown, base 3.50c; Granite City, base 3.60c; New York del. 3.74c; Phila. del. 3.68c; Pacific ports 4.05c.
(Andrews Steel Co. may quote galvanized sheets 3.75c at established basing points.)

Corrugated Galv. Sheets: Pittsburgh, Chicago, Gary, Birmingham, 29 gage, per square 3.31c.

Culvert Sheets: Pittsburgh, Chicago, Gary, Birmingham, 16 gage, not corrugated, copper alloy 3.60c; copper iron 3.90c, pure iron 3.95c; zinc-coated, hot-dipped, heat-treated, No. 24, Pittsburgh 4.25c.

Enameling Sheets: Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Middletown, 10 gage.

base 2.75c; Granite City, base 2.85c; Pacific ports 3.40c.
Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Middletown, 20 gage, base 3.35c; Granite City, base 3.45c; Pacific ports 4.00c.

Electrical Sheets, No. 24:

	Pittsburgh Base	Pacific Ports	Granite City
Field grade	3.20c	3.95c	3.30c
Armature	3.55c	4.30c	3.65c
Electrical	4.05c	4.80c	4.15c
Motor	4.95c	5.70c	5.05c
Dynamo	5.65c	6.40c	5.75c
Transformer			
72	6.15c	6.90c	.....
65	7.15c	7.90c	.....
58	7.65c	8.40c	.....
52	8.45c	9.20c	.....

Hot-Rolled Strip: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Middletown, base, 1 ton and over, 12 inches wide and less 2.10c; Detroit del. 2.22c; Pacific ports 2.75c. (Joslyn Mfg. Co. may quote 2.30c, Chicago base.)

Cold Rolled Strip: Pittsburgh, Cleveland, Youngstown, 0.25 carbon and less 2.80c; Chicago, base 2.90c; Detroit, del. 2.92c; Worcester base 3.00c.

Commodity C. R. Strip: Pittsburgh, Cleveland, Youngstown, base 3 tons and over, 2.95c; Worcester base 3.35c.

Cold-Finished Spring Steel: Pittsburgh, Cleveland bases, add 20c for Worcester; .26-.50 Carb., 2.80c; .51-.75 Carb., 4.30c; .76-1.00 Carb., 6.15c; over 1.00 Carb., 8.35c.

Tin, Terne Plate

Tin Plate: Pittsburgh, Chicago, Gary, 100-lb. base box, $5.00; Granite City $5.10.

Electrolytic Tin Plate: Pittsburgh, Gary, 100-lb. base box $4.50.

Tin Mill Black Plate. Pittsburgh, Chicago, Gary, base 29 gage and lighter, 3.05c; Granite City, 3.15c; Pacific ports, boxed 4.05c.

Long Ternes: Pittsburgh, Chicago, Gary, No. 24 unassorted 3.80c.

Manufacturing Ternes: (Special Coated) Pittsburgh, Chicago, Gary, 100-base box $4.30; Granite City $4.40.

Roofing Ternes: Pittsburgh base per package 112 sheets; 20 x 28 in., coating I.C., 8-lb. $12.00; 15-lb. $14.00; 20-lb. $15.00; 25-lb. $16.00; 30-lb. $17.25; 40-lb. $19.50.

Plates

Carbon Steel Plates: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Sparrows Point, Coatesville, Claymont, 2.10c; New York, del., 2.30-2.55c; Phila., del., 2.15c; St. Louis, 2.34c; Boston, del., 2.42-67c; Pacific ports, 2.65c; Gulf Ports, 2.47c. (Granite City Steel Co. may quote carbon plates 2.35c, f.o.b. mill. Central Iron & Steel Co. 2.20c, f.o.b. basing points.)

Floor Plates: Pittsburgh, Chicago, 3.35c; Gulf ports, 3.72c; Pacific ports, 4.00c.

Open-Hearth Alloy Plates: Pittsburgh, Chicago, Coatesville, 3.50c.

Wrought Iron Plates: Pittsburgh, 3.80c.

Shapes

Structural shapes: Pittsburgh, Chicago, Gary, Birmingham, Buffalo, Bethlehem, 2.10c; New York, del., 2.28c; Phila., del., 2.22c; Gulf ports, 2.47c; Pacific ports, 2.75c. (Phoenix Iron Co., Phoenixville, Pa. may quote carbon steel shapes at 2.30c at established basing points and 2.50c, Phoenixville, for export.)

Steel Sheet Piling: Pittsburgh, Chicago, Buffalo, 2.40c.

Wire Products, Nails

Wire: Pittsburgh, Chicago, Cleveland, Birmingham (except spring wire) to manufacturers in carloads (add $2 for Worcester):

Bright basic, bessemer wire	2.60c
Galvanized wire	2.60c
Spring wire	3.20c

Wire Products to the Trade:

Standard and Cement-coated wire nails, polished and staples, 100-lb. keg	$2.55
Annealed fence wire, 100 lb.	3.05
Galvanized fence wire, 100 lb.	3.40
Woven fence, 12½ gage and lighter, per base column	.67
Do., 11 gage and heavier	.70
Barbed wire, 80-rod spool, col.	.70
Twisted barbless wire, col.	.70
Single loop bale ties, col.	.59
Fence posts, carloads, col.	.69
Cut nails, Pittsburgh, carloads	$3.85

Pipe, Tubes

Welded Pipe: Base price in carloads to consumers about $200 per net ton. Base discounts on steel pipe Pittsburgh and Lorain, O.; Gary, Ind. 2 points less on lap weld, 1 point less on butt weld. Pittsburgh base only on wrought iron pipe.

In.	Butt Weld Steel Blk.	Galv.	In.	Iron Blk.	Galv.
⅛	56	33	¼	24	3½
¼ & ⅜	59	40½	⅜	30	10
½	63½	51	1-1¼	34	16
¾	66½	55	1½	38	18½
1-3	68½	57½	2	37½	18

In.	Lap Weld Steel Blk.	Galv.	In.	Iron Blk.	Galv.
2	61	49½	1¼	23	3½
2½-3	64	52½	1½	28½	10
3½-6	66	54½	2	30½	12
7-8	65	52½	2½, 3½	31½	14½
9-10	64½	52	4	33½	18
11-12	63½	51	4½-8	32½	17
			9-12	28½	12

Boiler Tubes: Net base prices per 100 feet, f.o.b. Pittsburgh in carload lots, minimum wall, cut lengths 4 to 24 feet, inclusive.

O. D. Sizes	B.W.G.	—Seamless— Hot Rolled	Cold Drawn	—Lap Weld— Steel	Charcoal Iron
1"	13	$ 7.82	$ 9.01	.....	.....
1¼"	13	9.26	10.67	.....	.....
1½"	13	10.23	11.72	$ 9.72	$23.71
1¾"	13	11.64	13.42	11.06	22.93
2"	13	13.04	15.03	12.38	19.35
2¼"	13	14.54	16.76	13.79	21.63
2¼"	12	16.01	18.45	15.16	.....
2½"	12	17.54	20.21	16.58	26.57
2¾"	12	18.59	21.42	17.54	29.00
3"	12	19.50	22.48	18.35	31.38
3½"	11	24.63	28.37	23.15	39.81
4"	10	30.54	35.20	28.66	49.90
4½"	10	37.35	43.04	35.22	.....
5"	9	46.87	54.01	44.25	73.93
6"	7	71.96	82.93	68.14	.....

Rails, Supplies

Standard rails, over 60-lb., .f.o.b. mill, gross ton, $40.00.
Light rails (billet), Pittsburgh, Chicago, Birmingham, gross ton, $40.00.
*Relaying rails, 35 lbs. and over, f.o.b. railroad and basing points, $28-$30.
Supplies: Angle bars, 2.70c; tie plates, 2.15c; track spikes, 3.00c; track bolts, 4.75c; do. heat treated, 5.00c.

*Fixed by OPA Schedule No. 46, Dec. 15, 1941.

Tool Steels

Tool Steels: Pittsburgh, Bethlehem, Syracuse, base, cents per lb.: Reg. carbon 14.00c; extra carbon 18.00c; special carbon 22.00c; oil-hardening 24.00c; high car.-chr. 43.00c.

High Speed Tool Steels:

Tung.	Chr.	Van.	Moly.	Pitts. base, per lb.
18.00	4	1	-	67.00c
1.5	4	1	8.5	54.00c
	4	2	8	54.00c
5.50	4	1.50	4	57.50c
5.50	4.50	4	4.50	70.00c

Stainless Steels

Base, Cents per lb.—f.o.b. Pittsburgh

Type	Bars	Plates	Sheets	H. R. Strip	C. R. Strip
CHROMIUM NICKEL STEEL					
302	24.00c	27.00c	34.00c	21.50c	28.00c
303	26.00	29.00	36.00	27.00	33.00
304	25.00	29.00	36.00	23.50	30.00
308	29.00	34.00	41.00	28.50	35.00
309	36.00	40.00	47.00	37.00	47.00
310	49.00	52.00	53.00	48.75	56.00
311	49.00	52.00	53.00	48.75	56.00
312	36.00	40.00	49.00	.....	.....
*316	40.00	44.00	48.00	40.00	48.00
*317	50.00	54.00	58.00	50.00	58.00
†321	29.00	34.00	41.00	29.25	38.00
‡347	33.00	38.00	45.00	33.00	42.00
431	19.00	22.00	29.00	17.50	22.50
STRAIGHT CHROMIUM STEEL					
403	21.50	24.50	29.50	21.25	27.00
**410	18.50	21.50	26.50	17.00	22.00
416	19.00	22.00	27.00	18.25	23.50
††420	24.00	28.50	33.50	23.75	36.50
430	19.00	22.00	29.00	17.50	22.50
‡‡430F	19.50	22.50	29.50	18.75	24.50
442	22.50	25.50	32.50	24.00	32.00
446	27.50	30.50	36.50	35.00	52.00
501	8.00	12.00	15.75	12.00	17.00
502	9.00	13.00	16.75	13.00	18.00
STAINLESS CLAD STEEL (20%)					
304	.....	§§18.00	19.00	.....	.....

*With 2-3% moly. †With titanium. ‡With columbium. **Plus machining agent. ††High carbon. ‡‡Free machining. §§Includes annealing and pickling.

Basing Point Prices are (1) those announced by U. S. Steel Corp. subsidiaries for first quarter of 1941 or in effect April 16, 1941 at designated basing points or (2) those prices announced or customarily quoted by other producers at the same designated points. Base prices under (2) cannot exceed those under (1) except to the extent prevailing in third quarter of 1940.

Extras mean additions or deductions from base prices in effect April 16, 1941.

Delivered prices applying to Detroit, Eastern Michigan, Gulf and Pacific Coast points are deemed basing points except in the case of the latter two areas when water transportation is not available, in which case nearest basing point price, plus all-rail freight may be charged.

Domestic Ceiling prices are the aggregate of (1) governing basing point price, (2) extras and (3) transportation charges to the point of delivery as customarily computed. **Governing basing point** is basing point nearest the consumer providing the lowest delivered price. **Emergency basing point** is the basing point at or near the place of production or origin.

Seconds, maximum prices: flat-rolled rejects 75% of prime prices; wasters 75%, waste-wasters 65%, except plates, which take waster prices; tin plate $2.80 per 100 lbs.; terne plate $2.25; semifinished 85% of primes; other grades limited to new material ceilings.

Export ceiling prices may be either the aggregate of (1) governing basing point or emergency basing point (2) export extras (3) export transportation charges provided they are the f.a.s. seaboard quotations of the U. S. Steel Export Co. on April 16, 1941.

Bolts, Nuts

F.o.b. Pittsburgh, Cleveland, Birmingham, Chicago. Discounts for carloads additional 5%, full containers, add 10%.

Carriage and Machine

½ x 6 and smaller	65½ off
Do., ⅝ and ¾ x 6-in. and shorter	63½ off
Do., ¾ to 1 x 6-in. and shorter	61 off
1⅛ and larger, all lengths	59 off
All diameters, over 6-in. long	59 off
Tire bolts	50 off
Step bolts	56 off
Plow bolts	65 off

Stove Bolts

In packages with nuts separate 71-10 off; with nuts attached 71 off; bulk 80 off on 15,000 of 3-inch and shorter, or 5000 over 3-in.

Nuts	U.S.S.	S.A.E.
Semifinished hex.		
⅞-inch and less	62	64
½-1-inch	59	60
1⅛-1½-inch	57	58
1⅝ and larger	56	..

Hexagon Cap Screws

Upset 1-in., smaller	64 off
Milled 1-in., smaller	60 off

Square Head Set Screws

Upset, 1-in., smaller	71 off
Headless, ¼-in., larger	60 off
No. 10, smaller	70 off

Piling

Pittsburgh, Chicago, Buffalo 2.40c

Rivets, Washers

F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham

Structural	3.75c
⅞-inch and under	65-5 off
Wrought washers, Pittsburgh, Chicago, Philadelphia, to jobbers and large nut, bolt manufacturers l.c.l.	$2.75-3.00 off

Metallurgical Coke

Price Per Net Ton

Beehive Ovens

Connellsville, furnace	*6.50
Connellsville, foundry	7.50- 8.00
Connellsville prem. fdry.	7.75- 8.10
New River, foundry	8.50- 8.75
Wise county, foundry	8.00
Wise county, furnace	7.00

By-Product Foundry

Kearny, N. J., ovens	12.15
Chicago, outside delivered	11.50
Chicago, delivered	12.25
Terre Haute, delivered	12.00
Milwaukee, ovens	12.25
New England, delivered	13.75
St. Louis, delivered	†12.25
Birmingham, ovens	8.50
Indianapolis, delivered	12.00
Cincinnati, delivered	11.75
Cleveland, delivered	12.30
Buffalo, delivered	12.50
Detroit, delivered	12.25
Philadelphia, delivered	12.38

*Operators of hand-drawn ovens using trucked coal may charge $7.00, effective Feb. 3, 1943. †$12.75 from other than Ala., Mo., Tenn.

Coke By-Products

Spot, gal., freight allowed east of Omaha

Pure and 90% benzol	15.00c
Toluol, two degree	28.00c
Solvent naphtha	27.00c
Industrial xylol	27.00c
Per lb. f.o.b. works	
Phenol (car lots, returnable drums)	12.50c
Do., less than car lots	13.25c
Do. tank cars	11.50c
Eastern Plants, per lb.	
Naphthalene flakes, balls, bbls., to jobbers	8.00c
Per ton, bulk, f.o.b. port	
Sulphate of ammonia	$29.20

Pig Iron

Prices (in gross tons) are maximums fixed by OPA Price Schedule No. 10, effective June 10, 1941. Exceptions indicated in footnotes. Allocation regulations from WPB Order M-17, expiring Dec. 31, 1942. Base prices bold face, delivered light face. Federal tax on freight charges, effective Dec. 1, 1942, not included in following prices.

	No. 2 Foundry	Basic	Bessemer	Malleable
Bethlehem, Pa., base	$25.00	$24.50	$26.00	$25.50
Newark, N. J., del.	26.62	26.12	27.62	27.12
Brooklyn, N. Y., del.	27.65	....	....	28.15
Birdsboro, Pa., del.	25.00	24.50	26.00	25.50
Birmingham, base	†20.38	†19.00	....	....
Baltimore, del.	25.67	....	....	....
Boston, del.	25.12	....	....	....
Chicago, del.	†24.47	....	....	....
Cincinnati, del.	24.30	22.92	....	....
Cleveland, del.	24.12	23.24	....	....
Newark, N. J., del.	26.24	....	....	....
Philadelphia, del.	25.51	25.01	....	....
St. Louis, del.	†24.12	23.24	....	....
Buffalo, base	24.00	23.00	25.00	24.50
Boston, del.	25.50	25.00	26.50	26.00
Rochester, del.	25.53	....	26.53	26.03
Syracuse, del.	26.08	....	27.08	26.58
Chicago, base	24.00	23.50	24.50	24.00
Milwaukee, del.	25.17	24.67	25.67	25.17
Muskegon, Mich., del.	27.38	....	....	27.38
Cleveland, base	24.00	23.50	24.50	24.00
Akron, Canton, O., del.	25.47	24.97	25.97	25.47
Detroit, base	24.00	23.50	24.50	24.00
Saginaw, Mich., del.	26.45	25.95	26.95	26.45
Duluth, base	24.50	24.00	25.00	24.50
St. Paul, del.	26.75	26.26	27.26	26.76
Erie, Pa., base	24.00	23.50	25.00	24.50
Everett, Mass., base	25.00	24.50	26.00	25.50
Boston, del.	25.50	25.00	26.50	26.00
Granite City, Ill., base	24.00	23.50	24.50	24.00
St. Louis, del.	24.50	24.00	....	24.50
Hamilton, O., base	24.00	23.50	....	24.00
Cincinnati, del.	24.68	24.68	....	25.35
Neville Island, Pa., base	24.00	23.50	24.50	24.00
§Pittsburgh, del. No. & So. sides	24.69	24.19	25.19	24.69
Provo, Utah, base	22.00	21.50	....	....
Sharpsville, Pa., base	24.00	23.50	24.50	24.00
Sparrows Point, Md., base	25.00	24.50	....	....
Baltimore, del.	26.05	....	....	....
Steelton, Pa., base	....	24.50	....	25.50
Swedeland, Pa., base	25.00	24.50	26.00	25.50
Philadelphia, del.	25.89	25.39	....	26.39
Toledo, O., base	24.00	23.50	24.50	24.00
Mansfield, O., del.	26.06	25.56	26.56	26.06
Youngstown, O., base	24.00	23.50	24.50	24.00

*Basic silicon grade (1.75-2.25%), add 50c for each 0.25%. †For phosphorus 0.70 and over deduct 38c. ‡Over 0.70 phos. §For McKees Rocks, Pa., add .55 to Neville Island base; Lawrenceville, Homestead, McKeesport, Ambridge, Monaca, Aliquippa, .84; Monessen, Monongahela City .97 (water); Oakmont, Verona 1.11; Brackenridge 1.24.

High Silicon, Silvery

6.00-6.50 per cent (base)	$29.50		
6.51-7.00	$30.50	9.01- 9.50	$35.50
7.01-7.50	31.50	9.51-10.00	36.50
7.51-8.00	32.50	10.01-10.50	37.50
8.01-8.50	33.50	10.51-11.00	38.50
8.51-9.00	34.50	11.01-11.50	39.50

F.o.b. Jackson county, O., per gross ton, Buffalo base prices are $1.25 higher. Prices subject to additional charge of 50 cents a ton for each 0.50% manganese in excess of 1.00%.

Bessemer Ferrosilicon

Prices same as for high silicon silvery iron, plus $1 per gross ton.

Charcoal Pig Iron

Northern

Lake Superior Furn. $28.00
Chicago, del. 31.54

(For higher silicon irons a differential over and above the price of base grades is charged as well as [illegible] irons, Nos. 5 and 6.)

Southern

Semi-cold blast, high phos., f.o.b. furnace, Lyles, Tenn. $28.50
Semi-cold blast, low phos., f.o.b. furnace, Lyles, Tenn.. 33.00

Gray Forge

Neville Islands, Pa. $23.50
Neville Island, Pa. $23.50

Low Phosphorus

Basing points: Birdsboro and Steelton, Pa., and Buffalo, N. Y., $29.50 base; $30.81, delivered, Philadelphia.

Switching Charges: Basing point prices are subject to an additional charge for delivery within the switching limits of the respective districts.

Silicon Differentials: Basing point prices are subject to an additional charge not to exceed 50 cents a ton for each 0.25 silicon in excess of base grade (1.75 to 2.25%).

Phosphorus Differential: Basing point prices are subject to a reduction of 38 cents a ton for phosphorous content of 0.70% and over.

Manganese Differentials: Basing point prices subject to an additional charge not to exceed 50 cents a ton for each 0.50% manganese content in excess of 1.0%.

Ceiling Prices are the aggregate of (1) governing basing point (2) differentials (3) transportation charges from governing basing point to point of delivery as customarily computed. Governing basing point is the one resulting in the lowest delivered price for the consumer.

Exceptions to Ceiling Prices: Pittsburgh Coke & Iron Co. (Sharpsville, Pa. furnace only) and Struthers Iron & Steel Co. may charge 50 cents a ton in excess of basing point prices for No. 2 Foundry, Basic, Bessemer and Malleable. Mystic Iron Works, Everett, Mass., may exceed basing point prices by $1 per ton, effective April 20, 1942. Chester, Pa., furnace of Pittsburgh Coke & Iron Co. may exceed basing point prices by $2.25 per ton, effective July 27, 1942.

Refractories

Per 1000 f.o.b. Works, Net Prices

Fire Clay Brick

Super Quality

Pa., Mo., Ky.	$64.60

First Quality

Pa., Ill., Md., Mo., Ky.	51.30
Alabama, Georgia	51.30
New Jersey	56.00
Ohio	43.00

Second Quality

Pa., Ill., Md., Mo., Ky.	46.55
Alabama, Georgia	38.90
New Jersey	49.00
Ohio	36.00

Malleable Bung Brick

All bases	$59.85

Silica Brick

Pennsylvania	$51.30
Joliet, E. Chicago	58.90
Birmingham, Ala.	51.30

Ladle Brick

(Pa., O., W. Va., Mo.)

Dry press	$31.00
Wire cut	29.00

Magnesite

Domestic dead-burned grains, net ton f.o.b. Chewelah, Wash., net ton, bulk	22.00
net ton, bags	26.00

Basic Brick

Net ton, f.o.b. Baltimore, Plymouth Meeting, Chester, Pa.

Chrome brick	$54.00
Chem. bonded chrome	54.00
Magnesite brick	76.00
Chem. bonded magnesite	65.00

Fluorspar

Washed gravel, f.o.b. Ill., Ky., net ton, carloads, all rail	$25.00-28.00
Do., barge	25.00-28.00
No. 2 lump	25.00-28.00

(Prices effective Nov. 23, 1942)

Ferroalloy Prices

Ferromanganese: 78-82%, carlots, gross ton, duty paid, Atlantic ports, $135; Del. Pittsburgh $140.65; f.o.b. Southern furnaces $135; Add $6 per gross ton for packed carloads $10 for ton, $13.50 for less-ton and $18 for less than 200-lb. lots, packed.

Spiegeleisen: 19-21%, carlots per gross ton, Palmerton, Pa. $36.

Electrolytic manganese: 99.9% plus, less ton lots, per lb. 42.00c. Ton lots 40.00c. Annual contracts 38.00c.

Chromium Metal: Per lb. contained chromium in gross ton lots, contract basis, freight allowed, 98% 80.00c, 88% 79.00c. Spot prices 5 cents per lb. higher.

Ferrocolumbium: 50-60%, per lb. contained columbium in gross ton lots, contract basis, f.o.b. Niagara Falls, N. Y. $2.25; less-ton lots $2.30. Spot prices 10 cents per lb. higher.

Ferrochrome: 66-70%; per lb. contained chromium in carloads, freight allowed, 4-6% carbon 13.00c; ton lots 13.75c; less-ton lots 14.00c; less than 200-lb. lots 14.25c. 66-72%, low carbon grades:

	Car loads	Ton lots	Less ton	200 lbs.
2% C.	19.50c	20.25c	20.75c	21.00c
1% C.	20.50c	21.25c	21.75c	22.00c
0.20% C.	21.50c	22.25c	22.75c	23.00c
0.10% C.	22.50c	23.25c	23.75c	24.00c

Spot is ¼c higher

Chromium briquets: Contract basis in carloads per lb., freight allowed 8.25c; packed 8.50c; gross ton lots 8.75c; less-ton lots 9.00c; less 200-lb. lots 9.25c. Spot prices ¼-cent higher.

Ferromolybdenum: 55-75%, per lb. contained molybdenum, f.o.b. Langeloth and Washington, Pa., furnace, any quantity 95.00c.

Calcium Molybdate (Molyte): 40-45%, per lb. contained molybdenum, contract basis, f.o.b. Langeloth and Washington, Pa., any quantity, 80.00c.

Molybdic Oxide Briquets: 48-52%, per lb. contained molybdenum, f.o.b. Langeloth, Pa., any quantity 80.00c.

Molybdenum Oxide: 53-63%, per lb. contained molybdenum in 5 and 20 lb. molybdenum contained cans, f.o.b. Langeloth and Washington, Pa., any quantity 80.00c.

Molybdenum Powder: 99% per lb. in 200-lb. kegs, f.o.b. York, Pa. $2.60; 100-200 lb. lots $2.75; under 100-lb. lots $3.00.

Ferrophosphorus: 17-19%, based on 18% phosphorus content, with unitage of $3 for each 1% of phosphorus above or below the base; gross tons per carload f.o.b. sellers' works, with freight equalized with Rockdale, Tenn.; contract price $58.50, spot $62.25.

Ferrophosphorus: 23-26%, based on 24% phosphorus content, with unitage of $3 for each 1% of phosphorus above or below the base; gross tons per carload f.o.b. sellers' works, with freight equalized with Mt. Pleasant, Tenn.; contract price $75, spot $80.

Ferrosilicon: Contract basis in gross tons per carload, bulk, freight allowed; unitage applies to each 1% silicon above or below base.

	Carloads	Ton lots
50%	$ 74.50	$ 87.00
Unitage	1.50	1.75
75%	135.00	151.00
Unitage	1.80	2.00
85%	170.00	188.00
Unitage	2.00	2.20
90-95%	10.25c	11.25c

Spot prices ½-cent higher.

Silicon Metal: Contract basis per lb., f.o.b. producers plants, freight allowed; 1% iron; carlots 14.50c, ton lots 15.00c, less-ton lots 15.25c, less 200 lbs. 15.50c.

Silicon Metal: Contract basis per lb.; 2% iron; carlots 13.00c, ton lots 13.50c, less-ton lots 13.75c, less 200 lbs. 14.00c. Spot prices ¼-cent higher.

Silicon Briquets: Contract basis; in carloads, bulk freight allowed, per ton $74.50; packed $80.50; ton lots $84.50; less-ton lots per lb. 4.00c; less 200-lb. lots per lb. 4.25c. Spot ¼-cent per lb. higher on less-ton lots; $5 per ton higher on ton lots and over.

Silicomanganese: Contract basis freight allowed, 1½% carbon; in carloads per gross ton $135; ton lots $147.50. Spot $5 per ton higher.

Silico-manganese Briquets: Contract basis in carloads per pound, bulk freight allowed 5.80c; packed 6.05c; ton lots 6.30c; less-ton lots 6.55c; less 200-lb. lots 6.80c. Spot prices ¼-cent higher.

Ferrotungsten: Carlots, per lb. contained tungsten, $1.90.

Tungsten Metal Powder: 98-99%, per lb. any quantity $2.55-2.65.

Ferrotitanium: 40-45%, f.o.b. Niagara Falls, N. Y., per lb. contained titanium; ton lots $1.23; less-ton lots $1.25. Spot up 5 cents per lb.

Ferrotitanium: 20-25%, 0.10 maximum carbon; per lb. contained titanium; ton lots $1.35; less-ton lots $1.40. Spot 5 cents per lb. higher.

High-Carbon Ferrotitanium: 15-20%. Contract basis, per gross ton, f.o.b. Niagara Falls, N. Y., freight allowed to destinations east of Mississippi River and North of Baltimore and St. Louis, 6-8% carbon $142.50; 3-5% carbon $157.50.

Ferrovanadium: 35-40%, contract basis, per lb. contained vanadium, f.o.b. producers plant with usual freight allowances; open-hearth grade $2.70; special grade $2.80; highly-special grade $2.90.

Vanadium Pentoxide: Technical grade, 88-92 per cent V_2O_5; contracts, any quantity, $1.10 per pound V_2O_5 contained; spot 5 cents up.

Zirconium Alloys: 12-15%, contract basis, carloads bulk, per gross ton $102.50; packed $107.50; ton lots $108; less-ton lots $112.50. Spot $5 per ton higher.

Zirconium alloy: 35-40%, contract basis, carloads in bulk or package, per lb. of alloy 14.00c; gross ton lots 15.00c; less-ton lots 16.00c. Spot ½-cent higher.

Alsifer: (Approx. 20% aluminum, 40% silicon, 40% iron) Contract basis, f.o.b. Niagara Falls, N. Y., per lb. 7.50c; ton lots 8.00c. Spot ½-cent higher.

Simanal: (Approx. 20% each silicon, manganese, aluminum) Contract basis, freight allowed, per lb. of alloy; carlots 10.00c; ton lots 10.50c, less ton lots, 11.00c.

Borosil: 3 to 4% boron, 40 to 45% Si., $7 lb. cont Bo., f.o.b. Philo, O.

WAREHOUSE STEEL PRICES

Base Prices in Cents Per Pound, Delivered Locally, Subject to Prevailing Differentials. As of April 16, 1941

	Hot rolled bars	Structural shapes	Plates	Floor plates	Hot rolled sheets (10 gage base)	Hot rolled bands (12 gage and heavier)	Hot rolled hoops (14 gage and lighter)	Galvanized flat sheets (24 gage base)	Cold rolled sheets (17 gage base)	Cold finished bars	Cold-rolled strip	AISI hot bars 2300 series	AISI hot bars 3100 series
Boston	3.98[1]	3.85[1]	3.85[1]	5.66[1]	3.71[1]	4.06[1]	5.66[1]	5.11[14]	4.68[14]	4.13[21]	3.46	7.75[23]	6.05[28]
New York	3.84[1]	3.75[1]	3.76[1]	5.56[1]	3.58[1]	3.96[1]	3.96[1]	5.00[13]	4.60[1]	4.09[21]	3.51	7.60[23]	5.90[28]
Philadelphia	3.85[1]	3.55[1]	3.55[1]	5.25[1]	3.55[1]	3.95[1]	4.45[1]	4.90[16]	4.63[25]	4.06[21]	3.31	7.56[23]	5.86[28]
Baltimore (city)	3.85[1]	3.70[1]	3.70[1]	5.25[1]	3.50[1]	4.00[1]	4.35[1]	5.05[17]	5.00[20]	4.04[21]	....	....	....
Baltimore (country)	3.85[1]	3.70[1]	3.45[1]	5.25[1]	3.25[1]	4.00[1]	4.35[1]	4.75[17]	5.00[20]	4.04[21]	....	....	....
Washington, D. C.	3.95[1]	3.80[1]	3.80[1]	5.35[1]	3.60[1]	4.10[1]	4.45[1]	5.15[17]	5.10[20]	4.03[21]	....	....	....
Norfolk, Va.	4.00[1]	4.05[1]	4.05[1]	5.45[1]	3.85[1]	4.10[1]	4.10[1]	5.40[17]	4.50[24]	4.15[21]	....	....	....
Bethlehem, Pa.*	....	3.45[1]	....	....	....	....	....	....	....	....	....	....	....
Claymont, Del.*	.	.	3.45[1]	....	....	....	....	....	....	....	....	....	....
Coatesville, Pa.*	.	.	3.45[1]	.	.	.	.	.	.	.	.	.	.
Buffalo (city)	3.35[1]	3.40[1]	3.62[1]	5.25[1]	3.25[1]	3.82[1]	3.82[1]	4.75[15]	4.30[10]	3.75[21]	3.52	7.35[23]	5.65[28]
Buffalo (country)	3.25[1]	3.30[1]	3.62[1]	5.25[1]	3.15[1]	3.82[1]	3.82[1]	4.65[15]	4.20[10]	3.65[21]	....	....	....
Pittsburgh (city)	3.35[1]	3.40[1]	3.40[1]	5.00[1]	3.35[1]	3.60[1]	3.60[1]	4.75[15]	4.00[24]	3.65[21]	....	7.45[23]	5.75[28]
Pittsburgh (country)	3.25[1]	3.30[1]	3.30[1]	4.90[1]	3.25[1]	3.50[1]	3.50[1]	4.65[15]	4.00[24]	3.65[21]	.	.	.
Cleveland (city)	3.25[1]	3.58[1]	3.40[1]	5.18[1]	3.35[1]	3.50[1]	3.50[1]	4.62[15]	4.05[24]	3.75[21]	3.20	7.55[23]	5.85[28]
Cleveland (country)	3.25[1]	3.58[1]	3.30[1]	5.18[1]	3.25[1]	3.50[1]	3.50[1]	4.62[15]	3.95[24]	3.65[21]	....	..	..
Detroit	3.43[1]	3.65[1]	3.60[1]	5.27[1]	3.43[1]	3.43[1]	3.68[1]	4.84[12]	4.30[24]	3.80[21]	3.40	7.67[23]	5.97[28]
Omaha (city)	4.10[1]	4.15[1]	4.15[1]	5.75[1]	3.85[1]	4.20[1]	4.20[1]	5.52[10]	4.77[24]	4.42[21]	....	....	....
Omaha (country)	4.00[1]	4.05[1]	4.05[1]	5.65[1]	3.75[1]	4.10[1]	4.10[1]	5.52[10]	4.77[24]	4.42[21]	....	..	..
Cincinnati	3.60[1]	3.68[1]	3.65[1]	5.28[1]	3.42[1]	3.67[1]	3.67[1]	4.92[10]	4.37[24]	4.00[21]	3.45	7.69[23]	5.99[28]
Youngstown, O.*	.	.	.	.	.	.	.	4.40[12]	....	....	....	....	....
Middletown, O.*	.	.	.	.	3.25[1]	3.50[1]	3.50[1]	4.40[12]	....	....	....	..	....
Chicago (city)	3.50[1]	3.55[1]	3.55[1]	5.15[1]	3.25[1]	3.60[1]	3.60[1]	4.85[10]	4.10[24]	3.75[21]	3.50	7.35[23]	5.65[28]
Chicago (country)	3.40[1]	3.45[1]	3.45[1]	5.05[1]	3.15[1]	3.50[1]	3.50[1]	4.75[10]	4.00[24]	3.65[21]	....	....	....
Milwaukee	3.63[1]	3.68[1]	3.68[1]	5.28[1]	3.38[1]	3.73[1]	3.73[1]	4.98[10]	4.23[24]	3.88[21]	3.54	7.33[23]	5.88[28]
St. Paul	3.75[2]	3.80[2]	3.80[2]	5.40[2]	3.50[2]	3.85[2]	3.85[2]	5.00[2]	4.35[2]	4.34[21]	3.83	7.70[23]	6.00[28]
St. Louis	3.64[1]	3.69[1]	3.69[1]	5.29[1]	3.39[1]	3.74[1]	3.74[1]	4.99[10]	4.24[24]	4.02[21]	3.61	7.72[23]	6.02[28]
Indianapolis (city)	3.60[1]	3.70[1]	3.70[1]	5.30[1]	3.45[1]	3.75[1]	3.75[1]	5.01[10]	4.25[24]	3.97[21]	....	....	....
Indianapolis (country)	3.35[1]	3.45[1]	3.40[1]	5.05[1]	3.20[1]	3.50[1]	3.50[1]	5.01[10]	4.00[24]	3.97[21]	....	....	....
Memphis, Tenn.	3.90[3]	3.95[3]	3.95[3]	5.71[3]	3.85[3]	4.10[3]	4.10[3]	5.25[11]	4.66[24]	4.31[21]	....	....	....
Birmingham (city)	3.50[3]	3.55[3]	3.55[3]	5.83[3]	3.45[3]	3.70[3]	3.70[3]	4.75[10]	4.78[24]	4.43[21]	....	....	....
Birmingham (country)	3.40[3]	3.45[3]	3.45[3]	5.83[3]	3.35[3]	3.60[3]	3.60[3]	4.75[10]	4.78[24]	4.43[21]	.	....	....
New Orleans (city)	4.10[4]	3.90[4]	3.90[4]	5.85[4]	3.95[4]	4.20[4]	4.20[4]	5.25[26]	4.95[10]	4.60[21]	5.00	....	....
New Orleans (country)	4.00[4]	3.80[4]	3.80[4]	5.75[4]	3.85[4]	4.10[4]	4.10[4]	5.15[26]	4.95[10]	4.60[21]	....	....	....
Houston, Tex.	3.75[3]	4.25[3]	4.25[3]	5.50[3]	3.75[3]	4.30[3]	4.30[3]	5.25[26]	5.43[10]	4.50[22]	....	....	....
Los Angeles	4.35[4]	4.60[4]	4.90[4]	7.15[4]	4.95[4]	4.90[4]	6.70[4]	5.95[10]	7.15[6]	5.70[22]	....	9.55[26]	8.55[28]
San Francisco (city)	3.95[7]	4.35[7]	4.65[7]	6.35[7]	4.55[7]	4.50[7]	4.50[7]	6.60[10]	7.55[10]	5.55[22]	....	9.80[9]	8.80[9]
San Francisco (country)	3.85[7]	4.25[7]	4.55[7]	6.25[7]	4.45[7]	4.40[7]	4.40[7]	6.50[10]	7.45[10]	5.45[22]	....	....	....
Tacoma	4.20[8]	4.45[8]	4.75[8]	6.50[8]	4.65[8]	4.25[8]	5.45[8]	5.70[8]	6.63[24]	5.75[22]	....	....	....
Seattle (city)	4.20[8]	4.45[8]	4.75[8]	6.50[8]	4.65[8]	4.35[8]	5.45[8]	5.70[8]	6.63[24]	5.75[22]	....	....	8.00[8]

*Basing point cities against which warehouses equalized freight as of April 16, 1941, and which must now be used in calculating lowest combination prices.

NOTE—All prices except cold-rolled strip and AISI hot-rolled bars fixed by Office of Price Administration in amendment No. 10 to Revised Price Schedule No. 49.

BASE QUANTITIES

[1]—400 to 1999 pounds; [2]—400 to 14,999 pounds; [3]—any quantity; [4]—300 to 1999 pounds; [5]—400 to 3999 pounds; [6]—300 to 1999 pounds; [7]—400 to 39,999 pounds; [8]—under 2000 pounds; [9]—under 4000 pounds; [10]—500 to 1499 pounds; [11]—one bundle to 39,999 pounds; [12]—150 to 2249 pounds; [13]—150 to 1499 pounds; [14]—three to 24 bundles; [15]—450 to 1499 pounds; [16]—one bundle to 1499 pounds; [17]—one to nine bundles; [18]—one to six bundles; [19]—100 to 749 pounds; [20]—300 to 1999 pounds; [21]—1500 to 39,999 pounds; [22]—1500 to 1999 pounds; [23]—1000 to 39,999 pounds; [24]—400 to 1499 pounds; [25]—1000 to 1999 pounds; [26]—under 25 bundles. Cold-rolled strip, any quantity is base.

Ores

Lake Superior Iron Ore
Gross ton, 51½% Lower Lake Ports

Old range bessemer	$4.75
Mesabi nonbessemer	4.45
High phosphorus	4.35
Mesabi bessemer	4.60
Old range nonbessemer	4.60

Eastern Local Ore
Cents, unit, del. E. Pa.

Foundry and basic 56-63%, contract	13.00

Foreign Ore
Cents per unit, c.i.f. Atlantic ports

Manganiferous ore, 45-55% Fe., 6-10% Mang.	Nom.
N. African low phos.	Nom.
Spanish, No. African basic, 50 to 60%	Nom.
Brazil iron ore, 68-69% f.o.b. Rio de Janeiro	7.50-8.00c

Tungsten Ore

Chinese wolframite, per short ton unit, duty paid	$24.00

Chrome Ore
(Equivalent OPA schedules):
Gross ton f.o.b. cars, New York, Philadelphia, Baltimore, Charleston, S. C., Portland, Ore., or Tacoma, Wash.
(S/S paying for discharging; dry basis; subject to penalties if guarantees are not met.)

Indian and African	
48% 2.8:1	41.00
48% 3:1	43.50
48% no ratio	31.00
South African (Transvaal)	
44% no ratio	27.40
45% no ratio	28.30
48% no ratio	31.00
50% no ratio	32.80
Brazilian—nominal	
44% 2.5:1 lump	33.65
48% 3:1 lump	43.50
Rhodesian	
45% no ratio	28.30
48% no ratio	31.00
48% 3:1 lump	43.50
Domestic (f.o.b. Columbus, Mont.)	
48% 3:1	43.50
less $7 freight allowance	

Manganese Ore
Including war risk but not duty. cents per gross-ton unit, dry, f.o.b. cars, New Orleans and Mobile; 5 cents higher at Norfolk, Baltimore, Philadelphia, New York; adjustments for analysis variations. (Based on OPA schedules.)

Brazilian, 48%	73.8c
Brazilian, 46%	71.8c
Caucasian, 51%	75.3c
Caucasian, 50%	74.8c
Chilean, 48%	73.8c
Indian, 50%	74.8c
Indian, 48%	73.8c
South African, 48%	73.8c
South African, 46%	71.8c
(Duty Free)	
Cuban, 51%	86.5c
Cuban, 48%	85.0c
Cuban, 45%	82.0c
Philippine, 50%	85.0c
Domestic, 48%, f.o.b. mines	96.0c

Molybdenum

Sulphide conc., lb., Mo. cont., mines	$0.75

NATIONAL EMERGENCY STEELS (Hot Rolled)

Designation	Chemical Composition Limits, Per Cent—Carbon	Mn.	Si.	Cr.	Ni.	Mo.	Basic open-hearth Bars per 100 lb.	Basic open-hearth Billets per G T	Electric furnace Bars per 100 lb.	Electric furnace Billets per G T
NE 1330	.28-.33	1.60-1.90	.20-.35	.....	.....	.....	$ .10	$2.00	.....	.....
NE 8020	.18-.23	1.00-1.30	.20-.35	.....	.....	.10-.20	.45	9.00	$.95	$19.00
NE 8442	.40-.45	1.30-1.60	.20-.35	.	.	.30-.40	.90	18.00	1.40	28.00
NE 8613	.12-.17	.70- .90	.20-.35	.40-.60	.40-.70	.15-.25	.75	15.00	1.25	25.00
NE 8720	.13-.18	.70- .90	.20-.35	.40-.60	.40-.70	.20-.30	.80	16.00	1.30	26.00
NE 9255	.50-.60	.75-1.00	1.80-2.20	.	.....	.....	.40	8.00	.....	.....
NE 9262	.55-.65	.75-1.00	1.80-2.20	.20-.40	.....	.....	.65	13.00	.	.
NE 9415	.13-.18	.80-1.10	.40-.60	.20-.40	.20-.50	.08-.15	.80	16.00	1.30	26.00
NE 9442	.40-.45	1.00-1.30	.40-.60	.20-.40	.20-.50	.08-.15	.85	17.00	1.35	27.00
NE 9537	.35-.40	1.20-1.50	.40-.60	.40-.60	.40-.70	.15-.25	1.20	24.00	1.70	34.00
NE 9630	.28-.33	1.20-1.50	.40-.60	.40-.60	.....	.....	.80	16.00	1.30	26.00
NE 9642	.40-.45	1.30-1.60	.40-.60	.40-.60	.....	.....	.85	17.00	1.35	27.00

Extras are in addition to a base price of 2.70c, per 100 lb., on finished products and $54 per gross ton on semifinished steel major basing points and are in cents per 100 lb. and dollars per gross ton in semifinished. No prices quoted on vanadium alloy.

MAXIMUM PRICES FIXED BY OPA ON IRON AND STEEL SCRAP

Other than railroad grades quoted on the basis of basing point prices from which shipping point prices and consumers' delivered prices are to be computed. Scrap originating from railroads quoted delivered to consumers' plants located on the line of the railroad from which the material originated. All prices in gross tons. A basing point includes its switching district.

PRICES FOR OTHER THAN RAILROAD SCRAP

					ELECTRIC FURNACE, ACID OPEN-HEARTH AND FOUNDRY GRADES									
					Low Phos. Grades									
	OPEN HEARTH GRADES*	Mixed Bor., Turn., Machine Turnings	Cast Iron Borings	Shoveling Turnings	Billet, Bloom Forge Crops	Bar Crops and smaller; Punchings, Plate	Heavy Structural, Plate 3 ft. and less	Heavy Structural, Plate 2 ft. and less	Heavy Structural, Plate 1 ft. and less	Foundry Steel 2 ft. and less	Foundry Steel 1 ft. and less	Alloy-Free Low Phos. & Sulphur Turnings	First Cut Heavy Axle & Forge Turnings	Electric Furnace Bundles
Pittsburgh, Brackenridge, Butler, Johnstown, Midland, Monessen, Sharon, Steubenville, Weirton, Canton, Youngstown, Warren	$20.00	$15.00	$16.00	$17.00	$25.00	$22.50	$21.50	$22.00	$22.50	$21.50	$22.00	$18.00	$19.50	$21.00
Claymont, Coatesville, Harrisburg, Conshohocken, Phoenixville	18.75	13.75	14.75	15.75	23.75	21.25	20.25	20.75	21.25	20.25	20.75	16.75	18.25	19.75
Bethlehem	18.25	13.25	14.25	15.25	23.25	20.75	19.75	20.25	20.75	19.75	20.25	16.25	17.75	19.25
Buffalo	19.25	14.25	15.25	16.25	24.25	21.75	20.75	21.25	21.75	20.75	21.25	17.25	18.75	20.25
Cleveland, Middletown, Cincinnati, Portsmouth, Ashland	19.50	14.50	15.50	16.50	24.50	22.00	21.00	21.50	22.00	21.00	21.50	17.50	19.00	20.50
Detroit	17.85	12.85	13.85	14.85	22.85	20.35	19.35	19.85	20.35	19.35	19.85	15.85	17.35	18.85
Toledo	†15.35	12.85	13.85	14.85	....	....	....	....	....	....	....	....	....	....
Chicago	18.75	13.75	14.75	15.75	23.75	21.25	20.25	20.75	21.25	20.25	20.75	16.75	18.25	19.75
Kokomo	18.25	13.25	14.25	15.25	23.25	20.75	19.75	20.25	20.75	19.75	20.25	16.25	17.75	19.25
Duluth	18.00	13.00	14.00	15.00	23.00	20.50	19.50	20.00	20.50	19.50	20.00	16.00	17.50	19.00
St. Louis	17.50	12.50	13.50	14.50	22.50	20.00	19.00	19.50	20.00	19.00	19.50	15.50	17.00	18.50
Birmingham, Atlanta, Alabama City, Los Angeles, San Francisco, Pittsburg, Calif.	17.00	12.00	13.00	14.00	22.00	19.50	18.50	19.00	19.50	18.50	19.00	15.00	16.50	18.00
Minnequa, Colo.	16.50	11.50	12.50	13.50	21.50	19.00	18.00	18.50	19.00	18.00	18.50	14.50	16.00	17.50
Seattle	14.50	9.50	10.50	11.50	19.50	17.00	16.00	16.50	17.00	16.00	16.50	12.50	14.00	15.50

RAILROAD SCRAP

	Heavy Melting Steel	Scrap Rails	Rails for Rolling	Scrap Rails 3 ft. and under	Scrap Rails 2 ft. and under	Scrap Rails 18 in. and under
Pittsburgh, Wheeling, Steubenville, Sharon, Youngstown, Canton	$21.00	$22.00	$23.50	$24.00	$24.25	$24.50
Philadelphia, Wilmington, Sparrows Point	19.75	20.75	22.25	22.75	23.00	23.25
Cleveland, Cincinnati, Middletown, Ashland, Portsmouth	20.50	21.50	23.00	23.50	23.75	24.00
Chicago	19.75	20.75	22.25	22.75	23.00	23.25
Buffalo	20.25	21.25	22.75	23.25	23.50	23.75
Detroit	18.85	19.85	21.35	21.85	22.10	22.35
Kokomo	19.25	20.25	21.75	22.25	22.50	22.75
Duluth	19.00	20.00	21.50	22.00	22.25	22.50
Kansas City, Mo.	17.00	18.00	19.50	20.00	20.25	20.50
St. Louis	18.50	19.50	21.00	21.50	21.75	22.00
Birmingham	18.00	19.00	20.50	21.00	21.25	21.50
Los Angeles, San Francisco	18.00	19.00	20.50	21.00	21.25	21.50
Seattle	15.50	16.50	18.00	18.50	18.75	19.00

CAST IRON SCRAP OTHER THAN RAILROAD

(Shipping point prices in gross tons)

	Group A	Group B	Group C
No. 1 Cupola Cast	$18.00	$19.00	$20.00
No. 1 Machinery Cast, Drop Broken, 150 lbs. & Under	18.00	19.00	20.00
Clean Auto Cast	18.00	19.00	20.00
Stove Plate	17.00	18.00	19.00
Unstripped Motor Blocks	15.50	16.50	17.50
Heavy Breakable Cast	15.50	16.50	17.50
Charging Box Size Cast	17.00	18.00	19.00
Miscellaneous Malleable	20.00	21.00	22.00

Group A includes the states of Montana, Idaho, Wyoming, Nevada, Utah, Arizona and New Mexico.

Group B includes the states of North Dakota, South Dakota, Nebraska, Colorado, Kansas, Oklahoma, Texas and Florida.

Group C includes states not named in groups A and B, plus Kansas City, Kans.-Mo.

*Open Hearth Grades refer to No. 1 heavy melting steel, No. 1 hydraulic compressed black sheet scrap, No. 2 heavy melting steel, dealers' No. 1 bundles, dealers' No. 2 bundles and No. 1 busheling. No. 1 chem. borings, 1 per cent oil, $1 under, No. 2, 1.5 per cent oil, $2 under heavy melting steel. No. 3 bundles, $2 under No. 1 heavy melting; cast steel, $2.50 over, No. 2 busheling, $2.50 under No. 1 heavy melting steel, auto springs, crankshafts, $1 over No. 1 heavy melting. †Toledo open-hearth grades cover only No. 2 busheling.

A basing point includes the switching district of the city named. The Pittsburgh basing point includes the switching districts of Bessemer, Homestead, Duquesne, Munhall and McKeesport, Pa. Cincinnati basing point include: the switching district of Newport, Ky. St. Louis basing point includes the switching districts of Granite City, East St. Louis and Madison, Ill. San Francisco basing point includes the switching districts of South San Francisco, Niles and Oakland, Calif.

Inferior Grades: Maximum prices of inferior grades shall continue to bear the same differential below the corresponding listed grades as existed from Sept. 1, 1940, to Jan. 31, 1941. No premium allowed on grades considered superior, unless approved by OPA. Addition of special preparation charges prohibited. Purchase of electric furnace or foundry grades for open hearth or blast furnace use permitted only at no more than price for corresponding open hearth grade. Exceptions: Low phos. billet, bloom and forge crops and electric furnace bundles may exceed open hearth price, and electric furnace bundles may exceed blast furnace price, if material is delivered to the consumer direct from the original industrial producer.

Commissions: No commission is payable except by a consumer to a broker for services rendered, the commission not to exceed 50 cents per gross ton. No commission is payable unless: The broker guarantees the quality and delivery of an agreed tonnage the scrap is purchased at a price no higher than the maximum allowed; the broker sells the scrap to the consumer at the same price at which he purchased it; the broker does not split the commission with the seller of the scrap, with another broker or sub-broker, or with the consumer. Commissions must be shown as separate item on invoice.

Maximum Shipping Point Price: Where shipment to consumer is by rail, vessel or combination of both, scrap is at its shipping point when it has been placed f.o.b. railroad car or f.a.s. vessel. In such cases, maximum shipping point prices are: (1) For shipping points located within a basing point, the price listed in the above table for scrap at the basing point in which the shipping point is located, minus the lowest established switching charge for scrap within the basing point; and (2) for shipping points located outside a basing point, the price in the above table for scrap at the most favorable basing point, minus the lowest transportation charge by rail, water or combination thereof. When vessel movement is involved, dock charges shall be 50 cents at Memphis, $1 at Great Lakes ports, $1.25 at New England ports, 75 cents elsewhere. New England shipping point prices computed on most favorable basing point prices; maximum transportation charge on scrap from New England, $6.65 per ton.

Scrap shipped by motor vehicle is at its shipping point when loaded. For shipping points within basing points, maximum is price listed in table minus lowest switching charge. When outside basing point, maximum is price at most favorable basing point minus lowest established charge when hauled by common carrier. When hauled by seller charges are based on carload rate for rail shipment, minimum $1.00 per ton.

Maximum Delivered Prices: Determined by adding established transportation charges to shipping point price, not to exceed by more than $1 (plus freight rate increase March 18, 1942) the prices listed in the table for the nearest basing point. Certain exceptions specified in Revised Price Schedule No. 4 (Amendment 1) apply to St. Louis district consumers, to WPB allocations, to water shipments from Duluth or Superior, Wis., to shipments of billets, blooms and forge crops from Pittsburgh and to shipments of electric and foundry grades from Michigan; to shipments of turnings to ferroalloy producers and of borings to chemical users. Delivered prices of scrap shipped under WPB allocations may exceed prices at nearest basing point by more than $1, if most economical transportation is used.

Unprepared Scrap: Above prices are for prepared scrap. Maximum prices for unprepared scrap are $3.50 less; (material from which Nos. 1, 2 and 8 bundles made is $4 less) than for the corresponding grades of prepared scrap, except for heavy breakable cast. In no case shall electric furnace and foundry grades be used as the 'corresponding grades of prepared scrap."

Remote Scrap: Consists of all grades, except railroad scrap, in Florida, Montana, Idaho, Wyoming, Nevada, Arizona, New Mexico, Texas, Oklahoma, Oregon, Washington, Louisiana, Utah. Delivered price may exceed by not more than $5 the price at the basing point nearest consumer's plant, provided sworn details furnished OPA. Permission required to exceed by more than $5 the nearest basing point price. Colorado scrap is remote scrap for Colorado consumers only.

NONFERROUS METAL PRICES

Copper: Electrolytic or Lake from producers in carlots 12.00c, Del. Conn., less carlots 12.12½, refinery; dealers may add ¾c for 5000 lbs. to carload; 1000-4999 lbs. 1c; 500-999 1½c; 0-499 2c. Casting, 11.75c, refinery for 20,000 lbs., or more, 12.00c less than 20,000 lbs.

Brass Ingot: Carlot prices, including 25 cents per hundred freight allowance; add ¼c for less than 20 tons; 85-5-5-5 (No. 115) 12.25c; 88-10-2 (No. 215) 16.50c; 80-10-10 (No. 305) 14.25c; Navy G (No. 225) 16.75c; Navy M (No. 245) 14.75c; No. 1 yellow (No. 405) 10.00c; manganese bronze (No. 420) 12.75c.

Zinc: Prime western 8.25c, select 8.35c, brass special 8.50c, intermediate 8.75c, E. St. Louis, for carlots. For 20,000 lbs. to carlots add 0.15c; 10,000-20,000 0.25c; 2000-10,000 0.40c; under 2000 0.50c.

Lead: Common 6.35c, corroding or chemical, 6.40c, E. St. Louis for carlots; add 5 points for Chicago, Minneapolis-St. Paul, Milwaukee-Kenosha districts; add 15 points for Cleveland-Akron-Detroit area, New Jersey, New York State, Texas, Pacific Coast, Richmond, Indianapolis-Kokomo; add 20 points for Birmingham, Connecticut, Boston-Worcester-Springfield, New Hampshire, Rhode Island.

Primary Aluminum: 99% plus, ingots 15.00c del., pigs 14.00c del.; metallurgical 94% min. 13.50c del. Base 10,000 lbs. and over; add ½c 2000-9999 lbs.; 1c less than 2000 lbs.

Secondary Aluminum: All grades 15.00c per lb. except as follows: Low-grade piston alloy (No. 122 type) 14.50c; No. 12 foundry alloy (No. 2 grade) 14.50c; chemical warfare service ingot (99½% plus) 14.50c; steel deoxidizers in notchbars, granulated or shot, including ingot containing over 2% iron, Grade 1 (95-97½%) 14.75c, Grade 2 (92-95%) 14.50c, Grade 3 (90-92%) 14.00c, Grade 4 (85-90%) 13.50c, Grade 5 (less than 85%) 12.50c. Above prices for 30,000 lbs. or more; add ¼c 10,000-30,000 lbs.; ½c 1000-10,000 lbs.; 1c less than 1000 lbs. Prices include freight at carload rate up to 75 cents per hundred.

Magnesium: Commercially pure (99.8%) standard ingots (4-notch, 17 lbs.) 20.50c lb.; add 1c for special shapes and sizes, including 3-lb. ingot and 12-lb. round ingot; incendiary bomb alloy 23.40c, 50-50 magnesium-aluminum 23.75c, ASTM B80-41T No. 11 25.00c, ASTM B94-40T No. 13 25.00c, all others 23.00c. Prices for 100 lbs. or more; for 25-100 lbs. add 10c; for less than 25 lbs. 20c; incendiary bomb alloy f.o.b. plant any quantity; carload freight rate allowed all others for 500 lbs. or more.

Tin: Prices ex-dock, New York in 5-ton lots. Add 1 cent for 2240-11,199 lbs., 1½c 1000-2239, 2½c 500-999, 3c under 500. Grade A, 99.8% or higher (includes Straits), 52.00c; Grade B, 99.75-99.79% incl. 51.62½c; Grade C, Cornish refined 51.62½c; Grade D, 99.0-99.74% incl. 51.12½c, Grade E, below 99%, 51.00c.

Antimony: American, bulk, carlots, f.o.b. Laredo, Tex., 99.0-99.8% grade 14.50c, 99.8% and over (arsenic 0.05% max.; no other impurity to exceed 0.1% 15.00c. Add ¼c for less-carlots to 10,000 lbs.; ½c for 9999-224 lbs.; 2c for 223 lbs. and less.

Nickel: Electrolytic cathodes, 99.5%, f.o.b. refinery 35.00c lb.; pig and shot produced from electrolytic cathodes 36.00c; "F" nickel shot or ingot for additions to cast iron, 34.00c; Monel shot 28.00c.

Mercury: Prices per 76-lb. flask f.o.b. point of shipment or entry. Domestic produced in Calif., Oreg., Wash., Idaho, Nev., Ariz. $191; produced in Texas, Ark. $193. Foreign, produced in Mexico, duty paid, $193.

Arsenic: Prime, white, 99%, carlots, 4.00c lb.

Beryllium-Copper: 3.75-4.25% Be., $15 lb. contained Be.

Cadmium: Bars, ingots, pencils, pigs, plates, rods, slabs, sticks and all other "regular" straight or flat forms 90.00c lb., del.; anodes, balls, discs and all other special or patented shapes 95.00c lb. del.

Cobalt: 97-99%, $2.11 lb.; 100 lbs. or more on contract, $1.50 lb.

Indium: 99.5%, $10 per troy ounce.

Gold: U. S. Treasury, $35 per ounce.

Silver: Open market, N. Y., 44.75c per ounce.

Platinum: $36 per ounce.

Iridium: $165 per troy ounce.

Palladium: $24 per troy ounce.

Rolled, Drawn, Extruded Products

(Copper and brass product prices based on 12.00c, Conn., for copper. Freight prepaid on 100 lbs. or more.)

Sheet: Copper 20.87c; yellow brass 19.48c; commercial bronze, 90% 21.07c, 95% 21.28c; red brass, 80% 20.15c, 85% 20.36c; phosphor bronze, Grades A, B 5% 36.25c; Everdur, Herculoy, Duronze or equiv. 26.00c; naval brass 24.50c; manganese bronze 28.00c; Muntz metal 22.75c; nickel silver 5% 26.50c.

Rods: Copper, hot-rolled 17.37c, cold-rolled 18.37c; yellow brass 15.01c; commercial bronze 90% 21.32c, 95% 21.53c; red brass 80% 20.40c, 85% 20.61c; phosphor bronze Grade A, B 5% 36.50c; Everdur, Herculoy, Duronze or equiv. 25.50c; Naval brass 19.12c; manganese bronze 22.50c; Muntz metal 18.87c; nickel silver 5% 28.75c.

Seamless Tubing: Copper 21.37c; yellow brass 22.23c; commercial bronze 90% 23.47c; red brass 80% 22.80c, 85% 23.01c.

Extruded Shapes: Copper 20.87c; architectural bronze 19.12c; manganese bronze 24.00c, Muntz metal 20.12c; Naval brass 20.37c.

Angles and Channels: Yellow brass 27.98c; commercial bronze 90% 29.57c, 95% 29.78c; red brass 80% 28.65c, 85% 28.86c.

Copper Wire: Bare, soft, f.o.b. Eastern mills, carlots 15.37½c, less-carlots 15.87½c; weatherproof, f.o.b. Eastern mills, carlots 17.00c, less-carlots 17.50c; magnet, delivered, carlots 17.50c, 15,000 lbs. or more 17.75c, less carlots 18.25c.

Aluminum Sheets and Circles: 2s and 3s, flat, mill finish, base 30,000 lbs. or more; del.; sheet widths as indicated; circle diameters 9" and larger:

Gage	Width	Sheets	Circles
.249"-7	12"-48"	22.70c	25.20c
8-10	12"-48"	23.20c	25.70c
11-12	26"-48"	24.20c	27.00c
13-14	26"-48"	25.20c	28.50c
15-16	26"-48"	26.40c	30.40c
17-18	26"-48"	27.90c	32.90c
19-20	24"-42"	29.80c	35.30c
21-22	24"-42"	31.70c	37.20c
23-24	3"-24"	25.60c	29.20c

Lead Products: Prices to jobbers; full sheets 9.50c; cut sheets 9.75c; pipe 8.15c, New York; 8.50c Philadelphia, Baltimore, Rochester and Buffalo; 8.75c, Chicago, Cleveland, Worcester, Boston.

Zinc Products: Sheet f.o.b. mill, 13.15c; 36,000 lbs. and over deduct 7%. Ribbon and strip 12.25c, 3000-lb. lots deduct 1%, 6000 lbs. 2%, 9000 lbs. 3%, 18,000 lbs. 4%, carloads and over 7%. Boiler plate (not over 12") 3 tons and over 11.00c; 1-3 tons 12.00c; 500-2000 lbs. 12.50c; 100-500 lbs. 13.00c; under 100 lbs. 14.00c. Hull plate (over 12") add 1c to boiler plate prices.

Plating Materials

Chromic Acid: 99.75%, flake, del., carloads 16.25c; 5 tons and over 16.75c; 1-5 tons 17.25c; 400 lbs. to 1 ton 17.75c; under 400 lbs. 18.25c.

Copper Anodes: Base 2000-5000 lbs., del.; oval 17.62c; untrimmed 18.12c; electro-deposited 17.37c.

Copper Carbonate: 52-54% metallic cu; 250 lb. barrels 20.50c.

Copper Cyanide: 70-71% cu, 100-lb. kegs or bbls. 34.00c f.o.b. Niagara Falls.

Sodium Cyanide: 96%, 200-lb. drums 15.00c; 10,000-lb. lots 13.00c f.o.b. Niagara Falls.

Nickel Anodes: 500-2999 lb. lots; cast and rolled, carbonized 47.00c; rolled, depolarized 48.00c.

Nickel Chloride: 100-lb. kegs or 275-lb. bbls. 18.00c lb., del.

Tin Anodes: 1000 lbs. and over 58.50c, del.; 500-999 59.00c; 200-499 59.50c; 100-199 61.00c.

Tin Crystals: 400-lb. bbls. 39.00c f.o.b. Graselli, N. J.; 100-lb. kegs 39.50c.

Sodium Stannate: 100 or 300-lb. drums 36.50c, del.; ton lots 33.50c.

Zinc Cyanide: 100-lb. kegs or bbls. 33.00c, f.o.b. Niagara Falls.

Scrap Metals

Brass Mill Allowances: Prices for less than 15,000 lbs. f.o.b. shipping point. Add ⅝c for 15,000-40,000 lbs.; 1c for 40,000 lbs. or more.

	Clean Heavy	Rod Ends	Clean Turnings
Copper	10.250	10.250	9.500
Tinned Copper	9.625	9.625	9.375
Yellow Brass	8.625	8.375	7.875
Commercial bronze 90%	9.375	9.125	8.625
95%	9.500	9.250	8.750
Red Brass, 85%	9.125	8.875	8.375
Red Brass, 80%	9.125	8.875	8.375
Muntz metal	8.000	7.750	7.250
Nickel Sil., 5%	9.250	9.000	4.625
Phos. br., A. B. 5%	11.00	10.750	9.750
Herculoy, Everdur or equivalent	10.250	10.000	9.250
Naval brass	8.250	8.000	7.500
Mang. bronze	8.250	3.000	7.500

Other than Brass Mill Scrap: Prices apply on material not meeting brass mill specifications and are f.o.b. shipping point; add ¾c for shipment of 60,000 lbs. of one group and ½c for 20,000 lbs. of second group shipped in same car. Typical prices follow:

(Group 1) No. 1 heavy copper and wire, No. 1 tinned copper, copper borings 9.75c; No. 2 copper wire and mixed heavy copper, copper tuyeres 8.75c.

(Group 2) soft red brass and borings, aluminum bronze 9.00c; copper-nickel and borings 9.25c; car boxes, cocks and faucets 7.75c; bell metal 15.50c; babbitt-lined brass bushings 13.00c.

(Group 3) zincy bronze borings, Admiralty condenser tubes, brass pipe 8.00c; Muntz metal condenser tubes 7.50c; yellow brass 6.25c; manganese bronze (lead 0.00%-0.40%) 7.25c, (lead 0.41%-1.0%) 6.25c; manganese bronze borings (lead 0.00-0.40%) 6.50c, (lead 0.41-1.00%) 5.50c.

Aluminum Scrap: Prices f.o.b. point of shipment, respectively for lots of less than 1000 lbs.; 1000-20,000 lbs. and 20,000 lbs. or more; plant scrap only. Segregated 2s solids 10.00c, 11.00c, 11.50c; all other solids 9.50c, 10.50c, 11.00c; borings and turnings 7.50c, 8.50c, 9.00c; mixed solids 8.50c, 9.50c, 10.00c, mixed borings and turnings 6.50c, 7.50c, 8.00c.

Lead Scrap: Prices f.o.b. point of shipment. For soft and hard lead, including cable lead, deduct 0.55c from basing point prices for refined metal.

Zinc Scrap: New clippings, old zinc 7.25c f.o.b. point of shipment; add ½-cent for 10,000 lbs. or more. New die-cast scrap, radiator grilles 4.95c; add ½c 20,000 or more. Unsweated zinc dross, die cast slab 5.80c any quantity.

Nickel, Monel Scrap: Prices f.o.b. point of shipment; add ½c for 2000 lbs. or more of nickel or cupro-nickel shipped at one time and 20,000 lbs. or more of Monel. Converters (dealers) allowed 2c premium.

Nickel: 98% or more nickel and not over ½% copper 26.00c; 90-98% nickel, 26.00c per lb. nickel contained.

Cupro-nickel: 90% or more combined nickel and copper 26.00c per lb. contained nickel, plus 8.00c per lb. contained copper; less than 90% combined nickel and copper 26.00c for contained nickel only.

Monel: No. 1 castings, turnings 15.00c; new clippings 20.00c; soldered sheet 18.00c.

Sheets, Strip . . .

Sheet & Strip Prices, Page 166

Orders for narrow cold strip to apply against directives for hot material for May rolling are appearing in greater volume under CMP, with allotment numbers; production quotas for most rerollers for that month will be unchanged, allowing operations at 85 to 90 per cent of capacity. Processing of PRP tonnage to CMP is proceeding and May and June rollings under the latter will account for most tonnage.

Material already promised for delivery in second quarter will not be displaced by CMP orders taken prior to April 15, unless by special directive; this in effect protects consumers who placed orders before March 22 without assigned allotment numbers. By April 15 allotment numbers on approved CMP orders are expected to be assigned completely. By that time rerollers must have hot material schedules in for May and part of June and the influence of CMP will be increasingly felt as the quarter advances.

Striving for a balance in production schedules, producers are forced to watch bookings with a view of fitting orders into production quotas. High-carbon stock in some instances requires four anneals against two for other tonnage. As regards alloys, schedules for melting must be in 90 to 105 days ahead of cold-rolling. Demand continues heavy and is geared more closely to production quotas.

Plates . . .

Plate Prices, Page 167

Heavier applications for plates for May rolling are reported by some producers, exceeding April requests, while others find little change. Emphasis for May production is on ship work, merchant ship activity being relatively larger than for Navy craft. Producers also noted heavier applications for railroad rolling stock construction, especially for locomotives. Requirements for high-test gasoline and synthetic rubber plants are less, though an upturn is expected later.

While no figures are available for March plate production it is doubted if the total will reach the high mark of 1,300,000 tons expected by some observers.

Bars . . .

Bar Prices, Page 166

Cold-drawn bar sellers now have little left for second quarter delivery. Several days ago they gave the hot mills their carbon bar specifications for May rolling under their quota system, which means that they will not have much of the quarter left in which to process these hot bars.

Anyone placing a new order now would stand virtually no chance of obtaining delivery before the end of the quarter, as the hot bars required will not be specified to the mills before April 25, or thereabouts, for rolling in June. It is possible that some such tonnage might be rolled by hot mills in time for the cold drawer to make shipment before the end of the period, but the amount will be small.

As for alloy cold-drawn bars, delivery is definitely out of the question for second quarter and it would appear that a buyer could count on little before August.

Occasionally there are cancellations which permit tonnage to be shipped to another consumer fairly promptly, but such instances are rare. Not infrequently, however, jobbers benefit by such cancellations for they can take the tonnage and parcel it out to various buyers.

Second quarter allotments under CMP for Lend-Lease are expected out shortly, having been considerably delayed. In view of the sold-up condition of the mills for the greater portion of the period, it appears doubtful if much tonnage originally contemplated can be handled. In fact, it is understood that Lend-Lease is figuring on little tonnage now before late May.

Agricultural implement builders are being aided by directives for shipment of bars and other needed steel for the increased production program. Some of the directives are for small lots to fill immediate needs. Manufacturers of heavy forgings expect their large backlogs will be held through the year as demand shows no diminution.

Pipe . . .

Pipe Prices, Page 167

OPA has issued two corrections to price regulation No. 230. Under black pipe table I, the price of threaded and coupled pipe with 4¾-inch outside diameter and 7.1-pound per foot weight is corrected

for Zone 1; Zone 4 prices are corrected for threaded and coupled pipe in various sizes and weights from 5½ to 7 inches outside diameter; in the division for galvanized pipe in Table I, prices for plain ends are corrected; table II provides a division between prices for steel casing and steel drive pipe.

Wire . . .

Wire Prices, Page 167

In general wire markets are static, despite much talk about a greater volume of wire products for the merchant market. The fact remains that only a fixed tonnage of steel is available for conversion into wire and there is nothing to indicate that mill directives will be changed to permit any substantial increase of steel for this purpose.

Producers of merchant wire feel the big bulge is past for the current season inasmuch as the labor shortage will not permit farmers to spend much time mending their fences when the planting season gets under way. A large volume of applications by farmers for additional wire has been made to local ration boards and certificates for a large tonnage have been issued. This means virtually nothing, however, as the farmer must first find the wire before he can buy it and few jobbers are able to supply much fence or barbed wire.

Volume of new business in manufacturers' wire items remains unchanged and miscellaneous merchant products, including wire nails and similar items, are considerably below demand.

Rails, Cars . . .

Track Material Prices, Page 167

While some locomotive inquiry is still being noted, domestic demand for railroad rolling stock generally is negligible. Little car inquiry has been noted in several weeks, because of limitations placed on car construction. The program of 20,000 cars to be built for domestic carriers in the first half has long since been settled and because of the uncertainty that even a substantial number of these cars can be delivered before third quarter, and perhaps not until well into that period, railroads see little point in getting estimates on new equipment. Delivery of steel against this 20,000 car program is not expected to get under way before May.

Railroads generally claim they need additional equipment badly, and it is estimated in some official quarters that they could well utilize 80,000 new cars this year.

Structural Shapes . . .

Structural Shape Prices, Page 167

With deliveries ranging from five to six weeks on most tonnage, shipyards and their subcontractors are taking a high ratio of structural steel and demand for buildings, bridges and engineering projects is small. Numerous contracts have been transferred to CMP and as the quarter advances this plan promises largely to replace straight directives, which have applied to much tonnage, notably ships, in recent months.

While mills are usually well filled on ship channel and other lighter sizes, heavier sections are dull. While some restrictions on design operating against the use of structural steel are lifted, conservation and speed in delivery are factors in placing contracts for fabricated work. A 1600-ton building on Long Island was placed on a delivery basis, part of the material being on hand, and several hundred tons for a foundry building in New Jersey will be fabricated from an old steel frame structure.

Bookings of fabricated steel in February were 29,560 net tons, compared with 228,688 tons in February, 1942. The decline has been constant since last June when steel use was limited to war purposes. Shipments were 104,836 tons in February, against 164,599 tons in the same month last year. Tonnage available for fabrication within the next four months totals 475,575 tons. The figures are by the American Institute of Steel Construction.

Reinforcing Bars . . .

Reinforcing Bar Prices, Page 167

WPB has removed all size restrictions on the manufacture of concrete reinforcing bars from new billet steel during April and the order may be made permanent later.

Inquiry is light, with scattered price shading on larger tonnages. By drawing on inventories to meet limited buying, distributors are gradually lowering stocks, which are still ample for slack inquiry. On 500 tons for Panama 15 bidders, mostly mills, quoted a wide range of prices

on an f.o.b. basis, promising deliveries in three to ten days in several instances.

Scrap . . .

Scrap Prices, Page 170

Uneasiness continues to be felt over the situation in steelmaking scrap, although no shortage has developed. However, some steelmakers find current receipts fall short of consumption and inroads are being made in reserve stocks in many instances. At the same time rural scrap is not being gathered, farmers being busy with spring work, and collections from that source are falling off.

Yard stocks from various scrap drives are being worked over as completely as labor conditions will allow and this material is being shipped for use with better grades from industrial sources. Turnings continue a difficult problem and both dealers and consumers have a surfeit, much tonnage remaining unsold.

Remote scrap is not moving well as melters refuse to pay the high freight charges as long as supplies from nearby are available. Few directives are in effect as distribution is better than in the past.

Dealers in the Buffalo area complain that consumers are not accepting turnings even to the extent which WPB directs should be included in furnace mixtures. Mills state they are observing this rule but that they have large stocks on hand and cannot buy more. One consumer is said to have about 25,000 tons in stock.

Receipts by consumers in the St. Louis district are fair to poor but vary between plants. Two melters have reduced reserves in the past 30 days and another has applied to Washington for a directive to increase its tonnage. One has a surplus of low-grade scrap but lacks better grades. Railroad scrap is in good supply but country scrap is light, showing effect of the advancing season.

Scrap supply is improving moderately in the Chicago district, although at no time recently has scrap been a limiting factor in steelmaking. Increased wage to yard labor has not been in force long enough to show its effects in holding workers.

Collections, except of industrial scrap, have lagged in the Cincinnati district in recent weeks, allowing yard workers to clear up much of the old accumulations. Foundries have fairly large inventory and are not eager to take in all that is offered. Heavy melting steel is in demand unless it carries high freight charges. Country collections are expected to be light for some time as farm work broadens.

Institute of Scrap Iron and Steel Inc. has estimated February scrap consumption, both home and purchased, at 4,361,000 gross tons, compared with 4,753,000 tons in January and 4,276,000 tons in February, 1942.

Pig Iron . . .

Pig Iron Prices, Page 168

April allocations of pig iron were somewhat freer than in recent months, in the experience of some sellers. This was shown not so much in recognition of lower ratings as that consumers were given more nearly their full requests. Many consumers did not ask for as much as usual as their order books are lighter and schedules for April promise to be reduced. Contrary to the generally easier situation charcoal iron allocations were restricted noticeably. This is attributed to one charcoal producer in the Lake Superior region blowing out in April for repairs and to labor shortage of another interest in the same area.

Output is being maintained at a maximum but the strain is beginning to tell on equipment. Numerous stacks are on the ragged edge and a number will be forced down for relining. Carnegie-Illinois Steel Corp. has been forced to suspend Farrell No. 2 at Farrell, Pa. Carrie No. 7 at Rankin, Pa., is down for a patch, which will require about six weeks. This stack has been running nearly five years on the present lining. A stack in the Buffalo district is scheduled to blow out during April. A new furnace at the Lackawanna plant of Bethlehem Steel Co. is expected to be blown in within a month. This is No. 7 and will rank with stack H, which claims the world's monthly production record.

Pig iron supply is well balanced with demand for the present but it is believed the situation will tighten in coming months. As a hedge against shortened output producers have been able to build stocks at furnaces which are scheduled to go down for relining, under WPB permission to reserve tonnage for the idle period.

A new development in pig iron is undergoing test at several steel plants, small amounts of titanium and aluminum be-

ing added. This is in the laboratory stage, expected to be of value in certain applications because of deoxidizing qualities.

Metallurgical Coke . . .

Coke Prices, Page 167

Blast furnace operators are breathing easier now that the immediate possibility of a coal strike has been deferred. The weak spot is not so much the supply of coal, but the supply of beehive coke. Most buyers of furnace coke are living from hand to mouth and have been unable to build up any backlog. The same is true of the beehive ovens, which have not been able to increase coal stocks. Number of ovens in production remains virtually unchanged and the percentage of furnace and foundry coke also is static. Demand for foundry grades is a little more brisk and shippers find it increasingly difficult to obtain enough suitable cars.

OPA has included Monongalia, Preston and Upshur counties, West Virginia, under the same price regulation as the Connellsville region, which will give producers the advantage of the 50-cent differential for coke from hand-drawn ovens previously enjoyed by the Connellsville producers. This gives the West Virginia producers in hand-drawn ovens using trucked coal a price of $7 per net ton, f.o.b. Connellsville, and $6.50 for coke from machine-drawn ovens

Tin Plate . . .

Tin Plate Prices, Page 167

Some can producers are working with equipment engineers towards redesign of canmaking equipment so as to use tin plate in coils rather than boxed sheets as is now common practice. This development is a natural corollary to the use of electrolytic tin plate. Under the hot dip process it was not possible for a tin plate manufacturer to supply tin plate in coils because the nature of the operation required each plate to be dipped separately.

The electrolytic process normally produces tin plate in coils and some can manufacturers are now of the opinion that wastage can be reduced considerably through use of a continuous sheet of metal rather than individual sheets. The revision in equipment necessary to make this change is minor and consists merely of some means of handling the coil and shearing it at the beginning of the canmaking line. Some equipment makers have the problem already pretty well in hand and expect to be in a position to supply such units shortly.

Canada . . .

Toronto, Ont. — Business held at a steady rate last week, with about 90 per cent of orders directly associated with war production. The war program is being revamped in some directions and it is stated that more emphasis is to be placed on production of fighting ships. Additional large contracts are said to be pending for construction of corvettes of a new design, and substantially larger tonnages of steel will be allocated for this purpose. Iron and steel production in Canada also is moving upward and will be further lifted next month when Steel Co. of Canada Ltd., Hamilton, Ont., puts its new 65-ton electric furnace in operation. Both Algoma Steel Corp. Ltd., Sault Ste. Marie, Ont., and Dominion Steel & Coal Corp., Sydney, N. S., are within a few weeks of blowing in new blast furnaces and also will have plant additions ready for step-up in steel production.

Marine boilermakers have been placing heavy orders for plate in the past week or ten days and it is stated that bookings on this account for second quarter are topping all previous records. Canadian plate mills continue to produce well above rated capacity, and it also is reported that plans are under way to boost plate imports from the United States.

Inquiries and orders for sheets continue steady and mills now are fully covered on production for second quarter. Electrical equipment makers have been consistent buyers in lots of 10 to 15 tons. Limited supplies of black and galvanized sheets still are being made available to essential civilian consumers.

Carbon and alloy bar makers report heavy flow of new orders with record bookings for second quarter. As far as war industries are concerned, no shortage is reported but civilian consumers are having trouble obtaining supplies. War plants are beginning to rebuild inventories and some have fairly large stocks on hand. However, consumption of special steel bars is moving ahead at a rapid rate, indicating that requirements this year will be about 50 per cent higher than in 1942.

Merchant pig iron sales have developed

more action, rising to above 11,000 tons last week. Blast furnace representatives credit the improvement to scarcity of scrap. The improvement was directly in foundry and malleable grades, the former sales totaling approximately 5000 tons against some 6000 tons of malleable iron. Little action was reported in basic iron. Pig iron production in Canada is down to 93.3 per cent, due to blowing out one stack at Sault Ste. Marie.

While scrap iron and steel receipts by local dealers show some improvement, incoming scrap is not keeping pace with consumer needs. Supply is almost exclusively from war plants. Salvage campaigns in the rural districts are expected to get under way within the next couple of weeks and it is stated that fairly large tonnages will be available on the spring drive. Big stocks also are said to be held in northern Ontario mining areas and will start to move within the next week or ten days.

Firth-Sterling Reduces Carbides 10 Per Cent

Firth-Sterling Steel Co., McKeesport, Pa., in addition to quantity discounts recently made, announces a special price reduction of 10 per cent on its complete line of carbides for cutting tools. The company terms this a "1942 war discount".

This is the seventh price reduction since September, 1940. Increased use of carbide tools and standardization of sizes has made possible reductions totaling 80 per cent from the 1940 prices.

Steel in Europe . . .

London — (*By Radio*) — War requirements of Great Britain are expanding steadily but steel output is maintained at a rate sufficient to meet needs. Rerollers are heavily booked to the end of June, with some tonnage available for last half rolling. Substantial tonnages of plates are needed for ships, tanks, locomotives and other construction using heavy steel. Pressure for delivery of steel sheets is strong.

Nonferrous Metals . . .

OPA has restored maximum prices for primary lead ingots and linked ingots to their former level of $10 per ton over the maximum price for pig lead. The ceiling had been reduced to $5 per ton over the maximum price for pig lead on Jan. 20 but this level was found to be insufficient to cover cost of production.

Erwin Vogelsang, director of the Tin-Lead Division, warned the Tin Products Industry Advisory Committee last week that unauthorized sales of tin and the continued use of the metal for purposes that are prohibited by the tin conservation order will not be tolerated. The industry must put an end to the careless and wasteful use of tin alloys by consumers for purposes where either a substitute material or a lower tin content can be specified, he told industry representatives.

Revise Control Over Steel Warehouses

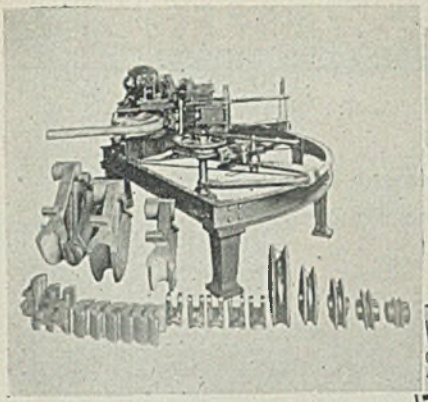
(*Concluded from Page* 91)

mills; and dealers, who buy from warehouses or other non-mill sources.

The order permits warehouses to deal only in those product groups and types of steel in which they dealt in the first quarter of 1941. After CMP goes into full effect July 1, they will be permitted to obtain materials only to replace steel sold in the previous 90 days in accordance with CMP Regulation No. 4, plus small amounts to compensate for scrap loss.

Dealers will operate entirely on a stock replacement basis, and can shift freely within any particular type among the various general steel products. Order M-21-b-1 establishes a procedure for dealer purchases and provides that orders for replacement of authorized sales must be certified by an endorsement provided by the order, which automatically makes the purchase an authorized controlled material order.

A provision permitting the ear-marking of warehouse stocks for a particular claimant agency is included, where such ear-marking is agreed upon by the Steel Division and the claimant agency involved. Deliveries from such ear-marked stocks are to be made only in accordance with specific directions issued at the time the stock is ear-marked.



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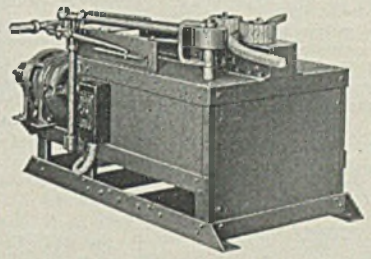
This is a powerful and fast machine for heavy duty work in both fabricating plants or in the field where large tonnage is required. It will handle as high as 20 tons a day. Circles of any size required in concrete reinforcing work from 18 inches in diameter up can be bent on this machine. It will bend bars with two or more radius on the same bar without stopping the machine.



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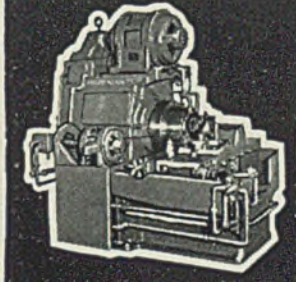

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DI-ACRO Shear squares and sizes materials, cuts strips, makes slits or notches, trims duplicated stampings.

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NEW BUSINESS

Plant Expansion, Construction and Enterprise, Government Inquiries, Sub-Contract Opportunities, Contracts Placed and Pending

SUB-CONTRACT OPPORTUNITIES

Data on subcontract work are issued by regional offices of the War Production Board. Contact either the office issuing the data or your nearest field office. Write, don't telephone, and mention key letters and numbers appearing before each item to assure prompt attention and avoid delay.

Philadelphia Office, Contract Distribution Branch, Production Division, WPB, Broad Street Station building, reports the following subcontract opportunities:

Buescher-12-1: A New York concern requires additional facilities for manufacture of radial jewel bearings. Quantity, 1500 required at present with continued requirements of 700 per month. Material: Mount, 17 st. aluminum, sapphire jewel overall dimensions on mount, O. D. .2821 to .2817, thickness .120 to .005; jewel dimensions, O. D. 9/64 x .065 with .0625 to .0627 hole. No material furnished. Prints at Philadelphia office.

Buescher-12-2: A New York company requires additional facilities for manufacture of radial thrust jewel bearings. Quantity, 725 required at present with continued requirements of 375 per month. Material: Mount, 17st. aluminum, sapphire jewel overall dimensions of mount, O. D. .1884 to .1880, thickness .50 to .010; jewel dimensions, radial jewels, O. D. ⅛ x .030, hole .0312 to .0314; thrust jewel O. D. ⅛ x .030-.002. No material furnished. Prints at Philadelphia offices.

Minneapolis Office, Contract Distribution Branch of WPB, 334 Midland Bank building, is seeking contractors for the following:

S. O. No. 390: Steel hinge. Material, cold-rolled steel. Quantity, 330. Priority, A-1. Subcontractor to do entire job, furnishing materials. Early delivery. Commercial tolerance. Price by negotiation. Drawings available.

S. O. No. 396: Marine anchor chain. Operations are forging, welding and machining. Quantities are substantial and deliveries start soon. Priority AA-1. Drawings and specifications available. Price by negotiation.

S. O. No. 382: Nut. Quantity, 250,000, deliveries 50,000 per month. Material, which is furnished, is free-machining stainless steel. Requires machining, centerless grinder. Tolerance, .002. Drawings are available.

S. O. No. 386: Single-speed two-drum uniwinch case. Two are wanted as soon as possible, more to follow as each is finished. Operations include planing, boring, milling. Material will be furnished. Price to be negotiated with Milwaukee prime contractor. Drawings available.

S. O. No. 387: Marine anchor chain. Each link about 8½ inches long, stock 1½ inches. Six lots, each of 210 fathoms (1260 feet). Forged from wrought iron. Priority AA-1. First lot to be delivered in 60 days, second in 90 days and others at 45-day intervals. Drawings and specifications supplied. Further opportunities to bid on further requirements may be expected.

S. O. No. 397: Stud. Priority AA-1. Immediate facilities needed for manufacture of 150,000 studs, 3/8 to 1¼ inches in diameter, of various lengths. All threads to have class 5 fit. Threads may be die-cut, milled, rolled or ground as long as desired fit is obtained. Repeat orders may be expected. Contractor supplies material.

S. O. No. 273: Local prime contractor has work for a number of turret lathes, 1½ to 2-inch, or engine lathes with turret heads. Material is furnished, quantities are large and work starts at once. Drawings and specifications are supplied.

S. O. 374: Clamp nuts, bushings, etc. Twenty-seven small items in quantities of 1000 or more of each. Work ideally suited to plants which have made perishable tools for ordnance. Calls for small turret lathes, hand screw machines and grinders. Material is cold-rolled steel, stainless steel and brass. Priority, AA-1. Tolerance, .001 to .005. Drawings at Minneapolis office.

S. O. No. 381: Coupling for plastic pipe, size 3 x 3¼-inch. Requires turret lathe and thread cutting. Material, welded or seamless steel tubing or gray or malleable castings. Deliveries, 7500 per month. Priority, AA-1. Drawings available.

S. O. No. 383: Cups, machine parts, in two sizes, 500,000 of each. Deliveries, 75,000 per month, starting April 1. Contractor will furnish free-machining stainless steel, ground to size, also all gages. Drawings available.

Boston office, Contract Distribution Branch of WPB, 17 Court street, is seeking contractors for the following:

SC-85: Multiple or single-spindle automatic screw machine work for machine having 11/16 to 1 1/16-inch diameter bar capacity. Four items ranging in length from 15/32-inch to 21/32-inch. Material, cupro-nickel, supplied by prime contractor. Tolerance, .002. Quantity, 37,000 each size. Reference 1-A-649.

Chicago office, Contract Distribution Branch of WPB, 226 West Jackson Boulevard, is seeking contractors for the following:

AC Spark Plug division, General Motors Corp., Flint, Mich., attention L. R. Steffen. Priority AA-1. Part, rocker arm pin to be finished complete. Contractor to supply material. Quantity, 200,000. Material, manganese steel. Dimensions, ¼ x 1¼-inch. Equipment, ⅜-inch single-spindle automatic screw machine, bench lathe 7 x 15-inch turret, carburizing equipment, No. 2 centerless external grinder.

A. S. Campbell Co., 161 Prescott street, East Boston, Mass. Priority AA-1. Parts, adapter, filling hole plug and filling hole seat. Material, cold-rolled steel or malleable iron. Quantity, 2500 of each item weekly continuously. Subcontractor to do entire job, including furnishing material. Equipment, 4½-inch capacity single-spindle automatic screw machine or 4½-inch bar capacity turret lathe.

Allison division, General Motors Corp., Speedway-Indianapolis, Ind., attention C. J. Kelley. Priority AA-1. Rough finishing of aircraft engine bearings. Facilities, 3½ to 6½-inch automatic screw machines, internal grinding or honing machines of same capacity, suitable for producing No. 85 micro inch finish, which is equivalent to rough grinding operation for removal tool marks. Contractor supplies materials. Substantial runs.

Hercules Motor Corp., Canton, O., attention A. R. Miller. Priority AA-1. Parts, four-throw and six-throw crank shaft. Dies could be furnished by contractor or new ones made by contractor. Required in lots of 500 and 1000. Material, steel forgings. Heavy forging equipment required.

Ohmite Mfg. Co., 4835 Flournoy street, Chicago, attention W. Wodika. Priority AA-1. Part, roller pin, ¼ x 1/16-inch. Material, tool steel, supplied by subcontractor. Quantity, 100,000 in lots from 5000 upward. Equipment, ⅜-inch capacity single-spindle automatic screw machine. Tolerance, .0005.

Remington Rand Inc., Buffalo, N. Y., attention Frank Meier. Priority AA-1. Part, firing pin ¼ x 2½-inch. Material, alloy steel, supplied by contractor. Quantity, 500,000, to be subcontracted in lots of 100,000 or 250,000, at 2500 to 3000 per day. Contractor will do heat treating if subcontractor does not have facilities. Equipment, ⅜-inch capacity single-spindle automatic screw machine.

STRUCTURAL SHAPES . . .

SHAPE CONTRACTS PLACED

2000 tons, building, Kaiser shipyard, Providence, R. I., to Bethlehem Steel Co., Bethlehem, Pa.

1600 tons, addition, aircraft plant, Long Island, N. Y., to Fort Pitt Bridge Works, Pittsburgh.

1254 tons, previously announced as 800, monitor framing, Basic Magnesium Co., Las Vegas, Nev., 878 tons to Consolidated Steel Corp. Ltd., Los Angeles, and 376 tons to Allison Steel Mfg. Co., Phoenix, Ariz.

SHAPE CONTRACTS PENDING

375 tons, Pennsylvania state bridge, Delaware county, National Structures, New York, low on general contract.

REINFORCING BARS . . .

REINFORCING BARS PLACED

175 tons, alcohol plant, Muscatine, Iowa, for Grain Processing Corp., to Bethlehem Steel Co., Bethlehem, Pa.; Weitz Co., Des Moines, Iowa, contractor; bids March 20.

131 tons, express highway, Willow Run, Mich., to Bethlehem Steel Co., Bethlehem, Pa.; W. J. Storen, contractor.

REINFORCING BARS PENDING

500 tons, Panama, sch. 6866; bids in.

220 tons, additions to airplane engine parts plant, Studebaker Corp., South Bend, Ind.; bids March 26.

215 tons, highway bridge, Cicero avenue over Belt railroad, Chicago, for Illinois state highway department; bids March 19.

137 tons, grade separations, Chicago; 72 tons at Pulaski and Keller roads, and 65 tons at Cicero and Keller roads, for Illinois state highway department; bids March 19.

150 tons, addition to airplane engine parts plant, Studebaker Corp., Ft. Wayne, Ind.

103 tons, highway bridge, Pulaski road over Belt railroad, Chicago, for Illinois state highway department; bids March 19.

100 tons, addition to airplane engine parts plant, Studebaker Corp., Chicago.

CONSTRUCTION AND ENTERPRISE

OHIO

AKRON, O.—Bender Machine Co., 150 North Case street, has acquired building on East Market street and lot adjoining, for manufacturing and expansion purposes.

CANTON, O.—Gusset Boiler & Welding Co., 1140 Marion avenue, will remodel its factory.

CLEVELAND—Hansen Mfg. Co., Fred E. Hansen, vice president, 1786 East Twenty-seventh street, will expand production with a $6000 machine shop.

CLEVELAND—Euclid Road Machinery Co., 1361 Chardon road, is expanding its facilities with a crane runway and factory additions. Estimated cost $15,000.

CLEVELAND—Parker Appliance Co., A. L. Parker, president, 17325 Euclid avenue, is adding to warehouse and erecting a power plant at Arabella road. Cost estimated at $100,000.

CLEVELAND—Jo-Pierce Co., 1438 East Fortieth street, is being incorporated under present name. Heretofore operating under a partnership, it is now incorporated by S. K. Wellman, of S. K. Wellman Co., 1374 East Seventy-first street, E. P. Pierce, and J. R. Nurney.

ELYRIA, O.—Electrical & Mechanical Service Co., Earl D. Jolley, proprietor-manager, has been granted permit for industrial building.

MIDDLEFIELD, O.—Geauga Die & Mold Co. has applied for charter for manufacture of and dealing in molds, jigs, dies and fixtures for the machine tool industry. Hugh G. Johnson, 115 South Main street, Middlefield, is agent, and Frank J. Levy, Frank Hrebek and John G. Roberts, Standard building, Cleveland, the incorporators.

PAINESVILLE, O.—Ohio Mfg. Co., Glenn McFarland, manager, 467 North State street, will continue manufacturing steel factory equipment after alterations are completed.

RHODE ISLAND

PAWTUCKET, R. I.—Royal Corp., 75 Savin street, Pawtucket, is altering three-story factory, for which contract has been awarded to Henry M. Soule Co., 110 Armistice boulevard, Pawtucket. Hamilton Standard Propellers Division United Aircraft Corp., 400 Main street, East Hartford, Conn., lessee.

NEW YORK

NEW YORK—New Jersey Powder Co., 15 Broad street, New York, will construct additional plant facilities in New Jersey. Estimated cost over $9,000,000. Project will be financed by Defense Plant Corp.

NEW YORK—National Carbon Co., 60 East Forty-second street, New York, plans erection of plant in Kentucky costing approximately $280,000, and additional plant facilities in North Carolina costing $1,450,000. Defense Plant Corp. will finance both projects.

NEW JERSEY

HILLSIDE, N. J.—A & B Tire Co., 34 Spring street, Newark, has awarded contract for one-story addition to Joseph Krunholz Construction Co., 15 Reynolds place, Newark, N. J.

JERSEY CITY, N. J.—W. Kellogg Co. will build one-story tool and locker building. Estimated cost $40,000.

PENNSYLVANIA

PHILADELPHIA—Defense Plant Corp. has authorized increase in its contract with Rohm & Haas Co., 222 West Washington square, Philadelphia, to provide additional equipment for plant in Tennessee, at cost of approximately $50,000.

MICHIGAN

DETROIT—Truscon Steel Co., 615 Wayne street, has let contract for foundation for mill building to O. W. Burke Co., 1010 Fisher building. Cost exceeds $50,000.

DETROIT—Aluminum Co. of America, 3311 Dunn road, has let contract for foundry addition, conveyors, elevators and knockout deck for aluminum plant to Barton-Malow Co., 2631 Woodward avenue. Cost exceeds $50,000. Malcolmson, Calder & Hammond, 1217 Griswold street, architects.

MUSKEGON, MICH.—Muskegon Piston Ring Co., 6 and Alpha streets, has let contract for two-story factory addition to Fred Movey, 1045 West Dale avenue. Estimated cost $40,000.

INDIANA

INDIANAPOLIS—Allied Bituminous Products, 2100 South Harding street, is rebuilding plant at cost of $40,000, with equipment.

MARION, IND.—Paranite Wire & Cable Co., D. Carpenter, general manager, is rebuilding at main plant building at cost of $200,000 or more, including equipment.

NORTH CAROLINA

WILMINGTON, N. C.—Lock Joint Pipe Co.,

Ampere, N. J., will soon start work on temporary plant near here to manufacture pipe for a nine-mile supply line for which federal funds have been allocated.

MISSOURI

KANSAS CITY, MO.—Defense Plant Corp. has given contract to Sanderson & Porter, 1111 Rialto building, for alcohol plant, including 12 buildings of various types, to cost about $2,000,000. National Distillers Products Corp., New York, will operate the plant.

WISCONSIN

KENOSHA, WIS.—Defense Plant Corp. has given contract to Holger Pahl for addition to building No. 19 of Nash-Kelvinator for heat treating pit.

LA CROSSE, WIS.—Trane Co. has given contract to Peter Nelson & Son for two additions to factory.

WEST ALLIS, WIS.—War Department has given contract to Gebhard-Berghammer Inc., 5420 West State street, Milwaukee, for two-story plant addition, operated by Wehr Steel Co.

MINNESOTA

MINNEAPOLIS—Brown Steel Tank Co., 2907 Southeast Fourth street, has given contract to Kraus-Anderson Co. Inc. for two-story factory addition and extensive alterations to present plant.

ST. PAUL—Northern States Power Co. has given contract to F. J. Romer Construction Co. for addition to steam power plant, to house a 50,000-kilowatt unit. Total cost of High Bridge power plant expansion estimated at $5,000,000, including equipment. Basil Nelson is purchasing agent for the company.

WINONA, MINN.—Donovan Contracting Co., 1725 Carroll avenue, St. Paul, plans addition to Diamond Huller Co. plant which it has leased and will install additional machinery.

KANSAS

WICHITA, KANS.—Aircraft Components has given contract to A. W. Soderberg Co. for one-story factory addition.

WICHITA, KANS.—Beech Aircraft Corp. has given contract to Armagost & Moreland for addition to factory.

NEBRASKA

LINCOLN, NEBR.—Lincoln Packing Co. has been granted permit for packing plant addition.

IOWA

WATERLOO, IOWA—Hawkeye Steel Products Co. recently sustained severe damage to its foundry by fire.

WEBSTER CITY, IOWA—McCollough's Inc. has let contract for rebuilding factory to Zitterell-Mills Co. Cost over $40,000, including equipment.

CALIFORNIA

LOS ANGELES—Building permit has been issued for addition to Peerless Pump Division plant of Food Machinery Corp. at 301 West Avenue Twenty-Six. Estimated cost $10,000.

LOS ANGELES — R.P.M. Flange & Welding Corp. has been organized by R. Watson, C. E. Martin and Emil Person. Representative, Eugene Harrab, 810 South Spring street, Los Angeles.

LOS ANGELES—Magnesite Co. of America has been incorporated with 20,000 shares of no par value stock, by David Greensburg, Irving Bromberg and M. M. Liebenson. Representative, Samuel Reisman, 530 West Sixth street, Los Angeles.

CANADA

MOUNT DENNIS, (TORONTO) ONT.—Canadian Kodak Co. Ltd., Eglington avenue West, plans to start work soon on plant addition to cost, with equipment, about $20,000.

WINDSOR, ONT.—Ford Motor Co. of Canada Ltd., Sandwich street East, has given general contract to Anglin Norcross (Ontario) Ltd., 57 Bloor street West, Toronto, for foundry additions, to cost about $65,000, equipment extra. Sub-trades are pending.

MONTREAL, QUE.—S. Mongeau & Co. Ltd., 8412 Boyer street, plans to start work soon on plant addition, to cost $6000, equipment extra.

MONTREAL, QUE.—Crane Ltd., 3800 St. Patrick street, has given general contract to Anglin-Norcross (Quebec) Ltd., 892 Sherbrooke street West, for pipe plant, to cost with equipment, about $375,000. T. Pringle & Son Ltd., 485 McGill avenue, engineer.

MONTREAL, QUE.—Precision Tool & Supply Co. Ltd., 1359 Notre Dame street West, has given general contract to A. F. Byers Construction Co. Ltd., 1226 University street, for machine shop building on St. Patrick street, to cost, with equipment, about $40,000.

THREE RIVERS, QUE.—Canada Iron Foundries Ltd., 227 St. Maurice street, is considering plans for plant addition and installation of new equipment, estimated to cost about $175,000.

USED and REBUILT EQUIPMENT MATERIALS

SPECIAL ATTENTION!

STEEL MILLS,
BLAST FURNACES AND FOUNDRIES!
For Sale:

ALLOY ("CRITICAL") SCRAP

TURNINGS: $9.00 G.T. Houston plus payable OPA Nickel or Moly. Premiums.
15 C/L SAE 3100; WPB No. 6
5 C/L SAE 4800; WPB No. 6
12 C/L Moly.-Mn.; WPB No. 7

TURNINGS: $12.91 G.T. Tracks, Chicago, plus payable OPA Nickel Premium.
15 C/L 1.00-3.75% Nickel; WPB No. 6

FLASHINGS & CROPS: $16.50 G.T. Houston plus payable OPA Nickel or Moly. Premiums.
6 C/L SAE 3100; WPB No. 6
3 C/L SAE 4800; WPB No. 6
6 C/L Moly.-Mn.; WPB No. 7

NOTE: Relative quantities of Turnings must be purchased with Flashings and Crops.

IRON & STEEL PRODUCTS, INC.
13462 S. Brainard Ave., Chicago, Illinois
"ANYTHING containing IRON or STEEL"

WANTED URGENTLY
COLD ROLLED STEEL

S.A.E. . . . . 1020 or equivalent
Size 1-5/8" x 1-5/8" preferred
Alternate Sizes which can be used
1-5/8" x 1-3/4"; 1-3/4" x 1-3/4";
2-1/2" x 1-5/8"; 2-1/2" x 1-3/4"
Priority AA 1. Advise size, quantity, delivery and price.
Box 229, Suite 617, 1457 Broadway
New York City

— WANTED —

6,000 C.F.M., 16-20 oz. centrifugal cupola blower direct connected to motor. Motor specifi. 3/60/440.

ST. PAUL ENGINEERING & MFG. CO.
Formerly St. Paul Foundry
500 Como Avenue St. Paul, Minn.

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BLOWERS - FANS - EXHAUSTERS

Connersville-Roots positive blowers.
Centrifugals for gas and oil burning.
Sand blast, grinder and dust exhausters.
Ventilating fans and roof ventilators.

GENERAL BLOWER CO.
404 North Peoria St. Chicago, Ill.

RAILS
AND ACCESSORIES

RELAYING RAILS — Super-quality machine-reconditioned—not ordinary Relayers.

NEW RAILS, Angle and Splice Bars, Bolts, Nuts, Frogs, Switches, Tie Plates, and all other Track Accessories.

Although our tonnages are not as large as heretofore, most sizes are usually available from warehouse stocks.
Every effort made to take care of emergency requirements. *Phone, Write or Wire . . .*

L. B. FOSTER COMPANY, Inc.
PITTSBURGH NEW YORK CHICAGO

RAIL-ACCESSORIES
RAILWAY EQUIPMENT

• BOUGHT • SOLD •
WRITE—WIRE—PHONE
DULIEN STEEL PRODUCTS, INC.
414 First Ave., So. Seattle, Wash.
2280 Woolworth Bldg. New York, N. Y.

RELAYING RAIL

Practically all weights—Any quantity. Immediate shipment, strictly first quality reconditioned Relaying Rail and Accessories.

Write, Wire, or Phone
MIDWEST STEEL CORPORATION
Charleston, W. Va.

SELLERS—BUYERS—TRADERS

More for Your Dollar!
IRON & STEEL PRODUCTS INC.
13462 S. Brainard Ave.
Chicago, Illinois
38 Years' Experience

"Anything containing IRON or STEEL"

BORING MILL, 60" N-B-P, R.P.T., M.D.
BORING MILL, 84" N-B-P, R.P.T., M.D.
GEAR PLANERS, Bevel 36" & 54" Gleason, M.D.
HAMMER; Steam Forging 1100 lb. N-B-P.
HAMMER; Steam Forging 2000 lb. Morgan.
LATHE, 36" x 29' Geared Head American, M.D.
SHEARS, Plate 44" & 54" x 3/16" M.D.
STRAIGHTENER, 12-roll Kane & Roach, 1-1/4".
STRAIGHTENER, Wire Shuster, cap. 5/8".
STRAIGHTENER, 12-roll H. & J., 84" x 1/2", M.D.
LANG MACHINERY COMPANY
28th Street & A. V. R. R. Pittsburgh, Pa.

FOR SALE

USED PIPE, FITTINGS, VALVES, STEEL RODS, STEEL BUILDINGS, INDUSTRIAL EQUIPMENT.

INDUSTRIAL SUPPLY & EQUIPMENT CO., INC.
1044 Canal Bldg., New Orleans, La.

FOR SALE

1—Acme 3-wheel automatic polishing machine for tubes or pipe up to 3" O.D. Driven by 15 H.P. A.C. motor with necessary starting equipment.

WELLMAN BRONZE & ALUMINUM CO.
2525 East 93rd St. Cleveland, Ohio

OFFER APPROXIMATELY A CARLOAD OF SHERADIZED SEAMLESS TUBING RANGING IN SIZES FROM 1¼ INCHES TO 3½ INCHES. WRITE FOR PRICES AND QUANTITY DESIRED.

Address Box 831
STEEL, Penton Bldg., Cleveland

FOR SALE

STEEL BUILDINGS
AND TANKS
PIPE AND BOILER TUBES

JOS. GREENSPON'S SON PIPE CORP.
National Stock Yds., Illinois

BUY — SELL — RENT

CARS, LOCOMOTIVES, CRANES
STEEL SHEET PILING, PILE HAMMERS
HOISTS, DERRICKS, TANKS, COMPRESSORS
BOILERS, TURBINES, DIESEL ENGINES, ETC.

MISSISSIPPI VALLEY EQUIPMENT CO.
503 Locust St. St. Louis, Mo.

WANT TO PURCHASE

4 inch O.D. Boiler tubes; steel pipe of all sizes; Valves; Fittings; Industrial plants; Mills; railroads; trackage, etc. Write, wire or phone

SONKEN-GALAMBA CORP.
108 N. 2d St. Kansas City, Kans.
We buy and sell. *Get our quotations.*

CONTRACT WORK

KIRK & BLUM

WELDED MACHINE BASES,
PEDESTALS and FRAMES
LATHE PANS
GEAR and BELT GUARDS
Pressed Steel Louver Panels and Cover Plates

THE KIRK & BLUM MFG. CO.
2822 Spring Grove Ave., Cincinnati, Ohio

SHEET STEEL FABRICATORS

Welded or Riveted Construction. Can handle No. 10 gauge and lighter. Send us your inquiries for estimates.

THE HAINES COMPANY
1931 W. Lake St. Chicago, Ill.

Castings

KING FOUNDRIES, INC., NORTH WALES, Pa. Grey Iron and Semi Steel Castings, also alloyed with Nickel, Chrome, and Molybdenum. Wood, Iron, Brass, and Aluminum Pattern work.

Send your inquiries for
SPECIAL ENGINEERING WORK
to the
A. H. NILSON MACHINE COMPANY, BRIDGEPORT, CONN.
designers and builders of wire and ribbon stock forming machines.
We also solicit your bids for cam milling

SUB-CONTRACT WORK

is being given out daily. Put yourself in line to receive your share of this business by listing your services in this section. Write STEEL, Penton Bldg., Cleveland.

Help Wanted

MECHANICAL DESIGNER-DRAFTSMAN WANTED

Man having 10-15 years practical experience drawing, designing, and checking drawings; preferably as done in steel plant or similar engineering departments. Permanent position with excellent future. Give brief history of experience and education. Address

Personnel Director

TUBE TURNS
INCORPORATED
224 E. Broadway
LOUISVILLE, KY.

SALES ENGINEER

Large well-known manufacturer of materials handling equipment seeks a home office sales engineer with electrical or mechanical engineer's background:

One capable of handling technical correspondence now, in preparation for post war expansion program. Give complete qualifications and draft status.

Reply Box 883, STEEL, Penton Bldg., Cleveland.

SMALL MANUFACTURER OF LIGHT EQUIPment desires research engineer to develop new products for the post war period. There is a permanent position in our western Pennsylvania plant for a man with mechanical and electrical experience. Applicant must be citizen, 35 to 50 years of age, and a graduate mechanical engineer. When replying, give education, experience, references, age and salary desired. Reply Box 857, STEEL, Penton Bldg., Cleveland.

ENGINEER FOR TUBE FABRICATING PLANT. Permanent position. Technical graduate with experience preferred, to take full charge of Engineering, Design and Production. Excellent opportunity with small, expanding organization. State complete personal details: Age, experience, marital status, salary expected. Replies strictly confidential. Address Box 890, STEEL, Penton Bldg., Cleveland.

SALES ENGINEER, WITH BROAD EXPErience and contacts in the steel industry. Should be familiar with rolling mills and other processing equipment used by steel industry; capable of determining applications for electro-mechanical control devices designed and built by this manufacturer. U. S. Citizen. Salary open. Location: New York. New York. Reply Box 887, STEEL, 110 East 42nd Street, New York City.

Opportunities

Opportunities

FOR SALE

STEEL FOUNDRY

(WEST COAST)

150 to 200 tons of finished castings monthly, medium size

Wire or Write to

FRANK B. FOSTER — 829 OLIVER BLDG. — PITTSBURGH, PA.

Help Wanted

FURNACE ENGINEER

Permanent position with long established and progressive Eastern manufacturer of heat treating furnaces. Applicant must have at least ten years of designing experience on medium-sized furnaces, be thoroughly familiar with standard furnace construction and capable of advanced designing for future operations.

Substantial salary to start with unlimited possibilities. For an interview at our expense, kindly furnish detailed experience and qualifications in writing. Reply Box No. 866, STEEL, Penton Bldg., Cleveland.

WANTED: DRAFTSMEN AND DESIGNERS on steel mill machinery and also on ordnance. Location Pittsburgh district. Application to state full experience and acceptable salary. Men at present engaged in defense work need not apply. Address Box 873, STEEL, Penton Bldg., Cleveland.

IN NEED OF QUALIFIED NIGHT SUPERINtendent in welded sheet and steel plate fabricating shop. Good salary and future for right person. Reply Box 886, STEEL, Penton Bldg., Cleveland.

STEEL FOUNDRY SUPERINTENDENT, AND steel foundry core room superintendent, for jobbing foundry on medium-large and small work. Address Box 889, STEEL, Penton Bldg., Cleveland.

SALESMAN—FAMILIAR WITH ALLOY AND stainless mill products. Replies confidential. Address Box 884, STEEL, Penton Bldg., Cleveland.

CLASSIFIED RATES

All classifications other than "Positions Wanted," set solid, minimum 50 words, 5.00, each additional word .10; all capitals, minimum 50 words, 6.50, each additional word .13; all capitals, leaded, minimum 50 words 7.50, each additional word .15. "Positions Wanted," set solid, minimum 25 words 1.25, each additional word .05; all capitals, minimum 25 words 1.75, each additional word .07; all capitals, leaded, minimum 25 words 2.50, each additional word .10. Keyed address takes seven words. Cash with order necessary on "Positions Wanted" advertisements.

Replies forwarded without charge.

Displayed classified rates on request.

Address your copy and instructions to STEEL, Penton Bldg., Cleveland.

Positions Wanted

SALESMAN OR SALES EXECUTIVE—CAN and have sold anything from a peanut roaster to big equipment. And why not? It takes energy, initiative, experience and a capacity to acquire knowledge. I am a university graduate, enjoy membership in effective technical and social organizations. Keenly interested in working for a sound progressing company and would appreciate opportunity of discussing your Pacific Coast sales program. Address Box 885, STEEL, Penton Bldg., Cleveland.

FACTORY MANAGER 24 YEARS BROAD practical and administrative machine shop, stamping, tooling, purchasing, production planning, engineering and cost control experience. Efficient aggressive organizer, age 44. American born, technical education. Communications confidential. Reply Box 856, STEEL, Penton Bldg., Cleveland, Ohio.

EXECUTIVE: WORKS MANAGER, ASSISTant, or Production Manager. Systems expert. Steel fabrication and heavy machinery. Production Control, Incentive. Reply Box 877, STEEL, Penton Bldg., Cleveland.

Representative Wanted

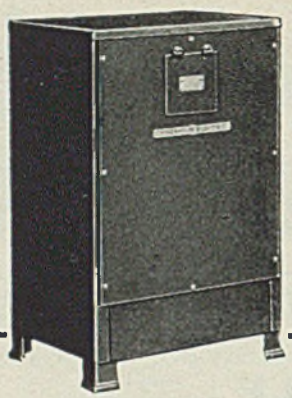
TOOL STEEL REPRESENTATION WANTED—West Coast territory. Promotion of complete line of high grade alloy tool steels. Must be an aggressive organization. Full cooperation of widely recognized Eastern concern offered. Please reply in full detail. Box 888, STEEL, Penton Bldg., Cleveland.

Employment Service

SALARIED POSITIONS—This advertising service of 33 years' recognized standing negotiates for high salaried supervisory, technical and executive positions. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission. Retaining fee protected by refund provision. Send for details. R. W. BIXBY, Inc., 110 Delward Bldg., Buffalo, N. Y.

IF YOU HAVE AN OPPORTUNITY TO OFFER

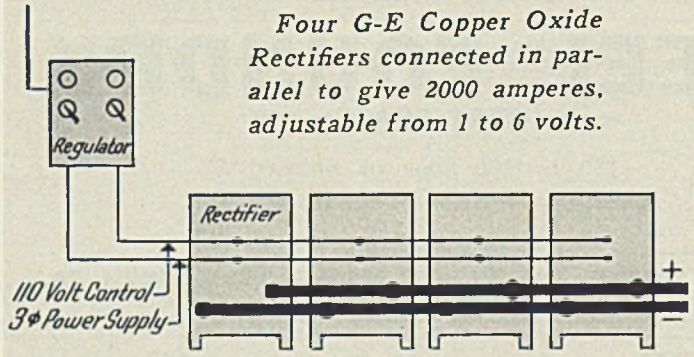
Use the "Help Wanted" columns of STEEL. Your advertisement in STEEL will put you in touch with qualified, high-calibre men who have had wide training in the various branches of the Metal Producing and Metalworking Industries.



ONE TOOL FOR MANY JOBS

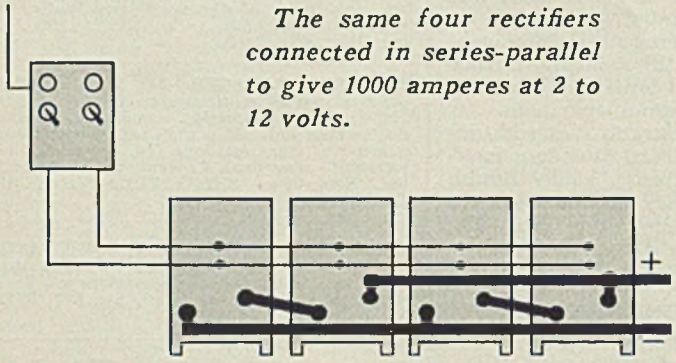
How one electroplater adapted General Electric Copper Oxide Rectifiers for various jobs, including still-tank plating, barrel plating and anodizing

Four G-E Copper Oxide Rectifiers connected in parallel to give 2000 amperes, adjustable from 1 to 6 volts.



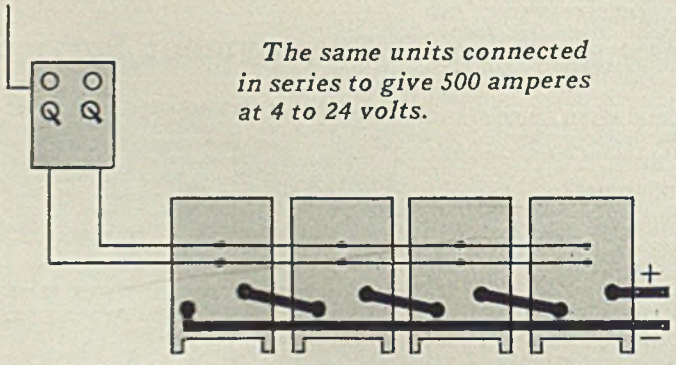
A

The same four rectifiers connected in series-parallel to give 1000 amperes at 2 to 12 volts.



B

The same units connected in series to give 500 amperes at 4 to 24 volts.



C

A. 6-VOLT TANK PLATING

By connecting four G-E Copper Oxide Rectifiers in parallel, the plater obtained 2000 amperes at from 1 to 6 volts for a still-tank plating job. The single regulator for the four units gave complete control over the full range output.

B. 12-VOLT BARREL PLATING

When a barrel-plating contract was obtained, it was a simple matter to rearrange the four rectifiers in series-parallel so as to secure 1000 amperes at from 2 to 12 volts required for the job.

C. ANODIZING

The same four rectifiers were also reconnected in series for an anodizing job requiring 500 amperes at 4 to 24 volts.

OTHER COMBINATIONS

These are only three common examples of the wide variety of groupings that can be obtained with G-E Copper Oxide Rectifiers to serve specific needs, including 40 volt anodizing.

Why not investigate the potential uses of G-E Copper Oxide Rectifiers in your electroplating? G-E Tungar and Metallic Rectifier engineers will be glad to consult with you. Write to Section A-434-90, Appliance and Merchandise Department, General Electric Company, Bridgeport, Connecticut.

GENERAL ELECTRIC

*Advertisements appear in previous issues.

Where-To-Buy Products Index carried quarterly.

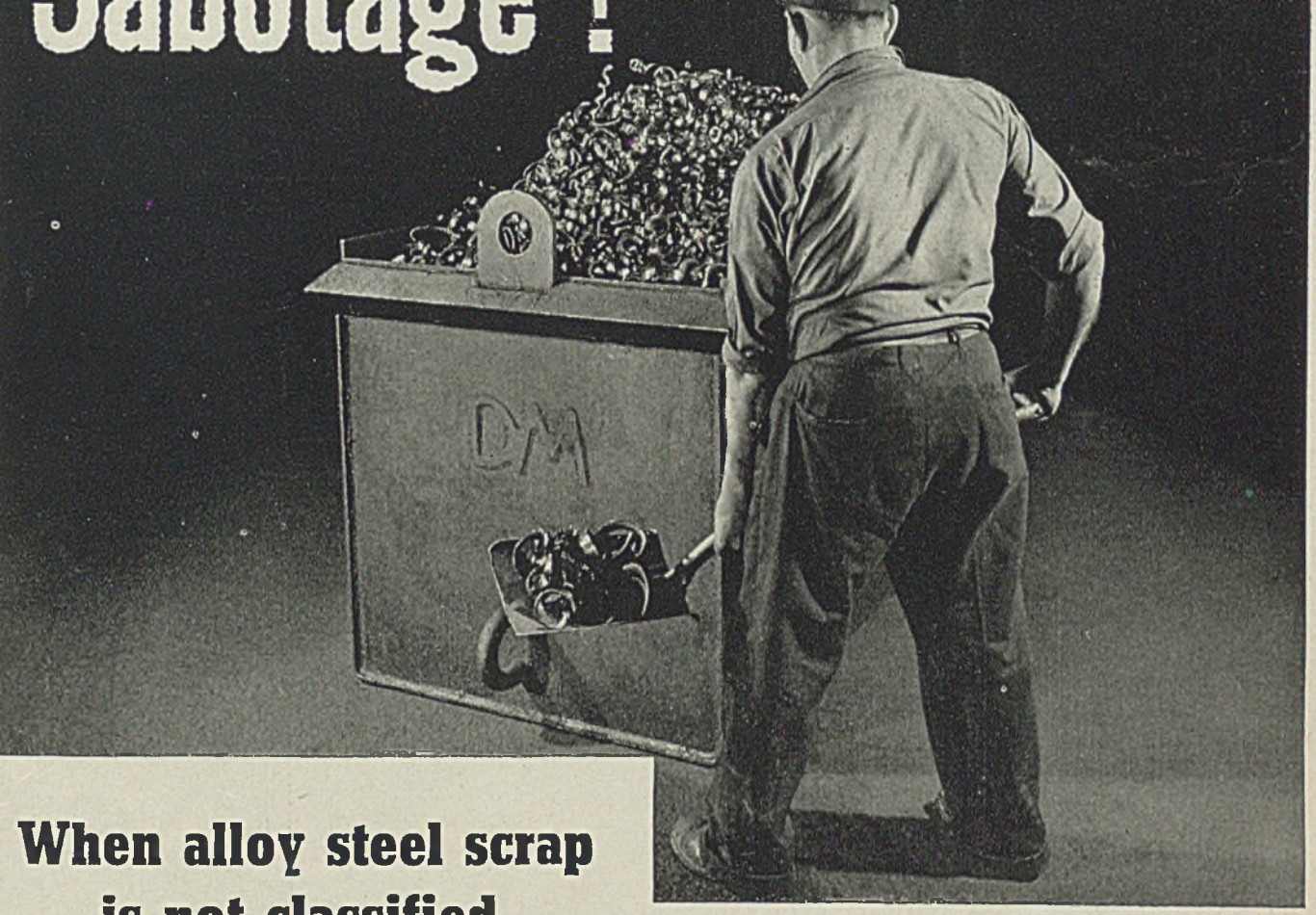
(Continued on next page)

ADVERTISING INDEX

*Advertisements appear in previous issues.

Where-To-Buy Products Index carried quarterly.

(Continued from preceding page)



When alloy steel scrap is not classified, critical alloying metals are lost to the war effort

Where alloys are concerned it isn't enough to sweep up turnings, flashings and other scrap and start it back to the steel mills.

When different grades of alloy scrap are flung together, or alloy and common scrap thrown on the same pile, the content of alloying metals, so critical in this alloy-steel war, is sunk without trace. The precious alloys are lost as completely as if they were dumped into the sea.

To help feed hungry furnaces and make more fighting alloy steels, alloy scrap must be classified, right at the spot where it is produced. It is so critical that we cannot afford to waste a pound of it. *One-half of this country's alloy-steel output depends on the availability, and therefore the proper classification, of alloy scrap.*

When alloy scrap gets "lost" it remains lost, for the man-hours that would be needed to pick over and check every shipment simply cannot be spared. And when hidden alloys contaminate steels made to meet certain physical specifications, entire heats may be ruined.

No one knows better than the steel-maker that painstaking classification of alloy scrap is no simple thing, takes patient organization. But it is a job worth doing, and one that can and must be done. There is no other way to make sure that every pound of critical alloying metals in the nation's scrap supply is tagged and made available to do its part in winning the war.

BETHLEHEM STEEL

Our government has issued a classification list showing how alloy steel scrap should be segregated. If you haven't it, and would like to receive a copy, let us send you one. Write to Bethlehem Steel Company, Bethlehem, Pa.

REMEMBER THE

PROBABLY the most disastrous example of obsolescence in history is the Maginot Line. It took 5 years to build, and cost $500,000,000. But—Hitler circumvented it in a few weeks with modern equipment and methods . . . panzer divisions, air forces and fifth columnists.

WE WONDER how many "Maginot Lines" there are in American industry, today. How much machinery, busy now on war production, will become obsolete with the coming of peace? Like Hitler's panzers and air forces, new materials and processes even now in development will drastically reduce the utility value of present machines. Newer and more productive equipment employed by aggressive and ingenious competition will dominate the peacetime markets.

SINCE POSTWAR PLANNING is now both respectable and popular, we believe it will benefit American industry, individually and collectively, to start studying the future usefulness of present equipment. We say *individually,* because of competition within our borders. We say *collectively,* because many of the machines shipped abroad are far ahead of much domestic machinery in newness, usefulness and durability. If we are to match wits and goods with foreign competition after the war, *and maintain our superior standards of living,* we must have more productive machines to overcome lower labor costs in foreign plants.

WORK AND PROSPERITY for all can come only from productive services. Money transferred from one pocket to another . . .

such as a government bounty to the unemployed . . . creates nothing. We can look for "business as usual" after the war, only if we replace depreciated and obsolete methods and equipment with the most modern and productive tools which ingenuity can develop.

LET'S NOT HAVE A MAGINOT LINE IN AMERICAN INDUSTRY!

Maginot Line?

THE MONARCH MACHINE TOOL COMPANY · · · SIDNEY · OHIO

MONARCH LATHES

Cover the Turning Field

BEHIND THE SCENES

Cooking with Gas

■ A lot of things are happening these days, and as you have undoubtedly noticed the editors of STEEL have pulled all stops in supplying you with a complete wartime information service on your desk the first of each week.

The young fry would say we're cooking with gas while the oldsters might lean over backwards a bit further and simply take time to advise us that STEEL today is a more essential source of information than it ever has been over the many years they have read it.

Let's take a minute and catch up on some of the more outstanding regular issue performances and extra-curricular services developed in the past few months.

■ Certainly one of the top jobs of any industrial publication in the country has been the continuous flow of information in STEEL since early last year on the development and application of NE Alloy Steels. In addition to digesting and correlating all the available information from the American Iron & Steel Institute, STEEL on its own initiative began early last fall to publish a series of User Reports on these new alternate steels, detailing experience by consumers in the successful application on specific substitutions. This series is still continuing and you will find any changes or new developments in the list of NE Steels reported promptly in these pages.

All of this important information has now been compiled into a 72-page NE STEEL HANDBOOK and NE STEEL SELECTOR which are now available at $1.00 *per set. A complete description and order coupon will be found this week on page* 133.

■ Or take Priorities and the whole conglomeration of government regulations of which they are a part. Well over a year ago STEEL's Washington editors and priorities staff in Cleveland developed the first special guide on Priorities, Allocations and Prices, published as a separate section. At the same time, as an extra service, STEEL began furnishing at cost the many PD forms required in a hurry and unavailable from regular government sources. Something over a half million of these forms were furnished to industry last year when the need was greatest.

As a supplement to the Priority Guides, a special page in STEEL each week reports all pertinent new orders, changes and revisions in old ones. Wrapped up as a package this complete priority service compares favorably with anything available in the country, and yet it is just a small part of STEEL's whole job each week.

As part of the May 3 *issue of* STEEL, *a revised and up-to-date issue of the Priorities Guide will be published. Extra copies will be available, as in the past, to regular subscribers free of charge.*

■ Over a ten-week period this year the editors of STEEL published under the feature Windows of Washington one of the most comprehensive and complete reports on postwar planning that has yet appeared in print. The information was compiled by E. C. Kreutzberg, Editor of STEEL, after literally dozens of interviews and contacts with the organizations involved. And in the same way he developed a review of Lend-Lease, a picture of present and postwar opportunities in Latin America, and concluding this week a report on the possibilities involved for materials and equipment manufacturers in food dehydration.

A complete 48-page reprint of Mr. Kreutzberg's report on Postwar Planning will shortly be available to regular subscribers free of charge upon request.

■ Heading southwest now for a complete tour of the aviation and shipbuilding industries is A. H. Allen, Detroit editor of STEEL, and justly famous for his Mirrors of Motordom and Wing Tips columns. Last week you read his on-the-scenes report of the amazing new Douglas plant at Oklahoma City, and the previous week his report on Wright Field and the aircraft scheduling unit. Look for more exclusive and original material in future issues.

Beginning this week, under Mirrors of Motordom, don't fail to read the first of a series on the Postwar Automobile to run over the next four weeks.

■ This week also, E. L. Shaner expands his interpretive analysis of the week's important news in the two-page feature, As the Editor Views the News. Reprints of these two pages are available at cost each week for further distribution among your employes or customers.

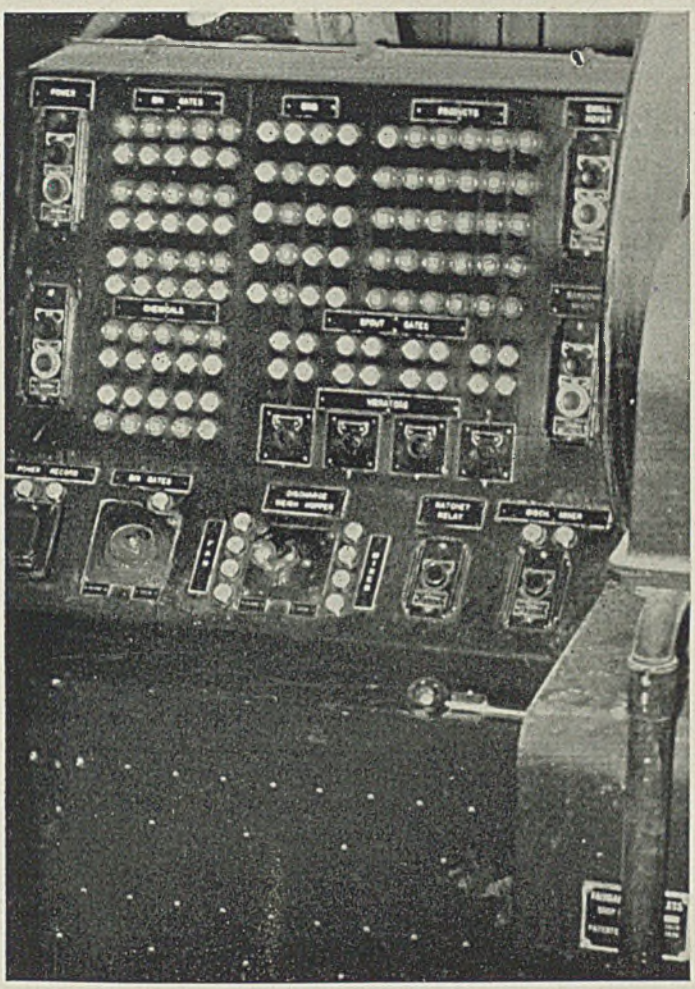
■ STEEL is really three magazines in one—a news weekly, an engineering and operating paper—and a weekly market guide. Newswise a nation-wide staff brings you prompt, crisp reports that are channelled down your alley and are an aid in keeping you informed on how to best conduct your business under present conditions of wartime regulations. From a technical standpoint, the engineering articles in STEEL probably give you the greatest roster of authoritative contributors of any publication in the country. From them have come the material which has later been compiled into STEEL's famous set of Ordnance Production Handbooks, the handbook on How to Improve Your Welding, and Improved Forging Technique, all of which are now in use throughout the industry.

■ But already the bottom of the page is crowding us, and we haven't even mentioned such things as the type of convention report published last week by Guy Hubbard on the ASTE at Milwaukee. We weren't able to get there, but certainly after reading Guy's story we had a better "feel" of the meetings and exhibits than if we had been there personally. If you missed it, find your April 5 issue and attend the meetings in print.

■ We promise we won't blast you with this enthusiasm every week but it just snuck up on us all of a sudden what a swell job those two-dozen editors of ours are doing and we're sure you'll fully agree.

Vol. 112, No. 15, April 12, 1943, issue of STEEL, published every Monday at Cleveland, Ohio. Entered as second class matter at the post office, Cleveland, O., under act of March 3, 1879. U. S. and possessions, Canada, Mexico, Cuba, Central and South America, 1 year $6; 2 years $10; all other countries, 1 year $12. Current issues, 25c. Yearbook of Industry issue, $2.00.

Editorial Contents—Page 57



EXACT CONTROL

★

FOR SURE PERFORMANCE

THE bomber pilot's course is guided by precision instruments. Refractory manufacture, too, must be guided by precision control.

Years of experience in meeting practical problems in the open hearth and electric furnace have shown that refractories best suited for modern steel making cannot be made by rule of thumb methods. They must be designed to meet specific conditions met in the furnace, and they must be manufactured to design...for balanced chemical composition, positive physical characteristics, and uniformity of product.

To insure the desired properties in the manufacture of products where extreme accuracy is essential, Basic Refractories developed and installed a plant built around precision equipment, operating automatically throughout. Key to this equipment is the electric control board shown here.

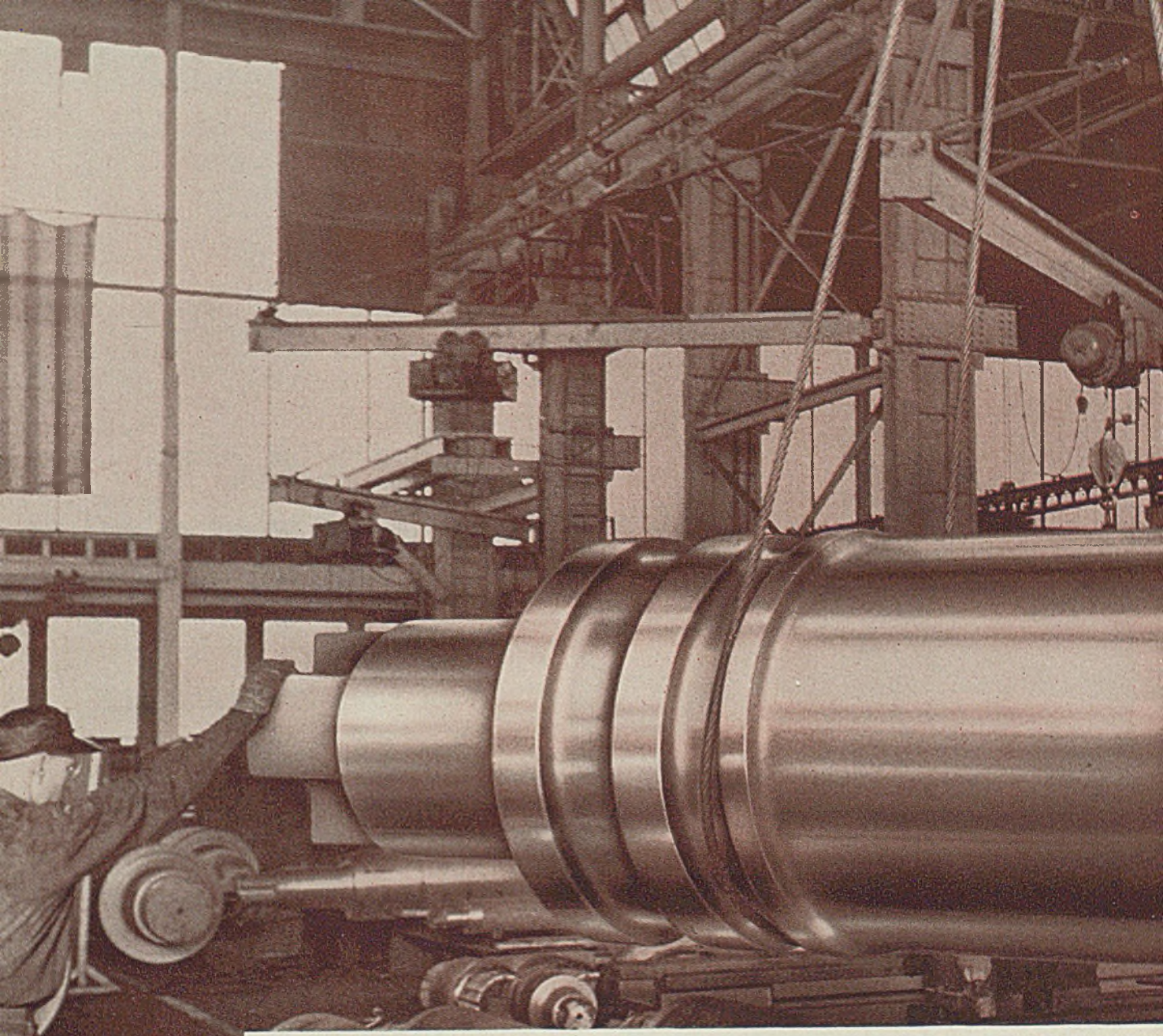
It provides exact and automatic control of those final, critical stages of a process—proportioning and mixing—which began with the manufacture of synthetic mineral compositions designed to perform specific work. Because these controls are mechanical and automatic, there is no possibility of deviation or error.

Ramix...Hearth Patch...695 Plastic... Gunmix...are typical products of this plant. Their outstanding performance in severe service is familiar to most furnace men. No small part of their continued success is due to the fact that, combining the best of research and practical experience they are made by a process rigidly controlled to insure uniformity and dependable quality.

BASIC REFRACTORIES, INCORPORATED

CLEVELAND, OHIO

PRODUCERS OF MAGNESITE AND DOLOMITE HEARTH MATERIALS FOR STEEL FURNACES



Meet the Mighty Grand-dad of a thousand Tools of War!

He's big! He's tough! He's a Blooming Roll! He breaks ingots down into slabs or blooms. He, and his companion Ohio Rolls, are withstanding the terrific abuse of record-smashing steel production, and are rolling out the weapons that are rapidly rolling on to Rome, to Berlin, to Tokyo.

CARBON STEEL ROLLS • ALLOY STEEL ROLLS • ALLOY IRON ROLLS
FLINTUFF ROLLS • NICKEL CHILL ROLLS • PLAIN CHILLED ROLLS
MOLYBDENUM CHILL ROLLS • DENSO-IRON ROLLS • HOLL-O-CAST ROLLS

ARMY E NAVY

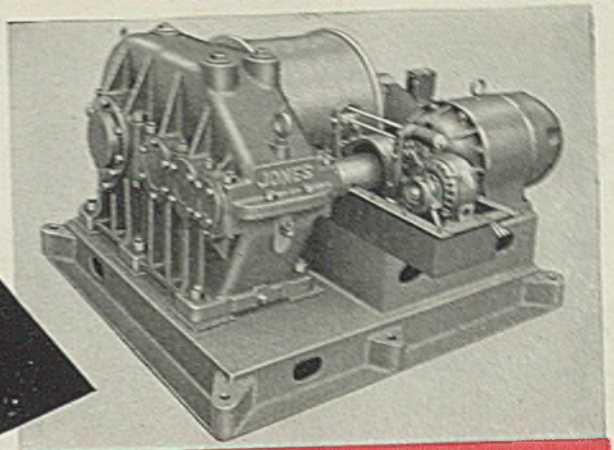
THE OHIO STEEL FOUNDRY CO.

LIMA, OHIO • SPRINGFIELD, OHIO

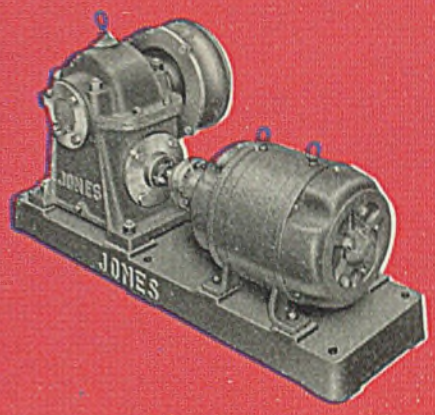
ENGINEERS • FOUNDERS • MACHINISTS

Ohio Rolls

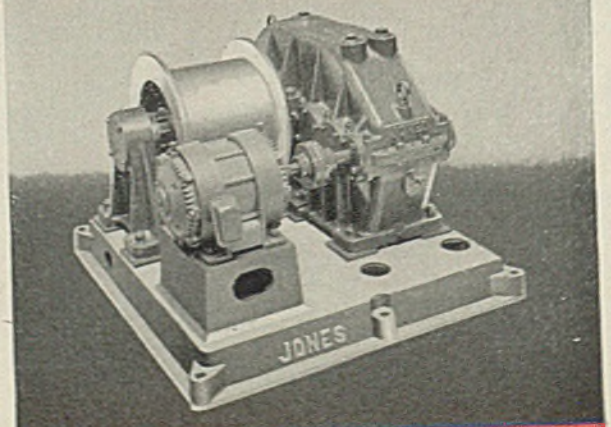
When the drive is built into the unit



• Jones Skip Hoist Drive built as a complete unit by the Jones organization in several types with base to take any motor specified by the purchaser. This drive is equipped with all the modern protective devices such as cam or [illegible] type limit switches, solenoid or disc type brakes and slack cable switches. The drives are single, double or triple reduction Jones Herringbone Speed Reducers.



• Jones door hoists are built in many ratings and may be installed with almost any convenient arrangement of sheaves and cables. Base will take any standard motor. No limit switches of any kind are required with this unit.

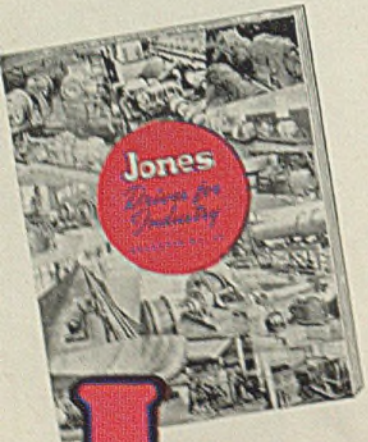


• A complete Jones car puller unit. These outfits are for use with wire rope and are manufactured in a wide range of capacities to suit the number of cars to be handled in each plant.

FOR many years the Jones organization has been developing various types of drive units in which Jones special or standard speed reducers form an important integral part of the unit.

The car puller, door hoist and skip hoist drives illustrated and described here are typical specimens of Jones Unit Drives. These machines are built as complete units by the Jones organization with base to take any motor specified by the purchaser.

The Jones organization has also worked with a great many manufacturers in the application of Jones gears and speed reducers to an extremely wide variety of complete assemblies. You are invited to make full use of this experience in connection with any power transmission problems that you may have.



W. A. JONES FOUNDRY & MACHINE CO.
4437 W. Roosevelt Road
Chicago, Illinois

Bulletin No. 80, "Jones Drives for Industry", may be helpful in giving you a complete picture of the Jones products, engineering services and manufacturing facilities that are available for helping you solve your drive problems.

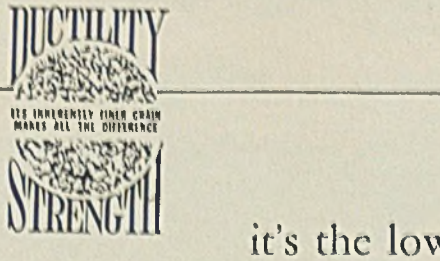
Jones

HERRINGBONE—WORM—SPUR—GEAR SPEED REDUCERS • PULLEYS
CUT AND MOLDED TOOTH GEARS • V-BELT SHEAVES • ANTI-FRICTION
PILLOW BLOCKS • FRICTION CLUTCHES • TRANSMISSION APPLIANCES

You can cold draw

N-A-X
High Tensile

easily



it's the low alloy steel
with exceptional ductility

Cold forming a product out of N-A-X HIGH TENSILE is no problem, because this low alloy, high tensile steel has the ductility necessary for successful cold forming and drawing. It is truly a remarkable high tensile steel, in that it combines the cold forming properties of mild carbon steel with the valuable qualities of high tensile steel.

Of major importance to users of high tensile steel is the unusually high resistance N-A-X HIGH TENSILE has to *impact* and *fatigue*, at normal as well as at sub-zero temperatures. This means that parts and products made of N-A-X HIGH TENSILE have the stamina to stay on the job, regardless of tough usage.

Great Lakes engineers are available to show you how you can use this really superior high tensile, low alloy steel to advantage. One will be glad to call at your plant, give you the benefit of wide experience in the use of N-A-X HIGH TENSILE in hundreds of exacting applications. No obligation. Write, telephone or wire for one today.

GREAT LAKES STEEL CORPORATION • DETROIT, MICH. *Sales Offices in Principal Cities*

Division of NATIONAL STEEL CORPORATION Executive Offices, Pittsburgh, Pa.

AN OPEN LETTER TO
★ ★ ★ Paul V. McNutt:

LAMSON CORPORATION
PNEUMATIC DISPATCH TUBES · MECHANICAL CONVEYORS OF ALL KINDS
SYRACUSE, NEW YORK

March 1, 1943

The Hon. Paul V. McNutt, Chairman
War Manpower Commission
Washington, D.C.

My dear Mr. McNutt: Manpower Waste in Handling Materials

The President's "Manpower" order of February 9th emphasizes the vital necessity of greater production -- not only more goods per worker due to longer hours but also more goods produced during each one of those hours. Yet one proven source of increased production remains largely unrecognized and untapped.

Operations consume at least 30% of the total time required to produce manufactured articles. This covers the movement of materials through the manufacturing, storage, and shipping stages. The manpower savings, when manufacturing plants properly apply materials handling equipment, are indeed prodigious, resulting in an amazingly rapid amortization.

We, of the materials handling industry, have countless case histories proving the effectiveness of conveyors and other types of materials handling equipment in increasing production per man hour. Typical of war-production speed-ups are the following - taken at random from our files:

1. Shell-fuze production increased 2½ times.
2. Aircraft accessories production quadrupled with but 25% increase in personnel.
3. Approximately 300,000 man hours of messenger service saved annually in a large bomber plant.

Despite examples like these, which our industry as a whole can multiply a thousand-fold, not one industrial plant in ten employs an engineer whose sole duty it is to find ways and means of reducing this 30% production time loss with its consequent wasted man hours.

Strangely enough, few plants invite a general survey by a qualified materials handling engineer to help eliminate such waste. Furthermore, so far as we have been able to determine, not one technical school in the country includes in its curriculum a course in materials handling as a major subject.

We are bringing this situation to your direct attention so that it may be recognized as one of the very important factors in planning effective manpower use.

Very truly yours,

Carl F. Dietz
President

CFD
emk

LAMSON CORPORATION · SYRACUSE, N. Y.

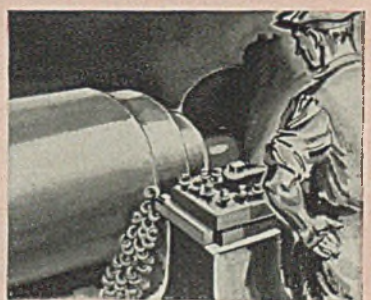
FIRTHITE SHOWS HOW..

TO BREAK UP YOUR ALLOY-STEEL CHIPS AUTOMATICALLY FOR SAFETY AND PROFIT

CHIP CONTROL. The rapid machining of **alloy steel** requires effective means of controlling chips. Long, hot, tough chips endanger the operator, make chip disposal difficult, reduce the value of scrap (by $2.00 a ton), cause tool breakage, and delay work.

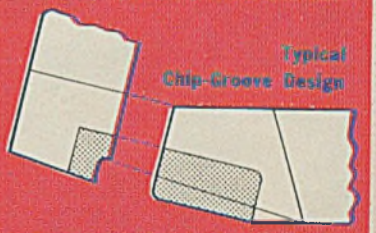
The remedy is properly designed chip breakers. Tools with chip breakers require a little more power but, where long chips are a problem, chip breakers are the answer.

Aside from the safety factor, chips that can be **shovelled** are readily marketable as scrap, command a higher sale price per ton, and—most important to the war effort—speed the **recovery** of scarce and critical alloys.



NO CONTROL without Chip Breaker OR CHIP CONTROL with Chip Breaker

HOW TO GRIND A CHIP BREAKER EASILY, QUICKLY, INEXPENSIVELY



A quick, simple method of designing and grinding chip breakers, as illustrated, is described on pages 41 to 43 of the FIRTHITE Users' Handbook... or a FIRTHITE Engineer will gladly discuss chip control in your plant.

Firth-Sterling

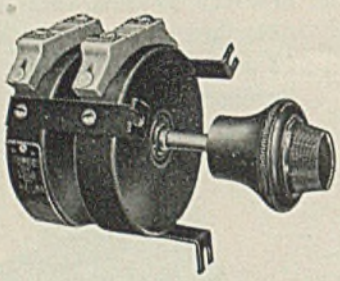
STEEL COMPANY

MAKERS OF FIRTHITE TUNGSTEN-TITANIUM CARBIDES FOR STEEL CUTTING

Offices: McKEESPORT, PA. NEW YORK - HARTFORD - PHILADELPHIA . CLEVELAND - DAYTON - DETROIT - CHICAGO - LOS ANGELES

FORTY-THREE STEPS OF CONTROL

in four inches!



Concentric arrangement for back of board mounting.

ARMY E NAVY

The new Ward Leonard 4-inch Pressed Steel Rheostat offers the happy combination of a small sturdy power rheostat with a large number of steps and ample current carrying capacity. Like all Ward Leonard Pressed Steel Rheostats this model may be arranged for front of board, rear of board and multiple assembly mounting. Other types and sizes also available. Send for descriptive bulletins.

WARD LEONARD

RELAYS • RESISTORS • RHEOSTATS

Electric control (WL) devices since 1892.

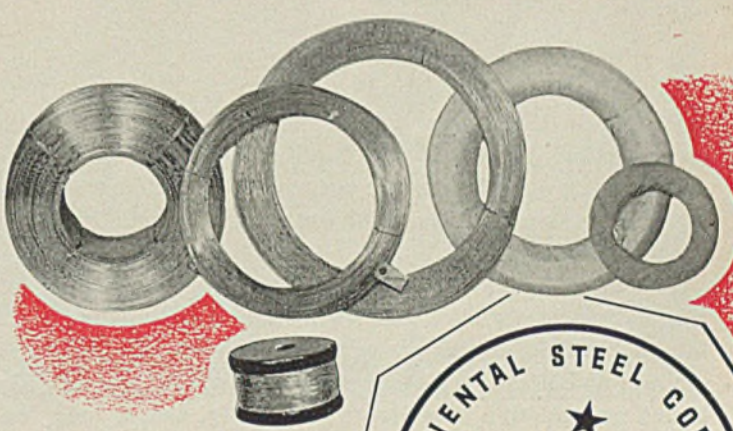
WARD LEONARD ELECTRIC CO., 65 SOUTH ST., MT. VERNON, NEW YORK

Better Steel for War Today...
Better Steel for You Tomorrow!

Even before war came, hands trained to the making of steel for peace had turned to the making of steel for war. Because war has made new demands of Continental steel . . . new requirements in specifications, new applications . . . Continental is building a reserve of metallurgical information, production experience and technical improvements. These resources will be at your command when the war is over. Continental will be better equipped than ever to meet your needs in wire and steel sheets and to work with you on your plans for new products and new production. We invite your inquiries now.

CONTINENTAL STEEL CORPORATION
KOKOMO, INDIANA

Plants at Canton, Kokomo and Indianapolis



CONTINENTAL
Manufacturer's Wire

Continental SUPERIOR wire is made in sizes from 34 gauge to ½-inch, in standard and special shapes, and in a wide range of finishes. The different combinations of specifications available are numbered in thousands.

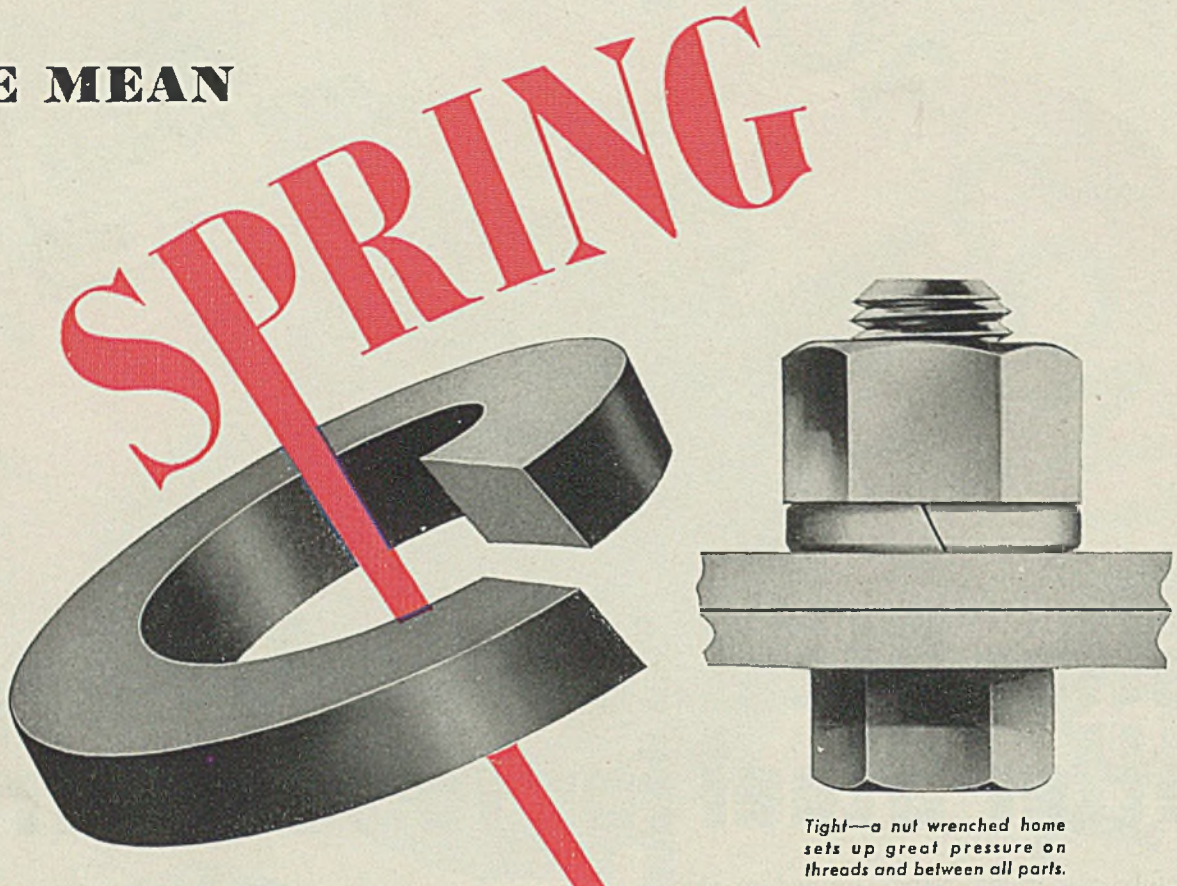
CONTINENTAL STEEL CORPORATION ★ SUPERIOR WIRE

CONTINENTAL
STEEL CORPORATION

PRODUCERS OF — **SHEETS: Black, Galvanized, Copperior, Hot and Cold Rolled, Special Coated, Long Terne, etc.**
WIRE: Bright Basic, Annealed, KONIK, Coppered, Tinned, Special Manufacturer's, etc.

When we say "spring"...

WE MEAN



Tight—a nut wrenched home sets up great pressure on threads and between all parts.

Still tight. Though the nut never turned, the other parts wore and stretched. The assembly would have loosened except for the wide range of spring power of a—

No other device has the power and the long range of live spring action given you by a Kantlink Spring Washer.

There is no substitute as economical. The short-range multi-toothed washers that bite in can not possibly equal Kantlink's range of spring power.

And the only claim for a fixed nut is that it can't turn on a bolt. Nuts rarely ever turn backward on bolts—they can't turn while there is any pressure at all on the threads of the nut and its bolt. But the **other** parts of almost every vibrating bolted construction wear loose inevitably, **unless** held fast by a strong compensating spring.

The parts wear loose because of bolt stretch and frictional wear of metal on metal, burrs and flares, and because of pulverizing of paint, scale and rust.

Kantlinks are being used with millions of nuts, bolts and screws of all types. They keep expanding to hold all parts **tight** despite inevitable wear.

In ordering spring washers—specify **Kantlink**, the big long range live spring washer.

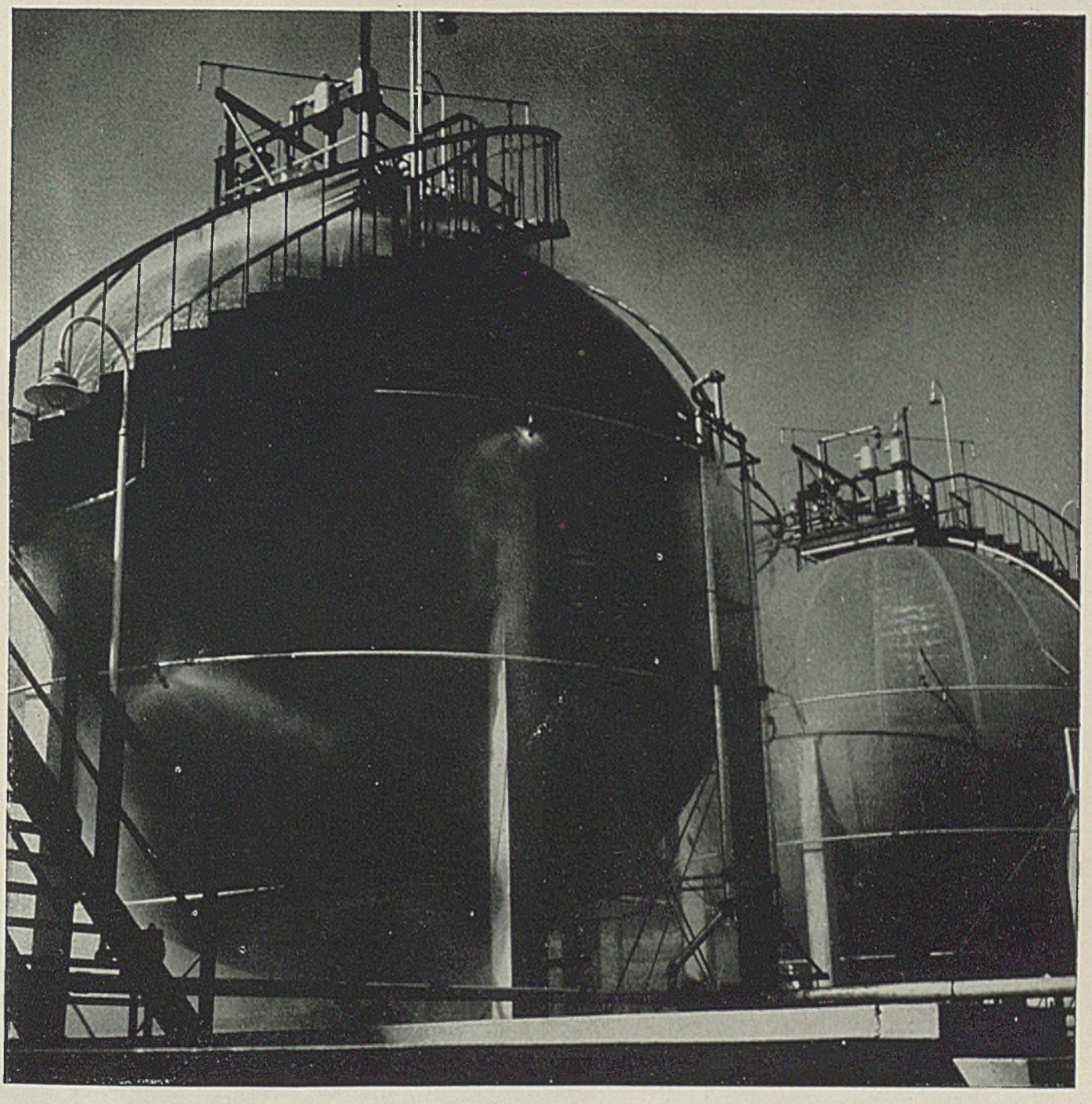
Let us send you samples,—send details of your application. Test and compare them on the same job with **any** type of nut, or with any other type of washer. Kantlinks can't lose a real test. Try them for efficiency, economy and real safety.

Write today for descriptive folder.

KANTLINK TRADE MARK

the long-range Spring Washer

THE NATIONAL LOCK WASHER COMPANY
NEWARK, N. J., U. S. A.



AMERICA'S WAR PRODUCTION DEPENDS ON TANKS LIKE THESE

Take a good look at these huge spherical tanks. Chances are your hose, your belts, your packings may come from them or from others just like them.

These are used for storing butadiene in the first of the synthetic plants operated by U. S. Rubber Company . . . a second will soon be in production.

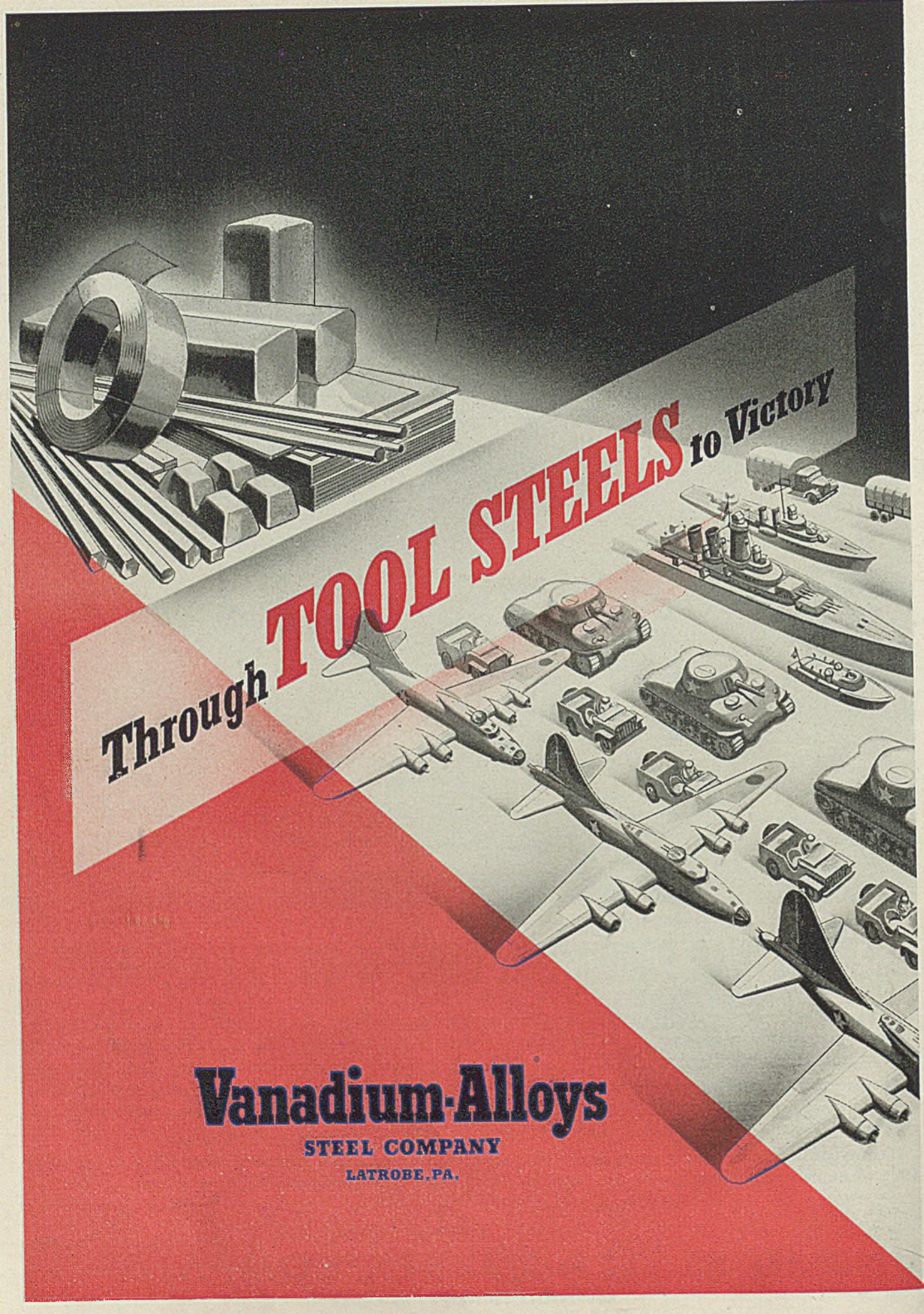
Having worked in the field of synthetic rubber since 1921 we know what uses each of the five basic types of synthetic rubber is best suited for . . . Neoprene, Buna-S, Buna-N, Butyl and Thiokol . . . U. S. Rubber uses all five types . . . knows which one to select for the performance required . . . and how to compound the specific synthetic rubber for the specific task. This experience is important to you.

Our booklet on synthetic rubber will give you much valuable information. Send for your copy.

Mechanical Goods Division

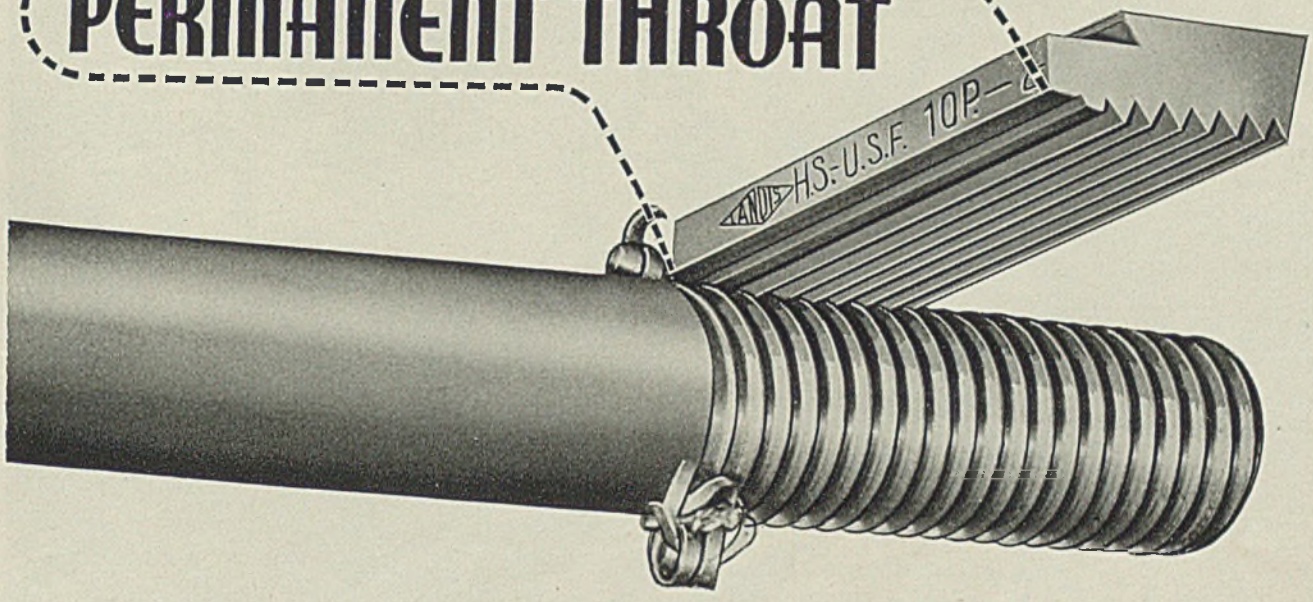
UNITED STATES RUBBER COMPANY

ROCKEFELLER CENTER • NEW YORK


Through TOOL STEELS to Victory
Vanadium-Alloys
STEEL COMPANY
LATROBE, PA.

LANDIS *Chaser Accuracy Is Maintained Throughout Its Life by the*

PERMANENT THROAT



12 Features of the LANDIS TANGENTIAL CHASER

1–Permanent throat permits close to shoulder threading throughout life of chasers
2–Rake angle range covers all machinable materials
3–Free cutting condition permits maximum cutting speeds
4–Simple grinding operation renews entire cutting edge and leading feature
5–Line contact with work lessens friction and minimizes thread distortion
6–Leading feature insures thread of accurate lead
7–Lateral absorption of cutting strain reduces vibration and chaser breakage
8–Right and lefthand threading feature reduces chaser equipment
9–Standard chasers thread all diameters with proper chaser holders
10–Interchangeability of chasers lowers operating cost
11–Chaser length provides exceptionally long life and low tool cost
12–Permanent throat gives equal distribution of cut

PERMANENT THROAT GIVES EQUAL DISTRIBUTION OF CUT

The throat is designed so as to enable the chasers to distribute the cut equally.

The initial accuracy of the chaser is maintained throughout its life. The cutting edge is renewed each time the chaser is reground, however no grinding is done on the throat or "lead" angle—it remains permanent and is not altered in any way.

The Finest Thread Cutting Tool in Industry

LANDIS
MACHINE COMPANY
WAYNESBORO, PA., U.S.A.

THREADING MACHINERY—THREAD CUTTING DIE HEADS—COLLAPSIBLE TAPS

McKAY ELECTRODES SPEED PRODUCTION IN EVERY WAR INDUSTRY

War and *necessity* are one . . . and necessity is the "mother of invention."

When war demanded new conceptions of production, *revolutionary applications of welding* were "invented" to meet the need.

In no small measure McKAY Shielded-Arc Electrodes contribute to the total accomplishment.

For it is only natural that a manufacturing policy, which merited the title "the researched line," should likewise rise to meet the requirements of this emergency. Thus new analyses, new coatings, new sizes, new ranges of adaptability . . . plus ever growing volume . . . have caused McKAY Electrodes to help speed production in every type of war industry.

THE McKAY COMPANY · PITTSBURGH, PA.

PACIFIC COAST SALES OFFICES: 125 S. Santa Fe Ave., Los Angeles · 100 Howard St., San Francisco

The McKay line includes regular carbon steel, stainless, and alloy steel electrodes for every welding purpose. Literature on request.

Among the first honored with the Navy "E", The McKay Company is proud of the broader award of the Army-Navy "E".

McKAY WELDING ELECTRODES

AND INDUSTRIAL, MARINE AND AUTOMOTIVE CHAINS

"KEEP ON BUYING U. S. WAR BONDS"

The Trend is Toward
SHENANGO-PENN
Centrifugal Casting

MANY manufacturers are finding that *centrifugal casting* by Shenango-Penn offers an improved, economical process for producing vital war products. In the marine and aviation fields, parts formerly made by other methods, are now being produced centrifugally, with impressive savings in production time—the conservation of critical materials—and actual improvement in product performance.

Shenango-Penn has pioneered centrifugal casting—can cast tubular bars or cylinders ranging from 2″ to 26″ O.D. and up to 26 ft. in length, that meet all Army, Navy and Air Corps requirements—deliver long, uninterrupted service.

If you want more facts on the process and how it may help your production problems, write for new Bulletin No. 143 today.

SHENANGO-PENN MOLD COMPANY
412 WEST THIRD STREET, DOVER, OHIO
Executive Offices: Pittsburgh, Pa.

ALL BRONZES •
MONEL METAL •
ALLOY IRONS •

SHENANGO - PENN

ORDNANCE DEPT. "SPEC" AXS-736 REV 1 — YOUR FINISH FOR CARTRIDGE CASES, PRIMERS, and OTHER STEEL PARTS

These are a few of the more important Government "Spec." finishes which we can furnish. For more complete list with descriptions send for "Spec." book.

3-67E	3-162B
14080	14105B
14120	JQD-144A Tentative
E-5e	196-131-59
P-27-b-2	3-163
3-86A	3-165A
52-P18 [Int]	M-485b

HOMB-ES-680a Tentative

AXS-736 Rev 1 Tentative

AN-TT-P-656 Amend 1

AN-TT-E-501

AN-TT-D-514

PXS-783 Rev 3

PXS-979 Rev 1

When steel began to replace brass and other non-ferrous metals for ordnance parts, EGYPTIAN technicians were ready with a special finish expressly developed for steel that would give adequate protection with speed and economy.

Fully meets U. S. Gov't Specification AXS-736 Rev. 1.

You'll like this new member of the EGYPTIAN family. Use it on steel percussion primers, and on both exterior and interior of steel cartridge cases to retard corrosion and reaction between casing and propellant material.

A 30 minute bake at 350° F after dip or spray application does the trick.

Send for 1943 Edition of our U. S. Gov't "Spec" Book S

THE EGYPTIAN LACQUER MANUFACTURING CO.
Rockefeller Center **New York, N. Y.**

EGYPTIAN FINISHES

EGYPTIAN Superior FINISHES

ROEBLING "Blue Center" is in there with them!

Trained and equipped to work *and* fight, our U. S. Navy Construction Battalion—"Sea Bees"—are erecting needed bases and facilities in the South Pacific today as fast as the terrain can be reasonably cleared of Japs. As often as not, before turning to jobs like the generator installation above, these versatile recruits from America's construction industry lend a hand with the "terrain clearing" themselves . . .

Wherever these work-wise veterans are working—hacking an airport out of New Guinea jungle, installing a generator to furnish light and power for beach installations in the Solomons, building roads and barracks and bases the world around—they use wire rope they know they can depend on to work and fight right along with them. Rope that has the right qualifications—type, size, construction—for the job on hand.

That's why you'll find Roebling "Blue Center" Steel Wire Rope on the job today where you find tough going like this. For with the know-how gained in more than 100 years of wire-rope engineering, Roebling men build into "Blue Center" the extra value that helps it meet the most difficult conditions unflinchingly. As battle-wise and work-wise as the "Sea Bees" themselves, "Blue Center" Rope is giving a fighting account of itself in thousands of installations—on cranes and bull-dozers and shovels, on ships and hoists and drilling lines.

ROEBLING
"Blue Center"
STEEL WIRE ROPE
PREFORMED OR NON-PREFORMED

ARE YOUR ROPES WORKING . . . OR FIGHTING TO WORK?

You can help your ropes work better, longer by relieving them of the necessity of *fighting* against worn sheaves, lack of proper lubrication, incorrect installation procedure . . . To help you do just that, Roebling has assembled a store of conservation data—summarized it on a handy 4 x 5 inch tag that you can put right onto your equipment. It's a simple, direct way of keeping your operating men constantly posted on the correct way of handling and using wire rope on the job. Copies of this tag are yours for the asking. Our nearest office will furnish you with as many as you need. Ask for Tag "A".

JOHN A. ROEBLING'S SONS COMPANY
TRENTON, NEW JERSEY *Branches and Warehouses in Principal Cities*

Sturtevant Systems

REG. U. S. PAT. OFF.

AND EQUIPMENT

ENGINEERED FOR PRECISION-VENTILATING, HEATING, AIR CONDITIONING, DRYING, DUST AND FUME CONTROL, PNEUMATIC CONVEYING, MECHANICAL DRAFT

Bad Breath get by...in 194V?

IT IS NO IDLE DREAM that after this war every plant must pay more attention to indoor air. In the miracles that America's industrial production is performing lies a lesson for any far-seeing business executive.

Think of the countless new plants that have been completely air conditioned. Whether for 'plane engines or range finders, gas tanks or uniforms, Sturtevant Equipment has gone in, not for employees' comfort alone, but to turn out war goods faster, cheaper, more efficiently.

In aircraft engine factories, for example, plant weather is *ideal* for production, *consistent* for machining parts that must be the same as yesterday's and tomorrow's. As a result, absenteeism as well as scrapage is held to a minimum. In the manufacture of ultra-precision range finders, air conditioning makes possible assembly and test adjustments within tolerances never realized before—*a millionth of an inch.*

In weaving wool fibres into uniforms, air conditioning eliminates troublesome static sparks... maintains quality and weight that meet strict Government "specs". In making self-sealing gas tanks, air conditioning is on the job to carry off toxic solvents and eliminate the static sparks that might explode them.

And a thousand more products, each with a special reason why Sturtevant Air Conditioning went to work. Remember all of this modern plant space will still be in the picture after the war. And any manufacturer who is going to compete without *controlled indoor air* will be at a decided disadvantage.

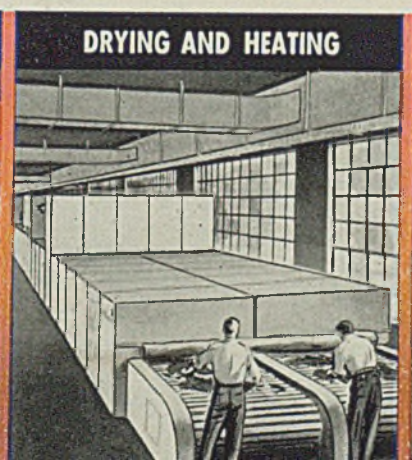
ENGINEERED AIR will make a difference...

Yes, in our post-war world, air will make the difference between profit and loss in many a plant—controlled air, engineered to serve efficiently—in all phases of industrial air conditioning, heating, ventilating, drying, dust and fume control, pneumatic conveying, and mechanical draft. And with new war-won knowledge, backed by experience as the pioneer in air-handling, Sturtevant will make available to you *engineered systems and equipment* that "Put Air to Work" with utmost efficiency and economy.

B. F. STURTEVANT COMPANY
Hyde Park, Boston, Mass. *Branches in 40 Cities*
B. F. Sturtevant Company of Canada, Ltd., Galt, Toronto, Montreal

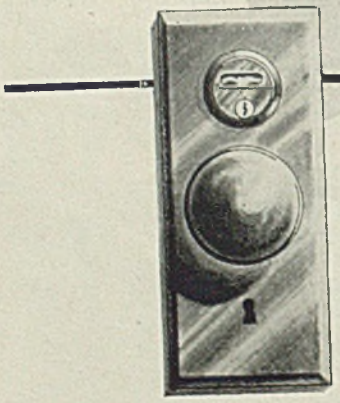
STURTEVANT—FOUNDER OF THE AIR HANDLING INDUSTRY

Sturtevant
REG. U.S. PAT. OFF
Puts Air to Work



THEY *PITCH* PROPS

and *RUN* locks



It may be the tough spring that helps "feather" the variable-pitch propellor, or a simple spring that operates a door lock—the requirement is that it work when called on—unfailingly. Among other things, war teaches the folly of hit-or-miss methods. Springs can be designed to serve a definite purpose, indefinitely. No matter how simple or involved a mechanism may be, it deserves the best spring possible in material, design and manufacture.

IN AMERICA'S GREAT PRODUCTION PLANTS . . .

At Thompson Aircraft Products Company, batteries of Acme-Gridley Automatics are attaining a degree of accuracy never before possible in mass production.

Millions of Parts—QUICK!

Two and three times faster than they have ever been produced before, metal parts in great variety, machined with the utmost precision—those are the demands of a war production greater than any nation has ever met!

Acme-Gridley Automatics are turning out these parts, at speeds and feeds limited only by the capacity of tools to stand up under 24-hour schedules.

These 4, 6 and 8-spindle machines are quickly adapted to many classes of work, often as many as 20 operations on a single set-up. Large tooling area speeds setting up. Operation is convenient, output is uniform, costs are low.

And when industry goes to work on the growing backlog of peace-time needs, Acme-Gridleys will be ready to carry their full share of the load—at lower costs than ever before.

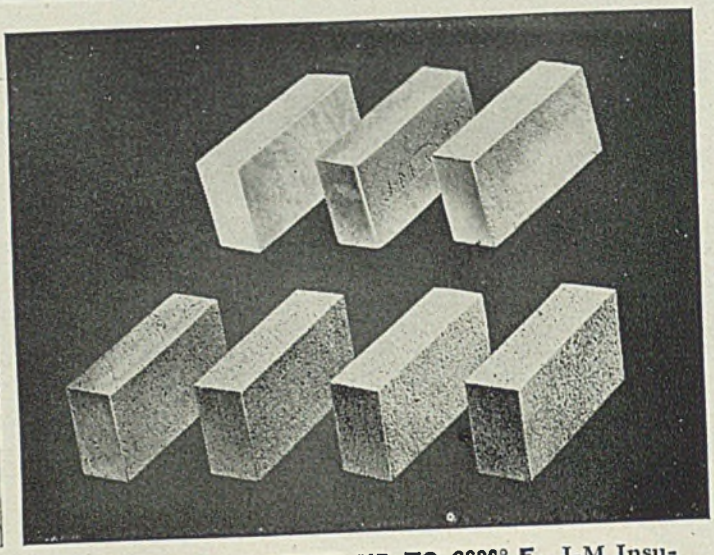
THE NATIONAL ACME CO

170 EAST 131ST STREET • CLEVELAND, OHIO

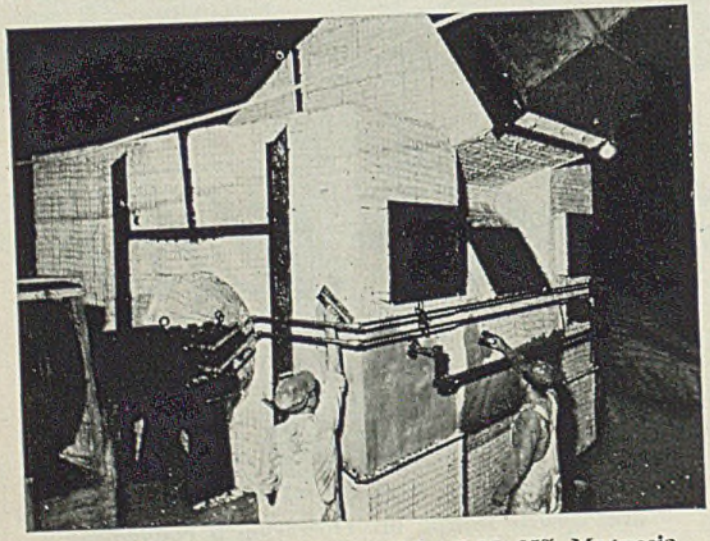
ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AND TAPS • SCREW MACHINE PRODUCTS • THE CHRONALOG • T SWITCHES • PRECISION

Meet wartime conservation demands with Johns-Manville Insulations

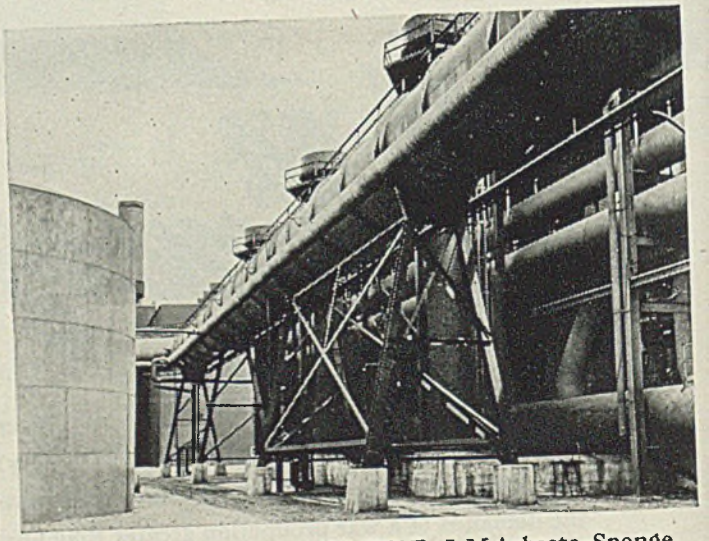
INSULATION FOR TEMPERATURES TO 1900° F. J-M Superex Blocks have long been standard for this service. High heat resistance, low thermal conductivity. Sizes 3" x 18", 6" x 36" and 12" x 36"; from 1" to 4" thick.



FURNACE INSULATION UP TO 2600° F. J-M Insulating Brick and Insulating Fire Brick are available in 7 types, with temperature limits ranging from 1600° F. to 2600° F. All provide light weight, low conductivity.



POWER PLANT INSULATIONS. J-M 85% Magnesia has been for many years the most widely used block and pipe insulation for temperatures to 600° F. and, in combination with Superex, for higher temperatures. Maintains high insulating efficiency. Standard block sizes 3" x 18", 6" x 36" and 12" x 36"; from 1" to 4" thick.



FOR STEAM LINES UP TO 700° F. J-M Asbesto-Sponge Felted Pipe Insulation is recommended where maximum efficiency, high salvage and resistance to abuse are essential. For temperatures over 700°, used in combination with Superex. It is available in 3-ft. lengths, from 1" to 3" thick, for standard pipe sizes.

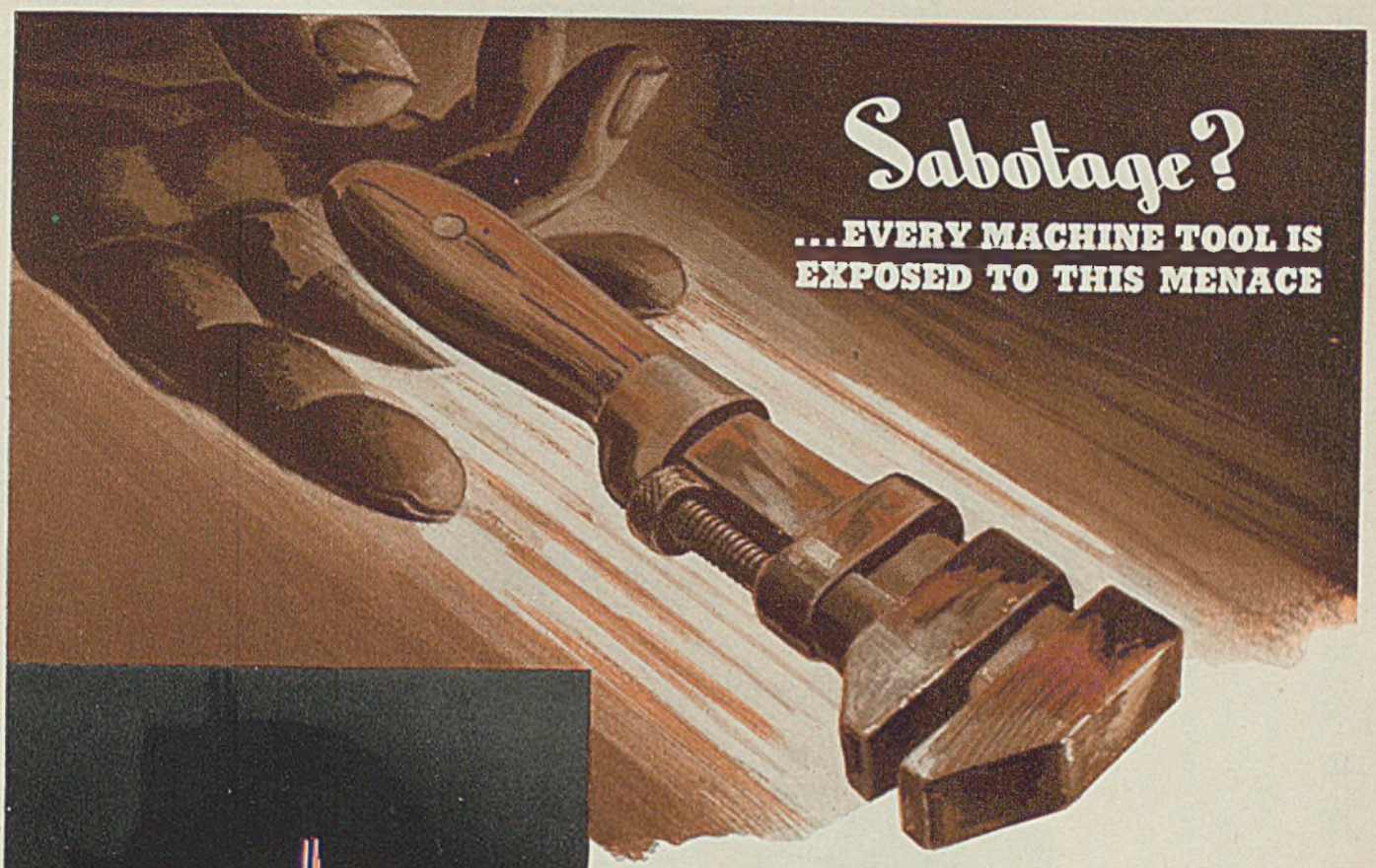
JOHNS-MANVILLE

Industrial Insulations

FOR EVERY TEMPERATURE . . . FOR EVERY SERVICE

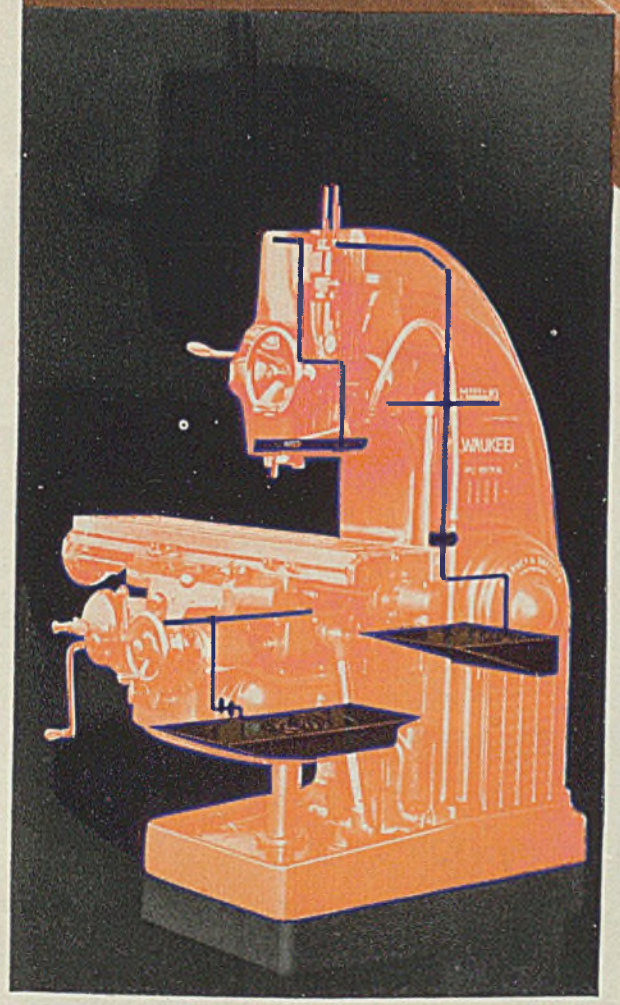
FOR DETAILS on these materials, and on the complete J-M Insulation line, write for Catalog GI-6A. Johns-Manville, 22 East 40th Street, New York, N. Y.

JM PRODUCTS



Sabotage?

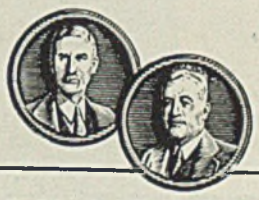
...EVERY MACHINE TOOL IS EXPOSED TO THIS MENACE



YES — "sabotage" is ever present even with every machine running smoothly — in step with the swift pace of wartime production — "Sabotage" in the form of excess wear in closely fitted parts — bearings — gear trains. And wear quickly shortens the production life of the machine tool — impairs accuracy — takes it out of action.

Such wear is most likely to occur under the peak loads of high production, unless the machine tool is equipped with self protection — adequate and automatic lubrication of all vital parts.

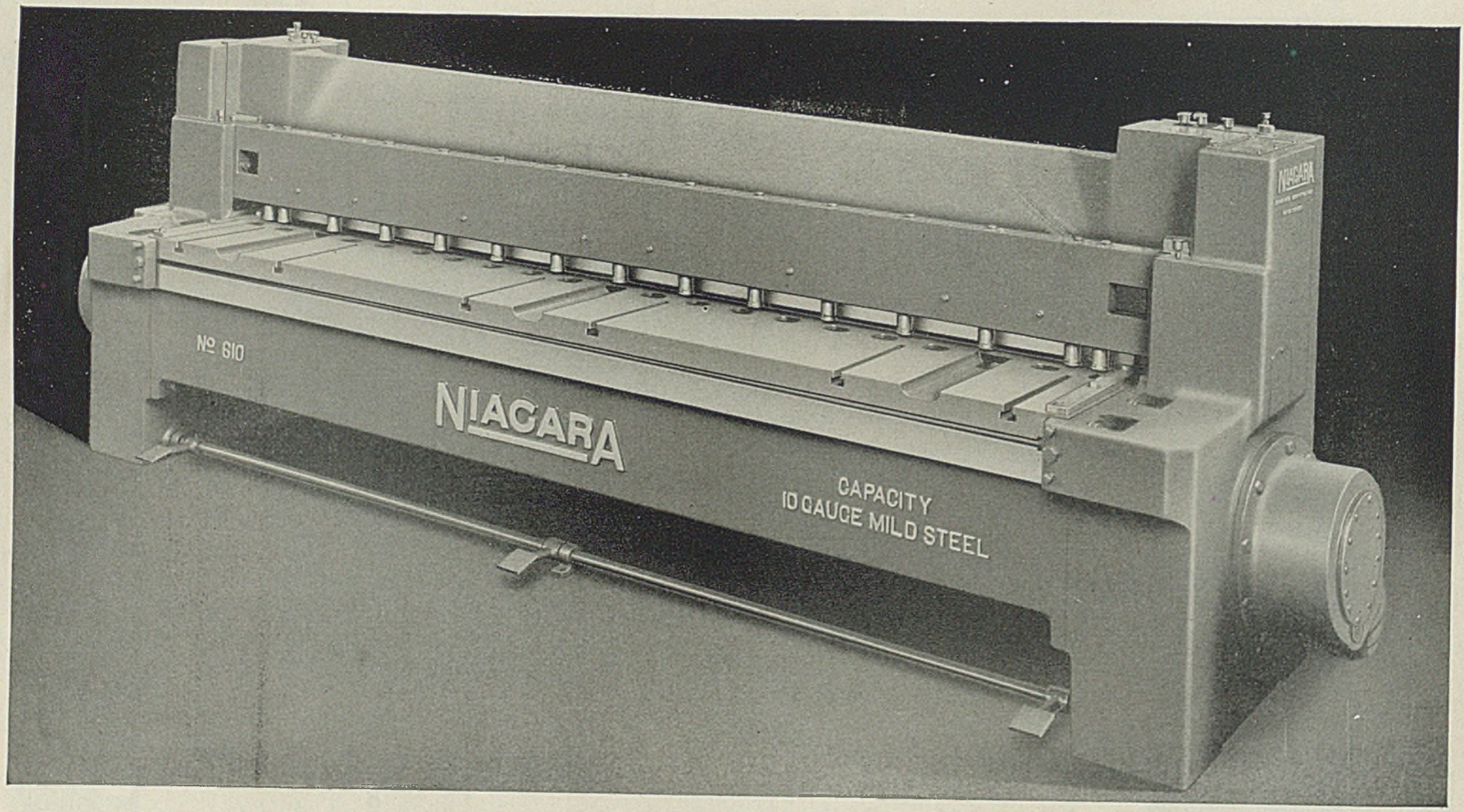
Automatic lubrication in Milwaukee Milling Machines is assured by pressure pumps in the column and knee of horizontal machines and in the sliding head of vertical machines. Only a minimum of attention is needed to keep the machine at full lubricating efficiency.



Buy Victory with at Least 10% in War Bonds

KEARNEY & TRECKER
CORPORATION
MILWAUKEE, WISCONSIN

Milwaukee MACHINE TOOLS



War plants are obtaining more production per man-hour with Niagara Power Squaring Shears because of accurate cutting, quick setting, ball bearing, self-measuring parallel back gages, full visibility of cutting line, instant acting Niagara sleeve clutch and other modern features.

Enclosed drive with gears, clutch and eccentrics running in oil assure long life and low maintenance cost. Four-edge, solid tool steel knives are standard equipment. Niagara Machine & Tool Works, Buffalo, N. Y. District Offices: Detroit, Cleveland, New York.

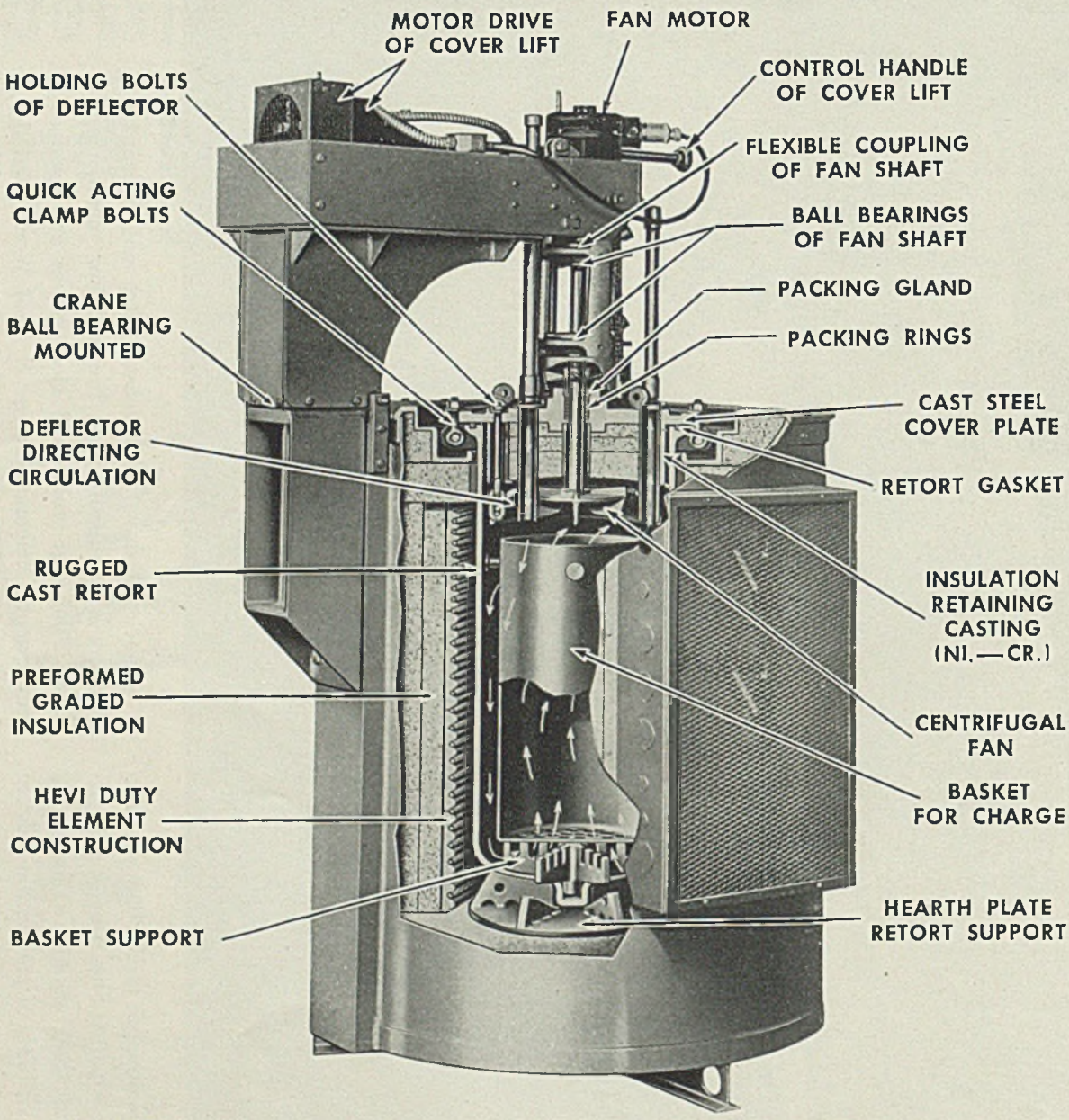
Shear knives available for cutting alloy and special steels. Let us know what you desire to cut. Prompt delivery on spare knives for Niagara Squaring Shears. Also factory re-grinding service by the same skilled men who grind new Niagara knives. —Advt.

BUY UNITED STATES WAR BONDS AND STAMPS

5 Standard Uses of THE HEVI DUTY CARBURIZER

● CARBURIZING ● NITRIDING ● DRY CYANIDING
● BRIGHT ANNEALING ● CLEAN HARDENING

A Versatile Tool for Production Heat Treating



Typical Construction of the Hevi Duty Carburizer

Send for Bulletin HD 142

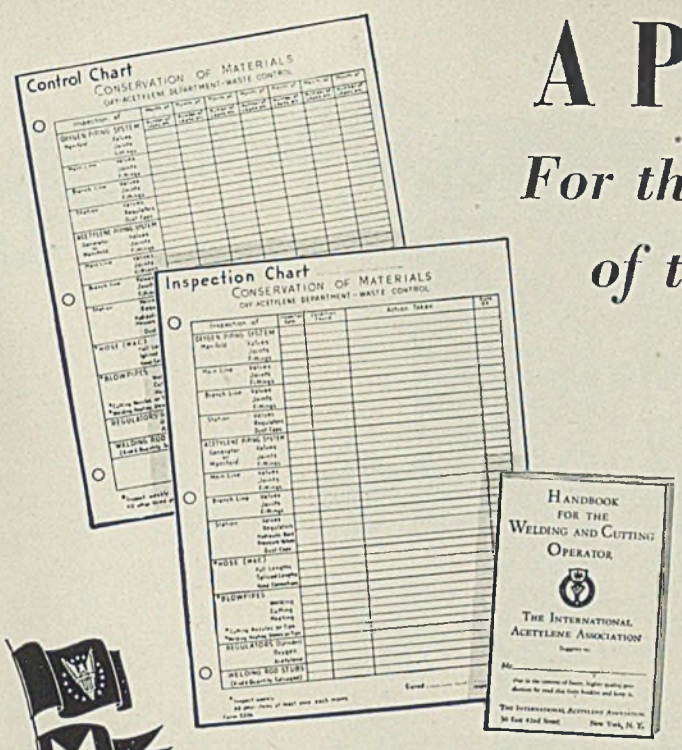
HEVI DUTY ELECTRIC COMPANY

HEAT TREATING FURNACES HEVI-DUTY ELECTRIC EXCLUSIVELY

MILWAUKEE, WISCONSIN

A PLANNED PROGRAM

For the Control of Waste in use of the Oxy-Acetylene Process



MARITIME "M" AWARD FOR OUTSTANDING PRODUCTION ACHIEVEMENT

The greatest over-all losses of oxygen and acetylene come from little things at many points—such as small leaks at fittings, leaky hose, and minor faults of operators, both experienced and new. An effective method for control of such waste must strike at each one of these small points.

Elimination of leaks and wasteful practices requires a planned program, the responsibility for which must be shared equally by management and operators. To help put such a program into effect, the Linde organization suggests the following plan be adopted—modified as needed to fit each shop.

1. **Appoint an inspector** to check regularly the piping system, the hose, and the apparatus while the equipment is in operation. Besides soapy water and a brush to test for leaks, wrenches, and a simple repair kit, he should have some form of INSPECTION CHART such as that shown above and a map of the oxy-acetylene system on which to record tests, repairs, and other pertinent information. *Sample copies of this chart (Form 5206), and of a map (Form 5207), will be sent by Linde without charge.*

2. **Summarize the inspection data** on a master CONTROL CHART such as that shown above. This will give plant executives an over-all picture of the waste control program. *Copies of this chart (Form 5205) are available from Linde.*

3. **Co-operation of every operator** should be solicited for the success of this waste control program. To remind operators of the many little ways in which waste can be avoided, Linde will send as many copies as you need of a vest-pocket-sized booklet, published by the International Acetylene Association, that presents the conservation story in a series of illustrated "do's" and "don't's." *Every operator should have a copy of this little handbook.*

The program outlined above will not only help to assure continued adequate supplies of oxygen and acetylene, but should also more than pay for itself in lowered costs and increased efficiency. For samples of the charts described above, and for handbooks for your operators, send the coupon, or ask any Linde office.

THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide and Carbon Corporation

30 East 42nd Street
New York, N. Y.

UCC

Offices in
Principal Cities

In Canada: Dominion Oxygen Company, Limited, Toronto

THE LINDE AIR PRODUCTS COMPANY
30 East 42nd St., Room 308, New York, N. Y.

Please send me, without charge, the material I have checked.

☐ Conservation of Materials—Inspection Chart—Form 5206.

☐ Specimen Inspectors' Map of Oxy-Acetylene Piping System—Form 5207.

☐ Conservation of Materials—Control Chart—Form 5205.

☐ Handbook for the Oxy-Acetylene Operator—published by the International Acetylene Association.

(Specify the quantity of Handbooks required) .....

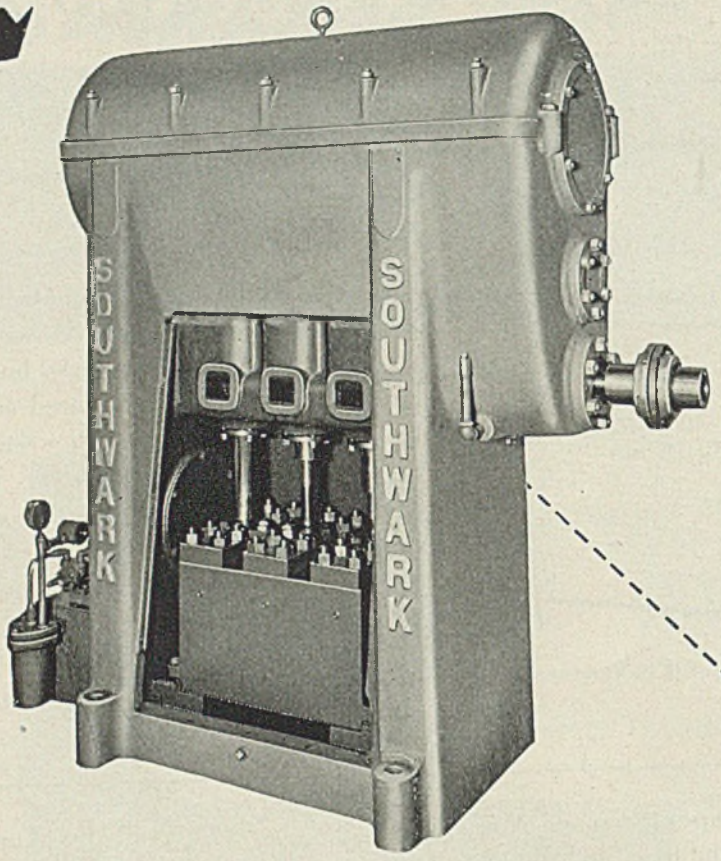
Name .....

Street and No. .....

City and State .....

LINDE OXYGEN . . . PREST-O-LITE ACETYLENE . . . UNION CARBIDE
OXWELD, PUROX, PREST-O-WELD APPARATUS . . . OXWELD SUPPLIES

The words "Linde," "Prest-O-Lite," "Union," "Oxweld," "Purox," and "Prest-O-Weld" are trade-marks.



High Pressure Pumps

Southwark's line of High Pressure Triplex Pumps have been thoroughly tested in actual service. Sound design and substantial construction have earned for these pumps a reputation for long life, low maintenance and high overall efficiency.

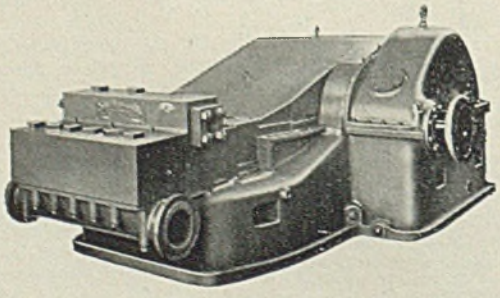
For delivering large volumes of water in conjunction with hydraulic press installations, horizontal pumps are built in 12-, 15-, and 18-in. stroke lengths. A 3-plunger arrangement provides a 60 degree overlap in discharge impulses and tends to smooth out pump pulsations.

The 12-in. stroke pump discharge ranges from 23 gpm at 7,500 lb per sq in. to 170 gpm at 1,000 lb per sq in.; that of the 18-in. stroke unit from 88 gpm at 7,500 lb per sq in. to 685 gpm at 1,000 lb per sq in. Other capacities and corresponding pressures are available.

Where a smaller capacity pump is required, the vertical pump—illustrated—is offered. Their capacities range from 2 to 100 gpm at pressures from 15,000 to 1,000 lb per sq in. respectively.

Write for Bulletin P-106 which contains a complete description of these pumps with tables showing dimensions, capacities and power requirements.

Baldwin Southwark Division, The Baldwin Locomotive Works, Philadelphia; Pacific Coast Representative, The Pelton Water Wheel Co., San Francisco.



BLW THE BALDWIN GROUP

BALDWIN SOUTHWARK

Division THE BALDWIN LOCOMOTIVE WORKS, Philadelphia, Pa.

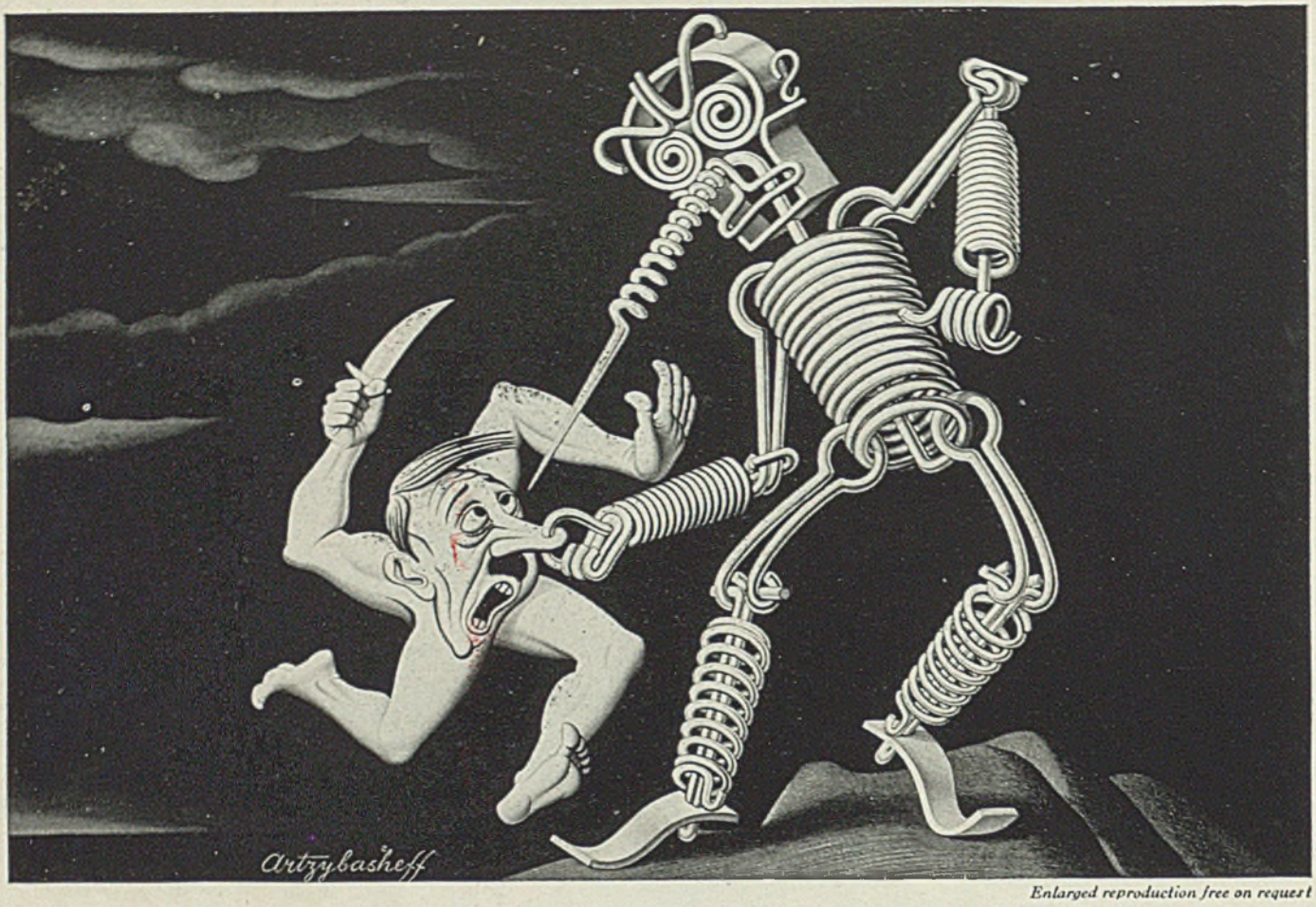
OUR JOB

BETTER ROLLS FOR GREATER PRODUCTION

Rolling Mills depend upon Phoenix Rolls to fulfill a definite and very important part in the war program with unflagging perseverance. This confidence is indeed warranted by the performance of these rolls under unusual operating conditions.

PITTSBURGH ROLLS

PITTSBURGH ROLLS DIVISION of
BLAW-KNOX CO.—"Steel's Partner" • PITTSBURGH, PA.



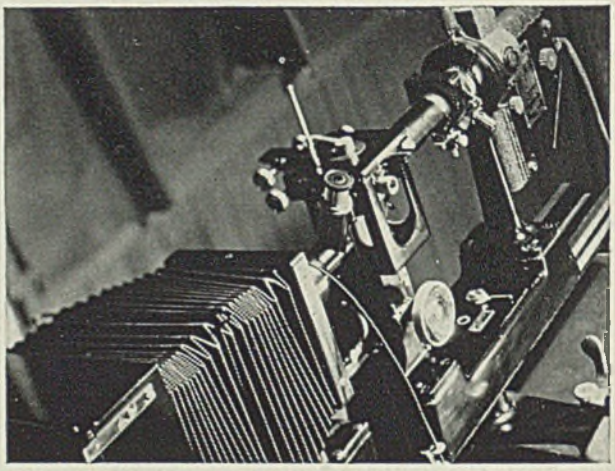
Enlarged reproduction free on request

Wire that's full of 'Fire'

A while ago billions of feet of Wissco wire a year were striving only to make life better. Now, fighting mad, the Wissco wire that streams through our blast furnaces, open hearths and seven mills is contributing its efficiency to

War planes	*Army trucks*	*Submarines*
Instruments	*Jeeps*	*Torpedoes*
Parachutes	*Scout cars*	*Machine guns*
Trainers	*Destroyers*	*Automatics*
Tanks	*Cruisers*	*Gun carriages*

If YOU have a war need that Wissco quality wire can help to meet, rush your specifications and priority rating to us. Here at wire headquarters you'll find *everything in wire:* high and low carbon wire, round and flat wire, wire for springs, for wire rope, for use in scores of industries, in a variety of sizes, tempers, grades and finishes. Wickwire Spencer Steel Company, 500 Fifth Avenue, New York; Buffalo, Chicago, Detroit, Philadelphia, San Francisco, Worcester.



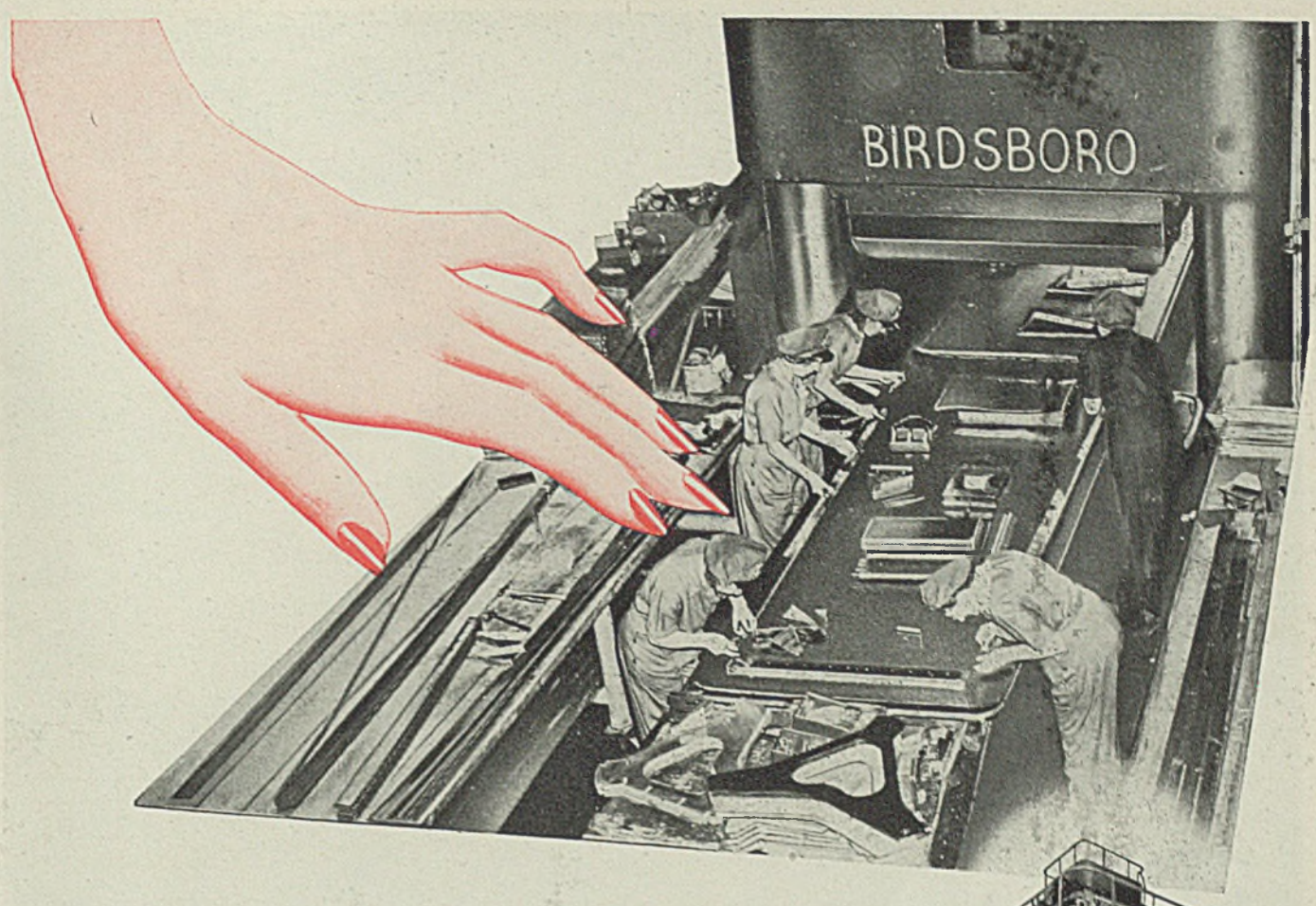
CONTINUOUS RESEARCH during 122 years of wire manufacture has enabled Wissco to help its customers find answers to all sorts of wire applications.

SEND YOUR WIRE QUESTIONS TO WICKWIRE SPENCER

WISSCO WIRE

BY WICKWIRE SPENCER

WISSCO PRODUCTS



4500 TONS

respond to the "Feminine Touch"

This huge 4,500-ton Birdsboro Hydraulic Press is one of the biggest pieces of equipment at Republic Aviation Corporation. But, despite its gigantic size and power, it responds to feminine hands just as readily as a sewing machine.

Thus, through Birdsboro's skill in press design and press making, another vital war plant is helped to carry on in spite of current shortage of the manpower so urgently needed to meet the requirements of war-pressed industry.

If *you* have a press problem, it will pay you to consult Birdsboro. Our engineers will be glad to work with yours, right down the line—from planning to designing to completion.

BIRDSBORO STEEL FOUNDRY & MACHINE COMPANY, BIRDSBORO, PENNSYLVANIA

BIRDSBORO

HYDRAULIC PRESSES

U. S. Army Signal Corps Photo

HERE'S SOMETHING TO HELP YOU *Clear the Air*

HANDBOOK OF SPECIAL STEELS

Newly revised and reprinted—a comprehensive book on the properties, uses, and best methods of handling, treatment, etc. of tool, stainless and other alloy steels. Plenty of tables to facilitate quick reference and selection. 128 pages, pocket-sized, latest data.

ELEMENTARY DISCUSSIONS: TOOL AND STAINLESS STEELS

Informative booklets giving clear, detailed data on the various types of tool and stainless steels, their properties and handling. Excellent for training courses in metals and metalworking.

THE lack of information can throw a pretty effective smoke-screen around jobs on the production lines. After all, it's about the same as on the firing line—you can't hit them if you can't see them.

Your plant is probably no exception to the general run of war producers. All have a steady job on their hands of training a stream of new men and apprentices in specialized machine operations or other fabricating procedures. Where the needed information concerns alloy steels, you'll find invaluable the publications listed in the panel to the left.

They're primarily for production men. For engineers and designers, complete and certified technical data on the various types of stainless and tool steels is available in Allegheny Ludlum "Blue Sheets." ● Write for the help you need.

ADDRESS DEPT. S-3

AL

STEEL FOR THE NATION'S WELFARE

Allegheny Ludlum

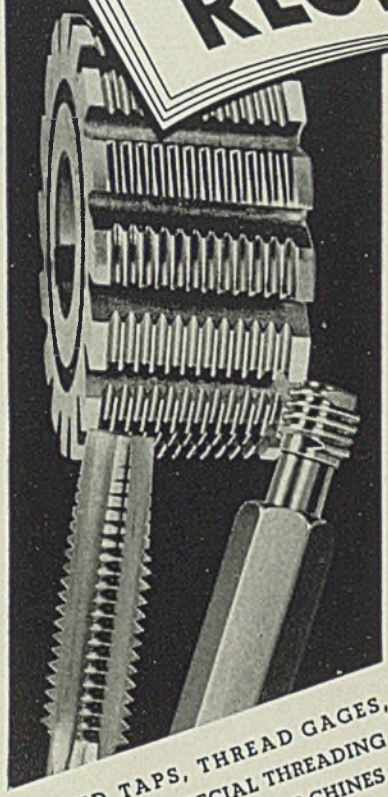
STEEL CORPORATION

BRACKENRIDGE, PENNSYLVANIA

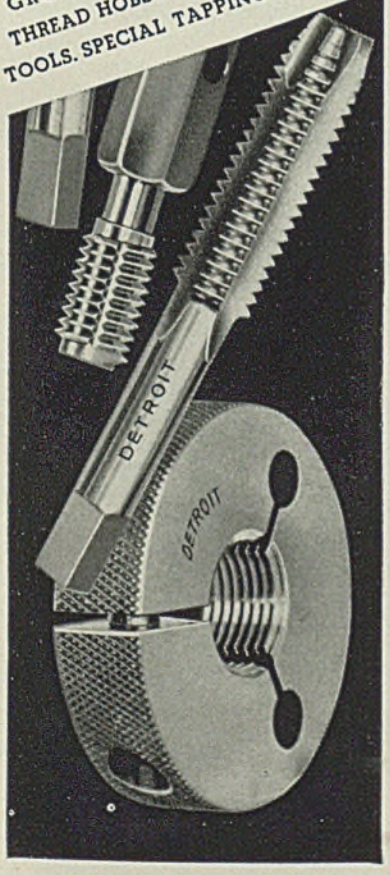
A-8836 . . W & D

WAR-TIME SHOP RECIPES

#2 for thread production

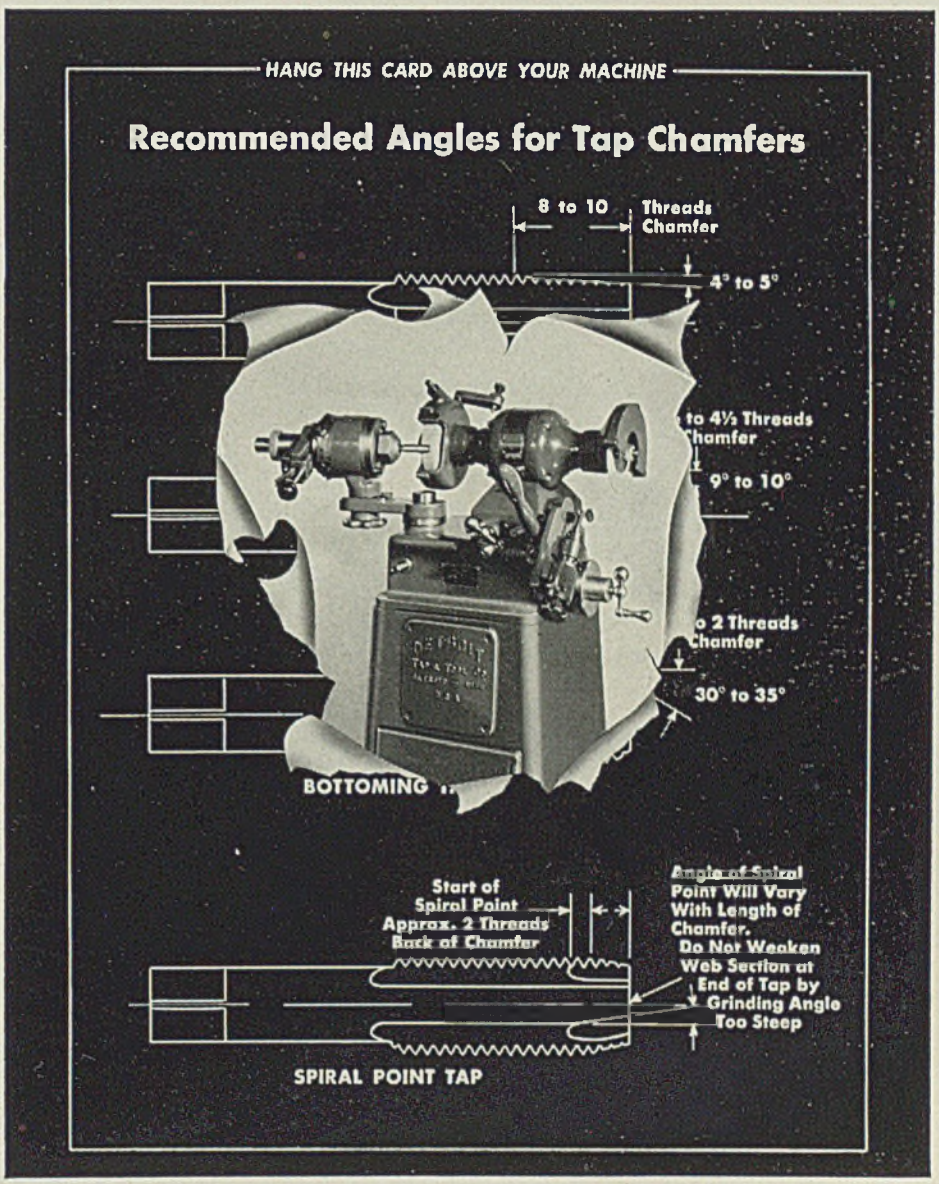


GROUND TAPS, THREAD GAGES, THREAD HOBS & SPECIAL THREADING TOOLS. SPECIAL TAPPING MACHINES



HANG THIS CARD ABOVE YOUR MACHINE

Recommended Angles for Tap Chamfers



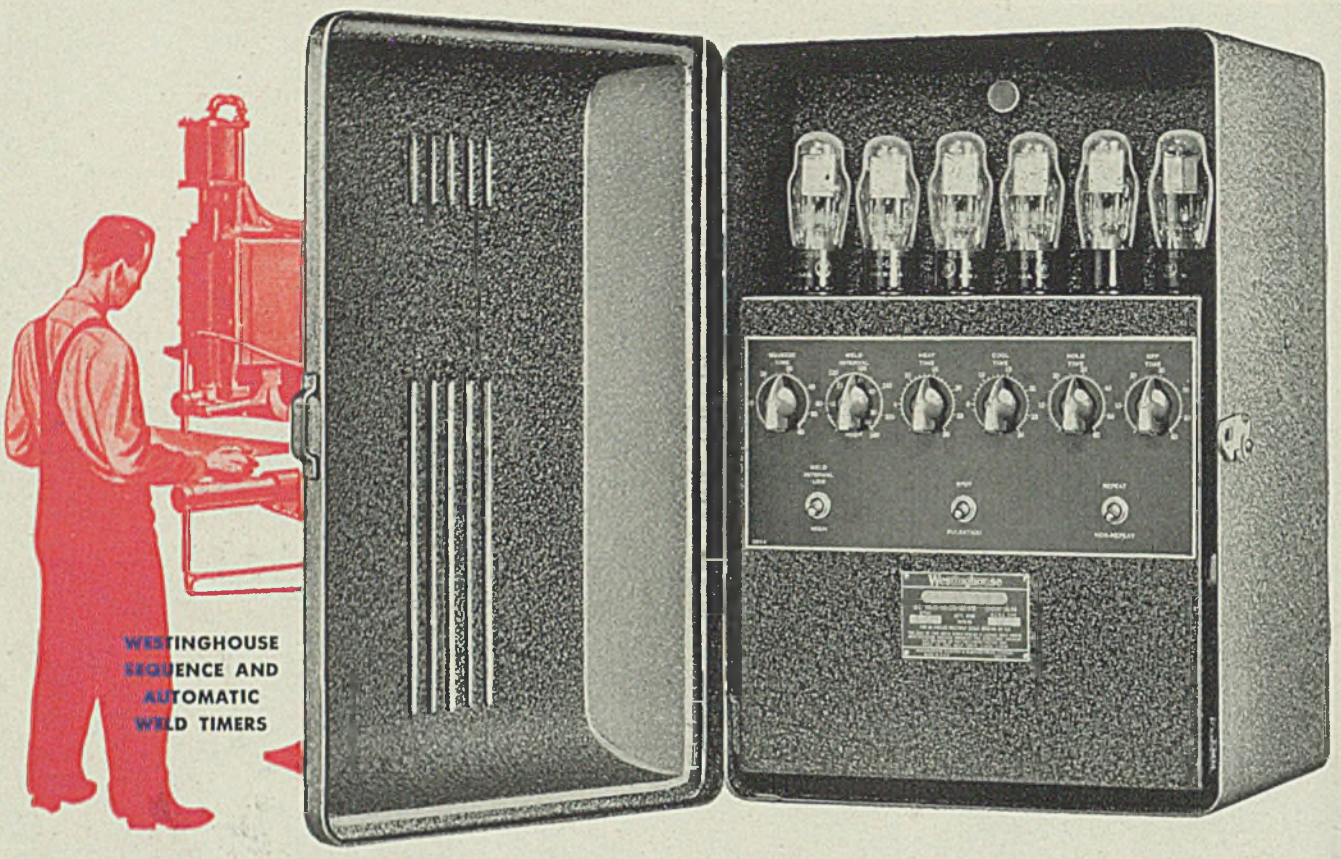
TAKE (1) All your dull or worn taps
(2) "Detroit" Tap reconditioning wall chart, as illustrated
(3) "Detroit" Tap Reconditioner

Then grind taps on the Reconditioner according to instructions on the wall chart and put them back to work — as good as new.

If you don't have a copy of this wall chart, write for one today on *your company letterhead*. Ask for Chart No. RTC.

DETROIT TAP & TOOL CO.

8432 BUTLER STREET, DETROIT, MICHIGAN, U.S.A.



New, Quick Change-over OF TIMING CONTROL

KEEPS RESISTANCE WELDERS IN ACTION!

With the new Westinghouse Electronic Weld Timer you can change complete timing panel for any of 18 different resistance weld operations —in less than three minutes!

The entire timing panel, for example, is released by a single thumb screw. It has an exclusive swing-out design, with special "hingeless-hinge" and snap-hook chains for easy removal and replacement. All connections to the main transformer panel are made by plug and receptacle. No special wiring is needed.

Cabinet for all controls is standard, but timing panels are available in 18 NEMA types as either:

Automatic Weld Timers — to control timing weld current and electrode operation where synchronous control is not required.

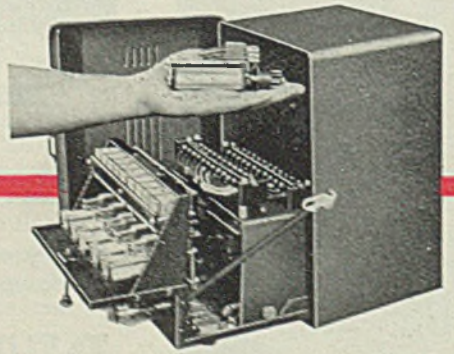
or *Sequence Timers* — to control only sequence of electrode operation where duration of weld current is adjusted by Synchronous Control.

Today's welding production calls for action. Write for Bulletin 3079. It tells you how to increase the adaptability of your resistance welders. Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pennsylvania, Department 7-N.

J-21190

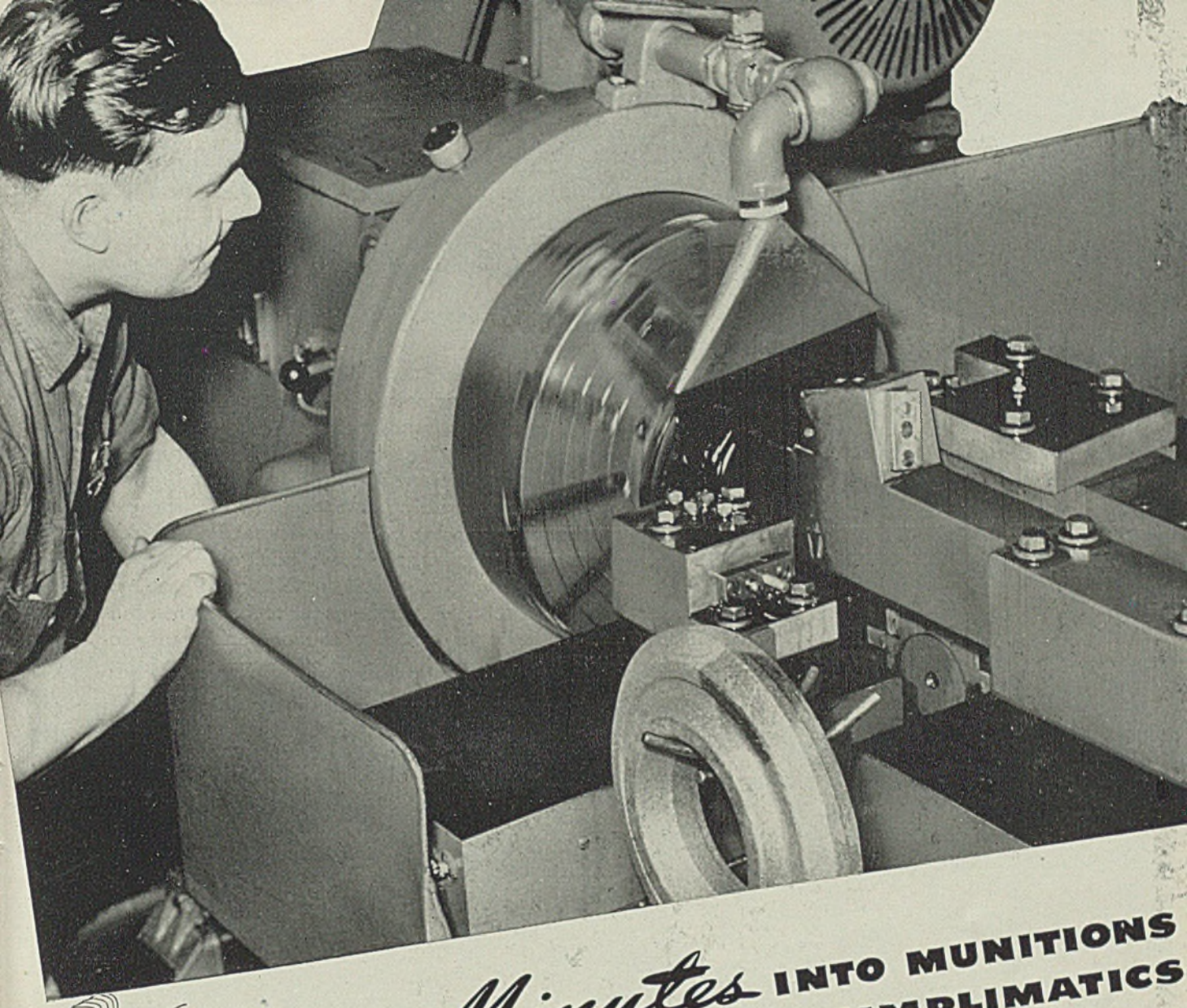
PLUG-IN TYPE RELAYS
... replaced in 10 seconds!

A typical example of how the new Westinghouse design speeds maintenance is the special type of plug-in relays. All wiring work is eliminated. Just pull out the old relay, insert a new one—and you're ready to go! Color coded relay base and sockets make identification quick and positive.



Westinghouse

RESISTANCE WELDING CONTROL



TURNING *Minutes* INTO MUNITIONS . . . . WITH SIMPLIMATICS

They're hard at it, these Simplimatics—giving added impetus to the unrelenting offensive in motion all the way between machine shops and enemies' lines.

Miracles in machining are made possible with the Simplimatics wherever large volume is required. Their automatic operation, speed and accuracy eliminate the need for highly skilled hands.

GISHOLT MACHINE COMPANY
1217 East Washington Avenue, Madison, Wisconsin

LOOK AHEAD . . . KEEP AHEAD . . . WITH GISHOLT IMPROVEMENTS IN METAL TURN

GISHOLT

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES

At Gisholt, the Army-Navy "E" and the Treasury Flag fly side by side

NO PREVIOUS WAR EVER SAW A ROAD-BUILDING JOB LIKE THE NEW ALCAN HIGHWAY...

nor the modern *Preformed wire rope*

THAT HELPED BREAK ALL RECORDS

Short cut to Japan—this 1,681-mile, 30-foot wide military artery for troop transport and supplies—a colossal task, bridging and crossing 200 streams, was completed in advance of schedule.

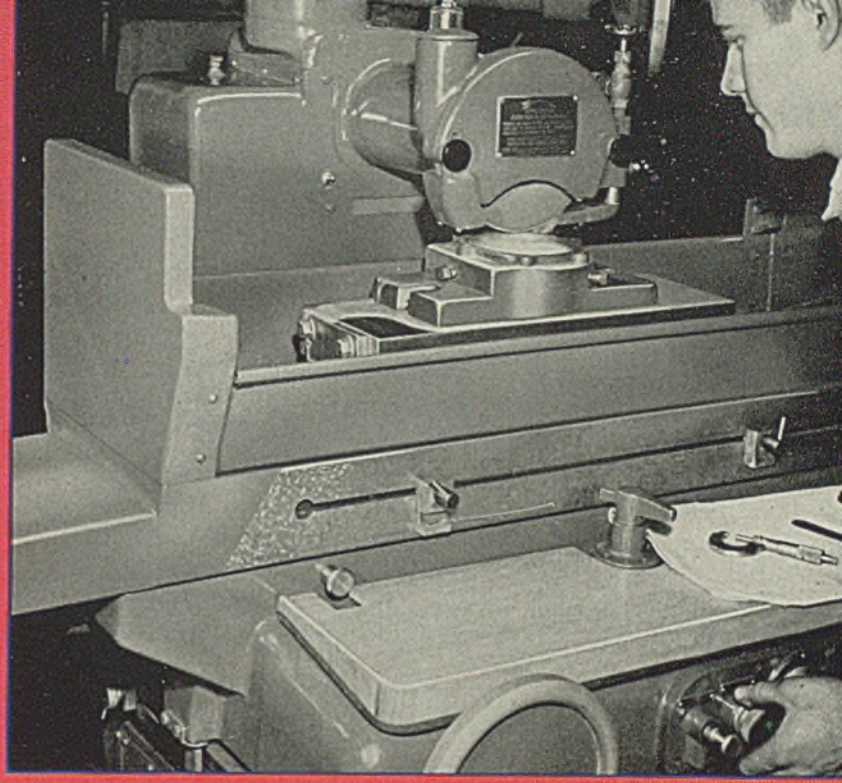
And every foot of the way, helping to accomplish the impossible, Preformed Wire Rope was on the job—lifting and swinging the giant shovels and grab-buckets biting away the tons of rock and soil, manning the booms that swung bridge-timbers and plates into place, winching trucks out of gullies and gravel pits.

Preformed Wire Rope—with its greater flexibility and stamina, easier handling, longer life, fewer shutdowns for replacements, and cost reducing—*proved* through years of peacetime performance in industry that it was made to order for the toughest wartime jobs.

Ask your own wire rope manufacturer or supplier

DoAll PRECISION GRINDER

Smooth AS A MIRROR EVERY TIME



● Especially designed and built with one purpose—to do the difficult task of super accurate grinding, so essential in our mass production program of today which calls for interchangeability of hundreds of vital parts.

The engineers worked for years to refine DoAll performance. Vibration is practically eliminated through rugged construction. Bearings are of larger area and hand scraped. Every part is so perfectly coordinated that you are assured of accuracy not only to size, but to flatness and parallelism.

GRINDING AT ITS BEST

For that final operation—a smooth, mirror-like finish—a finish that will pass every rigid inspection test — that will make a surface accurate to less than a ten thousandth of an inch, investigate the DoAll.

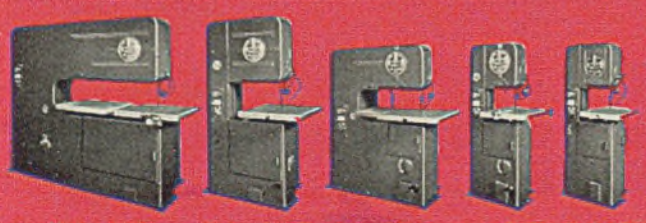
When the finish is so perfect that you can actually "wring" two flat surfaces together — well, that's super grinding — and that's what the DoAll has to offer. Adaptable to either wet or dry grinding.

Send for descriptive literature.

SAVAGE TOOL COMPANY
Dept. S Savage, Minn.

DoAll Offices in 25 cities, each in charge of a trained sales engineer to give you quick service on Surface Grinders, Gage Blocks, DoAll Contour Machines, DoAll Band Saws and Files.

DoAll CONTOUR MACHINES



Under $3000 Under $2500 Under $2000 Under $1500 Under $1000
All Models with Motor

DoAll BAND SAWS

100 feet in each Strip-Out Container

DoAll GAGE BLOCKS

The Measure Blocks of 1000 Uses, come in 3 accuracies: Working Set, Inspection Set and Laboratory Set.

Each set composed of 81 separate blocks.

AND NOW!

H-W MAGNAMIX

A Ramming Mixture of Washington Magnesite

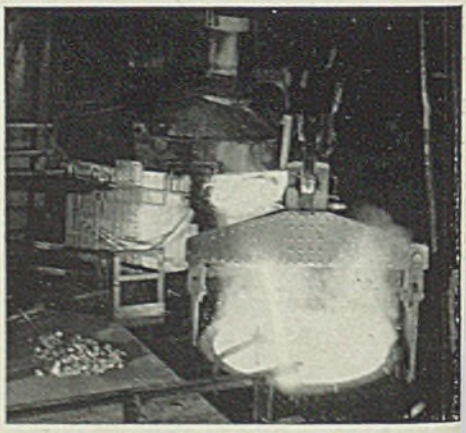
FOR

BASIC OPEN-HEARTH & ELECTRIC STEEL FURNACE BOTTOMS

The widespread introduction of H-W Magnamix into steel plant practice was of necessity delayed for more than two years pending the completion of long range plans for increasing the production of domestic magnesite. During the interval the promise shown by chemical and physical tests in the course of laboratory development has been confirmed in actual service, first in basic electric steel furnace bottoms and, more recently, in the bottoms of basic open-hearth steel furnaces. The same degree of confidence may be placed in H-W Magnamix as in the many other Harbison-Walker products which are so well established throughout the steel industry.

COMPOSITION

H-W Magnamix contains approximately 80 percent of magnesia, largely in the stable crystalline form periclase, which accounts for its high refractoriness. It is installed as received save the addition of water. The high magnesia content is not diluted by the addition of furnace slag.



QUALITY

Laboratory control and constant supervision of manufacture insure uniform quality and excellent working properties.

PREPARATION

H-W Magnamix requires only the addition of five to six pints of water per 100 pounds to bring it to the consistency of damp foundry molding sand which is ideal for ramming purposes.

STRENGTH

Furnace bottoms of rammed H-W Magnamix after drying have a density of 165 to 170 pounds per cubic foot, a crushing strength of over 1500 pounds per square inch, and a modulus of rupture of over 350 pounds per square inch.

ECONOMY

H-W Magnamix hearths are rapidly installed with common labor. Complete open hearth bottoms have been placed at the rate of over two tons per hour with less than five man-hours of labor per ton. The ramming of an H-W Magnamix bottom may begin immediately upon the completion of a furnace roof and proceed simultaneously with the construction of ports and end walls, and repairs to regenerators. The desired contour of the hearth and the working surface are established completely before any heat is applied. The furnace refractories are spared the severe treatment to which they are subjected in furnaces with bottoms sintered into place in successive layers.

H-W Magnamix is shipped dry in sacks of 100 pounds each. Shipments are made in full carloads or in mixed carloads with H-W Magnesite, H-W Chrome, H-W Improved Metalkase Magnesite, Magnex, Chromex or Forsterite brick.

TRADE MARK

REG. U. S. PAT. OFF.

HARBISON-WALKER REFRACTORIES COMPANY

and subsidiaries

WORLD'S LARGEST PRODUCER OF REFRACTORIES

GENERAL OFFICES • PITTSBURGH, PENNSYLVANIA

This advertisement is one of a series appearing regularly in national periodicals, farm publications, and prominent city newspapers. Reprints in full color are available for your use. Write us for them.

Reproduced from a full-color painting by Douglass Crockwell for Republic Steel.

"Now . . . if I was down there in Washington . . ."

That's Joe talking. Every night when he stops in for his coffee and sinkers he has plenty to tell the boys about how this war should be run. Maybe he's right and maybe he isn't.

The important thing is that he can say what he thinks—out loud. Right in front of Tom Burke, the cop. He couldn't do that in Germany or Japan or Italy . . . or in any of the nations that have been "liberated" by the New Order.

But Joe is an American.

★ ★ ★

And because Joe is an American, he has more privileges—*and more opportunities*—than can be found anywhere else in the world.

If he doesn't want to work for somebody else, he can operate a business of his own—anywhere. Joe is a free agent. His future is under his hat. Like millions of other Americans on the way up, Joe can cash in on a way of life that has brought America the highest standards of living in the world—by a big margin.

It is a typically *American* way of life—based on American ingenuity, ambition, desire to get ahead. It gives every person a chance.

That is why today, after a comparatively short time, teamwork and cooperation in American industry and American agriculture are performing miracles of production that would be impossible in a country weakened by years of regimentation and dictatorship.

That is why the steel industry—in which Republic holds a leading position—has been able to "come through" with the steels and steel products for our Nation's gigantic armament and shipbuilding programs. In 1942 Republic operated at 99.5% of capacity for the entire year. And the nearly 70,000 Republic men and women supporting our fighting forces* beat the 1941 record by 479,000 tons.

That, too, is why Republic chemists, metallurgists and engineers are constantly searching for—and finding—new and improved ways of making finer steels.

And that is why you can look with faith to the future—when victory will insure our *free* way of life—when you and we can return to the job we want to do most—produce peacetime products to make America a better, happier, safer place in which to live.

Until then, we have a big job to do. LET'S DO IT WELL and get it finished in a hurry. And let's guard faithfully our American way of life!

**Over 13,000 Republic men are now in uniform.*

REPUBLIC STEEL CORPORATION

General Offices: Cleveland, Ohio

Berger Manufacturing Division • Culvert Division
Niles Steel Products Division • Steel and Tubes Division
Union Drawn Steel Division • Truscon Steel Company
Export Department: Chrysler Building, New York, N.Y.

REPUBLIC STEEL — PRODUCTION FOR VICTORY

Republic

SHEETS AND PLATES

Alloy and Enduro Stainless Steels, Pipe, Upson Bolts—Nuts—Rivets, Electrunite Boiler Tubes, Mechanical Tubing.

Rx FOR VICTORY

SCRAP SCRAP MORE SCRAP

Ninety million tons of steel in 1943. That's what the doctor ordered to hasten the Axis demise. But to produce 90 million tons the mills must have 45 million tons of scrap metal. Regular sources of supply account for only half that amount. The remaining tonnage must come from scrap metal now lying around factories, garages, homes, farms.

How quickly we terminate this war depends on our ability to outproduce our enemies. And, according to no less an authority than Donald M. Nelson, "Nothing is more important to war production than scrap." Any relaxation in salvaging scrap would sabotage our entire war effort. Do your part in filling the victory prescription.

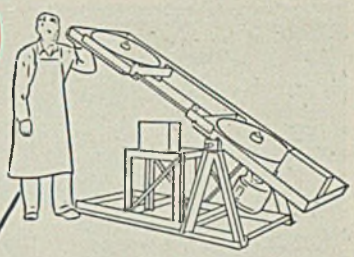
THE ANDREWS STEEL CO.
NEWPORT, KENTUCKY

DIVISIONS
THE NEWPORT ROLLING MILL COMPANY
THE GLOBE IRON ROOFING & CORRUGATING CO.

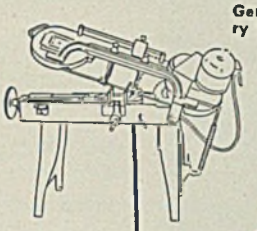
Wells SAWS
THE SIGN OF SERVICE

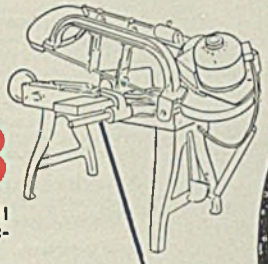
No. 9
General Foundry Saw.

No. 20
Designed for cutting risers off propeller blades.



No. 5
Ideal tool room size.

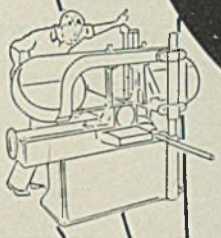




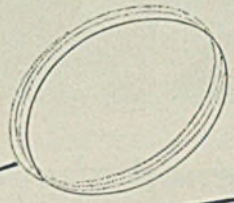
No. 8
Popular all around production Saw.

Wells
Fast-Accurate-Rugged
METAL CUTTING BAND SAWS

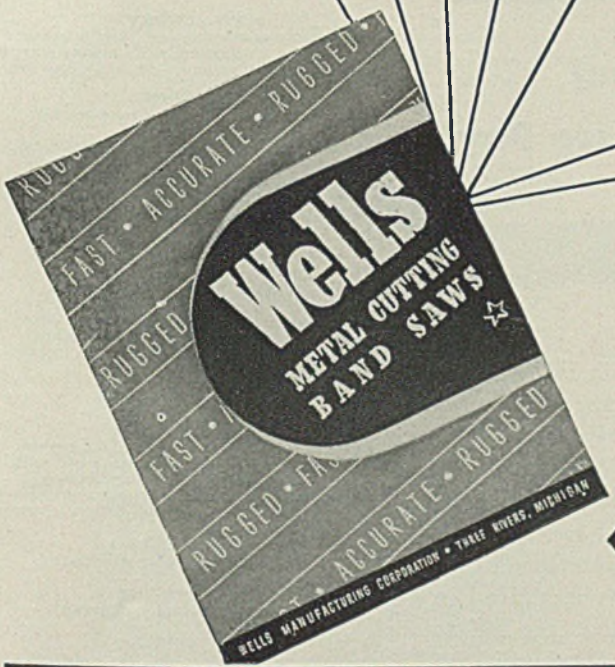
No. 12
Heavy duty production Saw.



SAW BLADES
Available at all times.



STOCK STANDS
Indispensable item for your shop.



WELLS METAL CUTTING BAND SAWS are engineered and designed for dependable long service in metal cutting efficiency, meeting the exacting requirements of present day demands on industry.

Whatever your metal cutting jobs are, call your distributor or write direct.

Wells Has Established Leadership

FREE NEW CATALOG on WELLS complete line is yours on request. Write or wire today.

WELLS MANUFACTURING CORPORATION
Wells METAL CUTTING BAND SAWS
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He learned about Galvanizing on the bottom of 'Frisco Bay!

There, deep below the surface, immersed in a constant bath of corrosive sea water, lay the steel pipe of a water supply line. That pipe, HOT-DIP GALVANIZED before it was laid in 1902, is still in good condition after 40 years of uninterrupted service! HOT-DIP GALVANIZING gave it the thickest possible coating of protective zinc, and saved the taxpayers large sums of money in maintenance and replacement expense. There are other methods of galvanizing, but only HOT-DIP GALVANIZING provides a thick zinc coating fused inseparably to the metal beneath—the most economic rust protection known to modern science. American Hot Dip Galvanizers Association, Inc., First National Bank Bldg., Pittsburgh, Pa.

"If it carries this seal it's a job well done."

Buy from the qualified members listed below and KNOW you are getting a genuine HOT-DIP job.

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LOS ANGELES GALVANIZING CO., HUNTINGTON PARK
EMSCO DERRICK & EQUIPMENT CO., LOS ANGELES
JOSLYN CO. OF CALIFORNIA, LOS ANGELES
WESTERN GALVANIZING COMPANY, LOS ANGELES
HUBBARD & CO., OAKLAND
JOHN FINN METAL WORKS, SAN FRANCISCO
SAN FRANCISCO GALVANIZING WORKS, SAN FRANCISCO

CONNECTICUT
WILCOX, CRITTENDEN & COMPANY, INC., MIDDLETOWN

GEORGIA
ATLANTIC STEEL CO., ATLANTA

ILLINOIS
EQUIPMENT STEEL PRODUCTS DIVISION OF UNION ASBESTOS AND RUBBER CO., BLUE ISLAND
JOSLYN MFG. & SUPPLY CO., CHICAGO
STANDARD GALVANIZING CO., CHICAGO

MAINE
THE THOMAS LAUGHLIN CO., PORTLAND

MARYLAND
SOUTHERN GALVANIZING COMPANY, BALTIMORE

MICHIGAN
RIVERSIDE FOUNDRY & GALVANIZING CO., KALAMAZOO

MINNESOTA
LEWIS BOLT & NUT CO., MINNEAPOLIS

MISSOURI
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ACME STEEL & MALLEABLE IRON WORKS, BUFFALO
BUFFALO GALVANIZING & TINNING WORKS, INC. BUFFALO
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THE SANITARY TINNING CO., CLEVELAND
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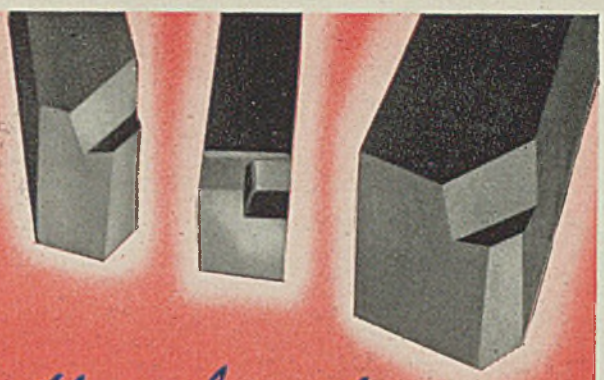
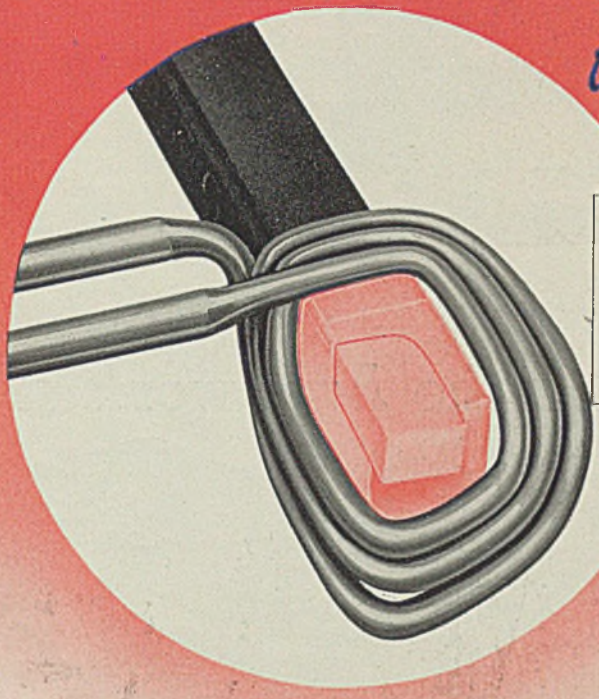
Not just Galvanizing **but hot-dip GALVANIZING**

BRAZE

TUNGSTEN CARBIDE CUTTING TOOLS

faster, surer, at fractional cost





Brazing the LEPEL way is simple and sure even for inexperienced operators because the heating cycle is automatically controlled. Heating coils for various tool sizes and shapes are instantly interchangeable.

WITH

Lepel

HIGH FREQUENCY

INDUCTION HEATING EQUIPMENT

Tool rooms, everywhere, are following the example of leading cutting tool manufacturers in discarding the torch in favor of high frequency induction heating for brazing tungsten carbide cutting tips. For this simple modern method removes all uncertainty from the brazing operation. With the heating cycle *automatically controlled,* it assures uniform brazing, and uniformly *sure* bond between tip and shank, *every time.* It eliminates losses due to overheating . . . cuts brazing time . . . conserves precious machine hours and critical materials . . . and permits quick removal of worn tips without injury to tip or shank. And it is equally efficient for any type of brazing alloy.

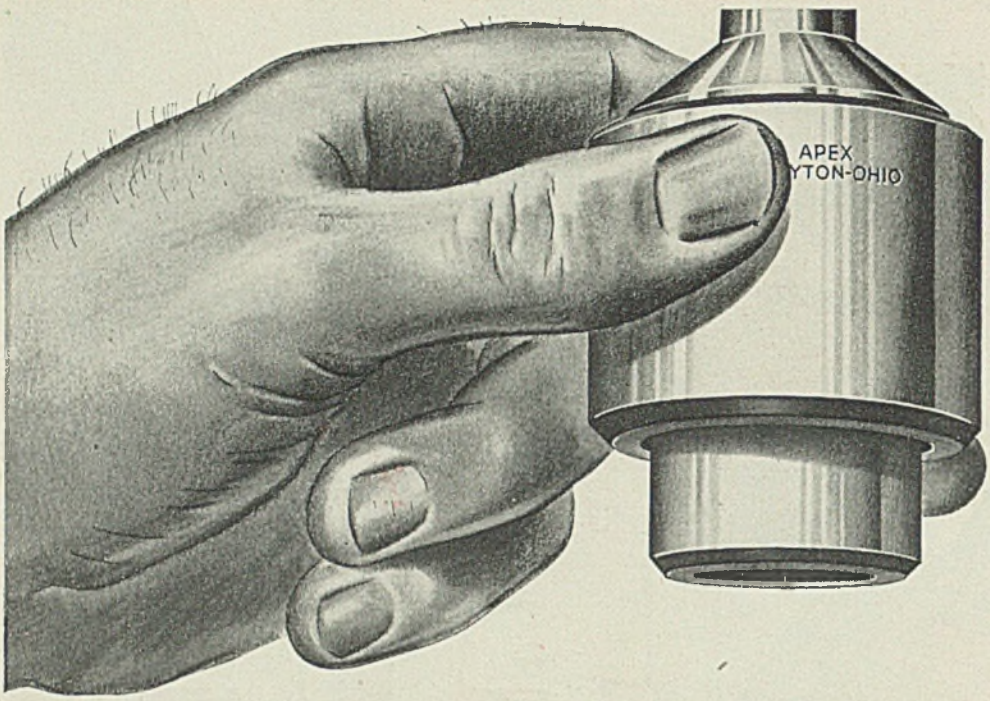
A simple request will bring you complete information on LEPEL High Frequency Induction brazing . . . as well as on the adaptability of compact and economical LEPEL units for *Hardening, Annealing, Soldering* and *Melting.* Write or wire today.

LEPEL High Frequency Induction Units are extremely compact, easily movable on casters, and relatively inexpensive. Operated manually, or, fully automatic. All other operations such as hardening, melting, soldering, etc. are performed by the same unit. Available in models for most industrial applications.

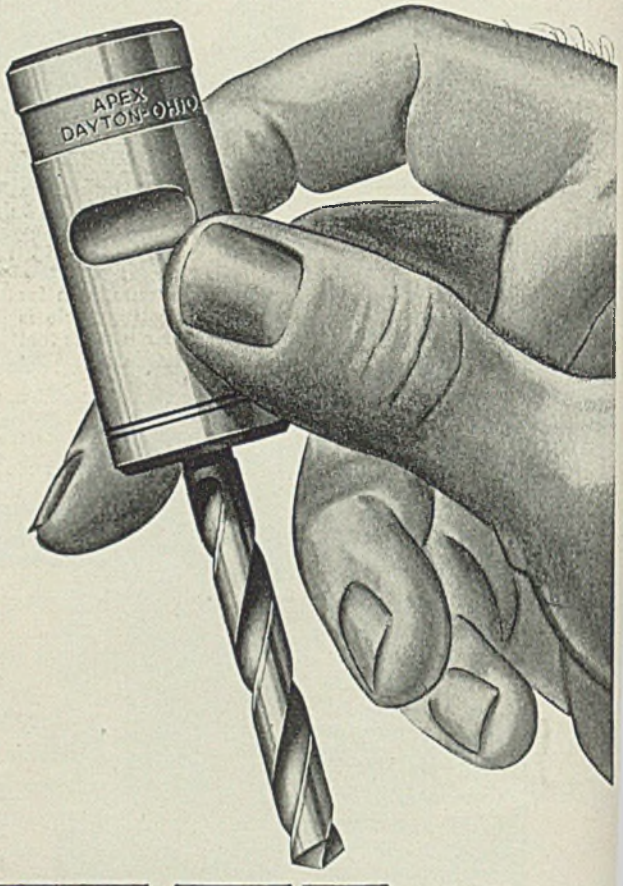
Lepel HIGH FREQUENCY LABORATORIES, INC.

39 West 60th Street, New York, N. Y.

PIONEERS IN INDUCTION HEATING



Here's another 10 seconds the Axis won't get!



Y*ou don't stop* or slow down the machine to change tools with Apex Quick Change Drill Chucks. And a few seconds saved repeatedly, give you extra *productive* man hours per week per machine.

Green hands catch on quick to these simple, rugged chucks. A flip of the wrist changes drills, taps, reamers, counterbores, etc.—on drill presses, radials, lathes, hand screws, electric and air tools. Plunger design prevents dirt from clogging hole. Ball nose plungers guaranteed not to fall out during life of chuck. Morse taper shanks are standard; others to your specifications. Write for the complete catalog of Apex production tools, No. 14.

APEX

THE APEX MACHINE & TOOL CO., DAYTON, OHIO

Manufacturers of Safety Friction Tapping Chucks, Quick Change and Positive Drive Drill Chucks, Vertical Float Tapping Chucks, Parallel Floating Tool Holders, Power Bits for Phillips, Slotted Head and Clutch Head Screws, Hand Drivers for Phillips and Clutch Head Screws. Aircraft Universal Joints, Plain and Universal Joint Socket Wrenches.

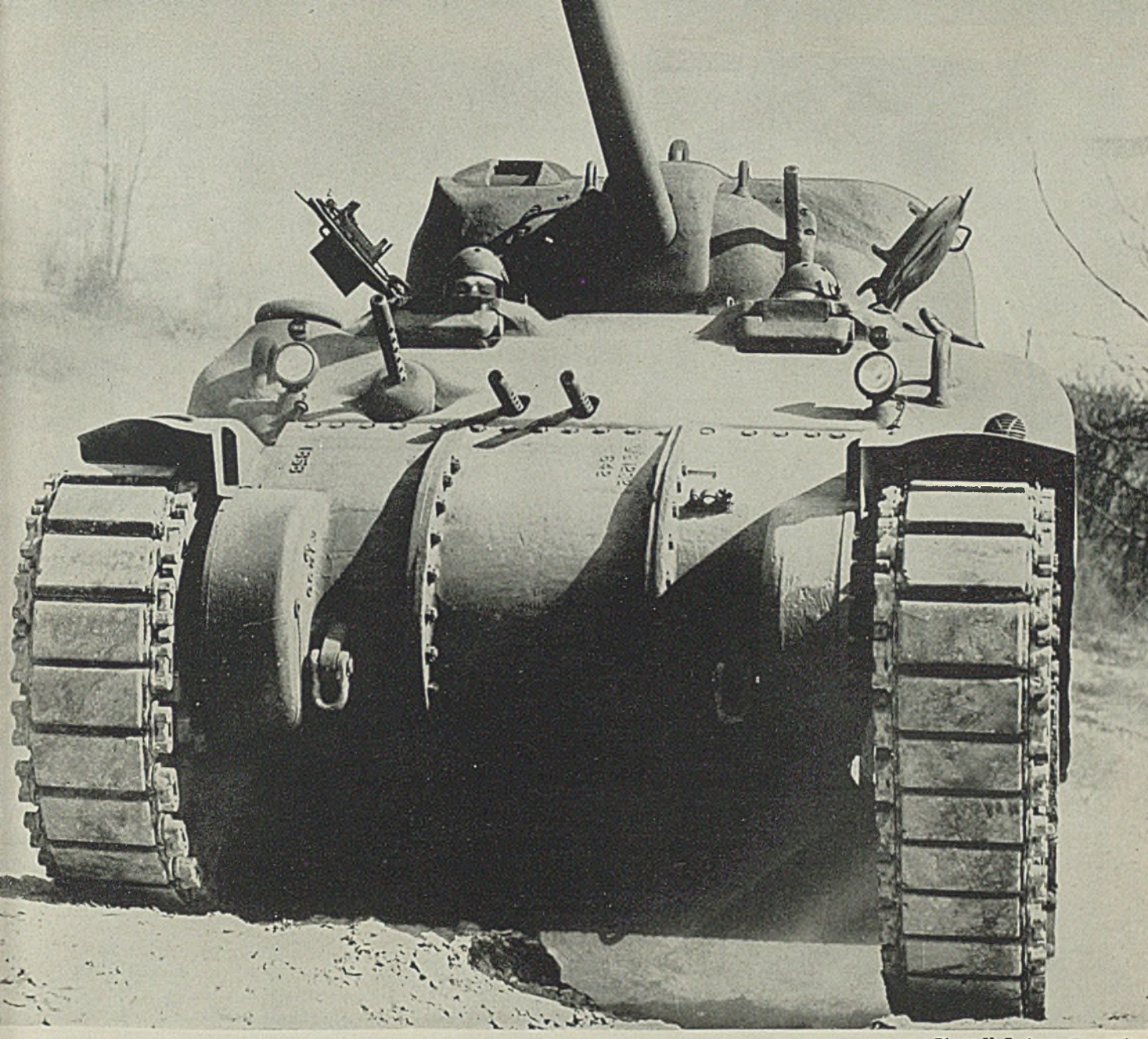


Photo U. S. Army Signal Corp

CAST ARMOR... an important contribution of the Steel Castings Industry to the war effort

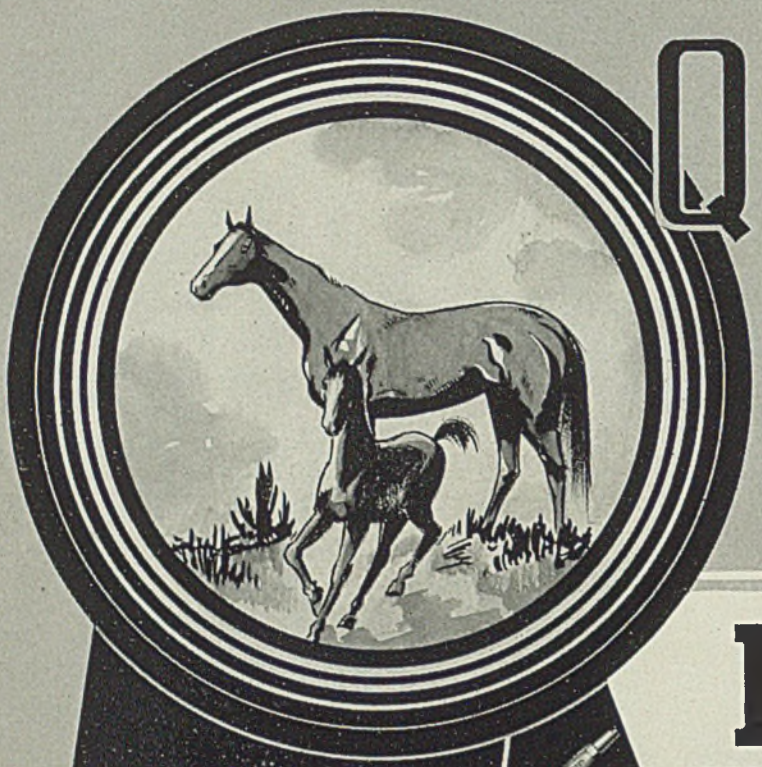
THE ARMY'S newest and best tanks are by weight 60% cast steel. Casting the armor for tanks—a new process—substantially reduces the cost compared with former methods.

The properties of Steel Castings that make these better tanks possible, and deliver them in less time, are the same properties that will permit you to build a better, more efficient and more economical product.

For information, consult your own steel foundry, or write to Steel Founders' Society of America, 920 Midland Bldg., Cleveland, Ohio.

MODERNIZE AND IMPROVE YOUR PRODUCT WITH

STEEL CASTINGS



QUALITY

LIKE GOOD BREEDING

is the Hall-mark

OF

THOROUGHBREDS

Hansen

INDUSTRIAL AIR LINE

EQUIPMENT

For the past quarter of a century Hansen air line equipment has been the outstanding *quality* line, never built down to meet a price but always maintained at a high quality level.

Hansen *quality* means more than just a talking point, it means advanced engineering, hair line accuracy, skilled craftsmanship and the finest materials obtainable. Hansen superiority is brought out and demonstrated in greater performance, speed, ease of operation, extremely low maintenance cost and longer life. Thousands of large and small industrial plants throughout the world are completely Hansen equipped.

Hansen—a name which means the finest in modern air line equipment that more than meets the demands of today's production and tomorrow's competition. *Send for free catalog.*

HOSE CLAMPS • AIR HOSE COUPLINGS
HOSE CLAMP SOCKETS • HOSE CLAMP PLUGS
AIR LIQUID SPRAY GUNS • ENGINE CLEANERS
AIR BLOW GUNS • SAND BLAST CLEANERS

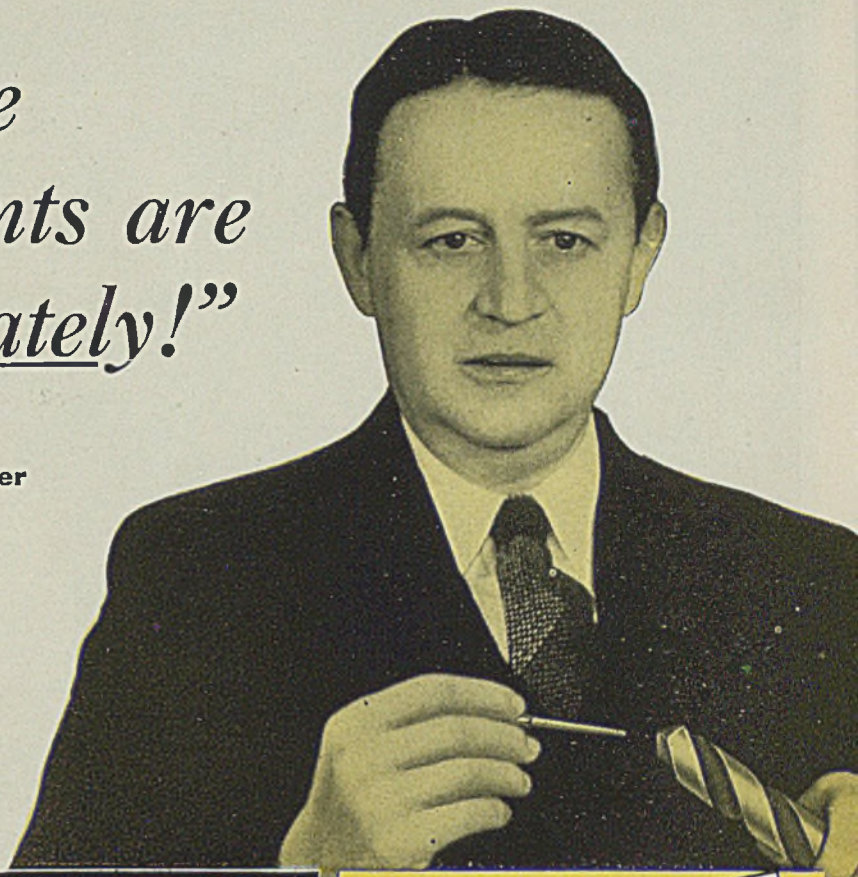
Hansen MFG. CO

INDUSTRIAL *Air Line* EQUIPMEN

1786 EAST 27TH STREET • • • • CLEVELAND, OHI

"Be sure twist drill points are ground accurately!"

says **A. J. SNYDER**, Works Manager
MORSE TWIST DRILL & MACHINE CO.
New Bedford, Mass.



OBTAINING MAXIMUM EFFICIENCY from twist drills is possible only when points are ground correctly. In modern drilling practice, drilling different grades of materials often requires a modification of the commercial 118° drill point. For example, hard materials require a blunter point than do soft materials. (See chart below.)

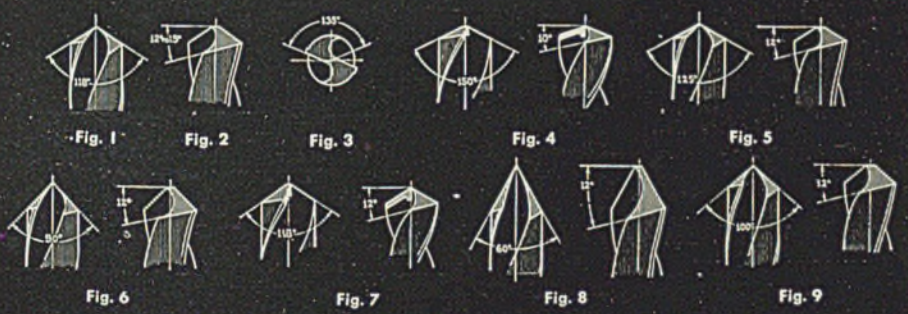


Fig. 1 Fig. 2 Fig. 3 Fig. 4 Fig. 5

Fig. 6 Fig. 7 Fig. 8 Fig. 9

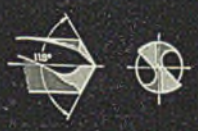
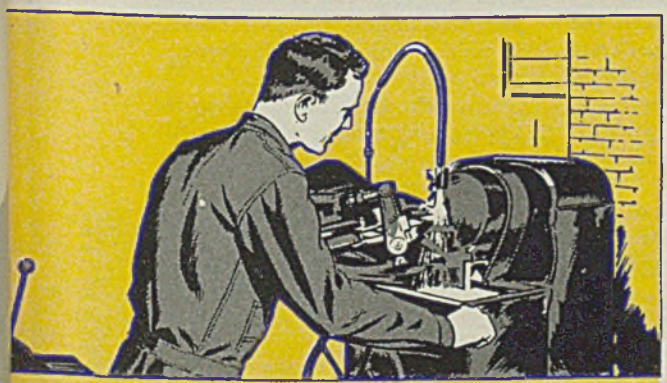


Fig. 10

MATERIALS USED ON

Fig. 1 }
Fig. 2 } Average Class of Work
Fig. 3 }
Fig. 4 Steel Rails 7% to 13% Manganese and Hard Material
Fig. 5 Heat Treated Steels, Drop Forgings (Automobile Connecting Rods) Brinell Hardness 250
Fig. 6 Cast Iron—Soft
Fig. 7 Brass
Fig. 8 Wood, Hard Rubber, Bakelite and Fiber (no. 6 may also be used)
Fig. 9 Copper
Fig. 10 Crankshafts

"FOR A DRILL to perform satisfactorily, the cutting edges should have a proper and uniform angle with the longitudinal axis of the drill. Also, the cutting edges should be of exactly equal length, with the proper lip clearance or contour of the surface back of the cutting edges. This clearance must be the same on each lip. When cutting lips are not uniform, holes will be oversize and the drill will wear on the margin of one cutting lip."

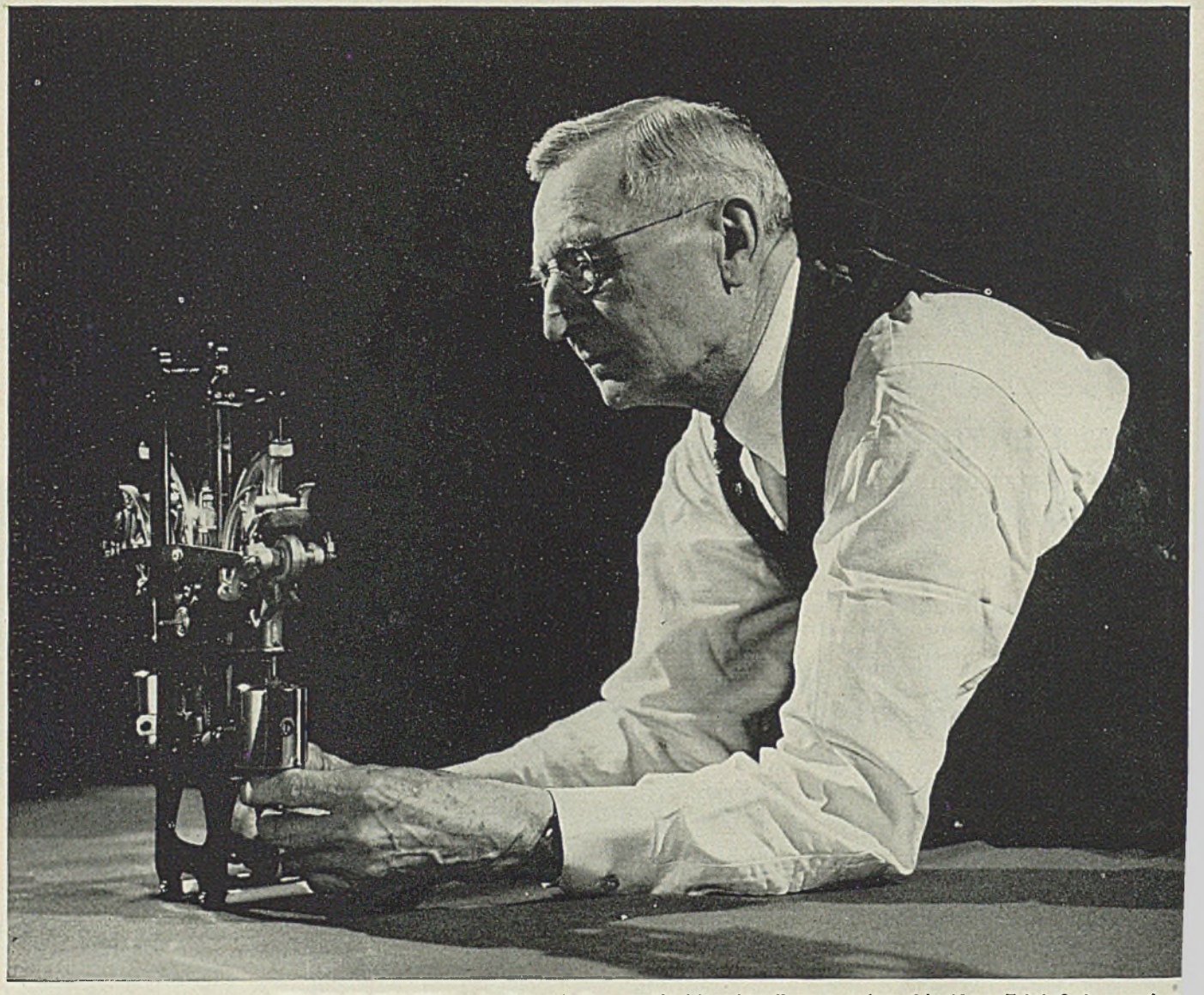


"THE FORM of a drill point exerts a powerful influence upon the rate of production, accuracy of drilled holes and the number of holes which can be drilled between successive grindings. Drill grinding machines, located in tool rooms throughout the plant, are steps toward getting the correct point on drills, as it is difficult to grind a point by hand that will give the desired results without too much loss of time."

The correct cutting oil is as important to proper drilling operations as the correct grinding of the drill points. That's why Shell has developed a control technique that "balances" the oil to the machine, the application and the tool. Call in the Shell man now for details.

SHELL

SHELL LATA OILS
FOR METAL WORKING



WIZARD OF WEIGHING—Dr. Halvor O. Hem, our Chief Consulting Engineer, is dean of the 65-man Toledo Scale research an engineering group. Personally responsible for many far-reaching developments in weighing, testing force-measuring. Norwegian-born; a forthright U. S. citizen for 40 years; a Toledo man for 28 of them

RESEARCH IS TIPPING THE SCALES OF WAR AND WILL SET THE STYLE OF A PERMANENT PEACE

Buttressing our far-flung fronts stand the services of Supply. Behind Supply roars Production—*mass-production.* Guiding Production is Engineering, converter of ideas into things—*fighting things.*

Fountain-head of Engineering is Research—"the science of making changes in a scientific way."* Research in its silent scientific way seeks out the solution to the Front Line's constant cry, "Give us more—and better."

To us War Research has meant: *Wind-tunnels* that dictate the shapes of super fighters and bombers; *Engine-testers* that telegraph the pulse, respiration and metabolic rate of the plane's engines; helping the engineer to better their fighting fitness; *Propeller-balancers* that speak for higher speeds and safer handling in the air; *Electronic explosives-batch controls* that robot the compounding of ammunition at war-tempo speed and to gnat's-eyebrow accuracy.

These, and dozens of other war-born weighing, testing and force-measuring devices, are war machines in which Toledo Research plays its part.

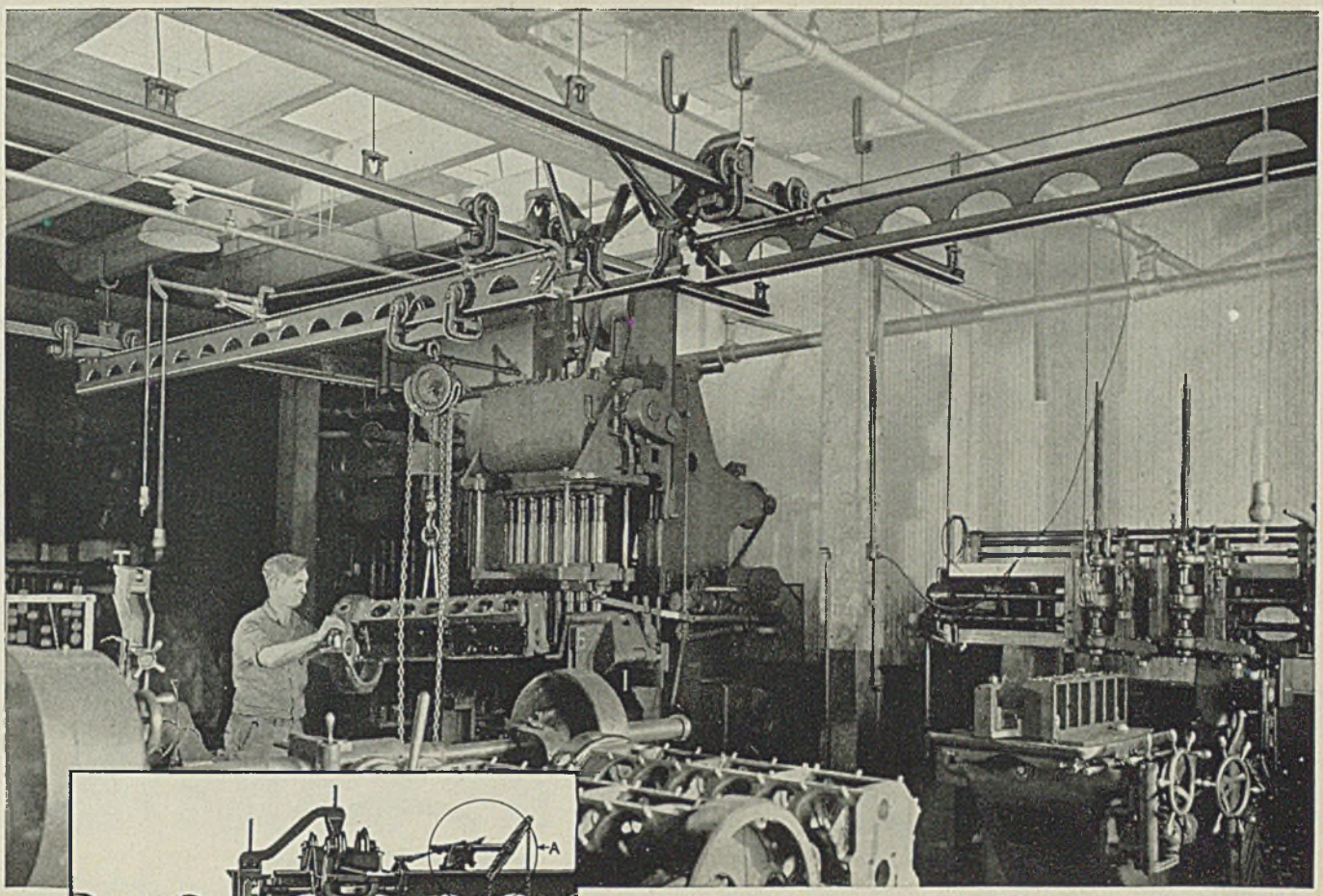
Research the Change-maker is tipping the Scales of War; and will set the style of the Peace to follow. For Research the War-winner will also be the Job-maker in the Peace that must, by right and might, be ours tomorrow.

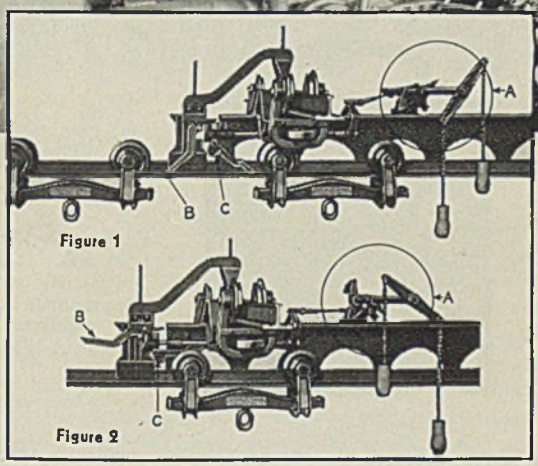
TOLEDO SCALE COMPANY

Toledo, Ohio

Canadian Toledo Scale Co., Limited, Toronto, Ont.

**As defined by that great proponent of Research, C. F. Kettering.*





TRANSFER BRIDGE MECHANISM

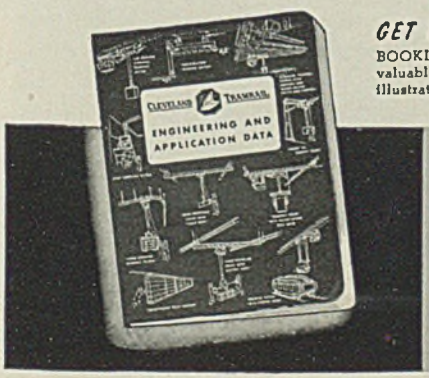
Transfer bridges are cranes except one or both ends are provided with an interlock. Carriers cannot be passed through an interlock until the bridge is aligned with another bridge or overhead rail and locked into position by the manually-operated throw-out (A). This causes the safety forks (B and C) to raise automatically and permit free travel. The mechanism prevents all possibility of a carrier running off an open end. Figure 1 shows a bridge in line with a connecting rail, with safety forks down, before throw-out has been operated. Figure 2 shows forks raised, after throw-out has been operated.

TRANSFER BRIDGES SIMPLIFY ENGINE HANDLING

Twelve-cylinder motors for fire engines built by The Seagrave Corporation, Columbus, Ohio, are easily moved from any point in one bay to any point in an adjacent bay in their machine shop, by means of Cleveland Tramrail transfer bridges. Because of a column of posts separating the bays it is impossible to make use of cranes spanning the entire width of the two bays.

The bridges interlock with short stationary rails, permitting the engines to be taken from one to the other without any intermediate handling. The carriers can also be transferred to the overhead Cleveland Tramrail rail system which provides handling coverage for nearly the entire factory. Thus engines can be delivered directly from the transfer bridges to all parts of the large shop.

The transfer bridges shown are of the hand-propelled two-runway type. Other bridges also are built for three, four and more runways either hand-propelled or electrically driven.



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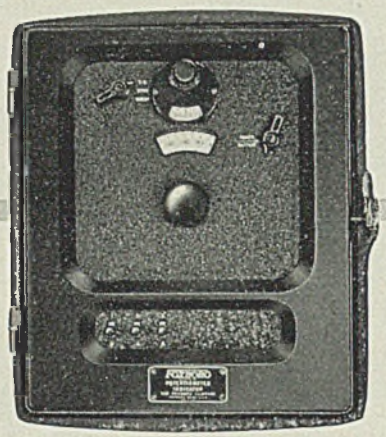
CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
1125 EAST 283RD ST. WICKLIFFE, OHIO.

CLEVELAND TRAMRAIL

OVERHEAD MATERIALS HANDLING EQUIPMENT

What it Takes for war-time heat treating!



Potentiometer Indicator by Foxboro. Available with 1 to 18 built-in switch points. See Bulletin A-305.

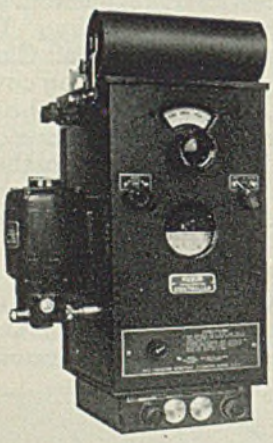
Tougher heat-treating standards demanded for war products now call for pyrometer precision higher than many pre-war jobs required. Today, just "good enough" won't do!

That's why you'll find Foxboro Potentiometer Instruments in use throughout many of the leading war plants. Foxboro's complete line of pyrometers *has what it takes* for close, dependable control of war-production furnaces.

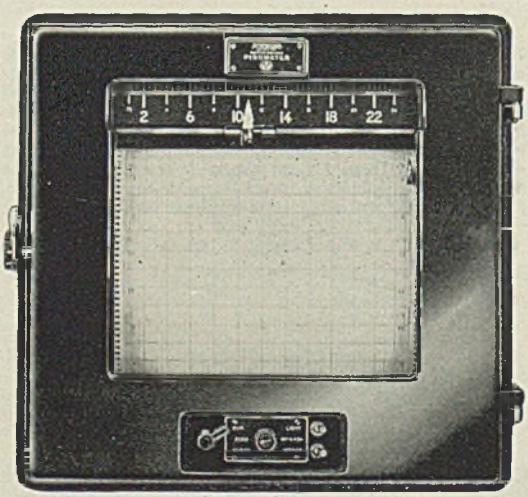
In all Foxboro Potentiometer Instruments . . . Recorders, Controllers and Indicators alike . . . exclusive Foxboro simplifications and refinements cut lost motion and wear to negligible minimums . . . furnish guaranteed accuracy of ¼ of 1% of scale, or better. In addition, these Foxboro features provide simpler, more exact setting by operators, due to use of larger, easy-reading scales.

Only four of Foxboro's Potentiometer Instruments are pictured here. Write for Bulletins covering the complete line. **The Foxboro Co., 118 Neponset Ave., Foxboro, Mass., U. S. A.** Branches in principal cities of U. S. and Canada.

Foxboro Portable Potentiometer Indicator. Industrial accuracy approaching laboratory standards. See Bulletin A-303.



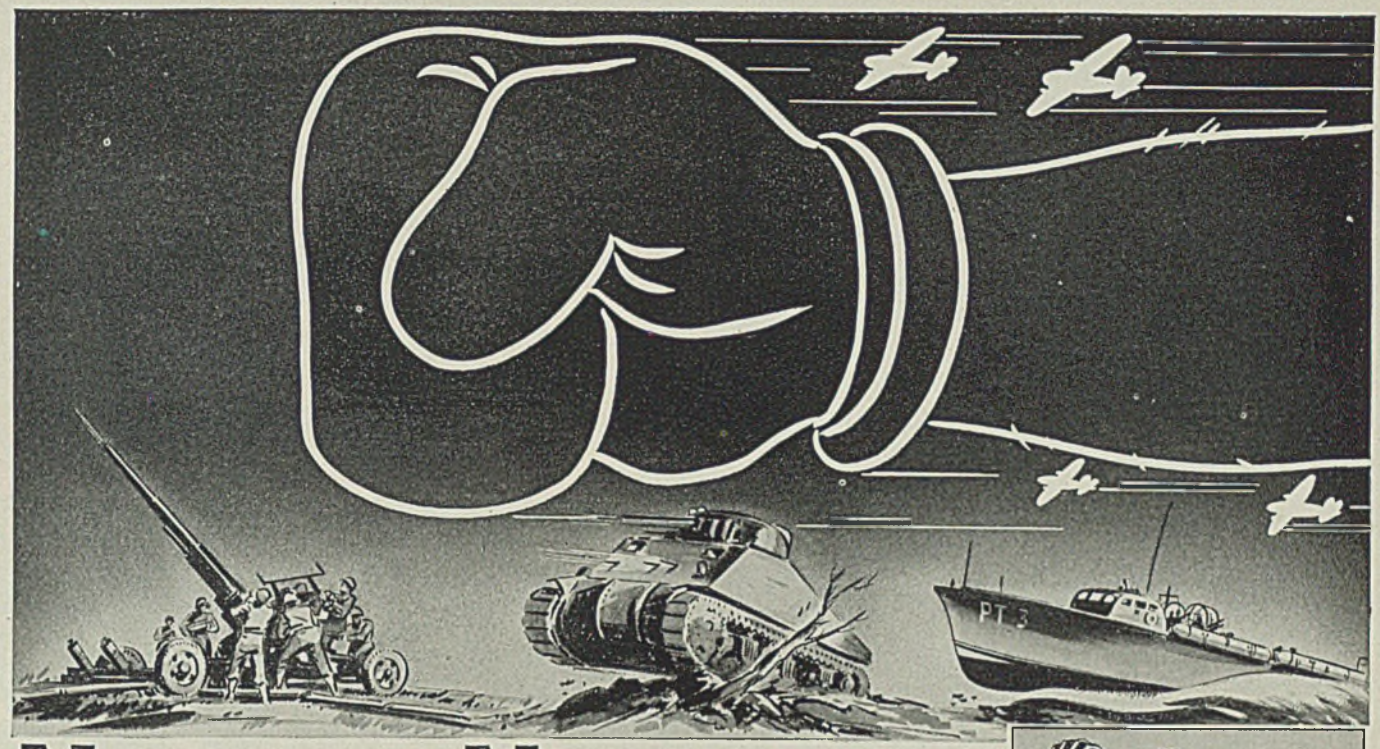
Non-Recording Potentiometer Controller by Foxboro. Unique fixed slide-wire and group-drive. See Bulletin 202-4.



Foxboro Potentiometer Recorder. Makes records of 1 to 8 temperature points. See Bulletin 190-6.

Potentiometer Instruments by FOXBORO

Reg. U. S. Pat. Off.



NITRIDED NITRALLOY

Packs Wallop INTO WAR MACHINERY

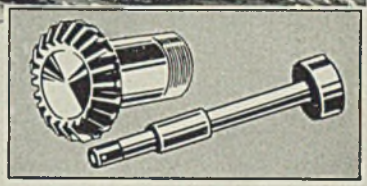
More than a mighty surface hardness makes Nitrided Nitralloy a force for victory. It's the power to put more endurance—more staying power into steel machinery parts—that makes Nitrided Nitralloy such a formidable ally.

Providing the hardest steel surface known, Nitrided Nitralloy enables military equipment to outlast itself by five, ten — even twenty times. Nitrided Nitralloy works enormous wear-resistance into aircraft engine cylinders. What's more, it resists fatigue in crank shafts, withstands weather and laughs at the toughest lubricating conditions. These vital properties help put off replacements, thus saving manpower, steel, production capacity and transportation. Specify Nitrided Nitralloy for war machinery parts subject to wear, and help end the war sooner.

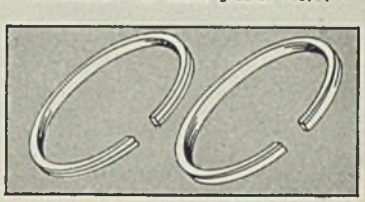
Nitralloy steels are available under government regulation where they will aid the war effort. Write us or any of the companies listed below, for detailed technical data.

OTHER EXCLUSIVE PROPERTIES OF NITRIDED NITRALLOY

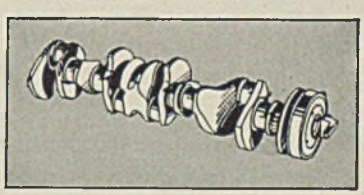
1. Extreme surface hardness (Vickers diamond brinell 900-1200)
2. Attains high hardness with a minimum of distortion.
3. Holds hardness and resists abrasion at high temperatures (750°F).
4. Doesn't soften by heating to 1200°F.
5. Unequalled abrasive resistance in wear against itself or other material, including sand, grit, mud, etc., under certain conditions, in the absence of lubrication.



PINIONS, PUMP SHAFTS, PLUNGERS, ETC., are some of the hundreds of applications in which NITRIDED NITRALLOY has added greater life.



Scoring is retarded in the case of NITRIDED NITRALLOY piston rings running against nitrided cylinder liners — even under faulty and limited lubrication.



Crank shafts of NITRIDED NITRALLOY, dismantled after thousands of hours in service, are within original tolerances.

THE
NITRALLOY
CORPORATION

230 PARK AVENUE · NEW YORK, N. Y.

Companies Licensed by The Nitralloy Corporation

Allegheny Ludlum Steel Corp. *Watervliet, N. Y.*
Bethlehem Steel Co. *Bethlehem, Pa.*
Copperweld Steel Co. *Warren, O.*
Crucible Steel Co. of America *New York, N. Y.*
Firth-Sterling Steel Co. *McKeesport, Pa.*
Republic Steel Corporation *Cleveland, O.*
The Timken Roller Bearing Co. *Canton, O.*
Rotary Electric Steel Co. *Detroit, Mich.*
Vanadium-Alloys Steel Co. *Pittsburgh, Pa.*
Atlas Steel Limited *Welland, Ontario*

Operating & Accredited Nitriding Agents

Camden Forge Co. *Camden, N. J.*
Commercial Steel Treating Corp. *Detroit, Mich.*
Engelhard & Kenny *North Arlington, N. J.*
The Lakeside Steel Improvement Co. *Cleveland, O.*
Lindberg Steel Treating Co. *Chicago, Ill.*
Link-Belt Co. *Philadelphia, Pa.*
Met-Lab, Inc. *Philadelphia, Pa.*
New England Metallurgical Corp. *Boston, Mass.*
Pittsburgh Commercial Heat Treating Co. *Pittsburgh, Pa.*
Queen City Steel Treating Co. *Cincinnati, O.*
Rex & Erb *Lansdale, Pa.*
Wesley Steel Treating Co. *Milwaukee, Wis.*
N. A. Woodworth Co. *Ferndale, Mich.*
Ontario Research Foundation *Toronto, Ontario, Canada*

Manufacturers of Nitralloy Steel Castings

Lebanon Steel Foundry *Lebanon, Pa.*
Empire Steel Castings Co. *Reading, Pa.*
The Massillon Steel Casting Co. *Massillon, O.*
Milwaukee Steel Foundry Div., Grede Foundries, Inc. *Milwaukee, Wis.*
Warman Steel Casting Co. *Los Angeles, Cal.*

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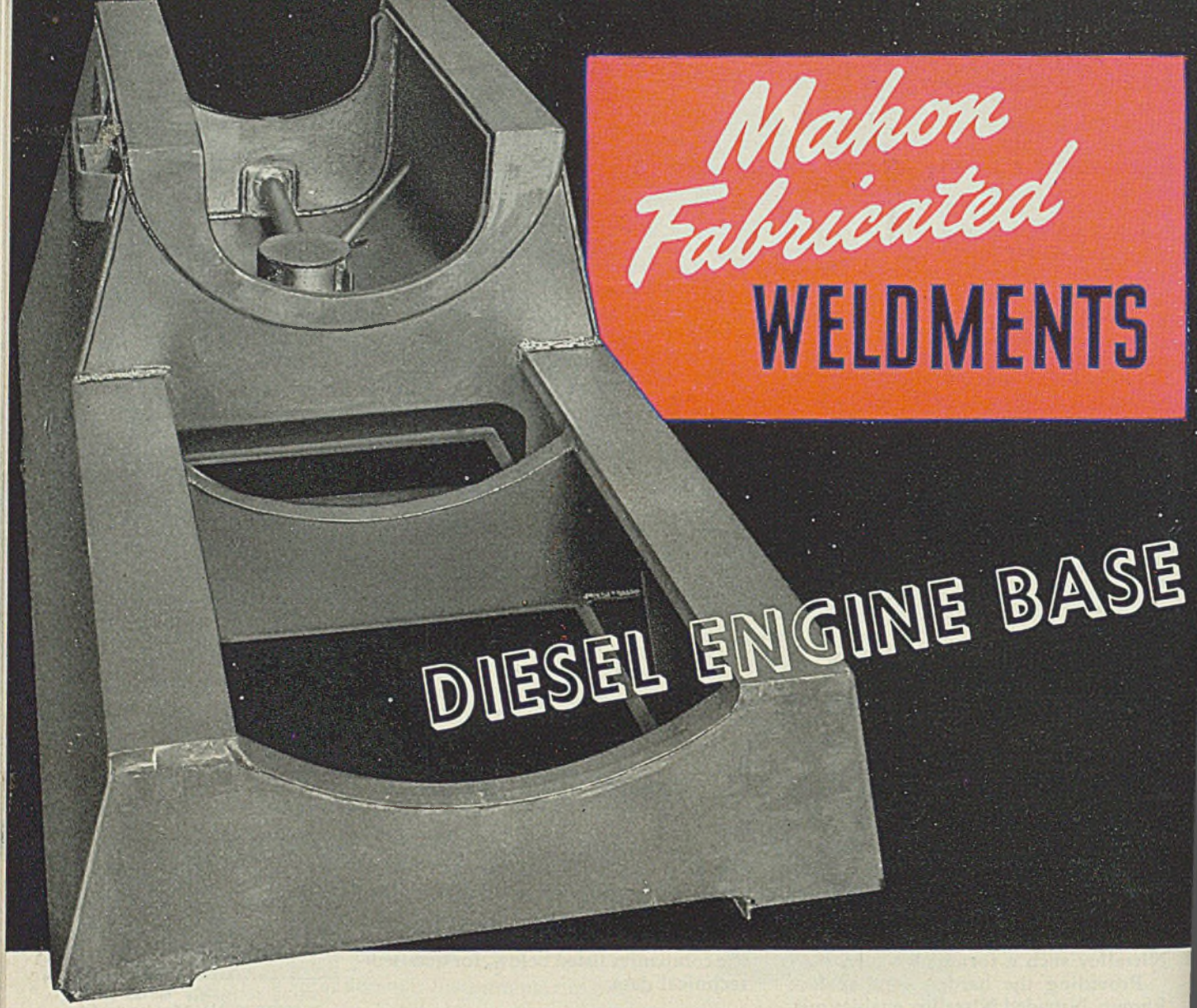

Another Industry Served by Mahon

Mahon skill in the fabricating of *welded* bases and frames has long been established throughout the machine tool industry. Recognition of that skill now extends into many other fields of manufacture.

The diesel engine base, pictured above, is but one of several such fittings in production for this important industry. Today the extensive facilities of Mahon also are being drafted for the fabrication of gun mounts, ship assemblies, frames and integral parts of electric motors and generators, supports and fittings for electric and hydraulic pumps, furnace casings—and a great variety of other weldments for as many additional industries.

War production has brought home to hundreds of manufacturers the superiority of *welded steel plate* as the ideal construction for bases, frames, casings and similar fittings. It is stronger, lighter, waterproof, requires less machining and finishing, makes a much better appearance—and, in most cases, can be produced faster and cheaper.

Send us your blueprints. Our engineers will advise you fairly and frankly whether welded steel plate construction is practical for YOUR product.

Fabricators of Machine Bases and Frames and Many Other Welded Steel Plate Produ

THE R. C. MAHON COMPANY
DETROIT CHICAGO