

EDITORIAL STAFF

E. L. SHANER
Editor-in-Chief

E. C. KREUTZBERG
Editor

WM. M. ROONEY
News Editor

IRWIN H. SUCH
Engineering Editor

J. D. KNOX
Steel Plant Editor

GUY HUBBARD
Machine Tool Editor

ARTHUR F. MAGCONOCHIE
Contributing Editor

DON S. CADOT
Art Editor

ASSOCIATE EDITORS

G. H. MANLOVE, W. J. CAMPBELL
W. BIRDSALL, F. R. BRIGGS, D. B. WILKIN
New York: B. K. PRICE, L. E. BROWNE
Pittsburgh: R. L. HARTFORD
Chicago: E. F. ROSS Detroit: A. H. ALLEN
Washington: L. M. LAMM
London: VINCENT DELPORT

ASSISTANT EDITORS

C. SULLIVAN, J. M. KURTZ, R. W. SHESTAG
J. M. WHELAN, A. J. FINGULIN

EDITORIAL CORRESPONDENTS

R. W. KINCEY L. C. FELDMAN
Birmingham, Ala. Buffalo, N. Y.
GEORGE R. REISS SAMUEL S. CARR
Youngstown, O. Cincinnati, O.
J. VON PAPIN F. S. TOBIN
St. Louis Toronto, Ont.

LUTHER WHITEMAN
1414 Paducah St., Los Angeles, Calif.

ROBERT BOTTORFF
415 Bush St., San Francisco, Calif.

R. C. HILL
408 Marion St., Seattle, Wash.

BUSINESS STAFF

G. O. HAYS
Business Manager

R. C. JAENKE C. H. BAILEY
Advertising Manager Advertising Service

New York, E. W. KREUTZBERG, K. A. ZOLLNER
Pittsburgh, S. H. JASPER,

B. C. SNELL, H. C. ROWLAND
Chicago, L. C. PELOTT, V. W. VOLK

Cleveland, D. C. KIEFER, C. H. CROSS

Los Angeles, F. J. FULLER

J. W. ZUBER
Circulation Manager

MAIN OFFICE

Penton Building, Cleveland 18, Ohio

BRANCH OFFICES

New York 17 16 East 43rd St.
Chicago 11 520 North Michigan Ave.
Pittsburgh 19 2800 Koppers Building
Cincinnati 2 6560 Cass Ave.
London 4 956 National Press Bldg.
Cincinnati 2 2030 Carew Tower
Los Angeles 4 130 N. New Hampshire Ave.
London 2 Caxton St., Westminster, S.W. 1

Published by THE PENTON PUBLISHING CO., Penton
Building, Cleveland 18, Ohio, E. L. SHANER, President
Treasurer; G. O. HAYS, Vice President and General
Manager; R. C. JAENKE, Vice President; F. G. STEINE,
Vice President and Secretary; E. L. WERNER,
Assistant Treasurer.

Printed and Published by Audit Bureau of Circulations; Associated
Press, Inc., and National Publishers' Association.

Published every Monday. Subscription in the United
States and possessions, Canada, Mexico, Cuba, Central
South America, one year \$6; two years \$10; all
other countries, one year \$12. Single copies (current
issue) 25c. Entered as second class matter at the
Post Office at Cleveland, under the Act of March 3,
1879. Copyright 1944 by the Penton Publishing Co.



STEEL

The Magazine of Metalworking and Metalproducing

SEPTEMBER 11, 1944

Volume 115—Number 11

NEWS

Early Return of Markets to Free Status Foreseen	67
<i>Departure from ceiling prices in scrap indicates trend</i>	
Market Prospects	68
Present, Past and Pending	69
Labor	70
Foundry Wages	71
West Coast	72
China	74
Steel Consumption	75
British Postwar Planning	79
Reconversion	80
WPB-OPA	81
Men of Industry	90
Obituaries	92
Activities	93
Re-employing Veterans	94

TECHNICAL

Selection and Application of Metallic Arc Welding Electrodes	98
<i>Stainless steel types discussed in first article of new series</i>	
Action of Extreme Pressure Lubricants in Gears and Machine Parts	102
<i>Behavior of contacting metal surfaces, prevention of welding studied</i>	
Heat Treatment of Broach Keeps Pace with Growing Popularity	106
<i>Range of equipment insures flexibility to meet inevitable changes</i>	
Postwar Importance of Beneficiated Iron-Bearing Materials	112
<i>Concluding article describes practice of full sinter burden for stack</i>	
Preferred Sizes Listed in Revision of Tool Shank Standards	115
<i>Latest standard approved by SAE, ASME and Tool Builders' groups</i>	
Joining Aluminum Alloys by Most Recently Accepted Practices	116
<i>Resin-bonding of metal-to-metal and metal-to-nonmetal joints appraised</i>	
Government List of Enemy-Held Metalworking Patents Published	140
<i>Final section, XI, of abstract from Alien Property Custodian's list</i>	

FEATURES

As the Editor Views the News	63
Postwar Previews	75
Windows of Washington	76
Mirrors of Motordom	83
Wing Tips	86
The Business Trend	96
Industrial Equipment	118
Construction and Enterprise	206

MARKETS

Uncertain Future Deters Steel Market Activity	183
Market Prices and Composites	184
Index to advertisers	213

PRELUDE TO A

Prefab Job

Ready for Navy inspection . . .

on Time
via GraybaR



The Green Lumber Co., of Laurel, Mississippi had a Navy contract for 175 prefabricated buildings, IF — the "IF" was a tough one. It called for completion of one unit — wired and ready for inspection — within one week! These were not ordinary prefabricated buildings. They were designed for housing navy training devices which called for plenty of electrical power.

Normally, the electrical wiring supplies for a project like this would be mobilized over several weeks or even months, as the preliminary construction proceeded. But here, "sample" lots of all items from dozens of different manufacturers had to be on the job within two or three days.

The Graybar Man took the bill of materials and went to work. Some items came out of local stocks. Others were located at various GRAYBAR stock points near-by. A few other unusual items not in stock were rushed from manufacturers overnight. All the electrical supplies, from panel boards to fans, needed for the first building were on the job in time

to complete the sample assembly.

Within the week, when the completed building received its O.K., electrical materials for *twelve more* had been mobilized and were on their way to the contractor. Delivery schedules were worked out to insure a steady supply of material for the entire project — via GRAYBAR.

**Can this fast-moving service
do as much for you?**

For "sample" quantities overnight, or product quantities delivered on a regular week-to-week schedule, you'll get fast-moving help from your local GRAYBAR "procurement advisor." GRAYBAR can save your time in choosing the right electrical items for the job, in seeking out available sources in centralizing responsibility, by bringing together all the products that go together on the job. Will you not call in the GRAYBAR Man today? His services are available through your electrical contractor or direct if you have your own electrical department.

MOBILIZED MATERIALS
No. 19 of a series of actual examples of GRAYBAR service, providing electrical materials to be installed in ships, planes and in war facilities.

GraybaR

IN OVER 80 PRINCIPAL CITIES

Executive Offices: Graybar Bldg., New York 17, N.Y.



Weighing the Evidence

Last Monday—the third Labor day of this war—unknown millions of Americans read in their newspapers or heard over the radio dozens of eulogies of “labor”. If we could know accurately the exact reactions of these uncounted millions to the words they read or heard, we could better judge not only the outcome of the forthcoming election but also the destiny of the labor movement.

For the most part, the addresses on Labor day paid tribute to American workers for their contributions to the war effort. Most fair-minded listeners probably applauded these tributes insofar as they apply to the overwhelming majority of employes. The public is discriminating enough to know that in “labor,” as in other classes of society, the majority does the right thing and a minority causes all of the trouble.

However, three-quarters of all of the gainfully-employed persons in the country do not belong to unions. Most people realize this. Moreover, they assume that most of the eulogies uttered on Labor day were directed to the members of unions. Under conditions existing today, the unaffiliated worker is a forgotten man.

Therefore, to all intents and purposes the fulsome praise of Labor day orators was heaped upon one-quarter of the nation’s workers—the one-quarter which, while pledged not to strike for the duration, has struck thousands of times. Even as the honeyed words of praise were spoken, miners in Pennsylvania and employes in a bearings plant in Ohio were on strike over trivial disputes. Also the major unions were about to hold annual meetings at which it was predicted the rank and file would press hard to induce their leaders to repudiate the “no-strike” pledge. Concurrently, the unions were polishing off demands for higher hourly wages to offset the loss of overtime, for contracts with industries instead of companies and for guaranteed annual incomes.

Had union members by sheer merit on their own account won a position to justify these demands, the man in the street probably would not object. But he knows that the unions are where they are largely by virtue of favors extended by the government administration. He knows too that the only way his government has found to curb union abuses is to seize the property of the innocent owners.

He is one of a jury of millions who are sifting the evidence. Their verdict will weigh heavily in the election and in the future of the labor movement.

HOW MUCH CONTROL? When the idea of a planned economy for the United States was first broached, many persons opposed it bitterly. They did so because they felt, first, that the half-way measures of control that would be acceptable under American standards would not go far enough to be effective and, secondly, that controls far-reaching enough to really work could be exercised only under a totalitarian dictatorship, which would be obnoxious to the people of a democracy.

This reasoning now is supported by the present

situation in scrap. Six months ago we all thought that the controls on scrap were quite thorough. The law of supply and demand seemed non-existent. Today we are told that the government has practically little control over scrap and the law of supply and demand is back at the old stand, as hale and hearty as ever.

What to do? If the mills continue to stay out of the market the scrap dealers’ yards will become idle and their employes will drift away. Then, should a new demand for scrap arise suddenly, how

can the dealers meet it with depleted stocks and inadequate manpower?

If we were to face another emergency, which would you favor: Full, absolute controls; partial controls, or no controls at all? —pp. 67, 80

"CONSTRUCTIVE" TAXES: Of the numerous federal tax proposals now offered for public perusal, the one most closely conforming to the view of enlightened American industry is that sponsored by the Committee for Economic Development. This organization, headed by Paul Hoffman of Studebaker, has been far out in front of other agencies—government or otherwise—in studying problems of the postwar period.

The federal tax plan proposed by CED attempts to meet three imperative objectives. It is designed to give as full encouragement as possible to the creation of more employment, to apportion the tax burden fairly among persons and to provide adequate revenues.

These goals are so infinitely preferable to the intent of the crazy-quilt pattern of existing taxes—many of which are discriminatory, punitive and inequitable—that the CED plan merits careful study and positive support by every forward-looking industrialist. —p. 76

MAJOR ACHIEVEMENT: Outstanding among the new combat weapons announced by the army on Labor day is the Buick Hellcat, a high-speed 19-ton tank destroyer, known officially as the 76-millimeter gun motor carriage M-18. Contracts for this weapon were awarded in January, 1943.

While Buick was the prime contractor, 80 per cent of the value of the contract was distributed to 298 suppliers of productive parts and 314 of non-productive items. In addition, machinery dies, jigs and fixtures were supplied by 150 other sources and 13 other General Motors plants supplied components to Buick. Thus hundreds of separate companies participated in the manufacture of this super weapon, which is giving such a good account of itself in battle.

When one considers the combat experience which determined the design of the M-18, the work of the Ordnance Department in perfecting the details and the problem of organizing home front facilities for efficient production, one realizes that the presence of these weapons on the battlefields of Europe is a major achievement. —p. 83

TARIFFS AND PRICES: Powerful influences are at work to revamp the freight rate and commodity price structure of the nation. It is believed that the motive behind the action of the Department of Justice against the railroads is to obtain more favorable tariffs for shippers in the South, Southwest and Far West. Hints that similar action will be taken against certain industries probably mean that the department is not satisfied with the present price set-up.

This campaign cannot progress far without reviving a study of the steel basing point system. Already producers, fabricators and consumers of steel on the West Coast, with eyes alert to postwar opportunities, are looking into the intricacies of the pricing of steel. They contend that industrial development in their area has progressed to a point where a reshuffling of rate and price alignments is justified.

The time is not far off when all interests involved will be called upon to tackle this problem realistically. —p. 72

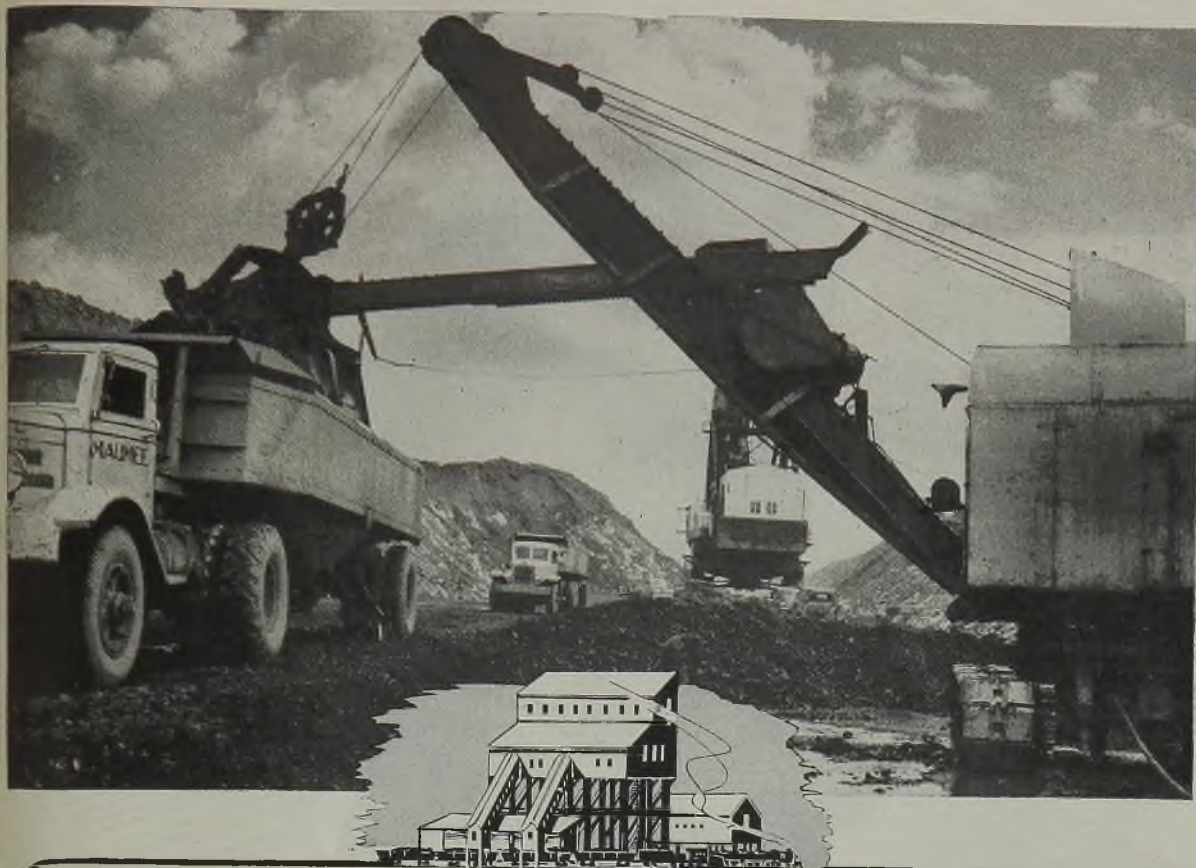
WAR ON FRICTION: Lubrication plays an important role in modern warfare. It is vital not only to the successful operation of planes, ships, tanks and other motorized vehicles in the war zones but also to the smooth functioning of the machines on the home front which turn out these mechanical marvels.

For instance, consider just one of the many highly specialized lubricants. Extreme pressure lubricants were developed for hypoid gears. Without this type of lubricant, designers of machines would not be able to utilize the advantages of greater strength and quieter operations which make hypoid gears so desirable.

The development of extreme pressure and other special lubricants has been an important factor in the steady improvement of machines. Much remains to be learned about what happens on the contacting surfaces of two materials sliding over each other but—thanks to research work being conducted in a hundred or more laboratories—we are making rapid progress in unveiling the mysteries of friction. —p. 102

E. L. Shaner

EDITOR-IN-CHIEF



Inland Hi-Steel buckets, truck bodies, screens, chutes, etc., are giving many times the service obtained from other steels.

COSTS TOPPLE AT A TIPPLE

Screens, Chutes and conveyors of Inland Hi-Steel Have Outlasted Mild Steel 12 times . . . and Are Still Going Strong!

The facts behind this story of lower costs began six years ago when Inland Hi-Steel replaced mild steel for buckets, truck bodies, chutes, screens, and conveyors in the tippie at Maumee Collieries.

The mine records indicate that mild steel failed every 5 to 6 months due to the abrasive action of the coal. The same records show that Inland Hi-Steel, with its high resistance to abrasion in this type of service, has been in use for over 6 years without a single replacement . . . and that it is still going strong.

After the first year, when the higher cost of Inland Hi-Steel was paid through savings, every ton of coal that traveled down the chutes, through the screens and over the conveyors was handled at less cost.

Inland Hi-Steel is not only abrasion and corrosion resistant, but its high-strength means weight saving as well. It is doing many important war and peace jobs where these favorable characteristics mean savings in time, labor and materials. Write for the Inland Hi-Steel Bulletin.

Inland Steel Company, 38 So. Dearborn Street, Chicago 3, Illinois. District Sales Offices: Cincinnati, Detroit, Kansas City, Milwaukee, New York, St. Louis, St. Paul.

INLAND STEEL



Call Ryerson When You Need Steel

Every type of steel from stainless to structurals is immediately available from Ryerson stock. Just reach for the phone and call any one of the eleven conveniently-located Ryerson service plants. Our operators will connect you at once with an experienced

service man who will see that you get the steel you need—when you need it.

JOSEPH T. RYERSON & SON, INC.
Steel Service Plants: Chicago, Milwaukee, Detroit, St. Louis, Cincinnati, Cleveland, Pittsburgh, Philadelphia, Buffalo, New York, Boston.

QUICK, DEPENDABLE SHIPMENT

Early Return of Markets to Free Status Seen in Scrap Break

WASHINGTON
THE decline from ceiling prices in steel scrap, and the return of the market to a free status, with prices reflecting the workings of the law of supply and demand, is regarded in Washington as a development forecasting a similar trend in numerous other markets over coming months, at least in the immediate transitional reconversion period.

From now on, the trend to free markets should assert itself gradually, and in advance of an easier supply of the products involved. The break in scrap, for example, came without any comment in total supply of scrap. It came because steel producers anticipated market developments. They believed that the favorable war news heralded an early end to the conflict with Germany and decided it would be wise to reduce the size of their scrap inventories. They particularly had in mind the recent prediction by War Production Board Chairman Donald M. Nelson that the end of the war with Germany would be followed by a reduction of some 35 per cent in war demand for steel—and they are not yet certain whether civilian demand will fill this gap at once. They could not see justification for continuing to pay ceiling prices for scrap when the scrap consumption was likely to be reduced in the near future and prices would sag. As far as the steel industry was concerned, this was simply a return to the normal policy of anticipating the market.

What the steel companies are doing about scrap is all the more understandable in view of indications that finished

Departure from ceiling prices in scrap, reflecting supply and demand law in operation, viewed as forecasting similar trend in other commodities over coming months

steel products may be headed to free market status within a matter of months. There are signs that even if the war with Germany continues the war demand for steel soon will tend downward. In fact, it is expected in some quarters that competition again will figure to a considerable extent in steel products for delivery as soon as first quarter. Steel products even now are selling at \$3 to \$5 a ton less in many instances than it costs to make them. Hence it is only natural that the steel companies begin to give thought to the prices they pay for scrap to be rolled into products to be sold competitively.

"Floor" Prices May Be Set

To prevent this competitive situation from bringing about ruinous prices in many products which have been sold at ceiling prices under conditions of scarcity, there has been considerable thought about setting "floor" prices to maintain stability after these products again become plentiful. The price control law would have to be revised for this purpose since it now permits only the setting of

"ceiling" prices. The government officials concerned have not given any indication as yet that they would urge such a revision on the Hill.

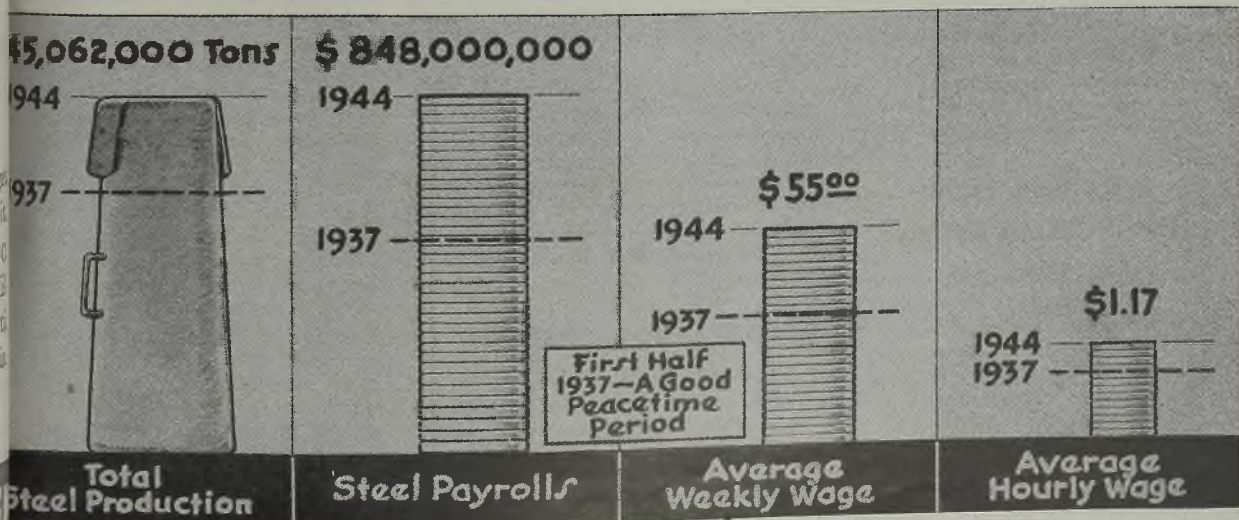
Chester Bowles, OPA administrator, has gone so far as to declare that his organization will be particularly concerned "not to set prices which would force deflation of the general wage level." But in so expressing himself Mr. Bowles has had ceiling prices in mind. In fact, he has said again and again that in his opinion all price controls should be removed just as soon after the war as possible. "Price control is a wartime measure and has no place in an economy of peace," he declared in San Francisco on Aug. 25.

In thus expressing his own ideas, Mr. Bowles expresses the prevailing sentiment in Congress, which is that all wartime controls should be ended as soon as it is possible to do so without hurting the national economy.

In other words, there is little chance at this time that the present law will be revised to include a new control by setting minimum prices. It probably would require development of a very bad price-cutting situation after the end of the period of scarcity before such a control would have any chance of adoption. That means, in brief, that whereas manufacturers will continue to have the benefit of ceiling prices for a considerable period ahead, they are not likely to have any government protection against low-priced competition.

Just what will be the attitude of manufacturers when they again are

FIRST HALF 1944 SETS NEW RECORDS IN STEEL OUTPUT, PAYROLLS, WAGES



Art by American Iron and Steel Institute

forced to sell competitively remains to be seen. It is of interest to note, however, that scrap dealers have not asked for any "floor" prices. It is understood scrap dealers favor a return to the law of supply and demand. What is worrying them now is the withdrawal of the steel producers from the market. They want to see the market settle to a level at which the steel producers will do business. They do not like to go to the expense of collecting scrap, and particularly sorting it into the different grades and preparing it for the market, just to build up big stocks in their yards. Some scrap dealers have pointed out that if the steel companies stay out of the market they will have no recourse but to lay off men, of whom there are barely sufficient in these days of short manpower to take care of normal demands.

There is another angle of the scrap development which illustrates the lack of authority in the government agencies to issue instructions without specific legislation. For example, the government is powerless to order the steel companies to keep up their scrap inventories; it is powerless to order them to invest their capital in scrap. The most that WPB Steel Director Norman W. Foy could do (STEEL, Sept. 4, p. 49) was "urge each producer to consider the scrap inventory problem, both in the light of current requirements and the fact that any future shortages through inventory reductions possibly cannot be made up by allocations." Mr. Foy had in mind the danger of drying up the normal scrap flow through a further deterioration in the labor situation in the scrap industry. "Producers are not asked to purchase scrap which is not needed," he warned, "but it becomes desirable to point out that if mill inventories are reduced to the point where producers are unable to cope with changes which might occur as the result of the fluidity of war, the Steel Division may not be in a position to guarantee a sufficient scrap supply through allocations."

In view of the fact that the War Production Board cannot do more than issue warnings in cases like this, the responsibility of the parties involved becomes that much greater. In other words, the steel companies might be called upon to explain at some time in the future any failure on their part to procure sufficient scrap to meet all demands for steel.

Jones Asks War Plant Operators: Want To Buy?

Inquiries were sent to 376 companies operating 586 war plants owned by Defense Plant Corp. last week by Jesse Jones, Secretary of Commerce, asking whether the companies intended to buy the plants when war production ends. The plants cost \$4.72 billion and are completely owned by the government—land, buildings, equipment and machinery—as distinguished from plants where the government has added "scrambled" facilities to owner's plants.

Steel Prices Not Likely To Be Affected by Decline in Scrap

Prospective increase in wages seen increasing pressure for higher price levels even though European war ends soon and demand temporarily slackens. Some products selling below cost at ceiling prices

PITTSBURGH—With price easiness in the iron and steel scrap market reflecting reluctance of the steel mills to continue heavy raw material purchases in the face of possible early ending of the European war, speculation is being encountered as to whether easiness in scrap prices will be duplicated in the steel market when war steel orders fall off.

So much depends upon actual developments it is difficult, if not impossible, to diagnose accurately the situation. Various factors now present, however, point to resistance by the steel producers to pressure for lower prices. Probably the controlling factor in the steel markets currently is the fact that few, if any, producers are receiving adequate profit returns on sales. Some interests are operating in the red on many products.

All producers have been desirous of obtaining upward adjustments in OPA ceiling prices in recent months. And anticipating early granting of wage increases in the industry by the War Labor Board it is only natural to assume that the pressure for higher ceiling prices will be intensified.

For several weeks past there has been a decline under way in consumer specifications for finished steel. Buyers are cutting down their inventories as much as possible. This, however, began before the weakness in scrap became widespread and in fact probably was one of the strongest influences in the scrap price decline.

For the most part steel producers are banking on sufficient tonnage overlap following the termination of the German war to keep mills relatively well occupied.

Indicative of the steel trade's plans for promptly filling civilian goods demand as soon as possible, last week several mills with room on rolling schedules were trying to interest consumers in enameling sheets for first quarter delivery, actual closing of orders to be subject to War Production Board approval.

RECONVERSION SPURRED

PHILADELPHIA — War Production Board's newly announced program for materially reducing production controls on industry once Germany is defeated is hailed generally in the steel trade as an important step in the reconversion which may come soon. It has served to accelerate peacetime planning, especially by

providing a more definite pattern of what lies ahead, and to cause many interests to revise their estimates as to the time required for getting back to civilian production.

It is noted, however, that there has been no change in board's estimate as to the extent of the reduction in military requirements. It is still 40 per cent within three months after Germany's collapse. Thus, it appears, there will be no more steel for civilian needs than recently anticipated. Nevertheless, the diversion of this surplus steel into normal channels should be considerably facilitated. The War Production Board in its new program has first made sure there will be ample supplies for carrying on the war with Japan, but beyond that has given industry practically free rein and there is little question but what industry will do the most effective possible job.

INVENTORIES WATCHED

CLEVELAND — Buying policy of steel producers and metalworking companies is increasingly directed toward inventory retrenchment to a workable minimum level as a hedge against possible early termination of the European conflict.

Despite this more conservative buying attitude, steel interests report little headway being made against order backlogs. Cancellation of tonnages on hand books due to war program revisions and cutbacks have been relatively light recent weeks, while volume of new orders (practically all for first quarter delivery) booked during August was 10 per cent above the preceding month total. With few exceptions deliveries on most steel items are extended in next year, in some instances such as galvanized sheets and large rounds in June.

Most metalworking concerns have reduced their inventories to a workable minimum, but what may be considered minimum now could easily represent six months or more inventory following sharp curtailment of operations at the close of the war. However, many shops and cold drawers as well as other steel consumers are using the same equipment in war work as in civilian goods production, so their transition period should be relatively brief.

With the prospect of sharply curtailed operations for a period of 90 days or more following Germany's collapse steel producers have followed a strict

Be
rap
using
war end
ducts sell
one deli
and to
their ext
however,
in bond
the reduc
It is all
couple of
it appears
the distri
gated. Some
is supply
it is con
for produc
as first
supplies
ected to
Japan, if
this year.
Steel producers feel that should the
German war end soon there will be a
sharp drop in steel production to
round 60 per cent for a period of
about 90 days.

With steel producers already operating at a loss on many steel items, combined with prospect of additional increase in wage rates, there is little possibility of a weakening in the steel price structure during the transition period.

Bulk of order cancellations which follow the end of the war with Germany are expected to occur in the army program. The Navy will probably continue along present schedules until some future phase of the Pacific war, while a moderate tapering in the Maritime Commission program is expected to occur through the remainder of this year.

Steel producers feel that should the German war end soon there will be a sharp drop in steel production to round 60 per cent for a period of about 90 days.

EXPECT HIGHER COSTS

CHICAGO—Although volume of new steel orders gives no indication that end of the European war may be near, the fact that buying of scrap by mills has virtually ceased is a convincing barometer that V-Day may be close at hand. Steel makers decline to go out on a limb with predictions; likewise, they are reticent to comment on implications of the scrap situation as regards steel production present or future.

Nevertheless, certain conclusions can be drawn safely. Mills in this district have about 60-days' scrap supply on the ground and commitments on shipments to be received in the next month probably aggregate another 30 days' requirements. This 90-day inventory is based on near full-capacity operations, an amount which could easily stretch to months supply if operations drop to a 60 per cent level shortly after hostilities in Europe end.

What the cost of producing finished steel is going to be in the period after European war ends nobody knows. It is going to depend upon cost of raw materials, wages, and rate of operations. If war orders are canceled, mill books will fill with civilian orders of miscellaneous character and individually smaller tonnages. Therefore, rolling costs will be higher, because of more frequent changes, special treatments, etc. Furthermore, reports have it that steelmakers may win a substantial increase

in the pending wage case before WLB.

In the face of all this, steelmakers feel confident that OPA will recognize the necessity for higher prices for steel. But unfortunately, the case may have to be proved by submission of cost figures and there is fear that several months may elapse while these figures are studied and before relief will be granted.

NO WEAKNESS SEEN

BUFFALO—With costs so far out of line with prevailing OPA ceiling prices on steel products, local steel industry officials state they do not see how the present scrap market weakness can spread to finished steel products.

Mills report no surpluses, except for minor accumulations resulting from consumers experiencing terminated contracts.

SEE HEAVY DEMAND

CINCINNATI — Lower-priced scrap does not imply lower quotations for steel. That is the view of district steelmakers commenting on the decline in scrap in recent weeks.

Sheet mill interests contend that other expenses, with emphasis on wage boosts, should be a basis for higher sheet prices, say \$7 a ton.

Reliable sources predict a close to mill capacity demand for sheets in the next three years.

Present, Past and Pending

■ THREE CIVILIAN GOODS APPLICATIONS APPROVED

WASHINGTON—WPB field offices received 457 applications for the manufacture of civilian goods under the recent "spot authorization" order through the end of August. Three of these have been approved. They permit the manufacture of steel septic tanks, metal signs and class B stokers.

■ TO LIFT LABOR CONTROLS WHEN GERMANY FALLS

WASHINGTON—Prompt relaxation of strict controls over the labor force when Germany falls was promised last week by Manpower Commission Chairman McNutt.

■ ARMY PREDICTS 37% CUT IN ORDNANCE CONTRACTS

NEW YORK—Army officials have drawn up a tentative plan calling for an overall 37 per cent cutback in outstanding procurement orders when Germany falls.

■ STEEL PLATE OUTPUT CONTINUES DOWNWARD TREND

WASHINGTON—Steel plate shipments during August were below the comparable month a year ago for the first time this year, and were the lowest for any month since August, 1943. WPB reports plate output last month totaled 1,066,479 net tons, compared with 1,093,000 in July and 1,060,936 in August last year.

■ STEEL EMPLOYMENT, PAYROLLS UP IN JULY

NEW YORK—Steel employment increased during July with an average of 571,400 workers, compared to 569,800 in June and the July payroll climbed to \$141,794,000, compared to \$140,484,000 in June, according to the American Iron and Steel Institute. Employees received an average of 120.0 cents per hour in July whereas in June they averaged 117.7 cents.

■ AIRCRAFT PRODUCTION 3.5% BEHIND SCHEDULE

WASHINGTON—Aircraft production during August was 3.5 per cent below schedule at 7939 planes, and compared with July output of 8000, the WPB reports.

■ BANK BLAST FURNACE BECAUSE OF COAL SHORTAGE

CLEVELAND—Republic Steel Corp. has banked its new 1200 ton capacity DPC blast furnace at the Corrigan McKinney plant because of the lack of coking coal resulting from strikes in the bituminous coal fields of Pennsylvania. About 75 coke ovens were slowed down at the same works.

■ CONSTRUCTION INSTITUTE TO MEET OCT. 31

NEW YORK—American Institute of Steel Construction will hold its twenty-second annual meeting at the Claridge hotel, Atlantic City, Oct. 31 to Nov. 2, inclusive.

■ WPB'S MUNITIONS INDEX OFF SLIGHTLY IN JULY

WASHINGTON—Preliminary estimate of WPB's munitions output index figure for July is placed at 113. This compares with 114 recorded in June and 101 in July last year.

■ EXPANDING STEEL USE SEEN FOR POSTWAR PERIOD

PITTSBURGH—Industry will be operating at near the present wartime boom pace within six months after fighting stops, H. G. Batcheller, president, Allegheny Ludlum Steel Corp., said in a message to employees in the armed forces. He added that demand for steel, particularly alloy and specialty steels, will be "greater than ever."

Army Takes Over Struck Cleveland Bearing Plants

Seven thousand idle for six days in dispute over dismissal of one worker for destroying locker room equipment. Production of parts for superfortresses, heavy trucks, tanks interrupted

WHILE military leaders pleaded for more bombers, heavy trucks, tanks and other materiel to deliver the knockout blows against Germany and Japan, production of war goods during Labor Day week was seriously handicapped by work stoppages—many for trivial reasons.

While labor union leaders and government officials were making their customary Labor Day speeches praising organized labor for its contribution to the war effort, the war effort was being slowed by a strike in a vital bearings plant at Cleveland supplying sleeve bearings essential to the B-29 Superfortress and to trucks and other vehicles, by organizational strikes in soft coal mines, and by a series of miscellaneous stoppages.

One of the past week's most serious stoppages was that at the plant of Cleveland Graphite Bronze Co., Cleveland, where 7000 were made idle for six days because the union, the Mechanics Educational Society of America-independent, objected to the discharge of one worker for allegedly destroying locker room equipment. The plants were seized by the Army under direction by the President to finally end the walkout.

Cleveland Graphite Bronze produces the sleeve bearings for the Superfortress. Fifty per cent of the bearings used for heavy trucks are made by this company as well as a large share of those used in tank motors, half-tracs, jeeps and other combat materiel.

Lieut. Col. George D. Lynn, Cleveland ordnance district, who was placed in charge of the plants for the Army, said: "The stoppage of work in the two plants already has had the effect of causing a half dozen other top-priority facilities to halt production of heavy trucks, tanks, planes and navy equipment for the lack of parts which are produced in the struck plants."

"Four other important producers have only enough parts to keep going for a few days at the most."

Ben F. Hopkins, president of the com-

pany, which has had a remarkably good record in industrial relations, blamed the stoppage on "incendiary, self-seeking labor leaders."

The strike started Aug. 31. On Sept. 1, after unsuccessful efforts to adjust the dispute over the dismissal of the worker, who was reported to have broken the lock on his locker, the case was referred by the Secretary of Labor to the regional War Labor Board. The board issued an order directing the immediate termination of the strike and observance of the collective bargaining agreement.

The union refused to accept the WLB order, and threatened to call sympathy strikes at 64 other plants in Cleveland, Toledo, O., and Detroit, where the union has contracts. This threat was temporarily dispelled when the Army took over. Union leaders said, however, the strike would be called when the Cleveland Graphite plant was returned to its owners, unless the dismissed worker was reinstated.

Outside Unions Protest Thompson Products Vote

United Automobile Workers-CIO and the International Association of Machinists-AFL, both of which were defeated in National Labor Relations Board elections at the plants of Thompson Products Inc. and Thompson Aircraft Products Co., Cleveland, have filed protests against the conduct of the election with the re-

gional National Labor Relations Board.

The protests arose largely from the fact that Frederick C. Crawford, president of both Thompson companies, addressed employees on labor relations before the elections, and from charges by the national unions that company officials otherwise tried to influence the voting.

Additional Soft Coal Mines Seized by U. S.

Additional soft coal mines were seized by the federal government last week after they were struck in organizational disputes and the production of fuel for war purposes was threatened.

The dispute, which has been spreading through mines in Pennsylvania, West Virginia, Virginia and Kentucky, involves the demand of the United Clerical, Technical and Supervisory Union, a branch of the United Mine Workers, for recognition as a collective bargaining agent.

The seizure was ordered by President Roosevelt on the recommendation of George W. Taylor, acting chairman of the War Labor Board, who called attention to the strikes, and likewise to the peril to coal production from threatened strikes by supervisory employees in a large number of other collieries.

Mr. Taylor's letter to the President emphasized the gravity of the strikes at the moment when our armies are pressing toward victory in Europe. He said



Police untangle a block of strikers' cars at Cleveland Graphite Bronze Co. plant, where 7000 were idle for six days as result of the discharge of one employe for breaking a 75-cent lock.

Photo, courtesy, Cleveland Plain Dealer

Foundry Wages Adequate if Men Are Available

Manpower shortage can't be solved by industry-wide rate increase, Chicago WLB wage committee informed

CHICAGO

FOUNDRY wages in the sixth WLB region are high enough to attract workers if any are available, representatives from Illinois, Indiana, Wisconsin and Minnesota foundries told the wage rate committee of the regional WLB at a conference here Sept. 5. On Aug. 22, the committee had heard union arguments that a lag in foundry wages behind other metal industries was the cause of critical manpower shortage in the industry.

M. A. Fladoes, president, Sivy Steel Casting Co., Milwaukee, and chairman of the Steel Casting Industry Committee, asserted "an industry-wide raise would not solve the manpower shortage."

W. J. MacNeill, president, Federal Malleable Co., West Allis, Wis., testified that no problem has been or is being created by the established wage rates for foundry workers.

Charges Erroneous Concepts

He said that if the wage rate committee should consider the information developed at the hearing warranted a review of existing rates "a thorough analysis of factual data regarding such rates in the sixth region be undertaken."

The union's contention that foundry work is heavy, disagreeable, and hazardous, and offers but little chance for promotion was challenged by Mr. MacNeill. "This thoughtless indictment of one of the country's oldest basic industries has no foundation in fact and has needlessly created erroneous concepts," Mr. MacNeill said.

William J. Grede, president, Grede Foundries Inc., Milwaukee, referred to a document, allegedly prepared by WPB's labor division and offered as an exhibit on Aug. 22 by George Cratz, attorney for the International Molders' and Foundry Workers' Union of North America. This document consisted of a survey purporting to show that working conditions in foundries were unfavorable, and wage rates generally unattractive. Mr. Grede denied that this document has any official status and maintained it is not admissible as evidence.

R. B. Young, Continental Foundry & Machine Co., East Chicago, Ind., pointed out that voluntary separations from that company because of dissatisfaction with wage rates at no time exceeded 8 per cent of the total number of separations.



that nearly 70 mines are threatened with strikes. These employ 1500 supervisory employees, 30,000 production employees and produce 150,000 tons of coal daily, a substantial tonnage of which is converted into coke for steel mills.

"At the present time," he said, "several of the by-product coke plants have on hand less than a ten-day supply of bituminous coal. If the strikes are not terminated immediately, and if the threatened strikes materialize, the steel and other war industries will be adversely affected."

The seized mines will be operated under the direction of Solid Fuels Administrator Harold Ickes.

Sporadic Stoppages Disrupt Steel Output

CHICAGO

A few sporadic, unauthorized strikes in this district continue to interfere with production of war goods. The two most recent ones affected output of rolled steel and fabrication of landing mats and portable bridges for the armed services.

Twelve men employed as gas producers at the 42-inch and 80-inch hot strip mills of Carnegie-Illinois Steel Corp.'s sheet and tin mills, Gary, Ind., went off the job for a 24-hour period ended Sept. 4, causing a work stoppage for over 500 other employees. Strike resulted in last rolling of 2300 tons of steel intended for ship plates and coils. The strikers, members of United Steelworkers of America-CIO, sought an increase in their incentive pay rate. This was the 55th strike in the corporation's Chicago district plants since Jan. 1.

Some 500 employees of Ceco Steel

Products Corp. resumed production of landing mats and portable bridges Sept. 5 after an absence from their posts of nearly a week. The walkout took place after the regional WLB refused to reconsider a decision which denied a general wage increase. The workers, members of the Bridge and Structural Iron Workers International Association-AFL, returned after an international representative assured them an appeal would be taken to the national WLB.

TCI Blast Furnaces, Open Hearths Closed

Three blast furnaces and 11 open hearths at the Tennessee Coal, Iron & Railroad Co.'s Fairfield, Ala., plant were idle last week as result of a strike by 1000 workers resulting from failure of the War Labor Board to adjust a dispute over incentive pay. Two blooming mills also were closed, eliminating production of all semifinished steel. The company's sheet mill was partially idle as result of a dispute over time clock arrangements, and about 300 workers were given indefinite suspensions.

Army Takes Over Tool Plants in Texas

Two plants of the Hughes Tool Co., Houston, Tex., were ordered seized by the Army last week in a dispute over granting of maintenance of membership to the union as ordered by the War Labor Board. The order applied to the main Hughes plant and to a subsidiary aircraft strut plant.

Southern California Manufacturers Want Los Angeles Basing Point

Believe lower steel prices on West Coast necessary if industries there are to compete with other manufacturers in world markets. Murray committee told costs are restricting industrial development in the district

LOS ANGELES
ALTHOUGH little has been said as yet about it publicly, the problem of lower steel prices for the Pacific Coast is being studied intently by industrial leaders and business organizations here. It is becoming apparent to industrial leaders that the future welfare of the West and the immediate problems of California's reconversion are bound up with the price of this basic commodity.

Alden G. Roach, president, Consolidated Steel Corp. Ltd., in a recent discussion of steel prices and their bearing upon the future industrialization of the West, called for lower quotations. He believes lower prices will enable the West to compete on equal terms with other sections of the United States in world markets. In a recent statement to STEEL, Mr. Roach said: "The fact that the Coast possesses the Geneva and Fontana steel plants will bring about a more equitable price for steel in this area."

This statement comes from the head of a corporation controlling six plants, two in Texas and four in California.

Consolidated now is engaged in shipbuilding and ordnance construction for the government and normally is one of the West's largest producers of structural steel and fabricator of oil industry equipment.

The hearings held recently in California by the Senate Small Business Committee, headed by Sen. James E. Murray (Dem., Mont.), provided an opportunity for the Los Angeles Chamber of Commerce to present this problem of steel pricing before an interested governmental body.

In a statement filed with the Committee, James F. Bone, manager of the Industrial Department of the chamber, called attention to one of the stated objectives of the committee: "The development of new industrial frontiers to open greater opportunities for independent enterprise through the full use of the natural resources of all sections of the nation"—and the removal of restrictions that tend to arrest industrial development in the West. The first of these restrictions brought to the attention of the committee is the pricing system of the steel industry.

Mr. Bone declared in his statement to the committee "that until such time as a Los Angeles basing point price for finished steel is established, we will not know whether our local steel plants using local ore, limestone and coal are

economically justified on the basis of their ability to meet competition on a pure cost and efficiency basis. Until we know that, we cannot build for new markets and create new industries dependent on steel with any degree of confidence or security."

In the opinion of the chamber, a system under which steel products rolled in Los Angeles county are sold to Los Angeles customers at a price composed of the price for that product in the East, plus transportation charges by water to Los Angeles, is a definite restriction upon industrial development in the West.

The immediate problem of reconversion, becoming daily more pressing, is complicated by this steel pricing factor, it is claimed. In the Los Angeles area the large majority of industrial plants are too small to compete against steel prices not comparable to those in other parts of the country. There are probably 3500 factories in the Los An-



ALDEN G. ROACH

geles area employing less than 25 workers each.

In a recent analysis by the Chamber of Commerce, it was found that of 1610 Los Angeles county factories, 785 employed 25-50 workers; 389 employed 50-100; 273 employed 101-250; 894 employed 251-500; 69 employed 501 or more.

All these factories make products that must be sold in competitive markets. Their ability to expand depends upon the availability of raw materials and the reduction in cost to them of these materials, if they are to meet competitive prices.

Eastern Companies Planning To Establish West Coast Branches

LOS ANGELES

MORE than 100 inquiries from eastern manufacturers looking to the establishment of branch plants here at the end of the war have been received by the Chamber of Commerce.

In order to cover the field of these inquiries, the replies are now on a production basis; current market surveys and analyses are made periodically and supplied to all requesting information.

Near Raw Materials

From 1927 to 1943 inclusive, 117 national industrial firms established branch plants in Los Angeles and vicinity. Eighteen such branches began operations here in 1937, the largest number for any one year in this period. Owing to wartime restrictions, only two branch industrial firms with national distribution were opened in this area in 1943.

More than half of wartime plant investment here has been in expansion of existing industries and in creation of new industries—and not alone in the shipbuilding and aircraft industries.

Recently released figures of the U.S. Bureau of the Census emphasize that 50

per cent of the population gain in the 11 western states has been in the southern counties of California, giving these counties nearly one third of the population of the entire West. This population factor favors branch plants located here with low distribution costs on portion of products for sale in the West.

Proximity of sources of raw material to Los Angeles are expected to play an important part in decisions of national concerns contemplating branch plants here. The West possesses large and relatively untapped resources of coal and iron. Within less than 200 miles of this city, high grade iron ore deposits are so large, that, of one of them, according to the U. S. Geological Survey, "enough high grade ore is in sight to supply a modern blast furnace of a daily capacity of 500 tons of pig iron for more than 200 years."

Prominent among the new industries engaged in largely by branch plants of eastern concerns are aluminum reduction and extrusion, synthetic rubber, steel and copper tubing, powdered metals, plastics and optical glass.

War Supply Contracts Placed in California Exceed \$15 Billion

Manpower shortage acute as many wartime workers return to East or Middle West. Ship deliveries dropped sharply in July, due to changeover to heavier and more complex types. Liberty ship program completed

SAN FRANCISCO

CUMULATIVE war supply contracts in California showed a net addition of 3.3 per cent in June, according to War Production Board reports, reversing the decline indicated in May. At midyear the total of all major awards, excluding food and contracts under \$50,000, since June, 1940, was \$15,786,593,000 for the state.

Largest percentage and dollar volume increases in the principal industrial areas in June were for aircraft in San Diego and ordnance in San Francisco. The only reduction in contracts represented minor adjustments in the Los Angeles area's ship program and in the aircraft industry in San Francisco.

Total cumulative placements in the San Francisco area increased 5.3 per cent in June, bringing the aggregate for the four years to \$3,191,397,000. This total includes \$2,622,135,000 for ships, up 4.8 per cent for the month; \$121,169,000 for ordnance, up 14.6 per cent; aircraft, \$9,619,000, off 21.5 per cent; and other supplies, \$438,474,000, up 6.5 per cent.

Los Angeles area contracts totaled \$9,425,734,000, an increase of 0.4 per cent, and San Diego's volume was \$2,768,124,000, a gain of 11.1 per cent.

Meanwhile, a special survey by the San Francisco Federal Reserve Bank indicates production of war supplies in the Far West ran slightly behind schedule in June and July, although output of older established basic industries has shown little change in recent months.

In the aircraft industry, plant conversion and retooling necessary to produce heavier models have, with shortages of workers in certain specialized categories, contributed to some reduction in output in recent months. On a daily average basis, the weight of planes completed was lower in July than in any month since the fall of 1943.

Reflecting several factors, including manpower shortages and operating shifts to heavier and more complex types, ship deliveries to the Maritime Commission by Coast yards dropped sharply in July to the lowest level since mid-1942. The July total of 34 deliveries included the last three Liberty ships constructed by Pacific Coast builders. Construction now is being concentrated on heavier merchant vessels and special types for the armed forces.

Discussing reconversion to peacetime operations, the bank says:

"National attention is being directed

to the problems which may be expected to arise when war developments justify significant reductions in production of military supplies and an increased flow of goods to consumers. One of these problems is the effect of war contract terminations on industrial output and employment. Essential differences in types of facilities and output mean, of course, that the operations of all plants producing supplies used by the armed forces will not be affected in the same way by war contract terminations.

Plan To Reconvert Many Plants

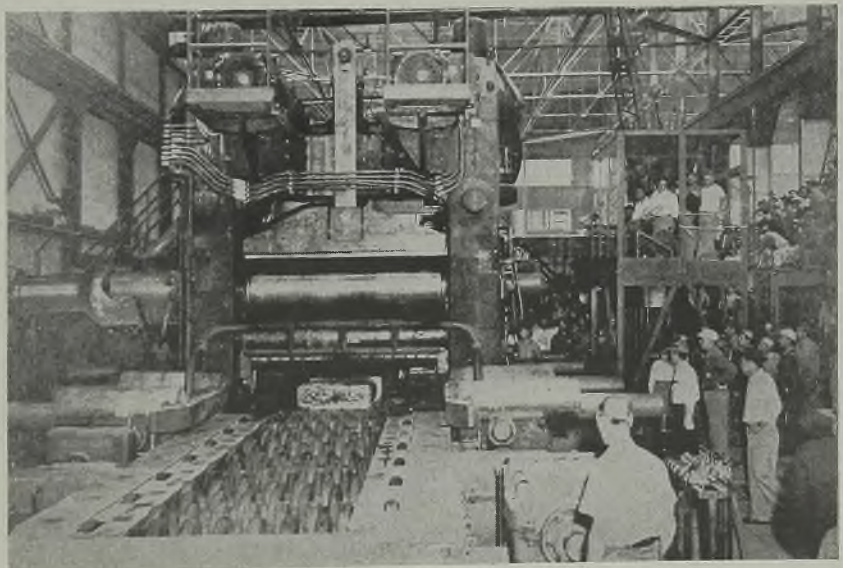
"Plants converted to the production of war supplies, for example, will likely be reconverted to produce civilian goods. Many special-purpose war plants or plants representing excess capacity relative to any conceivable level of civilian demand for their products will be shut down or dismantled unless they can be converted to entirely new products, which in many cases seems unlikely. In still other plants, the only fundamental change in operations will be a rechanneling of output from military to civilian consumers."

Incidence of plants in these three classifications varies greatly from region to region, but in the Far West newly constructed, and, in many cases, special purpose war plants predominate. Aircraft and ships which account for 90 per

cent of all war supply contracts on the Pacific Coast are fabricated largely in plants which did not exist before the war. In contrast, airplanes and ships account for only 44 per cent of war contracts awarded elsewhere in the U. S. where plant conversion was more prevalent. In the western area, subcontracting of parts has been in converted plants to a considerable degree, but in terms of the number of workers it is clear that major cutbacks will most seriously affect the airframe plants and shipyards themselves.

So far as manpower permits, the bank says, it is essential that preparations be made for the ultimate replacement of war production by the production of civilian goods. There are two primary, related objectives of such preparations: To make available as soon as possible sorely needed civilian articles long removed from the market, and to maintain employment levels when substantial war cutbacks occur. Industries having post-war uses should be prepared to take up as much as possible the slack in employment which must inevitably follow close on the heels of such cutbacks.

However, in view of current manpower shortages and the necessity of maintaining military production on schedule, any material increase in civilian goods output is unlikely until after Germany is defeated. This is especially true of the Far West where only comparatively few industries were converted from peacetime activities and where there is, as yet, no slackening in demand for aircraft, ships and ship repairs. Nevertheless, to the extent that less essential civilian production becomes possible, it should be prepared for, particularly as the opportunities for post-war employment in such West Coast war plants as aircraft factories and shipyards hardly loom large in comparison with the numbers of workers who may be expected to lose their war jobs.



Slabs are rolled into plates for ship construction at the Kaiser steel plant at Fontana, Calif.

China Planning 5,000,000-Ton Steel Industry

Rehabilitation of railroads and construction of new power plants included in country's industrialization program

NEW YORK

CHINA is planning development of a steel industry with 5,000,000 tons annual capacity within five years after the war is over in the Far East, according to reliable information here. Indications are she will have to start from scratch, insofar as modern equipment is concerned.

The country has sufficient iron ore for this program, taking into account the Malaya and Manchukuo deposits, which will be available after the war. She has coal in great abundance. Limestone should be no problem, and as for the alloying elements, China at least has substantial deposits of tungsten (far in excess of her own needs) and shouldn't have difficulty with respect to the others. What she doesn't have in sufficient amount herself, she shouldn't have to go too far to get. Chrome, for example, can be obtained from the Philippines.

No equipment for this program has yet been placed. The war is still going full blast in countries which could supply this equipment, and, moreover, there is no definite assurance as to when the war in the Pacific is going to end, and no knowledge as to precisely what the needs are going to be.

Even the full development of this steel producing program will leave China far short of meeting her own steel requirements, and especially in view of her plans for general industrialization. Immediately after peace is restored China is going to have to turn to other countries, particularly the United States, for heavy quantities of rails and structurals. In fact, her first aim is the rehabilitation of the railroads, which will mean not only rails, but rolling stock. China at present has about 12,000 miles of track, relatively small transportation facilities considering the size of the country and her huge population. These will need considerable repair and replacement. Within five years after the war, China expects to build an additional 3500 miles of railroad facilities.

Desirous of industrializing as rapidly as possible, China contemplates also a large power plant program. The Chinese government, in fact, wants to create some 7,000,000 horsepower of electric generating capacity within ten years after the war. Some authorities in the United States say this would cost \$3,000,000,000 directly and estimate that it would



Rolling mill at the Showa Steel Works at Anshan, near Mukden in Manchukuo, now is under control of the Japanese, may revert to the Chinese when the war ends. NEA photo

require an investment of \$28,000,000,000 to absorb this power, at least on the basis of American costs. Some point out here that this is a highly ambitious program to say the least and that to develop on this scale, China would have to develop in all directions. She would have to have transportation, river utilization, highways, motor trucks, housing, schools, hospitals, sanitation and many other things.

Very Ambitious Program

Many Chinese themselves realize that this is an ambitious program and especially in view of the difficulty she will have financing the materials and equipment she will have to import. China will be able to export huge quantities of tung oil. In fact, this is regarded as by far her major item of export. China also is a large producer of silk, but in recent years there has been the development in this country of nylon and rayon, which will undoubtedly reduce needs of silk in various world markets, particularly the United States.

China has always supplied a substantial proportion of the world's requirements of tungsten and antimony and a certain amount of tin. This will help meet her payments on imported material, but will still leave her with the huge problem of financing many things she needs from the outside world.

Incidentally, China notes with interest the rapid development of electrolytic tin plate capacity in this country, which means considerably less tin in relation to the amount of tin plate produced than ever before.

China has much to offer in the way of tea and spices, but so far as helping to balance her trade with this country,

this will be only a relatively small factor.

Consequently, much will depend upon what terms of financing China will be able to obtain. She is going to make a desperate effort, first, to try to finance rails and rolling stock. That is her primary need; then, will come electric power. And as fast as she can she also wishes to build up the nucleus for a modest steel industry of her own, getting up, as previously noted, to around at least 5,000,000 tons a year by the end of the first five year after peace is declared.

Generalissimo Chiang Kai-Shek in his book, *China's Destiny*, has outlined a program for his country's industrialization over a ten-year period. This plan calls for increasing coal output to 150,000,000 tons annually, producing 25,000 tons of copper, 11,500 tons of aluminum, and the purchase of 150,000 machine tools. He contemplates the installation of 3000 radio stations and 18,000,000 radio receivers.

Nelson May Be Studying China's Industrialization

Donald M. Nelson, War Production Board chairman now on a secret mission to China, is believed by some observers to be laying the groundwork for aiding that country's industrialization after the war as a means of invading Japan's markets and providing an outlet for American-built machinery and equipment.

Mr. Nelson has stated several times that the United States should build up a backlog of orders from other countries as a means of lessening the shock of cessation of munitions manufacture when hostilities end.

Shipbuilders Take One-Fifth of All Steel Shipped in First Half

Merchant and naval ship construction required 19.4 per cent of total output in period, continuing as nation's largest wartime consumer. Larger tonnage moved to railroads than in 1943. Distributors get more than last year

PRACTICALLY one-fifth of the nation's total steel shipments were sent to shipbuilders during the first six months of this year, just as during the entire year 1943, according to the American Iron and Steel Institute.

By far the nation's largest wartime consumer of steel, merchant and naval ship construction required 19.4 per cent of the total steel shipped in the first half of this year. During 1943 shipbuilders received 19.2 per cent of all steel shipped; in 1942 they got 15.6 per cent.

Of 30,677,000 tons of steel shipped in the first half of this year, 5,946,000 tons went to shipyards. Last year the yards received 11,509,000 tons out of

59,906,000 tons shipped in the full year, and in 1942, when shipyards first took rank as the No. 1 consumer of steel, they received 9,440,000 tons of steel.

According to the figures covering steel shipments for the first six months of this year, more steel has been going to the railroad industry classification than was the case last year. This industry received 2,887,000 tons, or 9.4 per cent of the total steel shipped during the first half of 1944, compared with 7.6 per cent of the total last year.

Jobbers, dealers and distributors received 3,785,000 tons or 12.3 per cent of the total shipments in the first half of this year. This compares with 11.3

per cent in the entire year 1943.

Other industry groups rated as follows during the first six months of this year: Construction industry, 2,139,000 tons, 7 per cent; pressing, forming and stamping, 1,427,000 tons, 4.7 per cent; container industry, 1,845,000 tons, 6 per cent; agricultural equipment, 529,500 tons, 1.7 per cent; automotive and aircraft, 1,081,000 tons, 3.5 per cent; oil, natural gas and mining, 784,000 tons, 2.6 per cent; machinery and tools, 1,216,000 tons, 4 per cent; miscellaneous, 6,196,000 tons, 20.1 per cent; steel converting and processing, 2,839,000 tons, 9.3 per cent.

SHIPMENTS OF STEEL PRODUCTS BY CONSUMING INDUSTRIES (Net Tons)

First Six Months—1944		Net Total Industries
1. Steel Converting and Processing		
(a) Wire drawers and wire product mfrs.	326,017	
(b) Bolt, nut, and rivet manufacturers	586,343	
(c) Forging manufacturers		
(1) Automotive and Aircraft	325,372	
(2) All other	803,294	
(d) All other steel plants and foundries	798,252	
Total	2,839,278	
2. Jobbers, Dealers and Distributors		
(a) Oil and natural gas industry	240,482	
(b) All other	3,544,621	
Total	3,785,103	
3. Construction Industry		
(a) Public (Municipal, State, National)	31,066	
(b) Highways	73,153	
(c) Railways	39,809	
(d) Automotive and Aircraft	62,170	
(e) Utilities	97,625	
(f) Bldg. trim, accessories and builders' hardware	205,540	
(g) All other	1,629,816	
Total	2,138,679	
4. Shipbuilding Industry	5,945,880	
5. Pressing, Forming and Stamping Industry		
(a) Metal furniture and office equipment	66,938	
(b) Hardware and household equipment	165,830	
(c) Automotive	646,487	
(d) All other	548,227	
Total	1,427,482	
6. Container Industry		
(a) Oil and natural gas industry	210,947	
(b) All other	1,634,482	
Total	1,845,429	
7. Agricultural, Inc. Impl. & Equip. Mfrs.	529,503	
8. Machinery and Tools		
(a) Machinery and tools, not incl. electric equip.	831,809	
(b) Electrical machinery and equipment	384,470	
Total	1,216,279	
9. Automotive and Aircraft Industry	1,081,404	
10. Railroad Industry		
(a) All railroads	2,026,549	
(b) Car and loco. builders and parts mfrs.	860,628	
Total	2,887,177	
11. Oil, Natural Gas and Mining Industry		
(a) Oil and natural gas, incl. pipe lines	672,840	
(b) Mining, quarrying and lumbering	111,551	
Total	784,391	
12. Miscellaneous Industries and Export	6,196,105	
13. Total (Items 1 to 12)	30,676,710	

POSTWAR PREVIEWS

CHINESE STEEL—China is planning development of a steel industry with five million ton annual capacity within five years after the war is over in the Far East; 3500-mile expansion of railroad facilities; and erection of huge electric generating capacity. Country will import heavy quantities of rails, rolling stock and structurals. See page 74.

BRITAIN—British government formulates plan for disposal of surplus war property, other than land, buildings, aircraft and machine tools. Designed to prevent flooding the markets, to assure equal opportunity of all ultimate consumers to use them, and to insure fair prices. See page 79.

RECONVERSION—Practically all controls will be lifted by War Production Board when Germany surrenders. Controlled Materials Plan will remain effective only for quarter in which hostilities cease. See page 80.

AIR TRANSPORTATION—Decline in postwar transportation rates, forecast by director of business research, Curtiss-Wright Corp., Buffalo. Many improvements in service and equipment anticipated. See page 86.

VETERANS—Many plans being advanced by industry for assisting war veterans and utilizing their new skills and training acquired while in service. Experience gained now will be invaluable in solving re-employment problems immediately after the war. See page 94.

STAINLESS STEEL ELECTRODES—War has stimulated application of stainless steel arc welding electrodes, with their adoption for welding armor on tanks and ships an outstanding example. See page 98.

PRESSURE LUBRICANTS—Lubrication of gearing and machine parts involving metal-to-metal contacts under heavy pressure will be more readily understood and more thoroughly controlled as a result of recent research into behavior of sliding surfaces and prevention of welding. See page 102.

BROACH HEAT TREATMENT—Routine commonly regarded as standard practice for hardening broaches is undergoing many progressive changes in step with expanding use of the broach for high-speed cutting of very hard metals. To "stay in the running," tool shops perforce will broaden their range of equipment to meet new demands. See page 106.

Postwar Federal Tax Plan for High Employment Proposed by CED

Repeal of excess profits tax, limitation of levy on corporate earnings to 16 to 20 per cent, and elimination of double taxation on stockholders' income are chief characteristics. Main income would come from personal income taxes

REPEAL of the excess profits tax, limiting the postwar tax rate on corporate earnings from 16 to 20 per cent, and removal of the inequity and the repressive effect of double taxation on stockholders' income constitute the main recommendations with regard to taxes on corporate earnings, contained in a "Post-war Federal Tax Plan for High Employment" issued last week by the Research Committee of the Committee for Economic Development. Chairman of the committee is Ralph E. Flanders, president, Jones & Lamson Machine Co., Springfield, Vt.

Goal of federal tax revision after the war, the committee believes, should be full employment and the creation of millions of new jobs through expansion of private business. It was pointed out that reliable studies agree that from seven to ten million more jobs must be found in private production enterprise than existed in 1940. If our present tax system were carried over into peacetime, it would be extraordinarily repressive upon production and employment, the report said.

Urges Cut in Federal Taxes

The committee urges that federal taxes be substantially cut after the war is over and that main reliance for funds to run the federal government be placed on the personal income tax. Taxes on corporate earnings, under the proposed plan, would in effect be a pay-as-you-go tax on the income of stockholders, similar to the tax now collected from business on wages paid out.

The report challenges the notion that inanimate objects, such as corporations can be taxed, pointing out that all taxes have to come eventually from the pockets of individuals. Taxes on corporate earnings come only partly from the pockets of the stockholders, because indirectly they come also from the pockets of the consumer and from the wage-earner in two important ways: First, in higher prices; second, through a tendency to keep down wages.

But perhaps the most important way in which taxes on corporate earnings hit the pocketbook of the man in the street is by smothering expansion of business and thus reducing the number of job opportunities, the committee suggests.

Reform of the federal tax system is essential if high-level employment is to be attained, the report points out, for two reasons. First, the federal budget after the war will take so great a pro-

portion of the national income that where, when, and how it takes the money out of the stream of business will have greater effect than ever before upon production and employment. Second, because the present tax system is so extraordinarily repressive.

In opinions of outstanding taxation experts, the postwar federal budget will be at least \$16 billion to \$18 billion,



RALPH E. FLANDERS

apart from funds required for social security and debt retirement. The lower figure is about 2½ times (the higher almost 3 times) the highest revenue raised in any single year before the war. On the basis of \$140 billion national income, it is equivalent to \$500 per family of four, compared with \$156 in 1940, if the tax load were spread evenly over the population, and on the same basis the proposed tax structure would yield from \$17.1 to \$19.5 billion.

"High as this may seem," the report says, "this committee is convinced that such a national income is not only attainable, but will be surpassed within the first decade after the war."

The five major conclusions of the committee's study are:

1. The personal income tax should provide at least half of the total federal taxes collected, at rates which would give all taxpayers marked relief from the present heavy burdens.
2. Excise and sales taxes should be lightened as much as possible.
3. Taxation applied directly against business operations should also be lightened as much as possible.

4. Serious inequities of the present tax laws should be removed.

5. Federal taxation should be heavy enough to end the long uninterrupted rise in the national debt, and to reduce that debt when production and employment are high.

The reasons why the committee believes that at least half of total federal revenues should come from personal income taxes are: First, that personal taxes have less repressive effects on production and employment than do sales excise or corporate taxes, provided the rates do not discourage higher-income groups from taking risks, or unduly reduce the purchasing power of the lower income groups. Second, because this is the fairest form of taxation, most closely adjustable to ability to pay. Third, because it is clearly evident where the tax falls. "The truth is that all taxes have to be paid out of the pockets of living persons. The mere circumstance that in many cases the taxpayer may be unaware of the tax does not alter the fact that he is paying it."

Proposes Reduced Income Taxes

The committee feels that it would be a healthy thing for 40,000,000 taxpayers "to be acutely conscious that they were contributing to the federal government. The result should be to make citizens aware of their stake in the nation, and it should tend to more economy and efficiency on the part of the government. It presents in detail suggested schedule of personal income tax rates which with national income of \$140 billion would yield about \$11 billion a year. Significantly, these rates would leave \$77 billion of income not taxed at all a deliberate design to maintain purchasing power.

Although the committee proposes reduced income taxes for all income groups, its suggested schedules would impose progressively heavier burdens on individuals with large incomes, and would take upwards of 60 per cent of all income in excess of \$1 million. It believes any higher imposts would kill initiative.

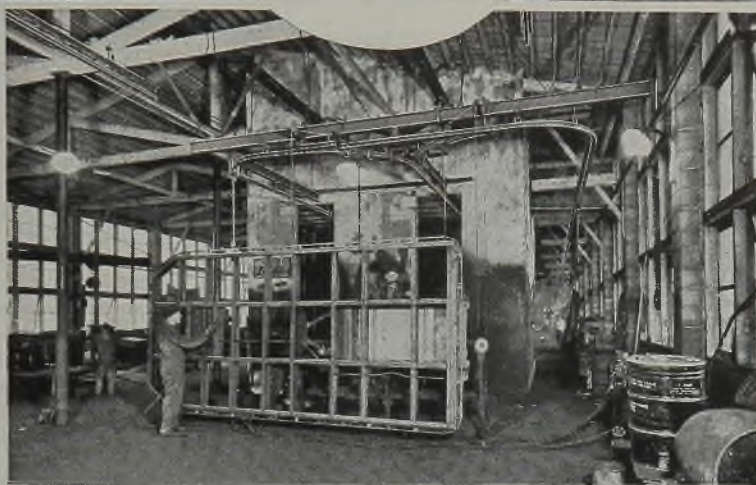
The committee recommends that excise taxes, except on liquor, tobacco and perhaps gasoline, be eliminated. That would reduce federal taxes by about \$3 billion and would represent tax relief principally to families with low and medium income, leaving them that much more income to spend on goods.

"Heavy taxation of corporate earnings is extremely and peculiarly damaging to employment," the report points out. "It takes vital and enormous funds out of the stream of business operations just when they are most likely to be used and where they can most effectually be used to increase production, create more jobs, pay out a greater total of wages, or reduce the price of goods manufactured."

Taxes on corporations are paid by individuals and the committee presents various reasons for believing that it does

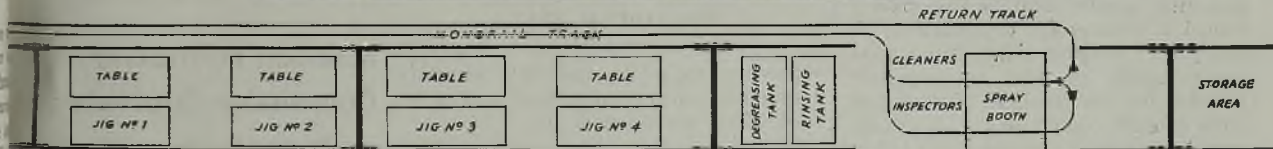
"WE CALLED IN AMERICAN MONORAIL ENGINEERS"

1 One of the jigs where complete chassis is tacked together. Electric hoist on MonoRail crane removes unit to table for complete welding. Completed frames are hung on MonoRail in background for inspection.



2 Air hammers and chippers remove slag from chassis hung on MonoRail tracks. Wiping and final inspection also completed here.

3 Primer finish is sprayed on frames; work being done in booth and on MonoRail loop. Note outside track for return of empty trolleys.



CRANE AND MONORAIL SYSTEMS FOR STRAIGHT LINE PRODUCTION AT YOUNGSTOWN STEEL CAR CORP., NILES, OHIO

• Photos show a recent American MonoRail installation in the plant of a company, which for years has specialized in stampings for truck and trailer chassis parts. Due to increased demands, manufacturing facilities were supplemented to enable them to furnish complete frame assemblies.

We quote part of a letter received from a top official of this company: "After quite some

thought, our engineers selected a section of our plant which they believed would be suitable for this type work, and one of our first steps was to call in your company to work with us. . . We are glad to advise that the design accepted worked out very satisfactorily and has allowed us to meet a rather sizable production schedule and keep our costs within our original estimate."

The tricks our engineers have learned in solving handling problems may be of real value to YOU. It will pay you to consult with the American Monorail Engineer NOW! This service is available at no obligation.

THE AMERICAN MONORAIL CO.

13102 ATHENS AVE.,
CLEVELAND 7, OHIO

less harm to business to tax the earnings after they have been received by stockholders as income. The committee, therefore, has made the recommendations mentioned above, that the excess profits tax, although justified in wartime, be repealed; that the corporate earnings tax rate be the same as the personal minimum income tax rate (16 to 20 per cent); that the manifest inequity of taxing corporate earnings twice (once as corporate income and again as personal income when the stockholder receives his dividends) be removed.

Various other inequities in the tax laws are pointed out, and remedies suggested. The committee does not believe in attempting to stimulate enterprise by offering tax concessions of one kind or another to new enterprise. "Such differentials," it says, "are likely to result in a vicious cycle of special subsidies which can be paid for only by added tax burdens on other types of income. Instead, we believe that moderate and equitable tax treatment for all groups in our economy will be more conducive to an expansion of production and employment."

The committee believes that both corporate and noncorporate businesses should be allowed to carry forward losses from business operations to apply against subsequent earnings for a period of six years. This recommendation is based on considerations of equity and the necessity for stimulating venture capital in every legitimate way after the war.

To clear up confusion which has arisen in connection with the establishment of proper depreciation rates, the committee recommends that both corporate and noncorporate businesses be permitted greater latitude in making annual allowances for depreciation. It was pointed out that ability to amortize assets rapidly provides an important stimulus for the purchase of new and more efficient equipment. This change should stimulate the capital goods industries after the war, and thus assist in the attainment of high levels of productive employment.

Brazilian Aircraft Engine Plant in Production

Brazil's government-owned and operated Fabrica Nacional de Motores, first plant in Latin America equipped to build complete airplane engines, has begun production on a limited schedule which is to be increased on arrival of additional machinery and equipment from the United States. It will produce about 500 Wright Whirlwind and Fairchild Ranger type engines annually to be installed in all-metal planes to be produced next year in a plant under construction at Lagoa Santa, state of Minas Geraes, and to replace engines now being worn out in service. In addition to complete engines, the plant will produce a wide variety of engine replacement parts.

Wartime Business Fatalities Low

Eighty-five per cent of enterprises closed since beginning of 1942 employed three or fewer people. Net decrease in two years has been approximately 500,000

WARTIME closings of American business enterprises have not been so numerous as was predicted even in conservative estimates at the beginning of hostilities, according to Sen. James M. Mead (Dem., N. Y.)

Quoting figures recently released by the Department of Commerce, the senator pointed out that, while there were 1,073,000 discontinuances during 1942 and 1943, the net decrease in the number of business establishments during the same time was approximately 500,000. The seeming discrepancy, he explained,



SEN. JAMES M. MEAD

represents the difference between old businesses which were closed and new ones which were started.

Senator Mead cites figures to show that most of the businesses which closed their doors from 1940 to 1943 were small. More than 85 per cent of all closings employed three or fewer people at that time and a majority of these had no employees at all. Most of the 147,000 retailers who closed their doors in 1943 were small. Slightly more than 100,000 had no employees at all; 38,000 more had one to three each. Only two hundred out of the entire 147,000 each had 50 or more employees. By kinds of business, food and liquor stores, eating and drinking places, and filling stations predominated.

Senator Mead observes that in normal times the total of business establishments in operation in the United States is more than 3,000,000. In good times, the total increases; and in bad times, it decreases. At the time of Pearl Harbor there were about 3,340,000 firms in operation. By the end of 1943 this figure had dropped to 2,840,000, showing a net decrease for the two war years of 500,000.

Referring to the total of 1,073,000 businesses reported to have closed dur-

ing 1942 and 1943, Senator Mead remarks that this figure was quite large, and since the firms had disappeared during the war it might appear that unusual war conditions were responsible for their disappearance.

Available figures for the two prewar years of 1940 and 1941, however, show that during that time 914,000 firms were discontinued, this being an average of 457,000 per year. In other words, 5/6 as many firms disappeared during the last two years before the war as disappeared during the first two years of the war. To put it still another way, for every five businesses that were discontinued prior to the war, six were discontinued during the war.

The story for the first full year of the war, 1942, however, is different. During that 12-month period, 678,000 discontinuances were reported. Conversion to the war effort, which extended throughout 1942 and into the first quarter of 1943, resulted in the closings of a number of firms. Beginning in the second quarter of last year, however, there was a marked decline.

The number of manufacturing plants closed from 1940 to 1943 remained comparatively constant. For the two prewar years and the first year of the war, it was 27,300, 26,400, and 27,700. During the second year of the war it declined to 23,200, a low for the period.

Mexican Purchasing Commission Established

A Mexican Purchasing Commission has been established with headquarters at 940 Shoreham building, Washington, under the direction of Felix Villaseor, prominent Mexican engineer and industrial consultant. It represents Desarrollo Industrial y Agricola de Mexico, Mexico City, a privately owned company which seeks to stimulate Mexican business by selling industrial and agricultural equipment to private enterprise in that republic.

The commission will employ an initial fund of \$20,000,000 for cash purchase of power plants, farm and industrial machinery, machine tools, railroad supplies and rolling stock, refrigeration plants, sawmills, equipment for processing foods and manufacturing drugs and chemicals, trucks, and many other items in the United States. The plan is to distribute this equipment to Mexico's industries at cost plus a small percentage to cover shipping and operating expenses. The project is backed by many of Mexico's leading financiers and industrialists and has the approval of the Mexican government.

White Paper Reveals Plans for Surplus War Property Disposal

Policy will be to release goods as rapidly as possible without flooding market, to distribute materials through normal channels, and to charge reasonable prices and to prevent profiteering by distributors

THE BRITISH government has announced preliminary plans for disposing of surplus war property other than land, buildings, aircraft and machine tools. Policies governing disposition of the latter types of property are to be announced later.

The property covered in a white paper includes raw materials, munitions such as guns, ammunition and fighting vehicles, manufactured goods suitable for, or adaptable to, civilian use.

The general principles to be followed in disposing of such property are:

1—The release of the stocks at a rate which, while fast enough to get the goods into the hands of consumers when they are most required and to clear badly needed storage and production space, aims at avoiding adverse effects on production through flooding the market.

2—Unless there is good reason to the contrary, the distribution of the goods through those traders or manufacturers who would normally handle or use them, and the assurance that ultimate consumers in all parts of the country will have a fair opportunity to use them.

3—Insuring, if necessary by statutory price control, that the prices charged to the ultimate consumer will be fair and reasonable in relation to the current prices of similar articles, to prevent profiteering on the part of dealers handling the goods, and to keep down the number of intermediaries to the minimum compatible with a proper distribution.

The first step will be co-ordination of the needs of government departments so that no goods shall be declared surplus which might be required for any public purpose. Goods which probably will be declared surplus over and above government needs already have been tabulated in various classifications. A number of factors remain to be determined before offerings to the public are made. Surpluses of some goods, for example, may be allocated in whole or in part for relief and rehabilitation of liberated territories. Too, no decision yet has been made as to the timing of offerings to the public. "Should the war end in two stages," says the white paper, "substantial amounts of some stores may be released after an armistice in Europe, but in other classes of goods there may be no surplus at all until Japan is defeated. The present tabulation, therefore, is in no way final. It merely shows the range of commodi-

ties involved and thus provides a basis on which plans for disposal may be prepared."

The way in which the various types of goods will be disposed of will be decided with due consideration for the needs of consumers, and after consultation with representatives of the industries and trades concerned, says the white paper. Provisional disposal plans will be prepared for all those classes of goods which the government considers important before the time when they actually are available for disposal in any quantity.

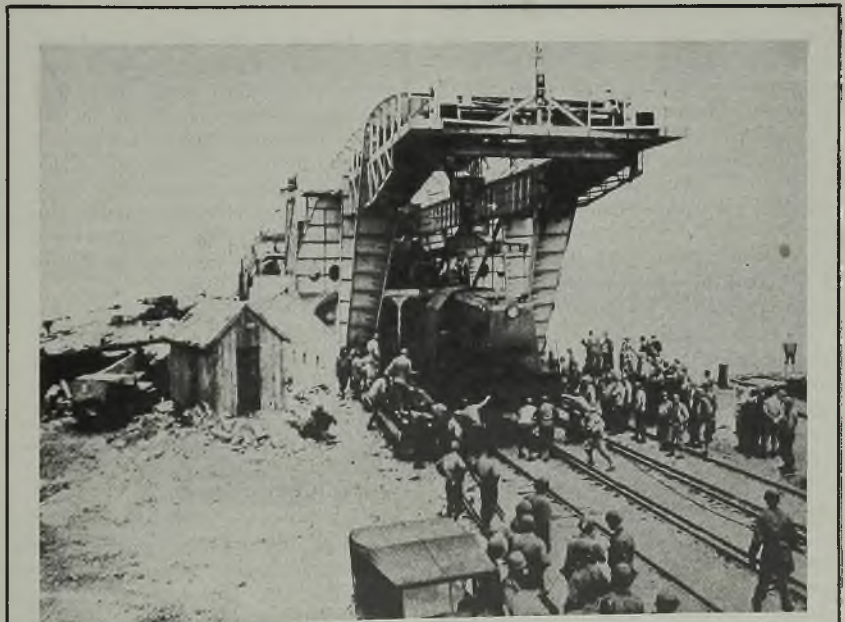
Selling Methods Will Vary

"The sale of surplus stores," says the white paper, "by unrestricted competitive tender to the highest bidder, will frequently be incompatible with some of the principles laid down and, where this is so, other arrangements will be made. These will no doubt differ considerably according to the character of the surplus articles, the extent to which they will be in short supply, the nature of the market for them, and various other factors. In some cases sale by negotiation or by tender in a restricted form may be appropriate; in

others it may be desirable, subject to satisfactory prices, to sell to, or through, a non-profit-making corporation or association, membership of which shall be open to all traders normally handling the goods in question. Discussions on these matters with trades and industries concerned have started.

The plan provides for reconditioning used surplus articles where appropriate, also for marking surplus goods with a distinguishing mark to facilitate price and distribution control. For most goods the Board of Trade and the Ministry of Supply will be the disposal agencies, but for certain classes of goods the Ministry of Works, the Ministry of Aircraft Production, the Admiralty and the General Procurement Office have been designated. These agencies will be responsible for deciding on methods of disposal, fixing of prices and margins, controlling the rate of release, and conducting necessary discussions with trade and industry with reference to those goods which they will handle. The Board of Trade will handle most consumer goods. The Ministry of Supply will handle internal combustion engines and many other items of industrial equipment, the Ministry of Works will handle builders' materials, the Admiralty will handle navigational instruments, etc.

"The arrangements set forth," says the white paper, "are without prejudice to the settlement of any questions that may arise in the disposal of stores received under lend-lease or mutual-aid. The disposal of United Kingdom government stores abroad, and the possible disposal in this country of stores owned by Dominion or Allied governments, will raise questions which will require discussion with other governments."



TRAIN FERRY: This British railway train ferry unloads the locomotive of a complete American-built train at Cherbourg. The locomotive weighed 65 tons. NEA photo

WPB Will Lift Practically All Controls When Germany Surrenders

Steel, copper and aluminum will be allocated under Controlled Materials Plan only for quarter in which hostilities cease in Europe. Allocation orders governing "tight" materials such as lumber, textiles and certain chemicals will remain effective

WASHINGTON
CONTROLLED Materials Plan for allocating steel, copper and aluminum will be continued only for the quarter in which hostilities in Europe cease. A few allocation orders will be continued for "tight" materials such as lumber, textiles, and certain chemicals.

This was decided at a meeting of the War Production Board last week after a resurvey of the military and production situation. The new program, which provides for the virtual scrapping of all controls over production of civilian goods once the war with Germany ends, is designed to provide the utmost stimulus to reconversion after Germany's defeat, but at the same time protecting production necessary for the Japanese war. The board believes that war production can be scaled down 40 per cent as soon as the war in Europe is won and would free 4,000,000 workers.

The reconversion program, giving industry practically a free hand to take what materials are left after supplying the needs to defeat Japan, has been agreed upon by the Army, Navy and major war agencies. Its main provisions are:

Removal of almost all controls over materials immediately on Germany's defeat except those absolutely necessary to assure Japan's defeat; use by government agencies of their full powers to assist and encourage industry in resuming civilian production and maintaining employment through the "know-how" of its industry divisions and industry-labor advisory committees; WPB will maintain its organization and powers so as not to relinquish authority until it is certain that the war production program is adequate for victory over Japan.

J. A. Krug, acting chairman of WPB, said industry will be allowed, according to the availability of markets, men, materials and plants "to do the swiftest and most effective job possible of restoring production, making whatever people want and affording maximum employment, just as quickly as possible."

Under the plan, there will be only one preference rating, in addition to the present emergency triple-A rating, and this will be reserved exclusively for military programs during the war against Japan.

All other production will be unrated, and manufacturers will be permitted to accept unrated orders but will be re-

quired to fill rated military orders ahead of other business. After Germany's defeat, there will be no "programming" of civilian production.

Paul V. McNutt, war manpower commissioner, attended the meeting and said the commission will announce a program soon for manpower after Ger-

RECALLED BY WPB



H. G. BATCHELLER

Hiland G. Batcheller, president, Allegheny Ludlum Steel Corp., Pittsburgh, has been appointed operations vice chairman of the War Production Board, succeeding L. R. Boulware, resigned. Thus, Mr. Batcheller resumes the position from which he resigned in December, 1943. He is expected to play an important role in WPB's reconversion activities.

Mr. Batcheller reportedly has agreed to return to Washington for a period of 90 days or until the end of the European war, whichever is shorter.

many's defeat. It will be designed to dovetail with the WPB program. Effective as of Sept. 1, 69 areas were classified by the commission as having an acute labor shortage. This represented a gain of one and included Freeport and Joliet, Ill.; Marion, Ind. and Pontiac, Mich. The new classifications move the following five areas from group I to group II (areas in which labor shortages exist that may endanger essential production or

areas that are approaching a balanced demand-supply situation): Eureka, Calif.; Hartford, Conn.; Hastings, Nebr.; Newport, R. I.; and Portland-Biddeford-Sanford, Me.

The WPB, WMC, and other government agencies are continuing to co-operate closely in their efforts to make the most efficient use of manpower and facilities. WPB will encourage the transfer of war production from plants that may readily be reconverted to civilian production to special-purpose plants, such as Willow Run. A meeting was held on Sept. 1 in Washington under the chairmanship of Arthur H. Bunker, deputy executive vice chairman, WPB, to determine what work can be put into the Willow Run plant to replace the production of B-24 Liberator bombers, which is being reduced sharply. The board favors moving additional aircraft work into the Willow Run plant, if it can be done without interfering with the war effort or other essential work.

Modifies Plumbing and Cooking Equipment Orders

Eight additional limitation orders governing production of plumbing, heating and cooking equipment have been amended to indicate specifically in the orders themselves that the products they cover are subject to the "spot authorization" procedure, established in priorities regulation No. 25. These orders are: Commercial dishwashers (L-248); commercial cooking, food and plate warming equipment (L-182); water heaters (L-185); oil burners (L-74); cast iron boilers (L-187); plumbing and heating tanks (L-199); coal stokers (L-75); and domestic cooking appliances and heating stoves (L-23-c).

Surplus Machine Tools Are Being Transferred

LOS ANGELES

The WPB in this area is transferring machine tools to the value of \$100,000 a month from both private and government surpluses to plants needing additional equipment for war contracts. Relatively little of this equipment is going into the production of civilian goods.

Surplus inventories of materials including 1,000,000 pounds of aluminum, 25,000,000 pounds of steel and 400,000 pounds of copper are listed with the WPB office here, available for resale. In the period of two weeks, July 26 to August 9, steel, to the value of \$2,782,576 was sold through the Los Angeles area office of the WPB.

The Air Force Material Command Western Procurement District, is holding conferences in this area in which speedy contract termination procedures are outlined. The army is attempting to organize procedures enabling settlement of contract terminations within a period of 90 days.

PRIORITIES-ALLOCATIONS-PRICES

Weekly summaries of orders and regulations, together with official interpretations and directives issued by War Production Board and Office of Price Administration

INSTRUCTIONS

EXCESS STOCKS: Holders of idle and excess stocks of controlled materials now are permitted to make special sales to persons who have been authorized to produce civilian goods under the "spot authorization" procedure. Special sales are those made by a person who holds materials in a form in which he does not, as a general rule, sell them. They may sell, without special WPB permission, such materials to persons authorized to produce civilian goods under the "spot authorization" procedure who have been granted the right to use an allotment symbol, the initial letter of which is "Z."

The buyer need not charge controlled materials bought under the new rules against any Controlled Materials Plan allotment account.

Holders may also make special sales of noncontrolled materials or products that may be sold to users on a rating of AA-5, if the buyer furnishes an order with a CMP allotment symbol bearing the initial letter "Z" granted him under priorities regulation No. 25, the "spot authorization" order. However, a production schedule authorized under PR No. 25 does not permit any person holding it to acquire materials or products that may not be purchased from idle and excess stocks without an AA-5 preference rating or without special WPB permission. In order to acquire such materials, the person holding the schedule must obtain the rating or get special WPB permission.

MOTOR TRUCKS: All purchasers of components scheduled under order L-1-e (Motor Trucks and Truck Trailers) must furnish manufacturers from whom they have ordered automotive components the following information: Specific use the purchaser will make of the component, program or project for which the component is required, the government contract number (if any) identifying the prime contract placed by the claimant agency for such program or project, the claimant agency sponsoring the program or project. The foregoing information also must be furnished to manufacturers of components by purchasers in respect to all future orders at the time the orders are placed. The purchaser should furnish a separate statement for purchase orders involving different programs or covered by more than one government contract number.

PRICE PROTESTS: Time limit of 60 days in which protest could be filed against the denial of an application for adjustment of a maximum price for commodities or service under government contracts or subcontracts has been eliminated. However, if the filing of a protest is unduly delayed, the defense of laches (unreasonable delay) may be available to OPA which considers 90 days as the time limit. Where the seller enters into a contract with two or more purchasing offices of the War or Navy departments, situated in two or more regions, he need file his application for adjustment only in the region in which his plant is situated.

WEATHER STRIPPING: Manufacturers of metal weather stripping, now may use the maintenance, repair and operating supplies (MRO) symbol to buy steel nails, which will be delivered along with asbestos shingles, asphalt roll roofing, asphalt siding, asbestos siding, asphalt shingles, or cork board for use in applying it.

BATTERIES: Distributors of flashlight batteries have been requested to discontinue filing applications for preference ratings for the third and fourth quarters of 1944 on form WPB-547 (formerly PD-IX). Use of this form for assignment of ratings on flashlight

batteries will be discontinued in the fourth quarter.

L ORDERS

COOKING APPLIANCES: Restrictions limiting the number of models and fuel types of domestic cooking appliances and heating stoves have been removed. (L-23-c)

REFRIGERATION, AIR CONDITIONING EQUIPMENT: Production restrictions in the order governing industrial and commercial refrigeration and air conditioning equipment have been modified by inclusion of a schedule A and the elimination of the four lists which were attached to it. Schedule A gives production quotas for each type of equipment covered by the order. Those types which may not be made at present have been as-

INDEX OF ORDER REVISIONS

Subject	Designations
Capital Equipment	PR No. 24
Cooking Appliances	L-23-c
Cutlery	L-140-a
Electric Power	L-46
Farm Machinery	L-257, 257-a
Refrigeration, Air Conditioning Equipment	L-38
Staplers and Staples	L-329
Utilities, Public	U-1
Price Regulations	
Commercial Vehicles	No. 341

signed a zero quota, which, when materials and parts become more plentiful, may be changed to permit production of the particular items involved. The four lists removed from the order covered prohibited items, items which could be obtained with automatic ratings, essential uses of equipment, and classes of refrigeration equipment which were permitted.

A preference rating of AA-5 or higher is required for the purchase of all new air conditioning and refrigeration equipment. MRO ratings may be used only for the replacement of worn out equipment which has been in the purchaser's possession for at least 90 days. Certain persons, however, who are permitted to use an AA-1 preference rating for their MRO requirements, will be permitted to use their ratings for minor capital additions.

Use of forms WPB-2448 and WPB-2449 have been discontinued. Applications for equipment now must be filed on forms WPB-1319 or WPB-617, depending upon how much construction is involved in installation of the equipment.

Items which are covered by order L-38 are specifically subject to the "spot authorization" procedure. The order restricts the use of condensing units, compressors, or controls, however, to those obtained either through special sales, which are governed by PR No. 13, or to those obtained from manufacturers and not from dealers, jobbers or manufacturers distribution outlets. (L-38)

ELECTRIC POWER: Order L-46, which governed power company operations in the Niagara Falls area, has been revoked. This action does not affect the overall restrictions that apply to electric power company operations as contained in order L-94. (L-46)

CUTLERY: Manufacturers of hand hair

clippers now may use 65 per cent as much metal as they used in the year ended June 30, 1941, compared with the previous rate of 45 per cent for large heavy duty and 25 per cent for light weight clippers. Provision permitting the sale of light weight clippers for export purpose only has been deleted from the governing order.

Eight types of pocket knives are permitted in the production of which copper and copper-base alloy may be used for linings and rivets. Aluminum is now permitted for any type of cutlery.

Products covered by the order are subject to the "spot authorization" procedure established in PR No. 25. (L-140-a)

FARM MACHINERY: Schedule B replaces schedule A in order L-257 and schedules X-11 through X-18 replace former schedules X-1 through X-10 in order L-257-a. The quota percentages of power sprayers have been raised to 100 per cent, and that of manure spreaders to 63 per cent. (L-257, 257-a)

STAPLERS AND STAPLES: Order L-329, governing the production of hand-operated industrial and office staplers and staples, has been revoked. Use of material to make these items will continue to be controlled, however, through allotments to manufacturers under the Controlled Materials Plan. (L-329)

U ORDERS

PUBLIC UTILITIES: Electric power, water, natural and manufactured gas and central steam heating public utilities have been granted the right to make certain minor plant additions and extensions up to \$10,000 in material cost without obtaining approval from the Office of War Utilities, WPB. Requirement that purchase of certain items (formerly listed in order U-1) be approved by regional utility engineers has been revoked. Limitations on purchases of specific items of materials that were contained in schedule B of the order also have been removed. Utilities now may purchase materials if their inventories on hand do not exceed their minimum requirements or more than a 90-day supply of such materials.

The special materials redistribution provision of order U-1 has been removed. (U-1)

PRIORITIES REGULATIONS


CAPITAL EQUIPMENT: Producers of capital equipment, including machine tools, precision measuring and testing instruments, electric motors and generators, and other general industrial equipment, need no longer obtain WPB permission to begin production on rated purchase orders for such equipment placed under priorities regulation No. 24. This change does not affect the provision of the regulation that requires purchasers of machine tools and other equipment to obtain specific WPB approval before they place an unrated purchase order. Persons desiring to place unrated purchase orders for the items covered by list A of PR No. 24 will continue to apply for approval to do so by filing a letter in triplicate with their nearest WPB field office, giving a description of the equipment, including make, type, size and approximate price. (PR No. 24)

PRICE REGULATIONS

COMMERCIAL VEHICLES: Dealers' mark-ups for warranty sales of used commercial vehicles of model years 1937 and later have been increased to encourage their repair and maintenance and keep them on the road. The warranty provisions in the used truck regulation have been changed so that dealers are liable for only half the expense that may arise under warranties. (No. 341)

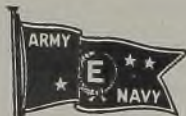
Appointments-Resignations

Merritt C. Penticoff, Chicago, has been appointed assistant vice chairman of the Office for Civilian Requirements, WPB.



Molybdenum cast steels are meeting practically every requirement involving high temperatures and pressures.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.



MOLYBDIC OXIDE, BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

Climax Molybdenum Company
500 Fifth Avenue • New York City

MOLY

MIRRORS of MOTORDOM

Wraps removed from new combat tanks and tank destroyers, in production many months. Motor plants disclose some details of new weapons. Most revolutionary is Buick Hellcat, high-speed 19-ton tank destroyer known as the M-18

DETROIT

IN RECENT weeks many official reports have been heard relative to increases in combat tank and tank destroyer production, as well as to new models of these vehicles. Some of the latter have been in production for many months, but have been carefully kept under wraps. About two weeks ago the Army Service Forces, after weeks of preparation, pulled all the stops with a huge demonstration of mobile equipment at the Aberdeen Proving Grounds, for the benefit of news associations and camera men. Labor day was decreed as the date for release of the information to the public.

Simultaneously, several of the motor plants were permitted to disclose details of a few of these new weapons which they are building. Five new types participated in the Labor Day parade here. Undoubtedly the most revolutionary of them all is the new Buick Hellcat, a high-speed 19-ton tank destroyer, known officially as the 76-millimeter gun motor carriage M-18. It was put through its paces in Flint, Aug. 31, and this writer had opportunity to observe the \$30,000 unit at first hand and to rumble over the proving ground perched inside the machine gun ring in the turret.

Rapid Development History

The M-18 went through a tedious but nevertheless rapid development history. At first it mounted a 37-millimeter gun, then a 57-millimeter gun, finally a 76-millimeter gun. Its experimental versions went from the T-22 to the T-42 to the T-49 to the T-69 to the T-70 and then to the production model the M-18. Production so far runs into four figures and hundreds of them doubtless are scurrying (55 miles an hour on level concrete road) across eastern France today in the vanguard of Patton's armies.

Contract for the M-18 was awarded to Buick in January 1943 and production began in July. The first pilot model, incidentally, has been in operation continually and has accumulated a service history of over 12,000 miles, phenomenal when compared with the normal life of, say, a medium or light tank.

The M-18 is mounted on independently sprung 20-inch track wheels with torsion bars instead of the conventional coil or volute springs. Heavy-duty automotive type shock absorbers provide cushioning against road shock. This system is responsible for the ability of the vehicle to travel at high speeds even on rough terrain, adding materially to its usefulness. The track is an assembly of 83 links—heavy drop-forgings of

S.A.E. 1020 steel, proofed against wear by a layer of Colmonoy wear-resistant alloy. The track embodies an automatic slack adjustment feature which plays an important role in keeping the track in place under all conditions and contributing to safe high-speed performance.

With respect to the novel torsion bar suspension system, the vehicle is supported by ten rubber-tired bogie wheels of dual construction which roll on the all-steel track. The wheels are attached to suspension arms by means of spindles extending from the suspension arms. The suspension arms incorporate, as an integral part, tubular axle shafts which are supported in the axle housings by two large diameter bearings, thus forming the axis about which the arms move. The axle housings are machined to receive the axle shaft bearings and to provide a seat or retainer in which the torsion bar of the opposite suspension arm is fitted. Silicomanganese steel torsion bars, having a splined section at either end, are anchored to the suspension arms at one end and extend through the tubular axle shaft to the opposite side of the hull where they are anchored in the axle housing. These bars serve to support the weight of the vehicle through torsional resistance and act as springs to cushion the ride.

Volute-type bumper springs are provided to limit the travel of the suspension arms should the track strike an obstacle of sufficient size to overcome the torsional resistance of the bar and

the control of the shock absorber. Shock absorbers are provided to control the movement of the suspension arms. Shock absorbers are not provided for the two center suspension arms as their location near the center of the vehicle makes shock control unnecessary. The track is kept tight at all times by movement of the driving sprockets through means of connecting links between their mountings and the suspension arms.

The various parts of the suspension system function as follows: As the track strikes an obstacle it raises the wheel in contact at that point which causes the suspension arm to move up and rotate, and since the torsion bar is anchored to a seat in housing at one end and to the suspension arm of that wheel at the other, this upward movement of the arm causes the bar to twist and its torsional resistance acts as a spring in supporting the vehicle.

Need for Weight Reduction

Despite the use of high-velocity 76-millimeter rifle, the requirements of speed and maneuverability demanded weight reduction at every turn, particularly with the use of the light hull. This entailed the development of a new type of light turret mechanism and an advanced type of gun mount. The light weight turret presented a new problem in turret balance which was met by adding a stowage box to the rear of the turret to balance the added weight of the gun in the trunnions.

Track links are joined by steel pins around which the links hinge. Rubber bushings vulcanized to a steel sleeve are used in the male section of the link incorporating a tongue which mates with a groove in the track pin, thus locking the pin to the bushing. The pins are



Novel type of torsion bar suspension, large diameter bogie wheels, low silhouette, 55-mile-an-hour top speed, and 76-millimeter high-velocity rifle are characteristics of the new M-18 tank destroyer

(Material in this department is protected by copyright and its use in any form without permission is prohibited)



New version of M-24 light tank weighs around 20 tons, incorporates torsion bar suspension system, 75-millimeter cannon, fully enclosed turret, and is powered by two 8-cylinder automotive engines driving through automatic transmissions

anchored in the female section of the link by means of a wedge typelock key which is held in place by a nut and lock washer. These bushings are pressed into the track lines with the tongue in such position that it causes the track links to be 11 degrees off of the horizontal plane when the pins are locked into place. This feature causes the track to follow around the sprocket without abnormal twisting of the bushings.

The track pins extend through the track links with the exposed section fitting into the teeth of the drive sprockets where they transfer the power from the final drive to the track. The track links incorporate a guide lug at the center of the link and when the track is installed it is between the two sections of the wheels, thus guiding the track and preventing it from leaving the wheels when the vehicle is turning or skidding. These guide lugs also serve as a cleaning device to clean out mud and earth which collect between the wheel sections.

Contains Two Spur Gears

Final drive assembly consists of two spur gears and a final drive shaft enclosed in a housing, and a hub with two sprockets. The gear housing is supported on two large diameter bearings in the final drive support housing which is attached to the hull, thus forming a pivot point about which the assembly can rotate. The lower end of the final drive housing is connected to the front suspension arm by a link, with the result that the final drive assembly is moved forward when the front track wheel passes over an obstruction, thus maintaining normal track tension. The

spur gears are supported by ball bearings and operate in a bath of oil. The sprocket shaft which is attached to the large drive gear extends through the gear housing where its upset flange provides a mounting for the hub on which the sprocket assemblies are mounted. The function of the final drive assembly is to transmit power to the track and to serve as a track compensator.

The engine, a 9-cylinder, single row, radial, air-cooled type developing 450 horsepower, is mounted in the rear section of the hull. The engine is carried by a special support assembly mounted on rollers which operate on rails welded to the hull, and to the rear door. Thus, when the door is lowered it becomes a platform on which the engine is placed and then is easily rolled into position. So completely is the power plant assembled before installation that when in place only four bolts need be tightened, gasoline, oil, electrical, and exhaust pipe connections made, the throttle control hooked up and the engine is ready to run. Air cleaner connections are automatically made when the power plant is bolted into position.

Power is transmitted through a universal joint which slides on to a splined shaft projecting from a transfer case which is bolted to a steel bulkhead and thence through a propeller shaft below the fighting compartment floor to the power train at the front end.

Due to the use of a torque converter in connection with the transmission, considerably more oil cooling had to be provided than is required for a conventional gearshift transmission. This, together with the oil cooling for the steering differential, is provided by a

centrifugal blower belt driven from pulleys mounted on the transmission end of the propeller shaft. This blower draws air through the oil coolers and discharges it out of the top of the hull.

The engine oil cooler is mounted directly on to the engine, around a centrifugal blower, carried on the engine flywheel. Air is drawn into the center of this blower, around the universal joint and is discharged through the circular oil cooler into the main air stream being drawn into engine cooling fan.

The M-18 has an overall length of about 208 inches and is 110 inches in width. An important feature of hull design is the relatively smaller frontal area and low silhouette as compared with tanks.

Almost 80 per cent of the value of the Buick tank destroyer contract is subcontracted to 298 suppliers of productive parts, and 314 nonproductive items. In addition to these were 150 sources for machinery dies, jigs and fixtures, plus 13 plants in the General Motors family which are furnishing components. Fisher Body, for example, is supplying hulls, turrets and turret rings, Continental the engines, an Ohio company the torsion bars, Detroit Transmission division the transmissions, etc. Buick manufactures the track link forgings, suspension axles and forgings and parts of the gun mount, but its task is principally one of assembly and test. Former passenger car assembly lines are used, and there are 54 major assembly stations.

New Fast Light Tank, M-24, In Production at Cadillac

A new fast light tank mounting a 75-millimeter cannon, and with automatic drive through eight speeds forward and four reverse, has been in production for months at the Cadillac Motor Car Division. Designated the M-24, it supersedes the Cadillac-built M-5.

Suspension system of the M-24 is almost identical with the Buick-built M-18, and in fact a number of parts are interchangeable, facilitating field servicing. The "power train" of the M-24 consists of two Cadillac V-type, 8-cylinder engines basically identical with those used in peacetime automobiles, and two Hydra-Matic transmissions operating through a power transfer unit.

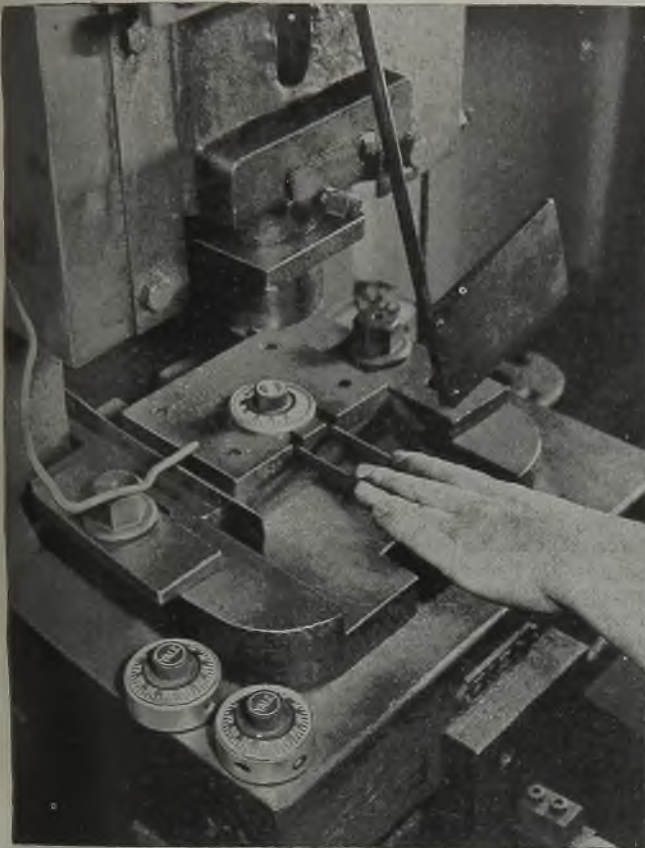
Maneuverability of this new 20-ton weapon, which has been made one foot wider than the heavier medium tank, is further improved by wide trackage and reduced ground pressure, as well as the 18-inch road clearance between tracks.

In addition to its cannon, the M-24 carries a .50-caliber antiaircraft gun, smoke mortar, .30-caliber coaxial gun and a .30-caliber bow machine gun.

The vehicle has a width of 112 inches, height from ground to turret-top of 86 inches, and overall length of 216 inches including the overhang of the cannon.

DUCTILITY!

—2 ZINC ALLOY DIE CASTINGS ASSEMBLED BY
"CURLING"—AT THE RATE OF 375 AN HOUR!



NOTE: Die cast parts only—interior lock mechanism not shown.

The ductility of zinc alloy die castings was not the determining factor in their adoption for the keyless (combination) padlock shown above. Economy, appearance* and accuracy gave the call to this metal and method of production. But ductility provides a "plus" advantage in the low cost assembly of the lock dial by a simple "curling" operation.

The die cast dial, with a slightly larger sheet metal disk fastened to its under side, is set into the cylindrically shaped die casting which is provided with a shoulder to support the disk. One strike of the punch in a press (above left) and the thin lip of the cylindrical casting is neatly curled over the disk. Thus the disk is locked between the shoulder and the curled-in lip, permitting the dial to be rotated but not pulled out.

Ductility is just one of the many physical and mechanical advantages that make die castings of zinc alloy the most widely used under normal conditions. *Every die casting company is equipped to make zinc alloy die castings*, and will be glad to discuss their advantages with you—or write to The New Jersey Zinc Company, 160 Front Street, New York 7, New York.

* The clean-cut figures and graduations are cast-in on the dial.



ZINC
FOR DIE CASTING ALLOYS

The Research was done, the Alloys were developed, and most Die Castings are specified with
HORSE HEAD SPECIAL (99.99 + % Uniform Quality) **ZINC**

WING TIPS

Decline in postwar air transportation rates forecast by Curtiss-Wright research expert. Travel expected to be seven times greater five years after the war. Express and mail traffic may show even greater increases

DECLINE in postwar air transportation rates, gradual at first and then accelerating, is forecast by Dr. D. H. Davenport, director of business research, Curtiss-Wright Corp., Buffalo.

Numerous improvements in service, a tremendous increase in air travel, and better equipment also are anticipated by Dr. Davenport in a discussion of "The Future of Air Transportation."

Dr. Davenport said it has been estimated that within five years after the war, domestic passenger rates will have declined from the prewar average of 5.1 cents per mile to 3.5 cents a mile, and express rates from the prewar 80 cents a ton-mile to 30 cents a ton-mile.

Numerous improvements in service may be anticipated to the advantage of passengers and shippers alike, Dr. Davenport pointed out, adding: "With the full application of wartime developments to peacetime air transportation, the number of accidents is expected to be so low that fear of travel should be eliminated entirely as a deterrent to air travel."

"Flight cancellations should be virtually negligible, and almost 100 per cent schedule performance may be expected," he continued. "Furthermore, the addition of lights and the extensions of service to many points not now served should make air travel as convenient as train travel. Finally, improvements in aircraft design and interior appointments may be counted on to add greatly to the comforts of air travel."

As a result of these influences, he pointed out, domestic air travel five years

after the war has been estimated at approximately seven times that of 1940—700 million passenger miles as against 104 million. Express, he said, is expected to show an even greater rate of increase—from 3.5 million ton-miles in 1940 to 110 millions five years after the war; while mail is estimated at 87 million ton-miles as compared with 10 million in 1940. Comparable rates of increase are expected in international air traffic.

"Small Part of Total Traffic"

"Even with the increases estimated above, air transportation, five years after the war, will still be a small part of total traffic," Dr. Davenport said. "As rates continue to decline, however, and approach competitive carriers' rates, the effects of the many indirect economies afforded by air transport will begin to be felt in increasing force and air cargo should increase at a rapidly accelerated rate."

"Rapid transit makes possible savings in inventories, in interest charges, in insurance, in packaging and in handling; these savings may not appear important when there is a differential of 15 to 20 cents per ton-mile between air and surface rates, but may well be critical when that differential has been reduced to a few cents."

Dr. Davenport said it is estimated that approximately 1500 planes will be sufficient, five years after the war, to meet the requirements of U. S. air carriers operating domestically and interna-

tionally, as well as the requirements of foreign operators in certain foreign areas which may be accessible to U. S. manufacturers.

He pointed out that in 1930 there were 497 planes in use in domestic air commerce. In 1940, the airlines carried 13 times as much traffic as in 1930 but with 330 planes. In 1943 the airlines handled 50 per cent more traffic than in 1940 with about half as many planes.

"The answer to this apparent contradiction lies in two factors—increased size of planes and increased performance due to greater speeds, greater load factors and higher utilization," Dr. Davenport said. "Postwar, the trend of greater size and better performance will undoubtedly continue. Consequently the increase in the number of planes is not expected to be as great as the estimated increase in traffic."

There is nothing to indicate, Dr. Davenport said, that giant planes carrying 150 to 200 passengers will be a common sight on the airways in the immediate postwar years.

"In the first place," he pointed out, "it may be at least several years after the war before even a single plane of that size will be available to the airlines. In the second place, it probably would not be possible to give the desired frequency of service and still maintain economical load factors with planes of that size for at least a number of years to come."

Medium-Sized Planes Most Suitable

He reported it was estimated that medium, trunk-line planes of 30 to 40-passenger size would best suit the requirements of the bulk of traffic during the immediate postwar years.

The study which Dr. Davenport summarizes was made to aid the airplane division in its planning for the postwar production and sale of peacetime Curtiss Commandos.

"After the war," he said, "Curtiss-Wright plans to be an active and important producer for the commercial airplane market as well as for the military. The C-46 Commando, originally known as the CW-20, was in fact originally designed as a commercial transport, but was converted to a military model after the war. Our plans for competing in the commercial market are, therefore, not new."

In commenting on surplus military aircraft, Dr. Davenport said there are "two compensating features in the surplus plane picture". Surplus military transports will have to undergo considerable modification which probably will be done by the original manufacturers; and surplus planes, sold at a fraction of their original cost, "may act as a stimulant to the expansion of the airline system."

"Despite its very rapid growth, air transportation has barely scratched the surface of the traffic potentially available to it," Dr. Davenport pointed out. "Today, the airlines are in the 'big business' category; yet it is apparent that they



Members of Curtiss-Wright Corp.'s postwar committee which is developing plans for peacetime production are shown above. Left to right, they are: C. M. Leeds, James C. Willson, Dr. D. H. Davenport, Peter F. Rossman, and Edmund D. McGarry

**NOW...ANOTHER REVOLUTIONARY
PRODUCT OF PHILCO BATTERY RESEARCH!**



The New "PHILCO Thirty" gives 30% Longer Life

A few months back Philco pioneering gave industry the outstanding development in stationary batteries—Philco Vitrabloc. Today, Philco engineering research scores again—with the top advance in motive power batteries—the new "Philco Thirty." With 30% longer life, and *more*—with new economy in maintenance and lower depreciation—here is headline battery news. Here, for the first

time in any battery, is a revolutionary new principle of fabricated insulation—developed, proved and backed by Philco. Here, too, is that famous 10% extra work capacity made possible by Philco's modern plate design. Ready today, is this great new post-war battery—the new "Philco Thirty"—now available in certain types and limited quantities. Write for full information.

PHILCO CORPORATION, Storage Battery Division, Trenton 7, New Jersey

For 50 Years a Leader in Industrial Storage Battery Development

stand at the very threshold of their ultimate expansion possibilities."

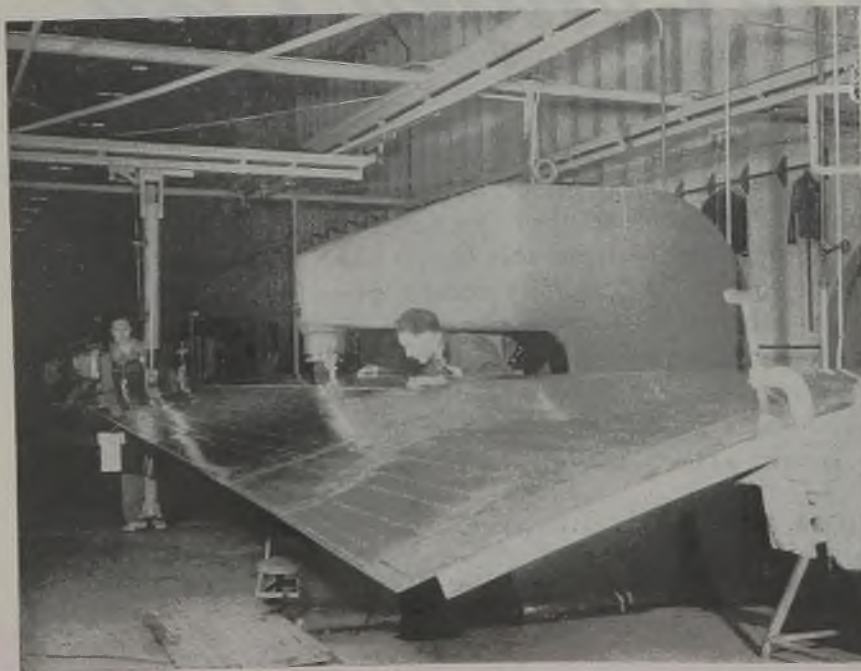
Multiple Hydraulic Riveting Speeds Work

One of the first aircraft companies on the West Coast to use multiple hydraulic riveting extensively, Ryan Aeronautical Co., San Diego, Calif., operates eight machines which are saving about 15,000 man-hours a month, or the work of 75 people, in production. No particular training is needed to operate the machines, women handling them successfully.

The type of machine in use at Ryan is made by the General Engineering Co., Buffalo. It is built of heavy welded steel plates, ram and toggles all designed for heavy-duty, high-speed production. This machine is operated by a hydraulic system which develops force sufficient to head thirty-two $\frac{3}{8}$ -inch diameter, twenty-four $\frac{5}{32}$ -inch, sixteen $\frac{3}{16}$ -inch, eight $\frac{1}{4}$ -inch, six $\frac{5}{16}$ -inch or four $\frac{3}{8}$ -inch aluminum alloy rivets. The riveting ram has a double action stroke. Pressing the left hand pedal of the foot switch drops the ram to give a $\frac{3}{4}$ -inch free opening. The working stroke is adjustable from $\frac{1}{2}$ to 3 inches by means of a selector dial.

The instrument is self-compensating for changing stock thicknesses.

Advantages of multiple riveting include: 1—Rivet heads are consistently uniform in size; 2—Warping caused by heading of rivet is negligible; 3—Personnel can be trained in less than one day to do high quality work; 4—Labor and time savings are in the amounts of 50 to 500 per cent depending upon previous methods used.



Multiple riveting of a large wing panel suspended from an overhead monorail conveyor system

Pressurized Cabins Permit U. S. Warplanes To Fly at 40,000 Feet

PRESSURIZED cabins, perfected after more than ten years of development work by the AAF Materiel Command, now permit United States warplanes to fly up to 40,000 feet.

Pressurization has opened both military and commercial vistas of interest. While currently a military concern, pressurized cabins may be applied commercially in postwar years as a means of comfortable, safe travel in the storm-free stratosphere. Now, these cabins provide the answer to high altitude, long-range aerial bombardment. The rarefied air of high altitudes confronted AAF engineers and aeromedical experts with two major problems: How to enable both gasoline engines and human beings to operate at extreme heights.

Supercharger Solves One Problem

Solution of the engine problem came with the supercharger. This mechanism pumps and compresses the thin upper air so that an engine obtains enough oxygen for proper combustion. But there remained the matter of the human reaction to altitudes above six miles up where air pressure is only one-fourth as much as at sea level.

In 1919, AAF engineers began work on the problem of pressurization by constructing pressure equipment on a DeHaviland observation plane. Elliptical in shape, the cabin leaked badly and was of no practical value. The project was dropped.

Interest in the problem was revived in

1934. Experts of the aeromedical laboratory of the Materiel Command built a decompression chamber in which to study the effects of high altitude on man. They found that it was not simply, as many had supposed, a problem of providing oxygen at 35,000 feet and above, but also a problem of pressure.

The demand system of oxygen supply provides fliers with more oxygen as altitude increases until at 30,000 feet all air is shut off and the flier breathes pure oxygen. However, even pure oxygen will barely keep a man alive up there. The pressure is so low that insufficient oxygen is forced through the membrane between the air sacs of the lungs and the blood stream. More pressure must be provided.

The first attempt at a solution was a pressurized suit, which actually was just blown-up overalls and a diver's helmet. It didn't work. Then two Materiel Command officers went up to 72,935 feet, a world's record, in a spherical balloon gondola. A sphere offered the ideal pressurization shape, but they couldn't put wings and an engine on a sphere and fly it, so Materiel Command experts began experimenting with cylindrical shapes and in 1936 came out with the XC-38, a Lockheed transport and the first successfully pressurized air frame.

The cabin worked but at high altitudes windows iced heavily on the outside and clouded with fog and moisture on the inside. Small fans, similar to those in use by motorists in winter, solved the problem.

Sealing the structure also was a major problem. Thin rubber cement was poured in doors and joints and the cabin was pressurized so that at an altitude of 20,000 feet, the cabin had an interior pressure equal to sea level—14.7 pounds per sq. in.

Boeing then built the 307, an airliner, but it wasn't the whole answer. Next came the XB-28, a North American design, in which AAF engineers supercharged the cabin to a pressure equal to 8000 feet when the plane was at an actual altitude of 30,000 feet. This was nearer modern performance.

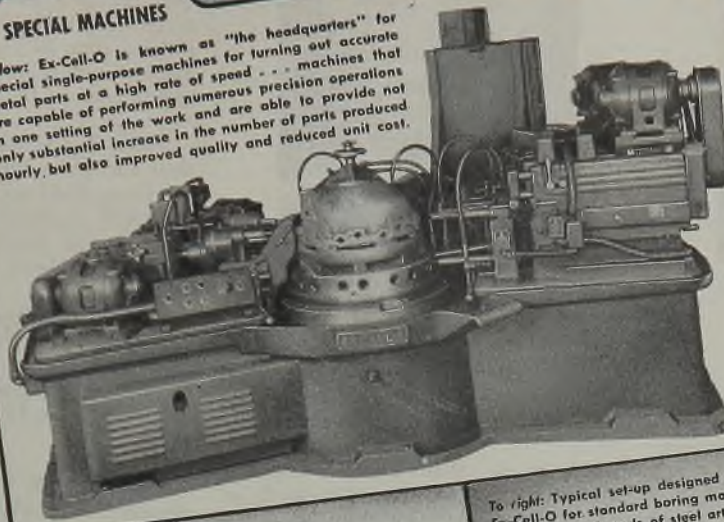
Three methods of pressurizing were developed. First was the auxiliary impeller geared to the supercharger. Second, the mechanical supercharger geared to the engine. In the third method, used on the B-29, a duct leading to the cabin is cut into the duct leading from the engine's supercharger to the carburetor—the cabin utilizing part of the air pulled in for the engines by the supercharger.

The pressurized cabin of the B-29 has a pressure differential of 6.55 pounds. This means that when the plane is at 30,000 feet the interior pressure is equal to 8000 feet; that at 35,000 feet the interior pressure is at 10,200 feet.

A File of EX-CELL-O Production Aids

SPECIAL MACHINES

Below: Ex-Cell-O is known as "the headquarters" for special single-purpose machines for turning out accurate metal parts at a high rate of speed . . . machines that are capable of performing numerous precision operations in one setting of the work and are able to provide not only substantial increase in the number of parts produced hourly, but also improved quality and reduced unit cost.

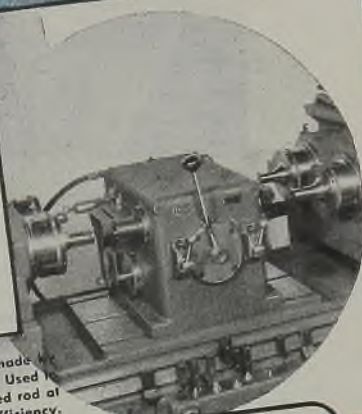


STANDARD MACHINES

Ex-Cell-O precision machine tools—for boring, turning, facing, thread grinding, broach sharpening, tool grinding, lapping—are sound in design and construction. The simplicity of their operation and the substantial production they attain on an economical basis, make these Ex-Cell-O standard machines of

practical interest to both the manufacturers who install them and to the men who operate them.

FIXTURES



To right: Typical set-up designed and made by Ex-Cell-O for standard boring machine. Used for semi-finish both ends of steel articulated rod at a high production rate with maximum efficiency.

DRILL JIG BUSHINGS

Ex-Cell-O drill jig bushings (A.S.A. Standards) are made with accuracy, assuring absolute uniformity, easy replacement, and longer life.



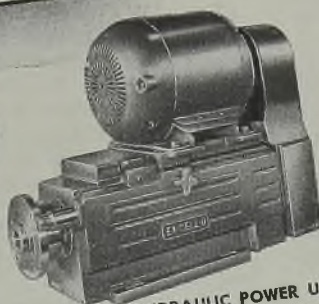
GRINDING SPINDLES

Many thousands of Ex-Cell-O precision grinding spindles are in daily use throughout American industry.



HYDRAULIC POWER UNITS

They provide an economical method of drilling, reaming, counter-sinking or spot-facing. Also may be used as prime movers or drivers for other machine units.



CONTINENTAL STANDARD and SPECIAL CUTTING TOOLS (High Speed and Carbide)



IN your production plans for now and the future, take advantage of Ex-Cell-O's substantial background of practical engineering experience in the designing and manufacture of precision machine tools and Continental cutting tools. Send for your free copy of General Products Folder No. 27132.

EX-CELL-O CORPORATION
DETROIT 6, MICHIGAN

XLO

EX-CELL-O for PRECISION

SPECIAL MULTIPLE WAY-TYPE PRECISION BORING MACHINES • SPECIAL MULTIPLE PRECISION DRILLING MACHINES • PRECISION THREAD GRINDING, BORING AND LAPPING MACHINES • BROACHES AND BROACH GRINDING MACHINES • HYDRAULIC POWER UNITS GRINDING SPINDLES • DRILL JIG BUSHINGS • CONTINENTAL CUTTING TOOLS • TOOL GRINDERS • DIESEL FUEL INJECTION EQUIPMENT • R. R. PINS AND BUSHINGS • PURE-PAK MILK CONTAINER MACHINES • PRECISION AIRCRAFT AND MISCELLANEOUS PARTS

MEN of INDUSTRY



JOHN M. COOK

John M. Cook, for the past 11 years sales engineer for Cutler-Hammer Inc., Milwaukee, has been appointed manager of the company's San Francisco district sales office.

E. A. Bonneville has joined Crosley Corp., Cincinnati, as a regional manager in the Commercial division. Previously he had been a vice president in charge of the Appliance Dealer division, Times Appliance Co., a branch of Graybar Electric Co. Inc., New York.

William B. Avery has been appointed personnel assistant to W. S. Fraula, operating assistant to the president, American Brake Shoe Co., New York. Mr. Avery, who joined Brake Shoe July 1, was formerly assistant chief, Employee Relations Branch, Civilian Personnel Division, Office of the Secretary of War, Washington.

George C. Beeson, formerly attached to the engineering departments of the Berwick, Pa., and St. Charles, Mo., plants of American Car & Foundry Co., New York, has been transferred to the New York office as sales engineer, to specialize in passenger car equipment.

Alexander S. Keller has been elected a vice president of Niles-Bement-Pond Co., West Hartford, Conn., and will devote the bulk of his time to promotion of export sales as head of the Pratt & Whitney foreign sales department.

Edgar C. Brandt has been named assistant to the general manager, Crocker-Wheeler Electric Mfg. Co., Ampere, N. J., division of Joshua Hendy Iron Works. Prior to his connection with Crocker-Wheeler, Mr. Brandt was vice president and general manager, Elliott Co., Jeannette, Pa.

George O. Desautels, president of George O. Desautels Co., Indianapolis, Ind., a sales and engineering organization, has been elected a director of National Tool Co., Cleveland. He succeeds Gordon Lefebvre, president and general



WILLIAM G. WALTERMIRE

manager, Cooper-Bessemer Corp., Mt. Vernon, O., who has resigned because of the increasing pressure of business.

William G. Waltermire has joined Lamson & Sessions Co., Cleveland, as sales engineer, operating from the Cleveland office. For the past two years he has been staff engineer for National Screw Machine Products Association.

Charles W. Wright has been elected president, Pullman-Standard Car Export Corp., Chicago, succeeding C. A. Liddle, who will remain a director. Mr. Wright is also vice president, Pullman-Standard Car Mfg. Co., Chicago, and in that capacity will continue in charge of the company's sales of war materiel.

Earl J. Senne has been appointed sales manager of the Spring division, Cleveland Wire Spring Co., Cleveland, succeeding Joseph F. Ursem, who is retiring after 48 years with the company.

J. S. McMahon has been appointed superintendent of blast furnaces, Geneva Steel Co., Geneva, Utah, United States Steel Corp. subsidiary. He succeeds J. M. Stapleton, who has been transferred to Carnegie-Illinois Steel Corp., Chicago, another United States Steel subsidiary, as assistant division superintendent of blast furnaces at the South Works.

C. D. Wing has been appointed director of advertising and sales promotion, Nash Motors division, Nash-Kelvinator Corp., Detroit. A former vice president of Barron's Advertising Co., St. Louis, Mr. Wing was associated with Maxon Inc. as an account executive before his present appointment.

E. W. Hoster Jr. has been appointed resident manager of sales of the Columbus, O., sub-office of Jones & Laughlin Steel Corp., Pittsburgh.

Raymond J. Cowden has been appointed general contract manager of American Propeller Corp., Toledo, O., Aviation Corp. subsidiary. Richard E.

Posthauer has been named manager of military contracts and service of the Lycoming division of Aviation Corp., Williamsport, Pa.

T. W. Tinkham has been appointed general manager, Eclipse Machine division, Bendix Aviation Corp., Elmira, N. Y., succeeding William L. McGrath, who is retiring after 28 years with that division. Mr. McGrath continues as a vice president and director of the Bendix corporation.

Alden P. Chester, formerly vice president and general manager, Globe American Corp., Kokomo, Ind., has been elected president, succeeding W. D. Harvey, who was elected board chairman. A. G. Sherman has been named vice president.

John W. Scallion has been elected a vice president, Pullman-Standard Car Mfg. Co., Chicago. He will be in charge of sales of transportation equipment and war materiel in Chicago and the Middle West.

Duties of R. B. Weeks, Chicago district manager, Kennametal Inc., Latrobe, Pa., have been extended to include direction of offices opened by the company in Kansas City, Kans., and St. Louis. Ralph H. Craig will be in charge of the Kansas City office and Lyle H. Wade is in charge of the office in St. Louis. Walter C. Lavers has been appointed tool serviceman and representative in the company's Los Angeles branch office.

Charles T. Craig, formerly director of purchases for Weatherhead Co., Cleveland, has been named head of the Chicago sales office which the company opened Sept. 1. Working with Mr. Craig will be Robert A. Lennox and C. V. Landwerlen.

Gustaf A. Ostrom has been named research engineer for Foote Mineral Co., Philadelphia. Mr. Ostrom assumes his new post after four years as a radio technician for Philco Radio Corp., Philadelphia.

W. S. Stephenson, Broad Street Station building, Philadelphia, has been appointed Philadelphia district representative for Barium Steel Corp., Canton, O.

E. J. Finkbeiner has been elected a vice president of American Car & Foundry Co., New York.

L. C. Truesdell has been appointed sales manager, Manufacturing division, Crosley Corp., Cincinnati. He continues his former responsibilities as assistant commercial manager.

Leo C. Coryell has been appointed WPB automotive consultant for Southern California.

S. E. Gates of General Electric Co., has been named chairman of the State Chamber of Commerce committee in

Southern California to study the problems of disposal of surplus government property. Others on this committee include C. W. Giegerich, Consolidated Steel Corp., and Harvey Hewitt, Bethlehem Steel Co., Los Angeles.

Army Air Forces' Materiel Command, Wright Field, Dayton, O., has announced that Adam Dickey, civilian chief and technical advisor of the Materiel Command propeller laboratory, received the Emblem for Exceptional Civilian Service, highest award the War Department can bestow upon a civilian employee.

James L. Straight has been appointed manager of the Los Angeles office of the Aircraft Manufacturers Council and its parent organization, the Aeronautical Chamber of Commerce. He has resigned as director of the Production Division, Aircraft War Production Council.

Col. Franklin C. Wolfe, chief of the Army Air Forces' Materiel Command armament laboratory, and world authority on aerial armament, has been relieved from duty pending retirement caused by physical disability. Col. R. E. Jarman is acting chief of the armament laboratory.

W. H. Loeber, formerly sales development manager for the eastern district, Electric Appliance division, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has been named eastern district manager, Electric Appliance division.

Frank Gaines of So-Cal Foundry, Los Angeles, has been named a member of the OPA industry advisory committee, representing aluminum and magnesium foundries.

Wilbur A. Lazier has resigned as research group leader in the chemical department, E. I. du Pont de Nemours

& Co. Inc., Wilmington, Del., to become director of the Southern Research Institute, which will establish laboratories at Birmingham, Ala.

Roy L. Clark, consulting engineer, has resigned as regional chief of the technical advisory service, Smaller War Plants Corp., and has returned to his private business in Des Moines, Iowa.

Ralph H. Norton, president, Acme Steel Co., Chicago, has been named president of Chautauqua Institution.

M. G. Lowman, personnel and public relations director of Andrews Steel Co., Newport, Ky., has resigned to accept a similar post with Waco Aircraft Co., Troy, O.

Walter H. Bodle has been appointed manager of the manufacturing plant and warehouse which Square D Co., Detroit, is opening at 2310 Ranier avenue, Seattle 44.

Hubert Glatte, formerly assistant purchasing agent, National Gypsum Co. Inc., Akron, O., has been appointed district engineer in western New York for Industrial Oven Engineering Co., Cleveland.

Theodore P. Wright, former vice president, Curtiss-Wright Corp., New York, has been named administrator of the Civil Aeronautics Administration.

Thomas O. Armstrong, manager of industrial relations, East Springfield, Mass., plant, Electric Appliance division, Westinghouse Electric & Mfg. Co., has been re-elected president of the National Association of Personnel Directors.

James S. Rose, formerly supervisory methods engineer in charge of heating and ventilation, Curtiss-Wright Corp., Buffalo, has been named manager of the San Francisco branch office of Ilg Elec-

tric Ventilating Co., Chicago. The San Francisco office has been moved to 826 Sharon building, 55 New Montgomery street, San Francisco 5.

James H. Miller, superintendent of the electrical department, Wisconsin Steel Co., Chicago, has been elected president, Electrical Maintenance Engineers. Harry G. Buckles, chief electrician, Ingersoll Steel and Disc division, Borg-Warner Corp., Chicago, is the new vice president of the association.

Alfred Marchev, president, Republic Aviation Corp., Farmingdale, N. Y., has been named president of the Aircraft War Production Council, East Coast, succeeding Victor Emanuel, president, Aviation Corp.

Joseph Muncey, formerly head of the Curtiss-Wright Corp.'s model shop, Kenmore, N. Y., has been appointed shop manager of the Airplane division's research laboratory.

George F. Kerbey has been named director of the Fumigant division in the eastern states territory for Dow Chemical Co., Midland, Mich. His headquarters are in Philadelphia.

Richard M. Wilson has been appointed manager of the Marine division of the Washington government office, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Foster E. Fike has been appointed manager of the Rock Falls, Ill., plant of Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y., succeeding the late Allen N. Bradford.

Arthur H. Young, industrial relations consultant, California Institute of Technology, Pasadena, Calif., and a former



EDWARD G. HARDIG

Who has been named vice president in charge of sales and a director of National Tool Co., Cleveland, as mentioned in STEEL, Aug. 28, p. 72.



STEVENS A. BENNETT

Who has been elected vice president, United States Steel Products Co., Los Angeles, in charge of the Bennett Mfg. division, as announced in STEEL, Aug. 21, p. 69.



JOHN J. TANSEY

Who has been elected vice president, General Alloys Co., Boston, as reported in STEEL, Aug. 21, p. 93.

vice president, United States Steel Corp., Pittsburgh, recently was awarded a certificate of meritorious civilian service to the Navy.

Four promotions in the Union Steel Castings division of Blaw-Knox Co., Pittsburgh, are: R. J. Davis, works manager; John Solomon, assistant works manager; R. J. Heinz, general superintendent, and J. M. Poklemba, superintendent.

Luther L. Jaynes has been appointed manager of the newly-formed Sheet Sales division, Wheeling Steel Corp., Wheeling, W. Va. Assistant managers are: Clyde L. Cunliffe, Glenn D. East and Robert L. Fleming. The new division was formed by merger of galvanized sheet sales and sheet and strip sales.

C. W. Dempsey, formerly vice president and treasurer, Liquid Carbonic Corp., Chicago, has been elected president and director, Central Scientific Co., Chicago.

Ernest P. Weckesser, a veteran of World War I, has been appointed administrator to correlate all activities in connection with employment of returning veterans by B. F. Goodrich Co., Akron, O.

Republic Steel Corp., Cleveland, has announced the following personnel changes in the Central Alloy district: R. F. Horn, divisional superintendent, assumes additional duties as head of the blast furnace and coke plant, steel plant and Stainless division at Massillon, the South Sheet division and the Canton Stark Sheet division; O. A. Bamberger has been made superintendent, Massillon Steel division; Roland Miller succeeds Mr. Bamberger as superintendent



LT. COL. V. A. ARMSTRONG

Who has joined Cone Automatic Machine Co., Windsor, Vt., as announced in STEEL, Aug. 28, p. 73.

of the mechanical department at Massillon; L. G. Briegel fills the newly created position of assistant superintendent of the Massillon Stainless division; E. D. Gibson has been named superintendent, Canton billet sheds; C. P. Houghton succeeds Mr. Millar as assistant superintendent, mechanical department, Massillon, and E. L. Bauman succeeds Mr. Briegel as chief shipper at Massillon.

William W. Knight Jr., formerly sales engineer in Pittsburgh for Morgan Construction Co., Worcester, Mass., has joined the engineering staff of the company's Rolling Mill division, Worcester.

Llewellyn W. Jones has retired as treasurer of Grinnell Corp., Providence, R. I., after serving the company for more than 53 years. He will continue as a director, member of the executive committee and financial adviser to the

company. C. R. Rison, formerly assistant treasurer, has been elected to serve as treasurer for the unexpired period of Mr. Jones' term of office.

J. N. Moorhead has been named manager, Buffalo Works, American Magnesium Corp., Cleveland, subsidiary of Aluminum Co. of America, and A. H. Hinton succeeds him as manager of the parent company's Cleveland Works sand foundry.

D. F. Newman has been named engineer in charge of the Refrigeration Engineering division, General Electric Co., Schenectady, N. Y., and L. W. Atchison has been appointed assistant engineer of the division. Mr. Newman succeeds Christian Steenstrup, holder of 113 patents covering many phases of refrigerator manufacture and engineering, who is retiring after 43 years with the company, but who remains as a consultant.

E. D. Page has been appointed controller, Colorado Fuel & Iron Corp., Denver.

A. Carl Tiedemann has been named executive vice president and general manager, Dockson Corp., Detroit. For several years he served as chief of the Parts and Supplies Branch, Engineering and Manufacturing Division, Office of the Chief of Ordnance, Detroit.

Milton Roy Pumps, Philadelphia, has announced appointment of the following representatives: W. K. Sims, 24 Commerce street, Newark, N. J.; George P. Schumacker, 1120 Chester avenue, Cleveland; J. J. Heinrikson, 421 B.M.A. building, Kansas City 8, Mo., and Charles Holz, the Industrial Equipment Co., Charleston 23, W. Va.

OBITUARIES . . .

Samuel Naismith, 74, who retired in 1935 as superintendent of the masonry department, South Works, Carnegie-Illinois Steel Corp., South Chicago, Ill., following 24 years of service, died Sept. 1 in Chicago. He was credited with invention of the open-hearth sloping backwall, one of the most valuable improvements to be made in the past 20 years in open-hearth design.

George R. Curtiss, 74, one of the men who helped found the Monroe Calculating Machine Co., South Haven, Mich., 33 years ago, died Sept. 3 in Cleveland. He had been assistant division manager for the company in Cleveland since 1927.

Percy L. Grammer, 70, retired assistant purchasing agent of the Pennsylvania railroad, Philadelphia, died recently in Washington. Since his retirement at

the beginning of this year, Mr. Grammer had been affiliated with WPB as chief of the Motive Power Section, Transportation Equipment Division.

Philip H. Stott, 52, chemist with the technical laboratory of the Dye Stuff division, E. I. du Pont de Nemours & Co. Inc., in Deepwater, N. J., died Aug. 29 in Wilmington, Del.

Fred Tod, 58, director, Youngstown Sheet & Tube Co., Youngstown, O., and president, Columbia Engineering Co., Hamilton, O., died recently in Youngstown.

Dr. Grant W. Curliss, 69, president, Fish Rotary Oven Co., Beloit, Wis., until its sale about five years ago, died Aug. 27 in Beloit.

Raleigh H. Barnes, 46, assistant director of research, American Steel & Wire Co., Cleveland, died Sept. 2 in

Cleveland. Mr. Barnes had been associated with the company for 24 years.

Milton H. Fellows, 62, who 20 years ago founded the Mellen Metals Co., Cleveland, died Aug. 31 in that city.

Ernest P. Nowell, 64, for 13 years president, E. P. Nowell Co. Inc., New York, died there Aug. 30.

Daniel T. Dobyns, 59, eastern representative of Flynn & Emerich Co., New York, died Sept. 4 in Montclair, N. J.

Paul Stewart, 62, president of Paul Stewart & Co., Cincinnati, dealers in electrical and steam machinery, died recently in that city.

S. Taylor Wilson, 75, retired president and general manager Tippet & Wood Co., sheet metal fabricators, Philadelphia, N. J., died Sept. 3 in Easton, Pa.

Steel Foundries Reopens Cast Armor Plant

Resumption of operations at East Chicago works made necessary by Army's accelerated tank production program

PREPARATORY to producing steel armor castings for the Army again, the cast armor plant of American Steel Foundries, East Chicago, Ind., was reopened Aug. 28. Col. John Slezak, chief, Chicago Ordnance District, said re-opening of this \$26,000,000 government-owned plant has been made necessary by the Army's accelerated tank production program.

The plant, which originally began operation in October, 1942, was ordered to cease production last May and was put in a standby condition.

American Steel Foundries will require a manufacturing force of approximately 2000 before full production can be resumed.

International Harvester Forms New Foreign Unit

International Harvester Co., Chicago, has announced formation of a foreign operations organization which will be in

charge of all the company's foreign activities except Canadian. G. C. Hoyt, heretofore vice president in charge of foreign sales, will head the new organization as vice president.

C. N. King, until now manager of foreign sales, becomes director of foreign operations, and will be assisted by an executive staff of specialists, designated as managers of foreign manufacturing, sales, engineering, accounting, supply and inventory, merchandising services, and treasury. These executives will be stationed at the general offices in Chicago.

A. M. Rode, formerly European controller and assistant treasurer of the company, has been appointed to the newly created position of director-general of European operations and will have charge of all European activities. After the war, he will maintain residence in Europe. J. L. Camp, formerly an executive of International Harvester Co. of Argentina has been appointed director-general of Latin American operations in a completely new set-up.

Interlake Chemical Buys Central Process Corp.

Interlake Chemical Corp., Delaware, O., chemical producer wholly owned by the Interlake Iron Corp., Cleveland, and by the Great Lakes Steel Corp., Detroit, a division of the National Steel Corp., reportedly has purchased the Central Process Corp., Forest Park, Ill.

A wide line of synthetic resins and plastic materials has been developed by the Central Process Corp. R. G. Booty

will continue to direct the Central Process Corp. Factory and research laboratory are at Forest Park but executive offices will be located in Cleveland. Interlake's general offices are in Cleveland and it maintains offices in Chicago also.

New officers of Central Process are Leigh Willard, president; J. A. Mitchell, vice president, and J. R. Alderman, secretary-treasurer.

Barium Steel Corp. Buys Clyde Iron Works Inc.

Barium Steel Corp., Canton, O., plans to buy the Clyde Iron Works Inc., Duluth, Minn., for about \$1,500,000, Rudolph Eberstadt, president of Barium Steel, announced recently.

Barium will buy all preferred and common stock of Clyde Iron deposited for sale, paying \$100 a share for preferred stock plus accrued dividends at 5 per cent from last July 1 and \$32 a share for common stock. No public financing was involved.

BRIEFS . . .

Jones & Laughlin Steel Corp., Pittsburgh, reports the three millionth howitzer shell rolled down the production line at its McKeesport works recently.

Moore Machinery Co., Los Angeles, has been appointed exclusive representative for the complete line of Reed Prentice Corp.'s die casting machines and also the complete line of improved type plastic injection molding machines in the Los Angeles territory.

Crosley Corp., Cincinnati, has appointed the Woodward, Wight & Co. Ltd. as distributor in southern Mississippi, southwestern Alabama and northwestern Florida.

American Standards Association, New York, has approved a fourth revision of terminal markings for electrical apparatus and approved a new war standard for American Truncated Whitworth threads so that Whitworth screw threads produced by American manufacturers may be interchangeable with British Standard Whitworth threads.

George Scherr Co. Inc., New York, announces resumption of publication of its house organ "Precise Production."

Carboloy Co. Inc., Detroit, plans to exhibit at the National Metal Exposition in Cleveland next month products made by independent tool manufacturers using cemented carbides supplied by Carboloy.

Ilg Electric Ventilating Co., Chicago, has moved its San Francisco branch office to larger quarters at 826 Sharon building, 55 New Montgomery street, San Francisco.



VETERAN: C. H. Reynolds, vice president, Sheffield Corp., Dayton, O., receives a 25-year service pin from Louis Polk, president of the company. Mr. Reynolds' headquarters are in Detroit

Programs for Placing Returning Servicemen in Jobs Developing

Early "dischargees" give industry experience in reorienting soldiers and sailors in civilian life. Many plans advanced for assisting veterans and utilizing new skills and training acquired while in service

By J. M. KURTZ
Assistant Editor, STEEL

URGENCY for planning rehabilitation and re-employment of war veterans becomes more apparent daily as the end of the war nears. Between 45,000 and 75,000 servicemen are being discharged monthly from the armed services and with these men industry is obtaining the practical experience in placement which will prove of inestimable value when the war ends and the task of finding jobs for the 13,000,000 men and women in uniform is cast into their laps.

At present, the placing of ex-servicemen is not too difficult because there are many types of work from which to select. But this condition probably will not exist when peace-returns for there will be a surplus of manpower. Thus far more than 500,000 of the 1,279,000 veterans already discharged have been placed by the Veteran's Employment Service of the War Manpower Commission.

Currently 75 per cent of the veterans being discharged from service are not returning to their old jobs. They are seeking new ones in line with new skills and training which they acquired in service.

When jobs become scarce, government officials believe the discharged veterans will notify their draft boards that they intend to take advantage of their statutory right to obtain their preservice jobs. This safeguard is provided for the veterans in the Selective Service act.

Although a veteran may make his own arrangements for accepting employment, three agencies are responsible for assist-

ing him to obtain a job if he calls upon them. These agencies are the Selective Service System, U. S. Employment Service, and the Veterans' Administration.

Selective Service, through its local boards, has the responsibility of assisting veterans who desire to return to their old jobs. Re-employment committeemen are attached to the local boards to assist in this procedure. The USES plays a highly important role in the employment of returning veterans. Both the Selective Service and Veterans' Administration are utilizing the USES to assist in placement. Within the USES is a Veterans' Employment Service which has the specific responsibility of carrying out the job with at least one veterans' employment representative at each local USES office. The Veterans' Employment Service also has a representative attached to the administra-

tive staff of USES in each state to coordinate veteran employment activities within the state.

The Retraining and Re-employment Administration, a recently established agency in the Office of War Mobilization, has been given overall responsibility in the general supervision and direction of the activities of all government agencies relating to the retraining and re-employment of persons being discharged or released from the armed services or other war work.

The Servicemen's Readjustment act of 1944, better known as the G. I. Bill of Rights, is designed to permit veterans to select the type of training they prefer.

Briefly summarized, the steps employers are advised to take in employing discharged veterans are:

1. Contact the Veterans' Employment

This war veteran at the right, being examined by an Inland Steel Co. doctor, does not have full control of his injured right foot. He has been placed on a job in a machine shop which does not require use of the right foot. NEA photo

These two veterans, center, are now working on an X-ray control in the X-ray division, Westinghouse Electric & Mfg. Co., South Philadelphia, Pa.

Many of the returning servicemen, like the one at the far right, must undergo special therapeutic exercises before they are able to take their place in industry. This war veteran is having his feet rehabilitated by foot exercises. NEA photo



Division of USES. Find out how it can help.

2. Contact the re-employment committeeman of the local draft board. Find out how he may be able to help in obtaining workers.

3. If there is a Veterans' Service Committee in the community, keep it advised of employment opportunities.

4. If the employer knows of any veterans who are returning, contact them directly. It is not necessary for veterans to clear through the USES in obtaining their first jobs.

Typical of the steps being taken by industry to meet the great postwar problem of placing discharged servicemen is that of Borg-Warner Corp., Chicago. More than fifty Borg-Warner officials, division executives and key men met recently in Chicago to discuss industry's responsibility to help discharged servicemen and women readjust themselves to productive civil life.

Many communities are undertaking plans to aid the returning servicemen. Altoona, Pa., has developed a plan which has been suggested as a model for other cities throughout the nation. Altoona has pledged counselling service and personal guidance to every veteran from the day he marches home until he becomes fully adjusted to civilian life. Fifty of the city's and county's most prominent industrial and professional leaders have formed a Veterans' Counselling Committee.

Committee members intend to help the veterans obtain the jobs for which they are best suited. Or, they will aid those

who wish further training to select the schools or courses where they can best obtain the training they want. An inventory has been made of available jobs in Altoona. Members of the committee have received a special seven weeks course in personnel counselling and vocational guidance at Pennsylvania State College to better prepare themselves for the task.

An office has been opened in Altoona, a full-time secretary employed, and the members of the committee rotate in interviewing veterans.

A selective placement system for the handicapped set up by the War Manpower Commission will play an important part in fitting veterans into the proper jobs. A job analysis method has been developed which places emphasis upon the physical capacities and other qualifications of the workers in their specific relationship to the physical demands and other requirements of jobs. Prior to this in job analyses, major emphasis was placed upon disability as the important selection factor.

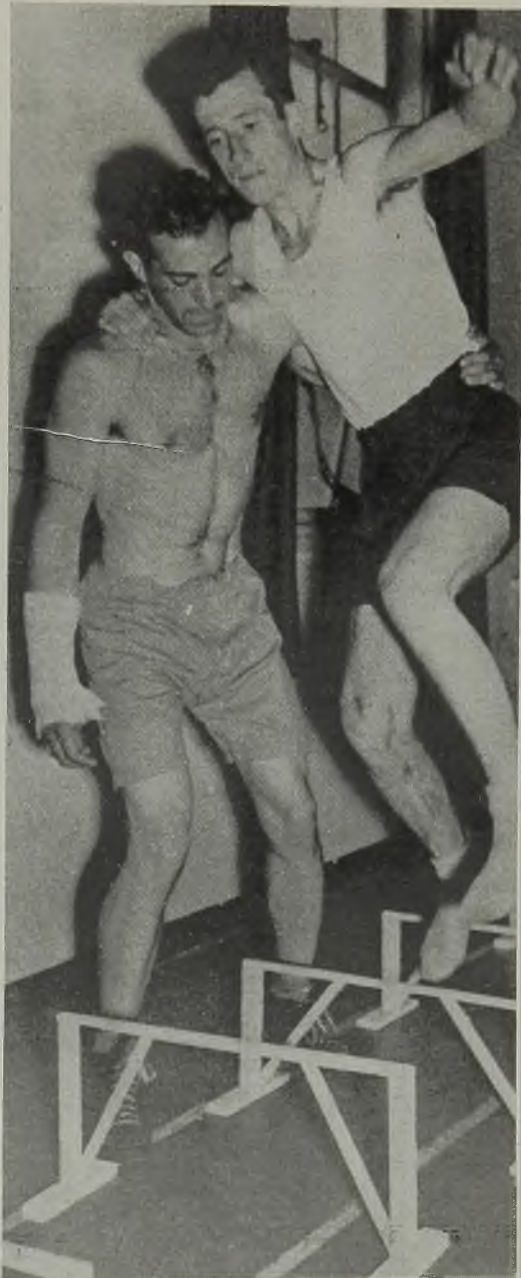
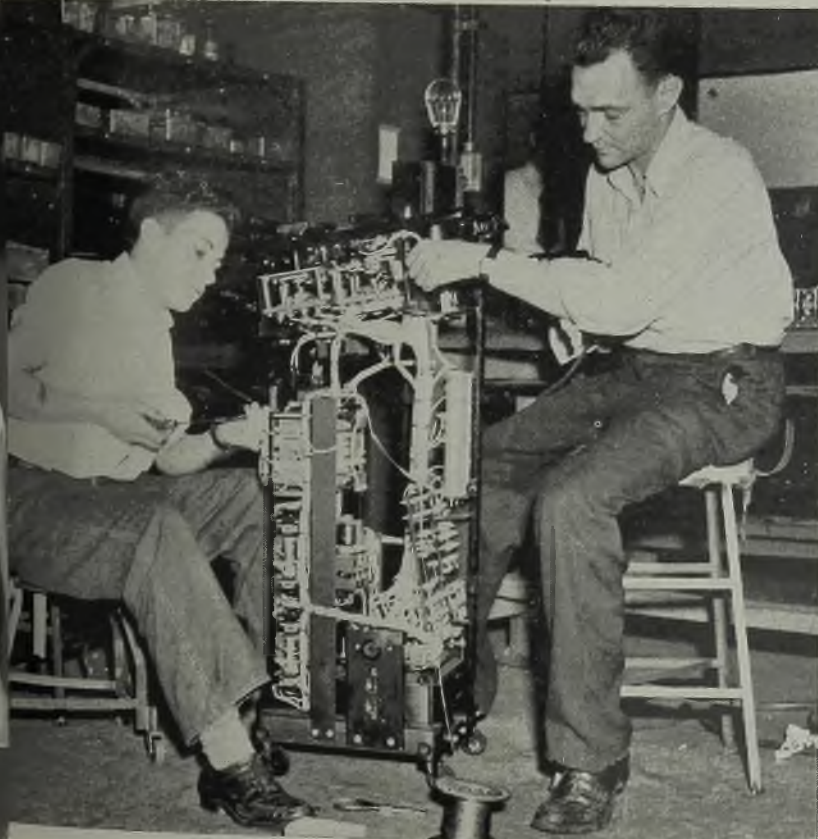
Three plans concerned with the re-employment and readjustment program which are attracting nation-wide attention are those known as the Peoria plan, the Connecticut plan, and the Governor's Committee Plan in Illinois. Under these plans, the returning veteran or the displaced war worker will report to a central co-ordinating committee whose function it will be to maintain accurate information relative to occupational trends in the community, available occupational agencies interested and accessible for

training, medical care, rehabilitation and re-employment.

The industry plans may be summarized as orienting the returning veteran and co-operation with existing community and federal agencies. This would include analyzing personnel data, with particular attention to the applicant's history, medical status, interests, needs, job requirements, training, skill, etc.

National Association of Manufacturers' Committee on Supervisory Relations, New York, points out that one of the foremost objectives of industry should be the special training of foremen for the important role they must play in the rehabilitation of returning war veterans, particularly during the critical first few weeks of their changeover from military to civilian life.

The committee suggests that management
(Please turn to Page 204)



THE BUSINESS TREND

Order Backlogs Reduced On Many War Programs

INTENSIVE pressure for delivery of the great majority of war goods items continues unabated, sustaining production schedules somewhat below the peak levels recorded late last year. Order backlogs in most industrial lines have tended downward in recent months, reflecting effort of manufacturers to reduce inventories to a workable minimum in view of the possible early termination of the European war.

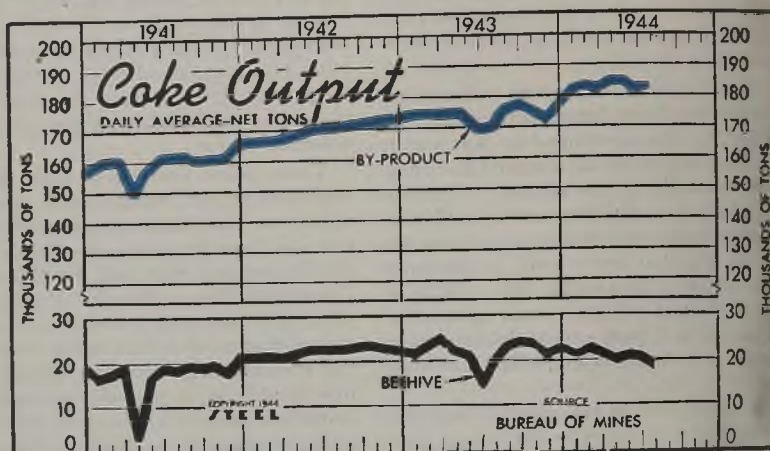
Major industrial indicators recorded encouraging gains during the latest period. The national steel rate recovered most of the ground lost during the preceding week, in advancing 1.5 points to 96.5 per cent. Gains were also recorded in electric power consumption, bituminous coal output, petroleum production, engineering construction awards, truck assemblies and revenue freight traffic. However, for the holiday week period ended Sept. 9, these industrial indicators will probably register a moderate decline, due to the observance of Labor day by many concerns.

RECONVERSION—Once war with Germany is over, the War Production Board will scrap virtually all controls over production of civilian goods (See page 80). Industry will be allowed, according to the availability of markets, men, materials and plants "to do the swiftest and most effective job possible of restoring civilian goods production", J. A. Krug, acting chairman, WPB, said. Under WPB's plan there will be only one preference rating, in addition to the present emergency triple-A rating, and this will be reserved exclusively for military programs during the war against Japan. The CMP procedure for allocating steel and copper will be continued only for the quarter in which hostilities in the European war theater cease. Allocation orders will be continued for "tight" materials such as lumber, textiles, and certain chemicals.

MANPOWER—The output of one out of every three civilian workers is going to

war, the Bureau of Foreign and Domestic Commerce estimates. About 15 million of these are nonfarm wage and salary earners. Only about 5 million are directly employed in manufacture of aircraft, ships, tanks, guns, explosives, etc. Those employed in government war agencies or in production of raw materials and machinery where expansion for war purposes is beyond any probable peacetime market, number roughly 2 million, the bureau states. Most of the other civilian war workers are in industries whose output for war does not differ much from prewar civilian output in the kind of plant facilities and manpower required.

COKE OUTPUT—Daily average output of by-product coke was up 0.2 per cent during July to 182,177 net tons. Easing in demand resulted in some beehive ovens being taken out of service during July with a consequent reduction of 4.5 per cent in daily average beehive coke output to 19,957 net tons.



Coke Output
Bureau of Mines
(Daily Average—Net Tons)

	By-Product		Beehive	
	1944	1943	1944	1943
January	182,226	174,044	21,933	21,440
February	184,384	175,099	22,248	23,987
March	183,123	175,051	21,529	24,369
April	185,259	175,857	20,457	22,948
May	184,071	174,400	20,783	21,200
June	181,891	168,900	20,472	14,000
July	182,177	170,100	19,557	20,400
August	.....	176,396	.....	23,102
September	.....	178,090	.....	23,637
October	.....	175,492	.....	23,495
November	.....	171,594	.....	20,423
December	.....	179,042	.....	22,935
Average	.....	174,465	.....	21,795

FIGURES THIS WEEK

INDUSTRY

	Latest Period*	Prior Week	Month Ago	Year Ago
Steel Ingot Output (per cent of capacity)	96.5	95.0	97.0	99.0
Electric Power Distributed (million kilowatt hours)	4,450†	4,418	4,399	4,351
Bituminous Coal Production (daily av.—1000 tons)	2,012	1,978	2,058	2,040
Petroleum Production (daily av.—1000 bbls.)	4,700†	4,667	4,651	4,235
Construction Volume (ENR—unit \$1,000,000)	\$69.3	\$37.3	\$31.8	\$61.7
Automobile and truck output (Ward's—number units)	20,055	19,855	20,220	15,350

*Dates on request.

TRADE

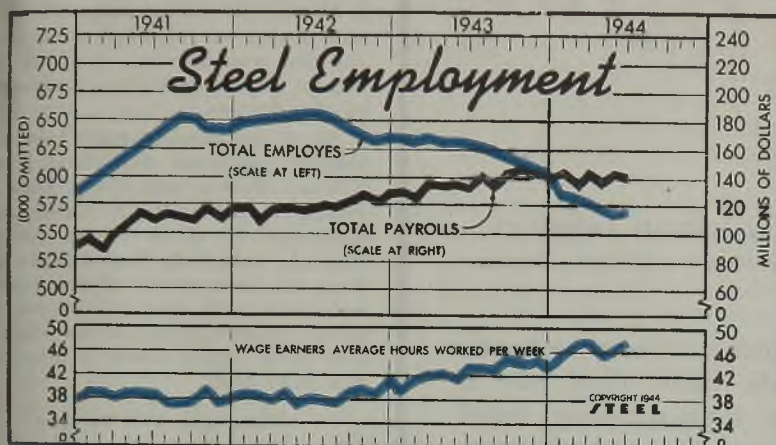
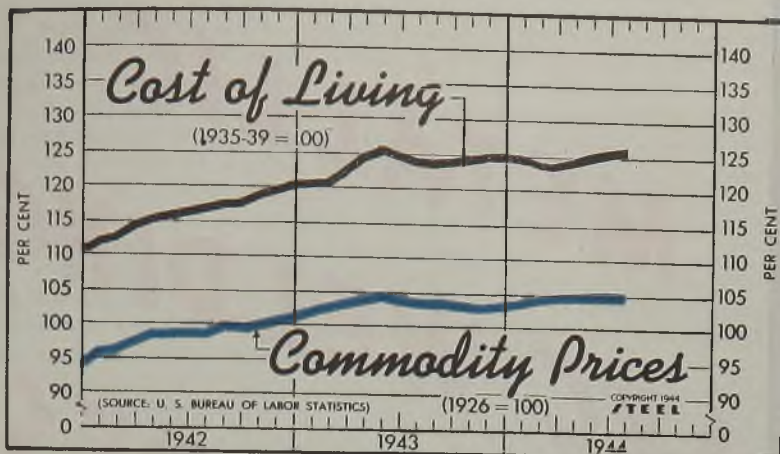
	Latest Period*	Prior Week	Month Ago	Year Ago
Freight Carloadings (Unit—1000 cars)	915†	906	890	901
Business Failures (Dun & Bradstreet, number)	14	22	19	26
Money in Circulation (in millions of dollars)†	\$23,221	\$23,047	\$22,134	\$18,571
Department Store Sales (change from like week a year ago)†	+1%	+13%	+11%	+15%

†Preliminary. †Federal Reserve Board.

Wholesale Commodity Price— Cost of Living Indexes

	Commodities— (1926 = 100)			Living Costs— (1935-39 = 100)		
	1944	1943	1942	1944	1943	1942
Jan.	103.3	101.9	96.0	124.2	120.6	112.0
Feb.	103.6	102.5	96.7	123.8	120.9	112.9
Mar.	103.8	103.4	97.6	123.8	122.8	114.3
Apr.	103.9	103.7	98.7	124.6	124.1	115.1
May	104.0	104.1	98.8	125.1	125.1	110.0
June	104.3	103.8	98.6	125.4	124.8	116.4
July	104.1	103.2	98.7	126.1	123.9	117.0
Aug.	103.1	99.2	99.2	123.2	117.5	
Sept.	103.1	99.6	99.6	123.9	117.8	
Oct.	103.0	100.0	100.0	124.4	119.0	
Nov.	102.9	100.3	100.3	124.1	119.8	
Dec.	103.2	101.0	101.0	124.4	120.4	

Avg. 103.2 98.8 123.5 116.5
*Preliminary.



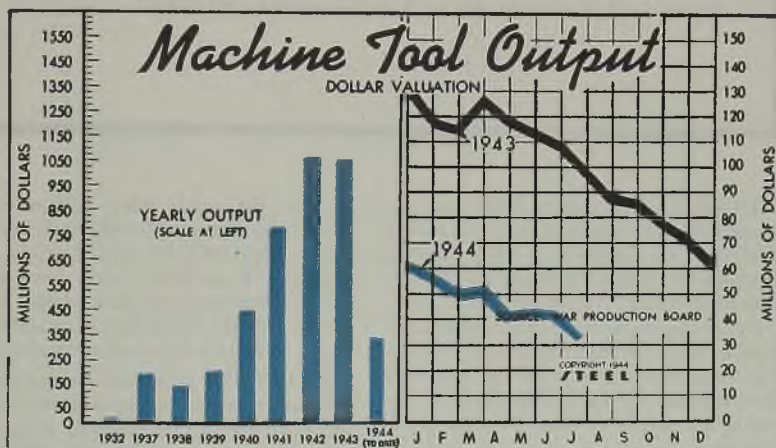
Steel Employment

	Employees— (000 omitted)			Total Payrolls— (Unit—\$1,000,000)		
	1944†	1943	1942	1944	1943	1942
Jan.	583	637	651	\$141.8	\$129.7	\$118.8
Feb.	583	635	651	137.6	122.8	108.5
March	578	637	653	145.3	136.8	117.0
April	573	634	654	138.9	133.3	118.5
May	569	632	656	145.4	137.4	117.4
June	570	631	659	140.5	136.2	118.0
July	627	655	655	142.8	120.7	
Aug.	625	647	655	139.9	118.7	
Sept.	620	641	655	143.8	124.8	
Oct.	615	635	655	144.9	126.6	
Nov.	611	632	655	141.5	122.8	
Dec.	605	633	655	140.2	129.3	

†Monthly average; previous reports showed total number regardless of whether they worked one day or full month.

Machine Tool Output

	(000 omitted)		
	1944	1943	1942
Jan.	\$56,363	\$117,384	\$ 83,547
Feb.	50,127	114,594	84,432
Mar.	51,907	125,445	98,358
Apr.	41,370	118,024	103,364
May	41,819	113,859	107,297
June	41,471	103,736	111,090
July	33,916	97,428	113,596
Aug.		87,405	117,342
Sept.		85,842	119,833
Oct.		78,300	130,008
Nov.		71,811	120,871
Dec.		60,861	131,960
Year			
1942			1,321,862
1941			812,462
1940			450,000
1939			210,000



FINANCE

	Latest Period*	Prior Week	Month Ago	Year Ago
Bank Clearings (Dun & Bradstreet—millions)	\$8,639	\$8,793	\$9,943	\$8,098
Federal Gross Debt (billions)	\$211.2	\$210.9	\$210.1	\$148.0
Bond Volume, NYSE (millions)	\$24.9	\$28.5	\$36.8	\$30.4
Stocks Sales, NYSE (thousands)	3,311	3,792	4,504	2,579
Loans and Investments (millions)†	\$55,906	\$56,383	\$57,065	\$46,719
United States Government Obligations Held (millions)†	\$41,875	\$42,229	\$42,460	\$34,209

†Member banks, Federal Reserve System.

PRICES

	Latest Period*	Prior Week	Month Ago	Year Ago
STEEL's composite finished steel price average	\$56.73	\$56.73	\$56.73	\$56.73
Spot Commodity Index (Moody's, 15 items)†	250.3	250.6	249.6	246.8
Industrial Raw Materials (Bureau of Labor index)†	112.8	114.3	113.8	112.7
Manufactured Products (Bureau of Labor index)†	101.1	101.1	101.1	100.0

†1931=100; Friday series. 1926=100.

METALLIC ARC WELDING ELECTRODES

By HAROLD LAWRENCE
Metallurgist and Welding Engineer

Mr. Lawrence resumes his outstanding series on selection of proper electrodes for specific applications with a discussion of stainless steel types. Hard surfacing, nickel and nickel alloy, cast iron, copper alloy and aluminum types will be covered in future issues of STEEL

AS WOULD be expected, the war has stimulated the application of stainless steel metallic arc welding electrodes as has been the case with thousands of metallurgical tools. Heretofore the lion's share of the stainless steel electrodes has gone into the chemical and food processing industries where welding materials were required to match the corrosion resisting properties of the stainless irons and steels.

During the war this same use has continued at an accelerated rate but even more important has been the adoption of stainless electrodes for welding armor on tanks and ships. This latter use developed from two very desirable properties of the stainless steel electrode types: First, the good physical properties associated with stainless weld deposits; and, second, the remarkable freedom from heat affected zone cracking in hardenable steels specified for armor plating.

Although this series of articles has tried to stress the welding electrodes, it has been necessary to cover steels in a limited manner to provide essential background information for the correct selection of arc welding electrode grades. When stainless materials are under dis-

cussion, the relationship that exists between the plate materials and the filler metal deposited by arc welding electrodes is, if anything, even more important. Therefore the first phase of this article will be devoted to a consideration of six well known stainless grades.

In 1943 the American Iron and Steel Institute reported the production of stainless steel by specific analysis groups and these are shown in Fig. 1. Over half the steel made was of the 18-8 (in discussing stainless steels it is customary to show the chromium content first followed by the nickel content) composition which very likely included allied types such as 18-8 columbium and 18-8 molybdenum. The second most important tonnage was the 12 to 14 per cent chromium analysis with the high chromium and high chromium-nickel grades contributing the next large block. The smallest tonnage subdivision was the 16 to 18 per cent chromium composition.

Stainless steels are commonly classified according to their AISI (American Iron and Steel Institute) numbers which refer to specific ranges of principal elements. Thus the six types to be covered in this study are AISI 308, 347, 316,

310, 410 and 430. The reasons for selecting these particular types will become obvious.

AISI Type 308, 18-8 Stainless Steel: Some liberty will be taken when the AISI names and numbers are given together. This becomes necessary for consistency with arc welding practice where higher analyses are selected to provide a margin of safety for losses of essential elements during arc transfer. While type 308 is more properly a 20-10 type, it is here considered as an 18-8. And electrodes with type 308 core wire are often used for the following 18-8 types: AISI 301X, 302, 304 and 308.

Stainless steels are those containing more than 10 per cent chromium. They may or may not have nickel in their composition. Those without nickel are classified as ferritic and are magnetic. Those with nickel are classified as austenitic and are nonmagnetic. A simple permanent magnet provides a ready means of identification.

All of the stainless steels have some unusual properties that have a pronounced effect on weldability. Those important to the austenitic chrome-nickel steels are: (1) 40 to 50 per cent less thermal conductivity than mild steel, (2) 6 to 12 times greater electrical resistance than mild steel, (3) 50 per cent greater thermal expansion than mild steel and (4) a slightly lower melting point than mild steel.

Features of 18-8 Stainless

The reduced thermal conductivity means that a lower welding current can be used to secure satisfactory welds and also suggests a retention of heat adjacent to the weld with a slow cooling of both the weld and the heat affected zone. With 18-8 stainless steels slow cooling of the parent steel alongside the weld leads to trouble. This difficulty concerns itself with the phenomenon of carbide precipitation which renders 18-8 susceptible to intergranular corrosion.

In the range of 800 to 1500 degrees Fahr. 18-8 stainless steel undergoes a structural change with the carbon separating out in the form of chromium carbide along the grain boundaries. By so doing the steel alongside the grain boundaries becomes poor in chromium and thereby unable to resist many corrosive media.

Carbide precipitation is influenced by at least four factors: (1) Time in the critical temperature range; (2) temperature reached; (3) carbon contained; and (4) chromium and nickel contents. The longer the time in which the 18-8 remains in the carbide precipitation temperature range, the more acute will be carbide formation and chromium depletion at the grain boundary region. As the temperature increases from 800 to 1500 degrees Fahr., the rate of carbide formation becomes different with the most rapid development of chromium carbides occurring in the neighborhood of 1200 degrees Fahr. Higher carbon contents provide the carbon essential to the

chromium carbide compound which accounts for a more pronounced attack in the higher carbon austenitic steels where conditions favorable to intergranular corrosion have been allowed. Increased chromium and nickel contents with a constant carbon content diminish the harmful effect of carbide formation with a 20-10 analysis being a better type than an 18-8.

Carbide precipitation is important only when the degree reached permits corrosive attack in the service for which the weldment was designed. In mild corrosive environments the presence of chromium carbides may be of no significance. Since the physical properties are virtually unaffected, carbide formation is inconsequential where physical attributes rather than corrosion resistance dictated the selection of an 18-8 analysis.

There are two ways of combatting carbide precipitation. The first is a cure and the second is a preventive. Austenitic stainless steel containing chromium carbides at the grain boundaries can be heated to 1850 to 1900 degrees Fahr. and held for a long enough period to bring about a solution of the carbides. Next a rapid cool to a temperature below 800 degrees keeps the carbon uniformly dissolved. But there are some weldments that cannot be treated so drastically. For these the preventive in the form of a columbium or titanium bearing steel is indicated.

AISI Type 347, 18-8 CB Stainless Steel: Since the 18-8 stainless steels were readily fabricated by welding, it was apparent that some means to overcome the objectionable formation of chromium carbides would greatly extend the utility of this analysis. A stabilizing element was sought and was eventually discovered in both columbium and titanium. The former proved useful in both plate and electrodes while the latter could be used in plate alone as it was entirely lost in passing through the welding arc. With suitable columbium and titanium contents heat affected zones could pass through the 800 to 1500 degrees Fahr. range repeatedly without introducing any lessened corrosion resistance. Other than a slight deterioration in ductility, the other properties of the 18-8 remained substantially the same.

AISI Types 316-317, 18-8 MO Stainless Steel: Molybdenum modified stainless steel has been recognized for quite some time as a superior analysis to resist the pit type of corrosion. It has been used both with and without columbium in many services where its particular stainless properties were needed. In addition this analysis enabled the War Production Board to save enormous quantities of scarce chromium and nickel by proving most effective in the welding of armor that previously had to be done with 25-20 electrodes.

AISI Type 310, 25-20 Stainless Steel: Corrosion resistance is but one of the two particular properties of the stainless steels that account for their widespread use. Resistance to oxidation is the other. Thus the higher analyses are selected for serv-

THE Joint AWS-ASTM Committee on Filler Metal has been hard at work for some time on matters relating to standards for filler metal. This committee consists of the following subcommittees:

SUBCOMMITTEE I on Iron and Steel Arc Welding Electrodes is under the chairmanship of the writer and has published its tentative specifications for iron and steel arc welding electrodes for a number of years, the latest issue being Serial Designation A-233-43T. This specification is still, unfortunately, tentative and we are making still further revisions after which we are hopeful that it can lose its tentative state.

SUBCOMMITTEE II on Iron and Steel Gas Welding Rods is under the chairmanship of J. H. Critchett and has developed a specification, Serial Designation A-251-42T. These specifications are tentative and it is expected that revisions will be made to them during the year.

SUBCOMMITTEE III on Aluminum and Aluminum Alloy Filler Metal is under the chairmanship of G. O. Hoglund and recently completed specifications for aluminum and aluminum alloy arc welding electrodes. It has still the work of writing similar specifications for aluminum and aluminum alloy gas welding rods. Their welding electrode specification carries Serial Designation B-184-43T.

SUBCOMMITTEE IV on High Alloy Steel Filler Metal is headed by R. D. Thomas as chairman. This subcommittee has been considering for a year or two now this most difficult specification and it is expected that they will report to their main committee shortly.

SUBCOMMITTEE V on Nickel—Nickel Alloy Filler Metal has O. B. J. Fraser as chairman. This subcommittee has written a specification which includes the filler metal of nickel, monel, inconel, illium and several hastelloy compositions, and it is hoped that they will report to their main committee and submit a specification shortly.

SUBCOMMITTEE VI on Copper and Copper Alloy Filler Metal has C. E. Swift as chairman. This subcommittee is preparing specifications for copper and copper alloy electrodes and it is hoped that they will make a report in the near future.

SUBCOMMITTEE VII on Hard Facing Materials.—Much data have been collected on hard surfacing electrodes and their deposits. A new subcommittee has been approved but as yet no chairman has been nominated for this work.

J. D. Deppeler, Chairman

Joint AWS-ASTM Committee on Filler Metal

ices where the greater cost of these types is more than offset by increased life. Furthermore the more highly alloyed varieties show an almost complete freedom from carbide precipitation so no stabilization is required.

AISI Type 410, 13 Per Cent Chromium Stainless Steel: Straight chromium stainless steels are selected either for resistance to corrosion or for high temperature service where oxidation must be fought. The physical properties of the straight chromium steels are somewhat different from those that were discussed under the chromium nickel steels.

The coefficient of expansion of the straight chromium steels approximates that of mild steel. Heat conductivity is half to two-thirds that of ordinary steel. Electrical resistance is three to six times that of plain steel. And melting points are only slightly less than those of the carbon steels.

Type 410 steel is unusual in several respects, first of which is the fact that it is hardenable. Response to heat treatment increases with carbon content as is commonly the case with all steels. It is a more difficult steel to weld than the chro-

mium nickel varieties because of the formation of brittle deposits and heat affected zones. It is not subject to intergranular corrosion resulting from carbide precipitation. Under all heat conditions the carbides stay in solution.

AISI Type 430, 17 Per Cent Chromium Stainless Steel: There is little difference in behavior between types 410 and 430. Resistance to corrosion and oxidation improves with greater chromium content and the range of physical properties achieved through heat treatment varies. Oftentimes the plain chromium stainless steels are welded with chrome-nickel electrodes where corrosion response permits.

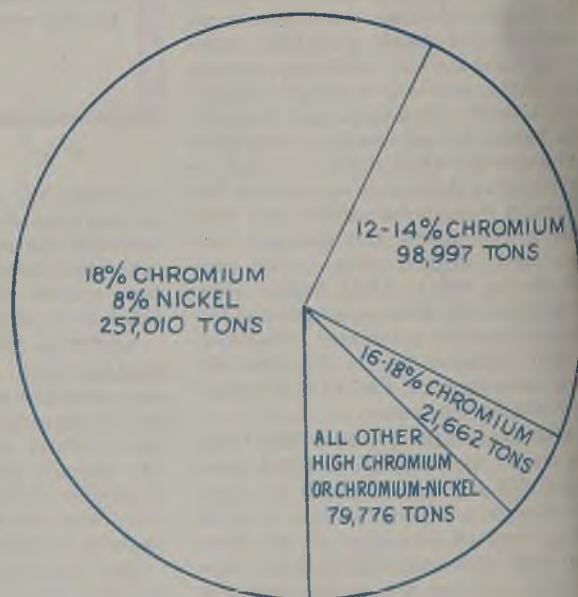
Thirteen manufacturers of stainless steel arc welding electrodes are reported in Table I. For convenience the types of electrodes made by each are given with specific information being restricted to the six most popular types now under discussion. It must be remembered that there are more than 30 types of stainless steel electrodes in use today with new combinations likely as the anticorrosion properties of still more alloy combinations come to the fore.

Chemical composition of core wire and

TABLE I
MANUFACTURERS AND TRADE NAMES OF POPULAR STAINLESS STEEL ELECTRODES

Manufacturers	Austenitic				Ferritic		Other
	18-8 AISI 308 Primary- Yellow Secondary- None	18-8Cb AISI 347 P-Yellow S-Blue	18-8 Mo AISI 316-317 P-Yellow S-White	25-20 AISI 310 P-Red S-None	13 Cr AISI 410 P-Grey S-Brown	17 Cr AISI 430 P-Grey S-Green	
Alloy Rods Co.	Arcaloy Type 308	Arcaloy Type 347	Arcaloy Types 316-317	Arcaloy Type 310	Arcaloy Type 410	Arcaloy Type 430	Yes
Yorck, Pa.	Chromend K	Chromend 19/9 Cb	Chromend K MoCb Chromend 18/8 Mo	Chromend HCN Stainlend HCN	Chromend 12	Chromend 16	Yes
Arcos Corporation	308	347	316 317	310	410	430	Yes
401 N. Broad St. Philadelphia							
Champion Rivet Co. Harvard Ave. & East 108th St. Cleveland 5							Yes
Harnischfeger Corp.	Harstain 18-8	Harstain 18-8 Cb	Harstain 18-8 Mo	Harstain 25-20			Yes
4400 W. National Ave. Milwaukee 14, Wisc.							
Hollup Corporation	Sureweld Type 18-8	Sureweld Type 18-8 Cb	Sureweld Type 18-8 Mo	Sureweld Type 25-20	Sureweld Type 12-14 Cr	Sureweld Type 16-18 Cr	Yes
4700 W. Nineteenth Street Chicago 50							
Lincoln Electric Co.	Stainweld A-5 Stainweld A-7		Stainweld C	Stainweld D			
12818 Coit Road Cleveland 1							
McKay Co.	Type 308	Type 347	Type 316 Type 317	Type 310	Type 410	Type 430	Yes
York, Pa.							Yes
Metal & Thermit Corp.	Murex 18-8	Murex 18-8 Cb	Murex 18-8 Mo	Murex 25-20 Type 310 AC-DC			Yes
120 Broadway New York 5							
Page Steel & Wire Div. American Chain & Cable Co., Inc., Monessen, Pa.	Page- Allegheny 18-8	Page- Allegheny 18-8 Cb	Page- Allegheny 18-8 Mo	Page- Allegheny 25-20 Racolloy 25-20	Page- Allegheny 12% Cr	Page- Allegheny 16% Cr	Yes
Reid-Avery Co.							Yes
Dundalk, Md.							
A. O. Smith Corp.	SW 162	SW 157	SW 160 SW 161	SW 159		SW 154	Yes
Milwaukee 1, Wisc.							Yes
Universal Power Corp.	Stainarc A	Stainarc B	Stainarc C Stainarc D	Stainarc L	Stainarc M	Stainarc O	
4900 Euclid Ave. Cleveland 8							
Westinghouse Electric & Mfg. Co. Nickelchromeight E. Pittsburgh, Pa.	Nickelchromeight Columbium						

Fig. 1—Distribution of 457,448 tons of stainless steel produced in the United States in 1943 as reported by the American Iron and Steel Institute



weld deposit has been a matter of much interest to the users of stainless steel electrodes. It has been customary for the producers of these electrodes to vie with each other on the alloy content of the core wire used. First this was 18-8, later it became 19-9 and ultimately grew to 20-10 for the ordinary 18-8 welding work. Although greater alloy content in the core wire was a strong talking point, the composition of the deposited weld metal was the real consideration. Both of these analyses as selected by a majority of stainless steel electrode manufacturers are given in Table II.

Some general and specific observations on chemical analyses ought to be in order: Certain elements are lost when passing through the arc. Of these chromium is the most important. Depending upon the type of coating employed, from 1 to

2 per cent of chromium will be oxidized and unrecoverable in an 18-8 electrode. About one-third of the available columbium will be lost. Nickel and molybdenum will be unaffected by arc transfer. In all of these transfer efficiencies the coating design is most important. Lime type coatings lead to a greater recovery of oxidizable elements than do the titania type of coatings. However the weld metal analysis from either type may be the same as it is customary in the industry to add elements to the coat-

ing to restore those percentages lost going through the arc.

Some of the statements made in the above paragraph may differ slightly from the values found in Table II. But when the added factor of spatter loss and dilution is considered these values may be more readily appreciated.

Carbon in the core wire and deposit is unchanged for all types except AISI Type 310. There a rise in carbon from core to

TABLE II
TYPICAL CORE WIRE AND DEPOSIT ANALYSES OF POPULAR
STAINLESS STEEL ELECTRODES

Common Name	AISI Type	Analysis of	C	Mn	P	S	Si	Cr	Ni	Mo	Cb
18-8	308	Core Wire	0.07	1.75	0.03	0.03	0.40	20.5	9.5		
		Weld Deposit	0.07	1.50	0.03	0.03	0.50	19.0	9.0		
18-8 Cb	347	Core Wire	0.07	1.75	0.03	0.03	0.40	20.5	9.5		
		Weld Deposit	0.07	1.50	0.03	0.03	0.50	19.0	9.0		0.70
18-8 Mo	316	Core Wire	0.07	1.75	0.03	0.03	0.40	19.5	13.5	2.5	
		Weld Deposit	0.07	1.50	0.03	0.03	0.50	18.0	13.0	2.5	
25-20	310	Core Wire	0.10	1.75	0.03	0.03	0.40	26.5	21.0		
		Weld Deposit	0.15	1.50	0.03	0.03	0.50	25.0	20.0		
13% Cr	410	Core Wire	0.10	0.75	0.03	0.03	0.40	13.0			
		Weld Deposit	0.10	0.75	0.03	0.03	0.50	12.0			
17% Cr	430	Core Wire	0.10	0.75	0.03	0.03	0.40	17.0			
		Weld Deposit	0.10	0.75	0.03	0.03	0.50	16.0			

types. In general the balance of properties among the austenitic chrome-nickel steels is better than those reported for the straight chromium varieties. Frequently chromium-nickel steels are selected for the welding of plain carbon steels because of the fine combination of strength and ductility secured in this fashion. For such uses the 18-8 and 25-20 types have been the most widely applied.

Current and voltage ranges shown in Table IV, are rather critical for stainless steel electrodes. Because of the increased electrical resistance of the core wire, it is not unusual for the electrode to overheat when slightly higher currents than those recommended are employed. The red or white hot wire tends to destroy coating adherence in addition to making porous welds. These reasons suggest restraint in the use of high currents if a loss of valuable electrodes is to be avoided. If the coating has been allowed to overheat, it is suggested that the stubs so produced be set aside until they have cooled thoroughly before they are used again. In this procedure the greatest possible strength will be restored to the coating and the electrode may be applied successfully.

Current varies both with the position of welding and the type of material. Bead welding, groove welding and horizontal fillet welding permit the maximum use of current with vertical and overhead welding necessitating the selection of lower currents. Of course allowable currents increase as the section being welded becomes greater. Or the welding of mild steels with stainless steel electrodes calls for higher currents.

Stainless Electrodes Gain

Narrow ranges of voltage are listed because voltage and arc length are vital to the successful application of stainless steel weld metal. Usually the best results come from holding as short an arc as possible. The coating may touch the work although the operator should be sure that all slag formed floats free and does not become trapped in the weld metal. A close arc aids in the conservation of chromium which is more readily destroyed when a long arc is held.

Metallic arc welding of many products with stainless steel electrodes has grown most rapidly. An excellent matching of physical properties and chemical composition has been reached. As a matter of fact stainless steel applications of the metallic arc fusion welding process come the closest of all welding to making the deposited metal exactly like the plate material it is used to join.

Heavily coated electrodes are used. The coating is of either one or another basic type generally spoken of as lime or titania types. Cellulosic coatings may not be employed with stainless steel electrodes which accounts for the standardization on all mineral types for this field. In the lime type of coating calcium carbonate and calcium fluoride are the prime ingredients with other materials being added to round out desirable slag and

(Please turn to Page 144)

TABLE III
TYPICAL PHYSICAL PROPERTIES OF POPULAR STAINLESS STEEL METALS

Common Name	AISI Type	Tensile Strength psi	Yield Point psi	Elongation % in 2"	Red. of Area, %	Impact Strength —in ft./lbs.— Charpy Izod	Endurance Limit psi	Brinell Hardness
18-8	308	80-95,000	35-45,000	35-50	40-65	65-110	85,000	130-190
18-8 Cb	347	80-95,000	35-50,000	30-50	40-65	77	45,000	130-190
18-8 Mo	316	80-95,000	35-45,000	35-50	40-65	70-110	43,000	130-190
25-20	310	85-95,000	45-65,000	35-55	40-60	85-65		155-200
13% Cr	410	65-85,000	35-45,000	20-35	50-65	60-100		130-170
17% Cr	430	70-90,000	40-55,000	20-30	35-55	8-25	50,000	145-185

TABLE IV
CURRENT AND VOLTAGE RANGES FOR POPULAR TYPES OF
STAINLESS STEEL ELECTRODES

Common Name	AISI Type	Diameter inches	Voltage Range	Amperes				Horizontal Fillet
				Flat	Vertical	Overhead	Downhand Fillet and Groove	
18-8	308	$\frac{1}{8}$	23-24	10-40	10-40	10-40	10-40	10-40
		$\frac{3}{16}$	24-25	20-55	20-55	20-55	20-55	20-55
		$\frac{1}{4}$	25-26	70-80	50-65	70-80	70-80	70-80
		$\frac{5}{16}$	26-27	120-130	80-100	80-105	120-130	120-130
		$\frac{3}{8}$	26-27	135-150	100-120	110-125	135-150	135-150
		$\frac{7}{16}$	26-27	150-170	110-130	130-145	150-170	150-170
18-8 Cb	347	$\frac{1}{8}$	27-28	220-250			220-250	220-250
		$\frac{3}{16}$	25-26	70-80	50-65	70-80	70-80	70-80
		$\frac{1}{4}$	26-27	120-130	80-100	80-105	120-130	120-130
		$\frac{5}{16}$	26-27	135-150	100-120	110-125	135-150	135-150
		$\frac{3}{8}$	26-27	150-170	110-130	130-145	150-170	150-170
		$\frac{7}{16}$	26-27	150-170	110-130	130-145	150-170	150-170
18-8 Mo	316	$\frac{1}{8}$	25-26	70-80	50-65	70-80	70-80	70-80
		$\frac{3}{16}$	26-27	120-130	80-100	80-105	120-130	120-130
		$\frac{1}{4}$	26-27	135-150	100-120	110-125	135-150	135-150
		$\frac{5}{16}$	26-27	150-170	110-130	130-145	150-170	150-170
		$\frac{3}{8}$	27-28	220-250			220-250	220-250
		$\frac{7}{16}$	27-28	220-250			220-250	220-250
25-20	310	$\frac{1}{8}$	25-26	70-80	50-65	70-80	70-80	70-80
		$\frac{3}{16}$	26-27	120-130	80-100	80-105	120-130	120-130
		$\frac{1}{4}$	26-27	135-150	100-120	110-125	135-150	135-150
		$\frac{5}{16}$	26-27	150-170	110-130	130-145	150-170	150-170
		$\frac{3}{8}$	27-28	220-250			220-250	220-250
		$\frac{7}{16}$	27-28	220-250			220-250	220-250
13% Cr	410	$\frac{1}{8}$	20-24	25-50	25-35	25-35	25-50	25-50
		$\frac{3}{16}$	22-25	40-60	25-35	25-35	40-60	40-60
		$\frac{1}{4}$	23-26	50-70	30-45	30-45	50-70	50-70
		$\frac{5}{16}$	23-26	60-95	45-80	45-80	60-95	60-95
		$\frac{3}{8}$	23-26	80-135	80-100	80-100	80-135	80-135
		$\frac{7}{16}$	24-28	125-165			125-165	125-165
17% Cr	430	$\frac{1}{8}$	24-28	150-225			150-225	150-225
		$\frac{3}{16}$	25-26	70-80	50-65	70-80	70-80	70-80
		$\frac{1}{4}$	26-27	120-130	80-100	80-105	120-130	120-130
		$\frac{5}{16}$	26-27	135-150	100-120	110-125	135-150	135-150
		$\frac{3}{8}$	26-27	150-170	110-130	130-145	150-170	150-170
		$\frac{7}{16}$	26-27	150-170	110-130	130-145	150-170	150-170

deposit is encountered. This situation is permitted because the increased carbon has no deleterious effect on corrosive properties. Manganese, in the chromium-nickel types, shows a loss from wire to deposit. Both phosphorus and sulphur are seemingly unaffected and thousands of analyses have substantiated this point provided that the coating ingredients are carefully selected to avoid weld deposit contamination. In all cases the silicon in the deposited metal is higher than that

in the core and comes from a reduction of the sodium silicate binder. Chromium losses are found with all types. Nickel losses are indicated although seldom found. Molybdenum shows no loss while the columbium loss is difficult to appraise as columbium is added in two ways. It may be incorporated in the core wire or it may be added through the coating.

Table III presents the physical properties of the six principal stainless steel

Extreme Pressure LUBRICANTS

... for industrial applications. Presented with the permission of The Texas Company from its publication *Lubrication* for August, 1944, are most recent data on lubrication of gearing and machine parts involving steel-to-steel contacts under heavy pressure.

By J. J. MIKITA

Technical and Research Division
The Texas Company
New York

IN 1869, E. E. Hendrick of Carbon-dale, Pa., filed letters of patent for a "new and improved compound to be used in the manufacture of lubricating oils and greases" which he called "plumbolum" and made by heating lead oxide with animal or vegetable oil in a suitable kettle.

The plumbolum or lead soap made by Mr. Hendrick has since been greatly improved and now is an important ingredient in certain gear oils having EP (extreme pressure) properties.

Late in the twenties, a new term "film strength" was coined to describe a characteristic of lubricants containing some forms of sulphur or phosphorus. Demonstrations of their properties were indeed dramatic. When tested with a special machine, straight mineral oil allowed seizure of a steel bearing on a steel shaft under a relatively low load. For comparison, this same oil containing a small percentage of a mysterious "dope" permitted the machine to operate without seizure at loads ten times greater. The treated oil had high "film strength".

It was not long before "film strength"

and "plumbolum" were put to real use concurrently with the development of the hypoid rear axle for automobiles in 1925 by Gleason Works. These axles and those of many other manufacturers require lubricants with extreme pressure properties¹ and plumbolum or lead soap was an important ingredient of many of the 200 brands of lubricants which were on the market by 1933.

The development of extreme pressure lubricants came about without a complete understanding of the exact mechanism of their action. Since this development, however, notable progress has been made in fundamental studies of what occurs on the surfaces of two metals sliding over each other under conditions which do not permit the complete separation of the surfaces with a film of oil.

Some of the current theories regarding seizure of metals and the action of certain type oil additives in preventing seizure undoubtedly will prove of interest to those constantly faced with industrial lubricating problems, and especially those relating to use of extreme pressure lubricants for lubricating a steel surface slid-

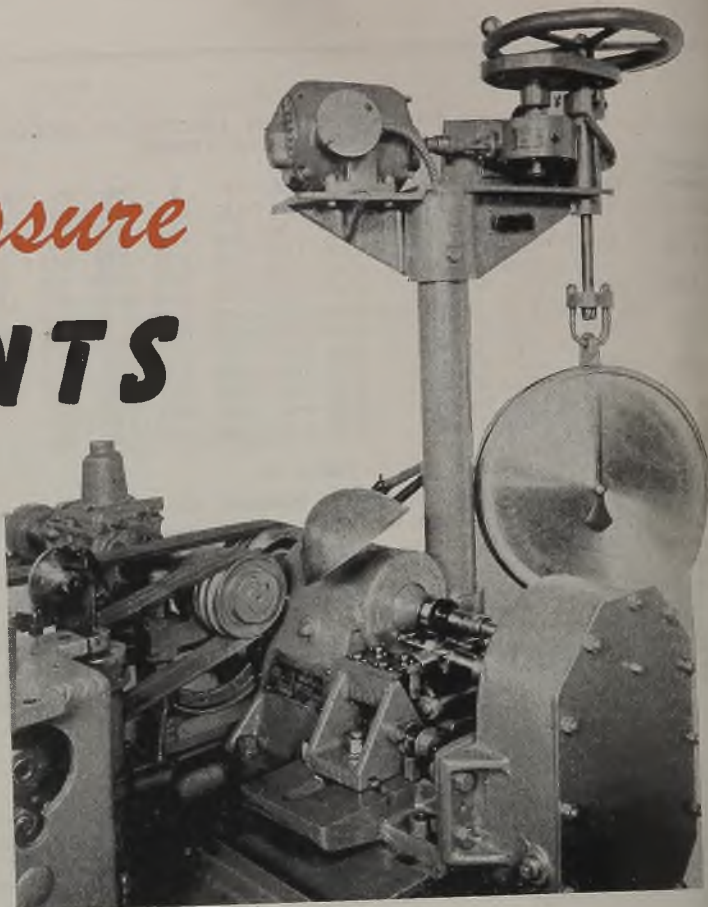
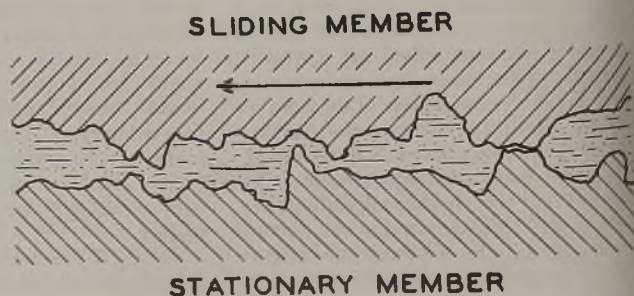
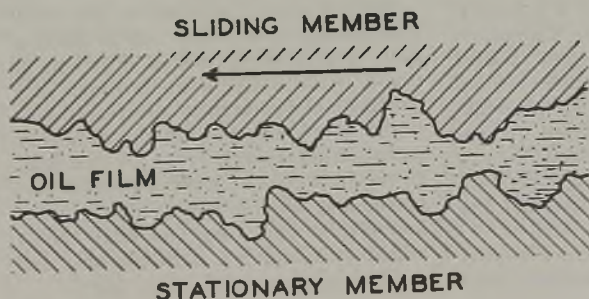


Fig. 1 (Above) — SAE extreme pressure lubricant testing machine. The test specimens consist of two special Timken test cups. The upper cup is rotated at 1000 revolutions per minute in a counter-clockwise direction, and the lower cup is rotated also in a counter-clockwise direction at a speed to give a rubbing ratio of 14.6 to 1. An automatic loading device loads the test specimens at a rate of 77 to 79 pounds per second

Fig. 2 (Left, below) With thick-film lubrication the moving parts are completely separated by an oil film. The roughness of the surfaces is greatly exaggerated

Fig. 3 (Right, below) — With partial boundary lubrication, the oil film is so thin that some of the high spots of the sliding members touch the high spots of the stationary member



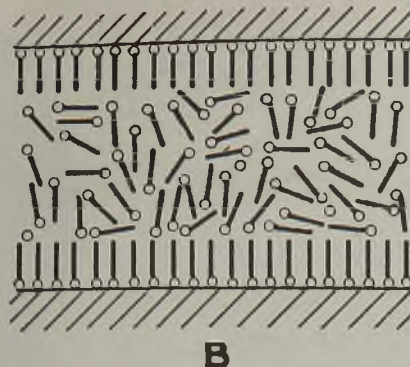
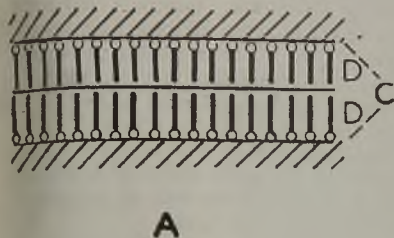


Fig. 4—In A the two surfaces are very close together and the polar molecules are absorbed on each surface in a single layer by the highly active ends C. In B the surfaces are farther apart, and while molecules are oriented on the surface, those in the center have no surface to which to attach themselves so they float around at random. (Figure from Pye, "The Internal Combustion Engine.")

ing over another steel surface as in the case of gearing or reciprocating machine parts.

Thick-Film Lubrication

When one surface slides over another in the presence of a lubricant, two different types of lubrication can exist:

1—Thick-film or hydrodynamic lubrication

2—Boundary lubrication

In thick-film lubrication the parts are completely separated by a film of oil. Since 1883, when Beauchamp Tower discovered that pressure was created in the oil film in a bearing, research workers have so completely explored this type of lubrication that today not only can a designer design machine parts so that sliding members are separated by a film of oil, but he can also tell you how thick the oil film will be, how hot the oil will become in passing through the bearing and most important of all, under what conditions the oil film will become so thin that the high spots of the sliding member begin to touch the high spots of the stationary member and thus pass from thick-film lubrication to partial-boundary or boundary lubrication.

Fig. 2 represents two surfaces, one a stationary surface and the other a sliding surface. The jagged peaks are the ridges left by grinding, lapping or other operations. These ridges actually exist and can be seen with the aid of a microscope. They can even be measured with instruments developed in the last 15 years. So long as the load on the surfaces does not exceed a particular value set by the designer, or so long as the speed is maintained above a certain minimum value and the oil viscosity is not too low for the

design, the parts will be separated by an oil film, and the only thing that will happen when one surface slides over the other is that the oil film will be sheared continuously. Under these conditions, the only important characteristic of an oil is its viscosity. The addition of phosphorus, chlorine or sulphur compounds to the oil can serve no useful purpose under these conditions; viscosity is the controlling factor and these compounds do not affect viscosity in the amounts in which they are normally added. The term "film strength" as applied to thick-film lubrication, therefore, has no significance. The oil film cannot be considered in terms of some material having resistance to puncture or which has tensile strength. It is a fluid material which supports the load entirely by hydraulic action, and the oil characteristic which controls this action is viscosity.

If the oil viscosity is increased, the oil film becomes thicker and more work is required to slide the moving member. In other words, the friction is increased. However, if the oil viscosity is decreased the film becomes thinner and although the work to slide the moving member is less, the high spots approach nearer to each other and the transition from thick-film to partial-boundary lubrication is ap-

proached. Similarly, if the load is increased or the speed is decreased, the two surfaces approach each other and again the action approaches partial-boundary lubrication.

Boundary Lubrication

When conditions of load, speed and oil viscosity are such that the oil film is too thin to completely separate the sliding member from the stationary member and the high spots begin to touch each other as illustrated in Fig. 3, thick-film lubrication no longer exists and the condition is termed partial-boundary lubrication. As the load is increased or the speed is decreased, more and more of the high spots come in contact and the force required to drag the sliding member over the stationary member increases. Eventually a stage is reached where speed and viscosity do not play a major role, and a transition is made from partial-boundary to boundary lubrication. What actually happens in the very thin film of oil clinging to the high spots and also what happens to the contacting surfaces involves both chemical and physical phenomena. Many brilliant experiments have been conducted to increase our understanding of this type lubrication, and from these experiments

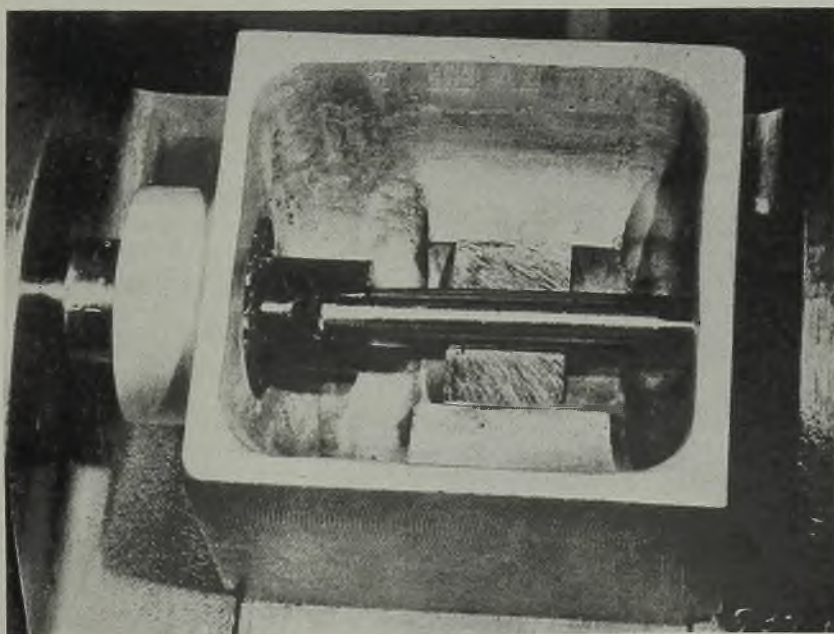


Fig. 5 (Right)—Almen EP lubricant testing machine showing test specimen boat with test pin and one-half of the test bushing installed. The $\frac{1}{4}$ -inch diameter steel rod operates at 600 revolutions per minute. The cold-rolled steel half bushings are ground to have a clearance of 0.006-inch on the steel rod. Load is applied by the addition of lead shot to a container on the loading bar

it is possible to piece together a partial explanation of the behaviour of the surfaces which come in contact and also the behavior of molecules which are there attempting to prevent destruction of the surfaces.

It has long been known that certain materials termed oiliness agents are effective in reducing friction under partial-boundary lubrication conditions. These materials are high molecular weight organic compounds containing carbon, hydrogen and oxygen as compared to lubricating oils which contain only carbon and hydrogen. The castor oil molecule which has the property of oiliness, differs from the lubricating oil molecule in one other important respect, namely, that one end is highly reactive and has the property of forming a powerful bond with the metal surface. It is called a polar molecule. It is "adsorbed" to the surface so powerfully that the last traces in some cases can be removed by nothing short of grinding. The lubricating molecule has no such effect. Pye² describes these polar molecules when they are attached to a surface as long molecules sticking out like the flexible bristles of a brush and he illustrated them with the diagrams of Fig. 4. Here the two neighboring surfaces each carry a single molecular layer of polar molecules in which the small circles at C represent the strongly adsorbed ends of the polar molecules and D the inactive hydrocarbon chains.

As Pye says, references to active ends of molecules are not unjustifiable flights of fancy. Physical measurements have shown that polar molecules act as described. We even know the length of such molecules. For example, the length of the oleic acid molecule, a molecule which exhibits oiliness properties, is one ten millionth of an inch.

Temperatures of Contacting High Spots

Before we consider what actually happens at the surfaces of the high spots when they begin to contact each other, it might be well to briefly review the brilliant experiment of Bowden and Ridler.³ These two scientists measured surface temperatures of contacting high spots by using the rubbing contact of two different metals as a thermocouple. When sliding constantan over mild steel, the electromotive force generated indicated that the average temperature of the high spots in contact was over 1800 degrees Fahr. When using lead on mild steel the temperature rise was 591 degrees Fahr., which corresponded to the melting point of lead. Since the electrical contact was made at the point of friction, information was obtained about the temperature of the high spots which were rubbing each other. These temperatures were high enough so that in the case of lead, actual melting occurred. With constantan on steel, the temperature was high enough to weld steel to steel.

Bowden and Ridler also learned that the temperature of the high spots increased with speed and load to reach a maximum which corresponded to the melting point of the material under test.

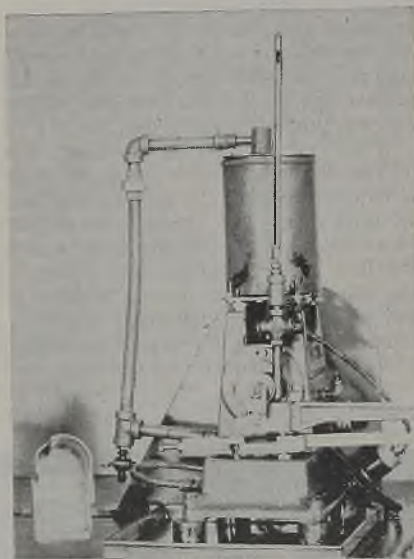
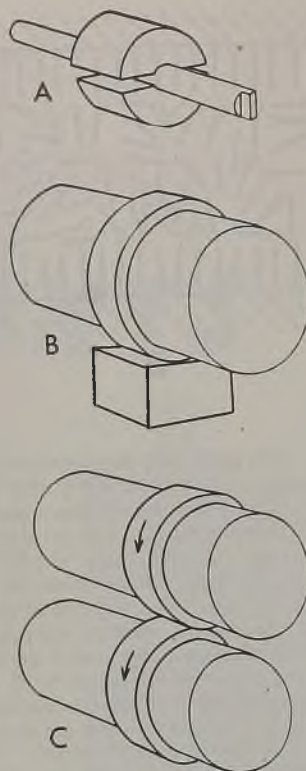


Fig. 6 (Top) Diagrammatic sketch illustrating the principle of operation of A Almen, B Timken and C SAE extreme pressure lubricant testing machines. In all three cases the rubbing surfaces are steel on steel

Fig. 7 (Bottom) — Timken EP tester. A special Timken cup is rotated at 800 revolutions per minute on a hardened steel block. The load is applied by a system of levers which forces the block up against the rotating cup

For example, the maximum temperature obtainable with lead was 591 degrees Fahr., the melting point of lead. With harder materials, materials of higher melting point, the maximum temperature was higher. This is readily understandable if one considers that the higher the tensile strength of the material, the greater is the energy expended in deforming one high spot with another and since this energy is dissipated in the form of heat, the greater will be the temperature of the high spots.

Welding of High Spots

Now we are ready to consider what happens at the surfaces of contacting high spots. In the case of steel on steel, the lubricant present, even the adsorbed polar molecules, cannot prevent high spots from deforming and breaking off to form fresh surfaces of clean metal. When two freshly formed surfaces come in contact, the temperature of these surfaces, as demonstrated by Bowden and Ridler, reach very high values, welding takes place, and rupture of the metal to form more fresh surfaces occurs. If conditions are right, more and more metal is torn off and eventually scuffing occurs. By this time most of the prominent high spots have been removed and instead of welding of the small peaks of a few high spots, larger areas weld, thus leading to seizure.

The entire situation is aggravated as the speed and load is increased. Bowden and Ridler demonstrated that with the higher loads the maximum temperature is reached at a lower speed and conversely, at a high speed, the load required to reach maximum high spot temperature is lower than at slow speeds.

This phenomenon explains why the lubricants that are satisfactory for spiral bevel gears may not have sufficient EP characteristics for hypoids. The speed at which the teeth of hypoid gears slide over each other is higher and consequently, for the same load, the contacting high spots of hypoid gears are more likely to reach welding temperatures.

Prevention of Welding

The chief function of a lubricant under partial-boundary or boundary conditions is to contaminate the surfaces and thus prevent welding. Oiliness agents do this effectively up to a certain point. The highly reactive ends of the molecules seize the fresh surfaces and cling there tenaciously. Whether they are successful in preventing welding depends on whether they can resist being rubbed off. If the loads are very high, as in hypoid gears, they are rubbed off and thus lose their effectiveness. Under such conditions it is necessary to use other materials to prevent welding.

Certain phosphorous compounds are effective in reducing welding. Hurd and co-workers⁴ have advanced an interesting theory on the action of lubricants containing tricresyl phosphate. Their experimental data indicate that tricresyl phosphate acts as a wear-reducing agent by corrosive action. The

(Please turn to Page 148)



Let Trouble be our Introduction

THERE's nothing like trouble to bring people together. That's why some of Revere's closest friends were gained through a mutual struggle against difficulties, troubles such as occasionally beset any business.

For an example, take the case of an important restricted war product. Rejections were running as high as 25%, due to trouble never before experienced with some of the material used in it. The manufacturer came in person to Revere, explained his difficulties, and asked if we could make any suggestions. We studied the matter in detail, and decided that a change in the traditional method of making the item might produce better results, but at a slightly higher cost. A special test run was made, and this proved to be completely successful. And, to our mutual delight, in the end the cost was not increased.

Revere, you see, has an open mind as well as an informed one, and is always ready to question the customary, find the answers to new problems. If something is worrying you

in your employment of non-ferrous metals, get in touch with Revere, not for ready-made answers, but for whole-hearted cooperation, a joint search for better results. This help is given freely, without obligation, of course. After all, we ought to know something about this business. We have been in it for 143 years.

* * *

Write for your complimentary copy of "Revere Copper and Copper Alloys—Technical Information for Product Designers." Contains 54 pages, with 106 graphs of physical and metallographic properties, a new chemical and physical properties chart, valuable illustrated data on welding.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

Executive Offices: 230 Park Avenue, New York 17, N.Y.

By WILLIAM L. GIBBONS
Metallurgist
Lapointe Machine Tool Co.
Hudson, Mass.

Heat Treating BROACHES

Routine commonly regarded as standard practice for hardening broaches is undergoing many progressive changes in step with widened use of the broach for high-speed cutting of extremely hard metals. Range of equipment insures flexibility to meet changes



Fig. 1—Drawing pull end of a 90-millimeter breech block broach

AS METAL-CUTTING operations by broaching are rapidly broadening, covering a greater range of work parts and materials at higher speeds and deeper cuts, the heat treatment of the metal-removing tool, the broach, of necessity is becoming more flexible in practice and metallurgical aspects.

Unless the tool is properly hardened, often controlled to specific requirements of metals broached, cutting speeds, depth of removal, shape of work parts and previous metal-cutting operations or heat-treatment, the entire broaching procedure is endangered regardless of broach design and other equally important factors on which success in metal removal by broaching depends.

Maximum hardness in the tool is desirable, but overheating the broach to brittleness must be guarded against. The goal in heat-treating practice is to hold within the high but safe range.

The broach is frequently damaged when trouble suddenly develops after a broaching operation has given no difficulty over an extended period. More often investigation of the condition will reveal that internal stresses have been set up in the material being broached by previous faulty heat treatment or metal

cutting. These are released by the broaching cut, causing immediate trouble; variations in density in work-part materials gives similar difficulty on some jobs which have been running smoothly.

While design and many other factors enter into satisfactory and fast metal-cutting by broaching, not the least in importance is hardening room practice.

Considering the fact broaching tools from 0.032 x 4 inches to 7 x 84 inches are heat treated and hardened, that these tools are designed and fabricated of the most costly high speed alloy steels, and that a multiplicity of skilled operations enter into their production before and after passing through the hardening furnaces, importance of hardening practice cannot be overstressed. A tool which may cost upward of several thousand dollars, overheated to embrittlement or

Fig. 2—SAE 50-16-spline finish broach being removed from high heat furnace immediately after reaching furnace temperature. Time is determined by size, shape of part. Operator sights through observation port for pass-out temperature



THE HARDEST METAL MADE BY MAN

Fights Rising Costs



In these 6 Fields of Use

ARE THEY ALL IN YOUR POST-WAR PLANS?

As a tool, Carboloy* **CUTS METALS** at unprecedented production rates . . . As a die, Carboloy **DRAWS AND FORMS** metals into parts of mirror-like finish, split-hair accuracy . . . As a matrix for diamonds, Carboloy reduces dresser costs on **GRINDING** . . . As a wear-resistant metal, Carboloy replaces quick-wearing **MACHINE PARTS** . . . As a long-life gage material, it aids **INSPECTION** work . . . even on your **MAINTENANCE**, installing machinery, wiring, etc., Carboloy—as a drill—saves time, penetrates concrete, etc., incredibly fast.

Take full advantage of the "hardest metal made by man" not only throughout your plant but also as wear-proofed, long-life parts on the products you sell.

*Carboloy Cemented Carbide

CARBOLOY COMPANY, INC.

11141 E. 8 MILE BLVD., DETROIT 32, MICHIGAN

BIRMINGHAM • CHICAGO • CLEVELAND • LOS ANGELES • MILWAUKEE • NEWARK
PHILADELPHIA • PITTSBURGH • THOMASTON, CONN.

- METAL CUTTING
- GRINDING
- INSPECTION
- PLANT MAINTENANCE
- MACHINE OPERATION
- PRESS WORK ON METAL . . .

• and _____
TO "WEAR PROOF" THE
PRODUCTS YOU SELL

CARBOLOY

TRADE MARK



For Cutting
STEEL

TUNGSTEN CARBIDES *** TUNGSTEN CARBIDES WITH TANTALUM AND/OR TITANIUM CARBIDES



Fig. 3—Spray painting broach with copper-base paint in ventilated booth prior to preheating at 1500 degrees Fahr. This is done to prevent decarburization during hardening cycle

otherwise, rendered unsatisfactory by faulty heat treating, becomes a double loss.

What may be catalogued as standard practice in broach hardening, varying naturally in some degree at different shops, is undergoing many progressive changes. There is a trend toward flexibility and change to meet specific needs. The enforced shift during the war from tungsten to molybdenum alloys has become a contributing factor in this, a development already exerting influences which will carry over into postwar era as supply of tungsten alloy steels becomes freer and there is likelihood of a wider range of steels, possibly some of them new.

The greater employment of broaching for increased speeds in metal cutting after the war is an accepted view of many persons in the metal-cutting industries—indeed the war had broadened the scope of broaching for numerous production programs. This unquestionably will have a profound influence on heat treating of these tools.

Heat treating is making possible a wider range in hardenability of work parts broached. While for best performance in broaching a C-25 to C-35 steel, rockwell has had acceptance, materials of work parts hardened well above this range are finished broached without difficulty, also others of lower hardness. At

Fig. 5—Straightening large 49-spline internal gear broach. Hot-straightening to within plus or minus 0.010-inch follows the quenching bath

the Lapointe heat treating department, what is classified as standard or basic practice covering a substantial part of the tonnage hardened follows, in general:

On delivery to the hardening department, all tools are checked for steel symbol which indicates the type and specification of steel used in each application. As both tungsten and molybdenum alloys are used, a further precaution is taken to insure proper heat treatment. After symbol inspection, each tool is spark tested to determine whether or not steel symbol is correct, thereby eliminating subsequent spoilage due to mistaken identity. After type analysis has been determined, tools are wired for hardening operations. This is accomplished by inserting wire through pull slots or other suitable means; thus broaches may be suspended vertically in hardening furnaces.

Balance of Routine

After wiring, tools of the molybdenum type are placed in a furnace operating at a temperature of 600 degrees Fahr. to burn off all cutting oil for subsequent spraying operations. Tools are then removed from the furnace and allowed to cool. A coat of copper-base paint then is applied manually with a spray gun in a ventilated booth, as in Fig. 3. This is done to prevent any possible decarburization during the hardening cycle. When the paint has thoroughly dried, the tools are ready for the preheat furnace, operating at a temperature of 1500 degrees Fahr. The time in preheat will vary for different sizes.

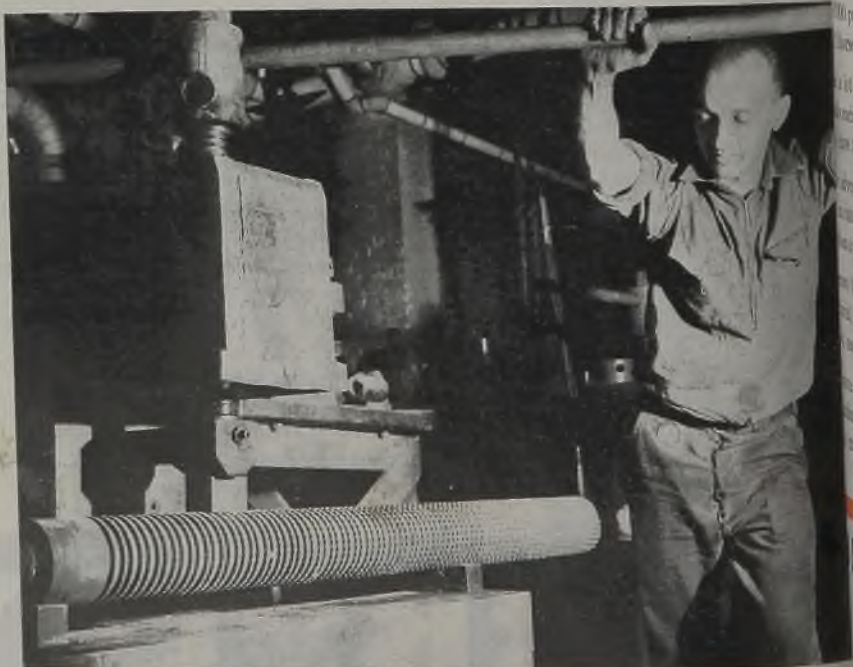
When the preheating cycle is completed the tool is removed to the superheat furnace (Fig. 2) operating at 2210 degrees Fahr. by means of an overhead electric hoist. The broach then is held in the high heat until it has reached furnace temperature, which is determined by visual inspection through an obser-

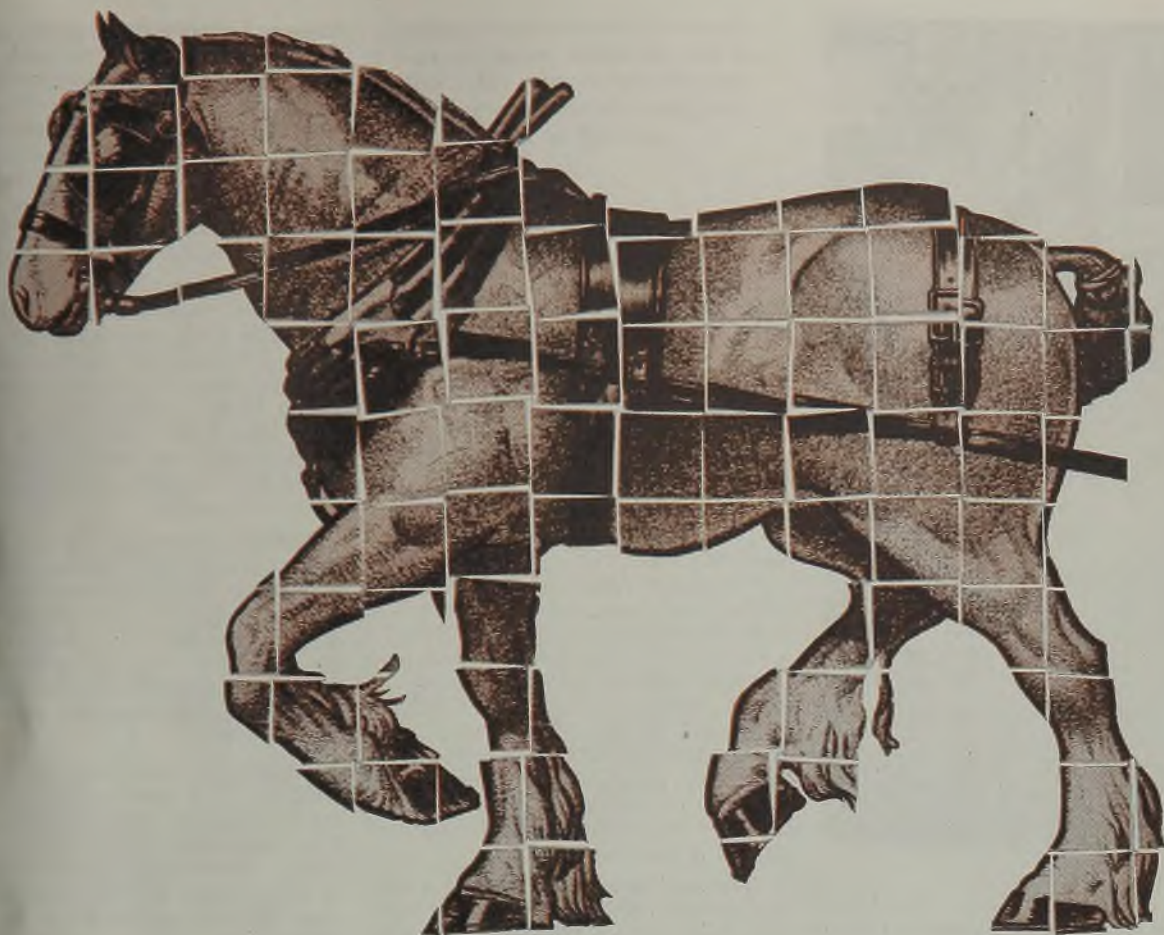


Fig. 4—Sixteen-spline broach is oil quenched at 125 degrees Fahr. upon removal from high heat treatment

vation port in the furnace. This time, of course, will vary according to the size and design of tool, type of furnace used, burner capacity, atmosphere, etc. Long practice has proven that by sighting through the observation port and watching for pass-out temperature, the best control is obtained.

After the cycle in superheat is completed the tools are oil quenched in a bath maintained at a temperature of 125 degrees Fahr. Fig. 4 shows finishing broach being lowered into quench tank. Following removal from quenching bath all broaches are hot straightened to within





James Watt's **horse** has been divided into 100 parts

For centuries "One Horsepower" had meant simply the work that one horse could do.

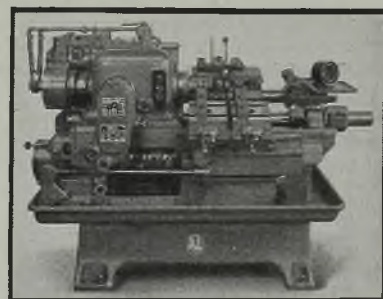
Then, 175 years ago, James Watt gave the term its modern meaning when he borrowed a husky dray horse from an obliging brewer and put the animal to the test. By means of tackles and weights, and some paper work, he determined that the horse could raise 1000 pounds at the rate of 33 feet per minute. So we got our familiar equation, . . . 1 horsepower = 33,000 foot pounds per minute.

This was a lot of power—ideal for draught work—useless for the smaller, more tedious tasks such as operating a razor, a needle, a fan or an egg beater. Only a visionary would have thought of this.

But, the advent and development of electrical power condensed Watt's horse and divided him into a hundred tiny fractions. Power far greater than his is now packed into less than a cubic foot, and fractions of him fit neatly into the palm of your hand.

Tomorrow, these tiny, useful fractions of horsepower will take over more and more of our trivial, but tedious, work. For, today, men with ideas have the help of the makers of modern, fast, accurate machine tools.

For over a century, Jones & Lamson engineers have been helping our most progressive manufacturers to put their newest ideas into profitable production. This accumulation of experience and knowledge is at your service today.



A Jones & Lamson Fay Automatic Lathe tooled to machine the frame for a small electric motor. Fay Automatic Lathes are used extensively to machine parts for all kinds of domestic appliances, that add to our comfort and lighten our work.

JONES & LAMSON

MACHINE COMPANY

Springfield, Vermont, U.S.A.



Profit-producing Machine Tools

Manufacturers of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.

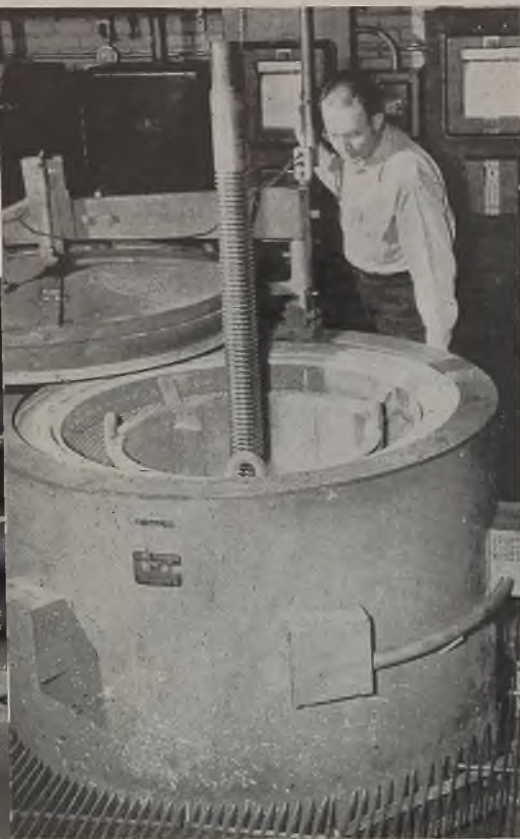


Fig. 6—All tempering at Lapointe is done in Homo tempering furnaces at 1050 degrees Fahr., with cycle again dependent upon shape and size of piece

furnaces are capable of handling tool lengths up to 84 inches.

Broaches of various diameters are hardened from 0.125-inch to 7 inches in these furnaces, to rockwell readings of from C-65 to C-67 consistently, with no decarburization or excessive scaling in evidence. Distortion is held at a minimum due in part to uniformity in hardening furnaces.

One of the most difficult tasks in broach hardening is holding distortion as low as possible, thereby holding to a minimum residual stresses in the finished tool due to too much straightening after tempering.

For small tools, Lapointe operates a battery of high-speed salt baths (Fig. 7) consisting of a preheat, superheat and quench, operating at temperatures of 1500, 2200 and 1150 degrees Fahr., respectively, for molybdenum steels, and 1600, 2350 and 1150 degrees Fahr. for tungstens. These baths are found highly efficient in high-speed hardening because of the uniformity of heating and control of decarburization.

Continued metallurgical control is easily obtained from day to day once holding times are established. These salt bath furnaces are also used for hardening some other alloy steels, such as high-carbon and high-chrome types, with satisfaction. Large numbers of rifling broaches are hardened daily, also cutters, blades and other shapes up to 36 inches long.

All tempering is done in Homo tempering furnaces, operating at 1050 degrees Fahr. Broaching tools are held in Homo

furnaces for various time cycles, depending on the size of tools involved. When the tempering cycle is completed, tools are removed to straightening department where they must be straightened to within plus or minus 0.005-inch. When broaches are brought to within the required tolerances, they are ready for subsequent final grinding operations. In Fig. 6 a 16-spline broach is prepared for stress relief.

In the heat treating of broaching machine parts, including ways made from high alloy steel, vertical high-speed furnaces are utilized, operating at 1800 degrees Fahr. and quenched by means of an air blast, thereby holding distortion low. When ways have cooled to 500 degrees Fahr. they are hot-straightened in the same manner as high-speed steel prior to tempering.

This will reduce the amount of distortion present after tempering and is well worth the added cost and effort. The hardness on these machine ways must be held at C-63 to C-65 rockwell. Six oven-type furnaces, automatically controlled, are used in the heat treatment of many other machine parts too numerous to mention.

Temperature ranges are 1420 degrees Fahr. to 1750 degrees Fahr. for the various types of steel hardened daily. Two large carburizing furnaces are employed exclusively for pack carburizing of many parts. All carburized steel is given the regenerative quench for core properties.

Quenching fixtures are used with many parts to hold distortion at a minimum. Draw straightening fixtures are also used on some complicated fixture parts, thereby eliminating in many cases the hazards of the straightening operation.

Two liquid carburizing baths are in operation to take care of all shallow case-

(Please turn to Page 166)

plus or minus 0.010-inch. See Fig. 5.

For high-speed hardening, two sets of Stewart vertical furnaces are operated, one operating at 1500 degrees and 2210 degrees Fahr. for the molybdenum alloys and the other at 1600 degrees and 2350 degrees Fahr. for tungsten type. All furnaces are automatically controlled by Leeds & Northrup recording instruments using rayo-tubes as the source of control.

The preheat furnaces have two zones of control and the superheat has three control zones. Five recording instruments are used for control of each battery of furnaces and a temperature control of plus or minus 3 degrees Fahr. is maintained throughout the furnace. These

Fig. 7—For hardening small tools, such as these 50-caliber rifling broaches, company operates battery of high-speed salt bath furnaces, finding them highly efficient for uniform heating and control of decarburization



Steve is in there
"plugging"
for you
—still



BACK in pre-induction days when he was working for your Industrial Supply Distributor ♦ Steve kept plugging to find the things you had to have to keep your war output moving on decent schedule.

You didn't see Steve very often—but you profited by his help every day. He knew of sources for the materials you had to have—and he spent hours on end running them down by 'phone. He was plugging for you

then and he is in there plugging for you still.

Today your Industrial Distributor's man-supply is reduced too, but he is organized to help you shortcut a lot of your routine. He can purchase everything that you and many other large users require, on a single shipment from the factory—can draw on stock for deliveries to you as needed.

Take him into your planning. Today and every day—

Telephone your **ISD** FIRST!



The **CLEVELAND**

TWIST DRILL COMPANY
1242 EAST 49th STREET
CLEVELAND

TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES
30 READE ST. NEW YORK 9 NORTH JEFFERSON ST. CHICAGO 650 HOWARD ST. SAN FRANCISCO
6515 SECOND BLVD. DETROIT LONDON - E. P. BARRUS, LTD. - 35-36-37 UPPER THAMES ST. EC4





Postwar Importance of

BENEFICIATED IRON-BEARING MATERIALS

Ore bridge operator adding to the pile of iron ore serving the stack in the background

Second and concluding article covers different procedures followed in blast furnace practice when stack is burdened with full sinter than when soft ore charges are employed. Furnacemen in near future may be compelled to use greater quantities of beneficiated materials in the burden. Ores subjected to beneficiation afford larger production with lower fuel rate and less by-products

By CHARLES E. AGNEW

Consultant
Blast Furnace and Sintering Plant Operations
Cleveland

APPLICATION of the earthy hematite iron ores from the Great Lakes region (1853) introduced the American blast furnace industry into a new era. The character of those ores caused changes of far-reaching effect in the previously accepted furnace practice and the character of those ores altered by beneficiation, likely will cause far-reaching changes in the present practice. For nearly 100 years American blast furnace operating and engineering thought has been devoted to developing blast furnaces, accessory equipment, and practice methods, designed to use natural soft ores to the best advantage and it seems reasonable to believe that these practice methods will reach their peak with the exhaustion of the naturally rich soft ores.

It has been fully demonstrated for 10 years or more in several Eastern District full sinter burden operations that soft ore practice methods are not applicable to a full sinter burden. Therefore, it also seems reasonable to believe that practice developed in the East, will become universally adopted as other districts are compelled to use an ever-increasing percentage of beneficiated materials.

Despite the fact that there have been tremendous developments in methods, furnace construction, and in accessory equipment within the past century, there have been only two new principles of operating economy introduced since the stone stack succeeded the open forge.

Installation of a bell at the top of the stack to make possible the recovery and use of some of the gas in the furnace operation was the first of these. The second was the incorporation of the furnace as a division of the steel plant which provided a market for the thermal value of the balance of the gas over and above the amount which was consumed in the furnace operation and permitted the processing of the metal in the molten state. Both of these divisions of the new principle gave substantial credits to the furnace operating economy.

Use of furnace gas under boilers began in the days of the stone stack and was one of the early attempts to utilize its

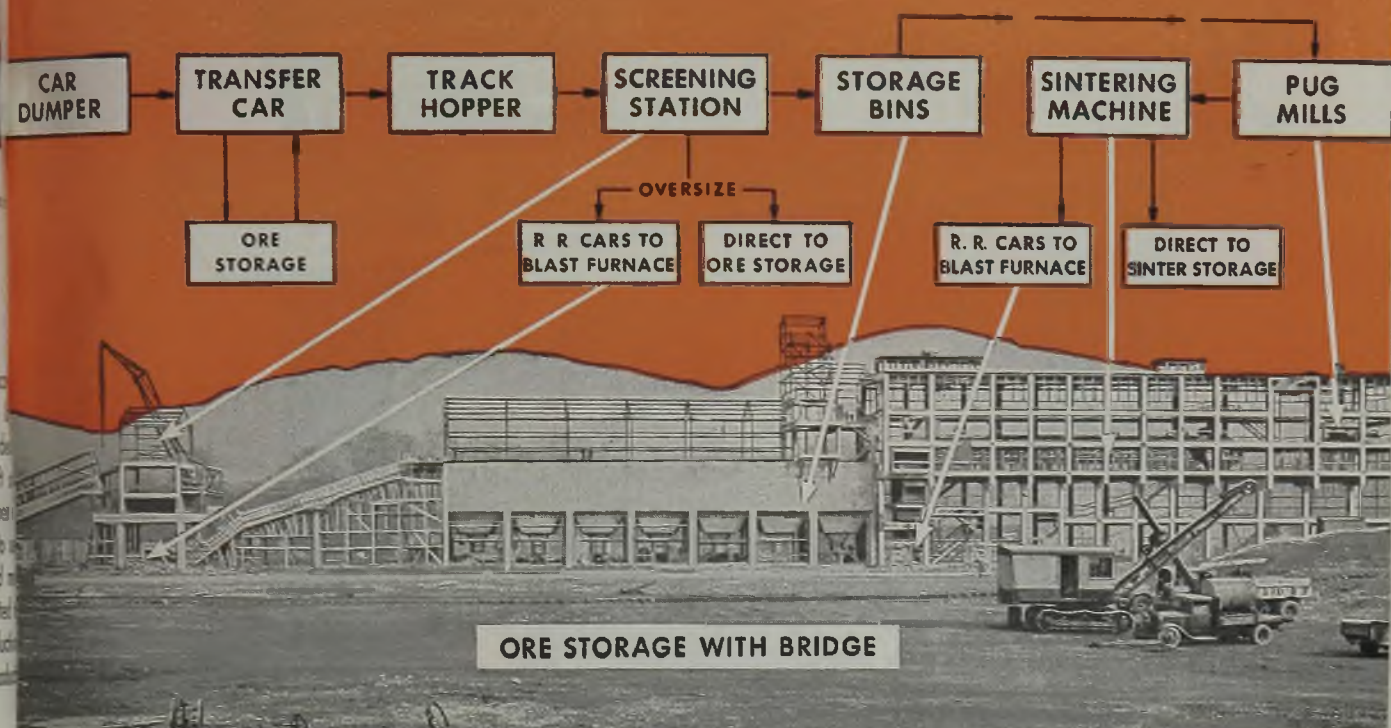
thermal value. The boilers were built on a level with the furnace top, apparently in the belief that the gas could not be forced down to the level of the furnace bottom. Probably the man who first conceived the idea of the downcomer was looked upon by many blast furnacemen as a visionary and radical thinker. But because someone had the courage to try the new idea the practicality of the downcomer was proven and it was possible to locate the boiler plant wherever desired and to transport gas through mains to the distances and for the various purposes it is used today. A second early use of furnace gas was that of preheating the blast.

Early furnaces were all "merchant" plants, that is, independent operations producing pig iron only. Their operating economy revolved around the furnace itself. As recently as World War I many merchant furnace plants were operated profitably. But the economic effect of incorporating the blast furnace as a division of the steel plant was even then in evidence. Developments in the furnace operating economy brought about by the

(Please turn to Page 174)

Modern Screening and Sintering Plant

Designed and built by Arthur G. McKee & Company
for Wheeling Steel Corporation



THE photograph reproduced above shows a modern sintering plant under construction by McKee for Wheeling Steel Corporation. This plant was completed and placed in operation in July.

As indicated by the accompanying flow sheet this plant is built on a simple, straight-line design and provides complete facilities for ore handling and preparation including ore yard, car dumper and storage facilities. The sintering machine is 6' wide by 89'3" long and has 14 windboxes.

The design of this plant is based on a complete study of raw materials, blast furnace requirements and seasonal shipment and storage of ores. Since all materials are received in railroad cars an analysis and flow sheet of all car movements of each ore during shipping and winter seasons was necessary.

Construction of buildings is entirely of concrete to comply with wartime restrictions. Simplicity and ruggedness of plant and equipment have been emphasized throughout.



Arthur G. McKee & Company

★ *Engineers and Contractors* ★

2300 CHESTER AVENUE • CLEVELAND, OHIO

ROCKEFELLER PLAZA
NEW YORK, N. Y.

COMMERCE BUILDING
HOUSTON, TEXAS



EVERY *Logan* LATHE GETS
THIS FINAL INSPECTION



The outstanding performance of Logan Lathes in sustained accuracy and speed results from the exacting care that goes into every detail of construction. In the final inspection, a point-by-point check of the entire machine assures a completed assembly ready for production service. Of equal importance, all individual parts and all sub-assemblies are thoroughly tested as they are manufactured to prevent incorporation in the machine of any part not

up to standard. The rigorous checking of parts, sub-assemblies, and the final inspection, strictly control the consistent accuracy and quality characteristics of Logan Lathes. Ask your nearby Logan Lathe dealer, or write for latest catalog describing all models of Logan Lathes.

Logan

LOGAN ENGINEERING CO.

CHICAGO 30, ILLINOIS

A NAME TO REMEMBER WHEN YOU THINK OF LATHES

TOOL SHANK STANDARDS

REVISED

By O. W. BOSTON*

Director

Department of Metal Processing
University of Michigan
Ann Arbor, Mich.

Preferred sizes listed in new edition approved by
American Standards Association

REVISION of the American Standard for Tool Shanks and Tool Posts for Lathes, Planers, Shapers, Boring Mills, and Turret Lathes (B5.2-1943) recently received final approval by the American Standards Association. The revised standard, developed under the sponsorship of Society of Automotive Engineers, National Machine Tool Builders Association, and American Society of Mechanical Engineers, presents a list of preferred sizes for square and rectangular tool bits, tool shanks, and tool holders. In addition, it includes a section on nomenclature applicable to various types of tool posts used on lathes, turret lathes, boring mills, planers, and shapers.

The first edition of the American Standard for Tool Holder Shanks and Tool Post Openings was completed in 1929 under the chairmanship of Paul M. Mueller. Its single table gave the shank section (width and height) of toolholder openings for lathes, planers, and shapers, and the lathe-center heights for a variety of sizes of tool shanks.

In 1935, a revision of this standard was started when Technical Committee 2 on standardization of tool shanks and tool posts was organized, with O. W. Boston as chairman, under the ASA Sectional Committee on the Standardization of Small Tools and Machine Tool Elements. The first work of this technical committee was to develop nomenclature for several types of tool posts. After standard nomenclature was agreed upon, extensive surveys were made to list current sizes of tool bits and shanks of high-speed steel, cast nonferrous metals, and sintered-carbide-tipped tools. This table grew to be quite extensive in the course of development, as tools

were being made in many different sizes by the various manufacturers. Length of bits and tools was particularly variable.

TABLE I
LENGTH OF FLAT, OF SQUARE TOOLS
FOR THE SECTIONS INDICATED

Cross Section ¹ Square	Length, l	
	Solid Tools (S) ²	Tipped Tools (T) ³
$\frac{1}{8}$	2	
$\frac{1}{4}$	2½	2¼
$\frac{3}{8}$	2½	2¼
$\frac{1}{2}$	3	2½
$\frac{5}{8}$	4	3½
$\frac{3}{4}$	4½	4
1	6	4½
1 1/8	7	7
1½	8	7
1¾	10	9

All dimensions are given in inches.

¹ All other lengths for standard square tools are considered special.

² Solid tools include such tools where the full section cutting end only of the full shank section consists of metal-cutting material.

³ Tipped tools are those where a relatively small piece of metal-cutting material is attached to the tool shank.

TABLE II
LENGTH OF FLAT, OF RECTANGULAR
TOOLS FOR THE SECTIONS INDICATED

Cross Section	Length, l	
	Solid Tools (S) ¹	Tipped Tools (T) ¹
$\frac{1}{4}$ x $\frac{1}{2}$	4	
$\frac{3}{8}$ x $\frac{5}{8}$	4½	
$\frac{1}{2}$ x $\frac{3}{4}$	5	
$\frac{1}{2}$ x $\frac{3}{4}$	5½	5¼
$\frac{1}{2}$ x 1	*5½ or 7	*5½ or 7
$\frac{5}{8}$ x 1¼	*6½ or 8	*6½ or 8
$\frac{3}{4}$ x 1½	*6½ or 9	*6½ or 9
1 x 1½	10	10
1 x 2	12	12
1½ x 2		*9 or 14

All dimensions are given in inches.

¹ Definitions of solid and tipped tools are given in the standard.

*Shorter lengths normally for turret lathes, boring mills, etc.

In view of this fact, the committee finally agreed that the number of sizes should be reduced to a minimum, and that the standard dimensions should cover the width, height, and length of the tool.

In addition, tools were reclassified according to whether they were solid or tipped tools, disregarding the specific material of which they were made. Solid tools were defined as those having the full section of the cutting end (or point) consisting of the metal-cutting material. Tipped tools are those having a relatively small piece of metal-cutting material attached to the tool shank to form the tool face and cutting edge.

Sizes of the bits or solid tools are given in Tables 1 and 2. Table 1 shows those of square section, whether of carbon steel, high-speed steel, cast nonferrous metal, or structural steel shanks tipped with these metals or with sintered carbide.

The tipped tools are slightly shorter than solid tools when new, as they may be shortened by grinding only a portion of the length of the tip before the tool is scrapped. Solid tools, on the other hand, may be ground shorter until they can no longer be held by the tool holder.

Percentage of Square Size Shipped

A manufacturer of sintered carbide tools showed that in 1939, of 39,298 tools shipped, percentages of each square size were as follows:

3.4 per cent for the	$\frac{1}{4}$ inch square
9.4 per cent for the	$\frac{3}{8}$ inch square
28.0 per cent for the	$\frac{1}{2}$ inch square
22.8 per cent for the	$\frac{5}{8}$ inch square
12.4 per cent for the	$\frac{3}{4}$ inch square
8.0 per cent for the	1 inch square
1.3 per cent for the	1 1/8 inch square
1.8 per cent for the	1 1/4 inch square

(Please turn to Page 168)

TABLE III

SIZE OF SHANK FOR VARIOUS TYPES OF TOOL HOLDERS

Turning Tools w x h x l	Cut-Off and Side-Cutting Tools w x h x l	Boring Tools w x h	Threading Tools w x h x l	Knurling Tools w x h x l	Carbide Tipped Tool Holder w x h x l	Planer Tools w x h x l
$\frac{1}{8}$ x $\frac{1}{2}$ x 4	$\frac{1}{8}$ x $\frac{3}{4}$ x 4½	$\frac{1}{8}$ x $\frac{3}{4}$	$\frac{1}{8}$ x $\frac{3}{4}$ x 5	$\frac{1}{8}$ x $\frac{3}{4}$ x 5		
$\frac{1}{4}$ x $\frac{3}{4}$ x 4½	$\frac{1}{4}$ x $\frac{5}{8}$ x 5	$\frac{1}{4}$ x $\frac{5}{8}$	$\frac{1}{4}$ x $\frac{5}{8}$ x 5	* $\frac{3}{8}$ x $\frac{5}{8}$ x 5		
$\frac{3}{8}$ x $\frac{5}{8}$ x 5	$\frac{1}{2}$ x 1 x 5	$\frac{3}{8}$ x 1	$\frac{3}{8}$ x 1 x 5	* $\frac{1}{2}$ x 1 x 5	$\frac{3}{8}$ x $\frac{1}{2}$ x 6	$\frac{1}{2}$ x 1 x 6
$\frac{1}{2}$ x 1 x 5	$\frac{5}{8}$ x 1 x 5	$\frac{1}{2}$ x 1	$\frac{1}{2}$ x 1 x 5	* $\frac{3}{8}$ x 1 x 5	$\frac{1}{2}$ x 1 x 7	$\frac{5}{8}$ x 1 x 7
$\frac{5}{8}$ x 1 x 5	$\frac{3}{4}$ x 1 x 5	$\frac{5}{8}$ x 1	$\frac{5}{8}$ x 1 x 5	* $\frac{1}{2}$ x 1 x 5	$\frac{5}{8}$ x 1 x 7	$\frac{3}{4}$ x 1 x 7
$\frac{3}{4}$ x 1 x 5	$\frac{1}{2}$ x 1 x 6	$\frac{3}{4}$ x 1	$\frac{3}{4}$ x 1 x 5	$\frac{1}{2}$ x 1 x 5	$\frac{1}{2}$ x 1 x 8	$\frac{1}{2}$ x 1 x 8
$\frac{1}{2}$ x 1 x 6	$\frac{3}{8}$ x 1 x 6	$\frac{1}{2}$ x 1	$\frac{1}{2}$ x 1 x 6	$\frac{3}{8}$ x 1 x 5	$\frac{3}{4}$ x 1 x 8	$\frac{1}{2}$ x 1 x 8
$\frac{3}{8}$ x 1 x 6	$\frac{1}{4}$ x 1 x 6	$\frac{3}{8}$ x 1	$\frac{1}{4}$ x 1 x 6	$\frac{1}{4}$ x 1 x 5	$\frac{1}{2}$ x 1 x 9	$\frac{3}{4}$ x 1 x 8
$\frac{1}{4}$ x 1 x 6	$\frac{1}{8}$ x 1 x 6	$\frac{1}{4}$ x 1	$\frac{1}{8}$ x 1 x 6	$\frac{1}{8}$ x 1 x 5	$\frac{1}{2}$ x 1 x 10	$\frac{1}{2}$ x 1 x 9
$\frac{1}{8}$ x 1 x 6	$\frac{1}{8}$ x 1 x 7	$\frac{1}{8}$ x 1	$\frac{1}{8}$ x 1 x 7	$\frac{1}{8}$ x 1 x 5	$\frac{1}{2}$ x 1 x 11	$\frac{1}{2}$ x 1 x 10
$\frac{1}{8}$ x 1 x 7	$\frac{1}{8}$ x 1 x 8	$\frac{1}{8}$ x 1	$\frac{1}{8}$ x 1 x 8	$\frac{1}{8}$ x 1 x 5	$\frac{1}{2}$ x 1 x 12	$\frac{1}{2}$ x 1 x 11
$\frac{1}{8}$ x 1 x 8	$\frac{1}{8}$ x 1 x 9	$\frac{1}{8}$ x 1	$\frac{1}{8}$ x 1 x 9	$\frac{1}{8}$ x 1 x 5		$\frac{1}{2}$ x 1 x 12
$\frac{1}{8}$ x 1 x 9		$\frac{1}{8}$ x 1		$\frac{1}{8}$ x 1 x 5		$\frac{1}{2}$ x 1 x 13
1 x 2 x 11		1 x 2				1½ x 1 x 13
1½ x 2½ x 13						1½ x 2 x 16
						1½ x 2½ x 19
						2½ x 2½ x 22

All dimensions are given in inches. *Tolerance of $\pm \frac{1}{32}$ in. may apply.



Now G-E COOLING keeps 'em rolling!

IN making rubber-coated wire, the rubber—after preliminary processing—is put through finishing rolls, which turn at different speeds . . . working the rubber rather than just pressing it.

Right here is where the hold-up took place. The rolls—even though water-cooled—became so warm that the rubber stuck to them. Every time this happened, the rubber had to be removed and the rolls allowed to cool.

To end this serious loss of time and output, G-E Refrigeration was called on. A thermostatically controlled cooling system now feeds water into the rolls at 45° to 50° F—keeps the water in the rolls constantly at the most

efficient temperature—greatly reduces the time for working the rubber—prevents sticking and shut-downs.

Unusual war production applications by the score are being found for G-E Refrigeration and Air Conditioning Equipment. As a result, G-E engineers are building up a fund of practical knowledge that should be most helpful to you, no matter what your heat transfer problems may be . . . now or in the future.

General Electric Company, Air Conditioning and Commercial Refrigeration Divisions, Section 449, Bloomfield, New Jersey.

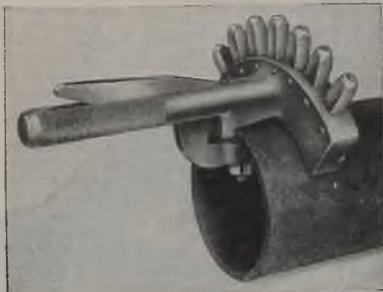
☆ BUY...and hold... WAR BONDS ☆

Industrial Refrigeration by
GENERAL  ELECTRIC

Hear the General Electric Radio Programs: The "G-E ALL-GIRL ORCHESTRA," Sundays, 10 p.m., EWT, NBC... "THE WORLD TODAY" News, Every Weekday, 6:45 p.m., EWT, CBS

Marking Holder

A new safety peripheral marking holder for stamping around the outer circumference of tubing has been developed by M. E. Cunningham Co., 172 East



Carson street, Pittsburgh. The holder is of all-welded design and constructed of safety steel. It features a hand grip lock and is equipped with a pointed screw which holds the unit firmly in position for marking. It eliminates separate handling for each character and permits peripheral marking around the end rather than marking along the length of tubes.

Bending Machines

A new line of bending and straightening machines in six sizes having capacities from 50 to 400 tons for cold bending and straightening structural shapes and other metal forms, is announced by Thomas Machine Mfg. Co., Pittsburgh. Beams, channels, rails, shafting, rounds, squares, forgings, structural sections or any metal sections that re-

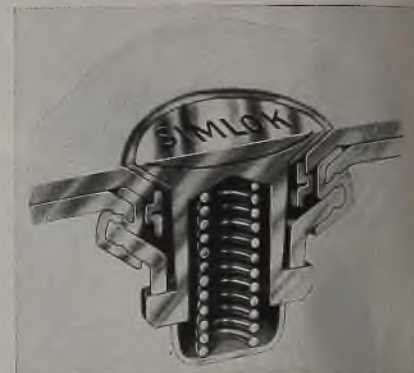
quire bending or straightening can be handled by the machines. Weighing from 3800 to 55,000 pounds, these units can bend and straighten 5 to 24-inch beams. Since the work is performed cold, no furnace is required and one man can handle the operation. Modernized with important mechanical improvements, welded steel frame, and entirely enclosed operating machinery, this new line replaces the company's previous equipment. A continuously running ram with one bending block, striking against the shape to be bent midway between two bearing blocks, represents the operating principle of the machines. The length of stroke of the ram is quickly adjustable by a convenient handwheel so located that the operator has unobstructed view of his work. Free running table rollers, with antifriction bearings, support material being passed through the machine. An auxiliary spacer block for bending small sections is furnished. Other construction details include flywheel in antifriction bearings, located within the frame for safety and to eliminate overhead load on bearings; V-belt drive providing quiet operation and reducing shock load on motor; cast steel gears and steel pinions, all having cut teeth with gear covers provided; high carbon steel forging cam shaft. Frames are of rolled steel plate with heavy cast steel throat filler and table.

Improved Fastener

Design and construction improvements on fasteners for cowlings and panels is announced by Simlok Division, Simmons Machine Tool Corp., Albany,

N. Y. The fastener now locks or unlocks with a quick quarter turn. When unfastened, the stud is self-ejecting so that it can be noticed easily.

The fastener is manufactured with three types of studs—flush head, oval



head and wing head. It is available in three sizes. The tapered design of the fastener is valuable in assembling curved sheets such as engine cowlings, actually forcing the assembly into proper alignment before it can be locked. Side play is eliminated and end play or spring deflection is held to a maximum of 0.008-inch or just enough to lock the fastener.

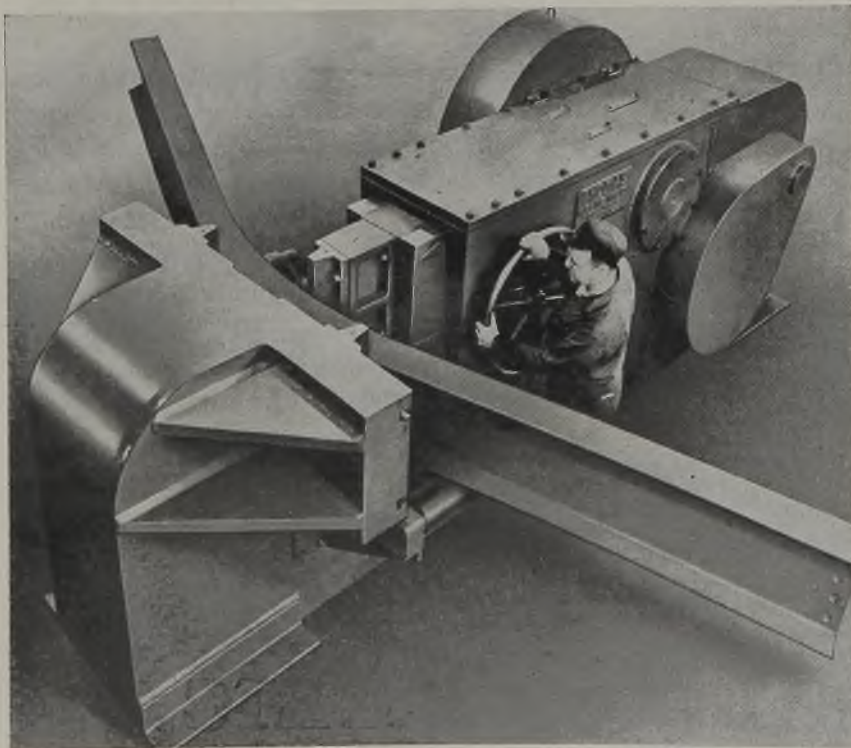
It is constructed with a hollow inner 1-piece housing which is integral with locking lugs. It is case-hardened to eliminate wear. Inside is a long-travel helical spring which ejects the fastener when unlocked. An outer housing retains the spring and the inner housing as a complete assembly. A locking ring makes possible permanent installation.

To lock, the two sheets are brought together so the stud enters the receptacle. Then the stud is depressed against the spring action and turned until it rides under the cam surfaces. It locks in a seat in the cam.

Rotary Gear Finishers

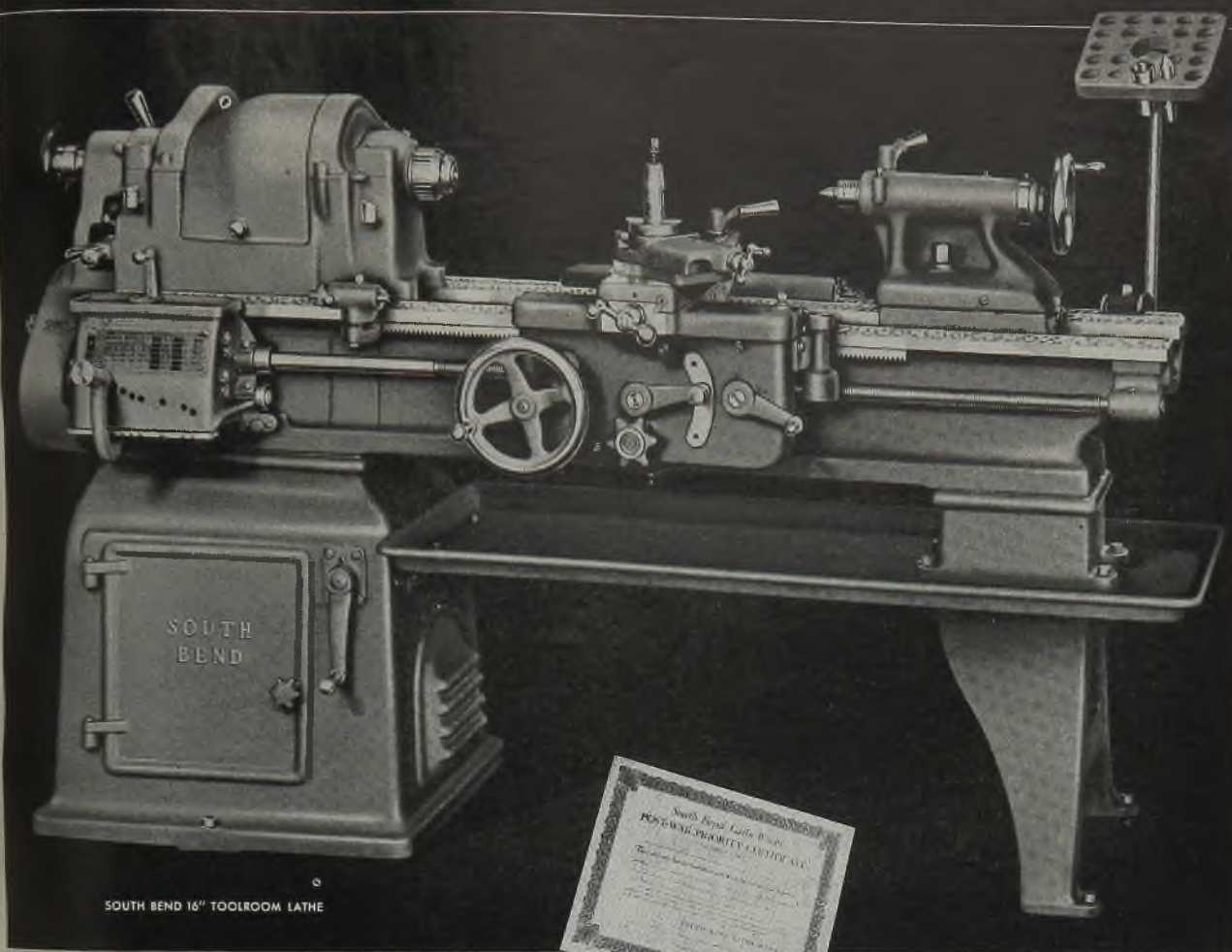
Michigan Tool Co., 7171 East McNichols road, Detroit 12, announces an improved line of its 860 series of rotary crossed-axis gear finishing machines. The line comprises four basic models, the 860 for shaving narrow face and shoulder gears by the "underpass" method; the 860-B for shaving wider faced gears by the "transverse" shaving method; the 860-A in which both the "underpass" and "transverse" shaving methods are provided; and the 860-C for shaving of internal gears. The first three models mentioned come in three sizes for shaving gears with a maximum outside diameter of 8, 12 and 18 inches, respectively.

Among improvements made in the machines are the use of cone-drive gearing which insures maintenance of initial operating clearance tolerances over a long period. The nature of the contact in this form of gearing also insures smoother



(All claims are those of the manufacturer of the equipment being described.)

Plan Now FOR POST-WAR PRODUCTION



SOUTH BEND 16" TOOLROOM LATHE



While war production is still America's No. 1 job—the time to look ahead to the greatest era of peace-time production is now. Placing orders immediately for post-war machine tools is the first step in reconverting to peace-time production. It means earlier delivery which will permit quicker reconversion—a very important competitive factor.

To manufacturing plants, large and small, where future-planning includes new lathe equipment, South Bend Lathe Works offers a practical post-war priority plan.

You can place your order now for any South Bend Lathe. No deposit or down payment is required. We ask only that your order be placed in good faith. Each order that is received will be acknowledged by a numbered Post-war Priority Certificate.

BUY WAR BONDS NOW...

SAVE FOR LATHES

When civilian production is resumed, lathe orders will be filled in the order established by the certificate numbers. Today's prices will apply unless conditions beyond our control necessitate changes. The order may be cancelled at any time. All South Bend Engine Lathes, Toolroom Lathes, and Turret Lathes, embodying improvements developed to meet exacting war production requirements, will be available. No revolutionary changes in design are contemplated.

Don't delay investigating this effective plan that will help strengthen your post-war position. Write now for full details of our Post-war Priority Plan and a copy of Catalog 100-C.



SOUTH BEND LATHE WORKS

LATHE BUILDERS FOR 37 YEARS

SOUTH BEND 22, INDIANA

3-M ABRASIVE SPECIALTIES

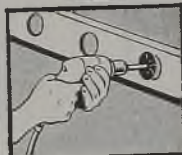


Finishing oil holes with Elek-Tro-Cut Three-M-ite Cloth Spiral Wound Strips

PERFECT HIGH-SPEED FINISHING OF HARD-TO-GET-AT AREAS AND DIFFICULT RECESSES

● That's the job 3-M Abrasive Specialty Items were designed to do—and they do it perfectly. There is a shape for every conceivable finishing problem—all made in many sizes and an ample range of grits.

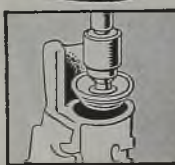
If you are not familiar with the 3-M Line of Abrasive Specialties use the coupon below to obtain a copy of our fully illustrated book showing some of the many uses for which 3-M Abrasives Specialty Items are time and money savers.



Elek-Tro-Cut Three-M-ite Cloth Overlap Slotted Disc



Elek-Tro-Cut Three-M-ite Cloth Cartridge Rolls



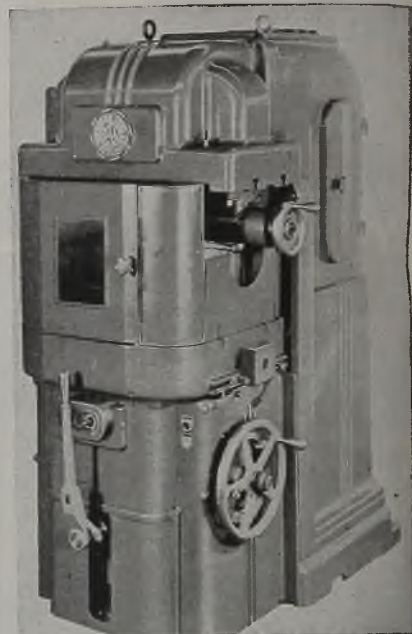
Three-M-ite Cloth Pyramid Disc Set



Elek-Tro-Cut Three-M-ite Cloth Cartridge Rolls—End Tapered and Full Tapered

drive, the gears mating with a pure sliding action.

With increased rigidity provided in the improved machines, motor power has been increased to 2 horsepower to provide a reserve for the special job, thus actually increasing the cutting capacity of the machines. Improved facilities for curve-shaving are available as optional equipment on these machines. One of the features of the curve-shaving unit is

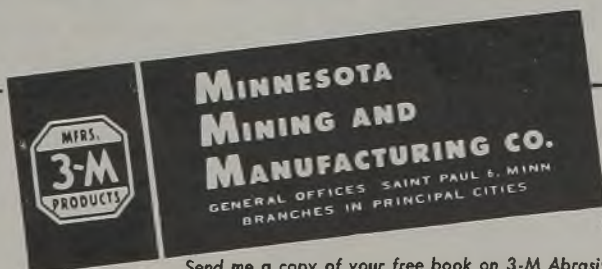


that set-up is both simple and positive, eliminating trial and error adjustments. Either the entire tooth face can be curve-shaved or any desired amount of center section of the face can be left "flat", relieving only one or both ends of the tooth.

On the 860, 860-B and 860-C machines, two sets of change gears are provided; one set giving five variations in cutter spindle speed while the other provides five variations in speed of the reciprocating mechanism. On the 860-A, on which there are two optional methods of shaving gears (underpass or transverse), there are separate provisions for change gears for each of the movements. The design is such, however, that the same actual gears can be used interchangeably for the underpass or the transverse change-gears. Standard machine equipment now includes six gears each for cutter spindle and reciprocation speed changes.

Vertical cutter feed (in-feed) now takes place during the first part of the reciprocating stroke rather than during the dwell at the end of the stroke, thereby shortening dwell period and increasing production.

Along with mechanical improvements giving longer service life in the 860 series machines, the latest models are provided with better sealing to even further reduce maintenance requirements. In the control panel a considerable number of changes have been made to provide maximum usefulness of these machines in



S944

Send me a copy of your free book on 3-M Abrasive Specialty Items.

Name _____
Address _____
City _____ Zone _____ State _____

—BUY MORE WAR BONDS!—

ON LAND

OR SEA

IN THE AIR

IN INDUSTRY

it's

TRU-LAY

Preformed Wire Rope

Whether at the jobs of war or in war production, American Cable **TRU-LAY** Preformed Wire Rope ranks as the preferred line. That's because it handles easier, reeves faster, lasts longer.

It is the preforming process that endows **TRU-LAY** with high fatigue resistance. Being more flexible than non-preformed, **TRU-LAY** bends easily, resists kinking and whipping, spools better. The preforming process sets new and higher standards for wire rope service, and **TRU-LAY** is the original preformed wire rope. Be sure your next line is **TRU-LAY** Preformed made by American Cable.

AMERICAN CABLE DIVISION

Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, Portland, San Francisco, Tacoma

AMERICAN CHAIN & CABLE COMPANY, Inc.

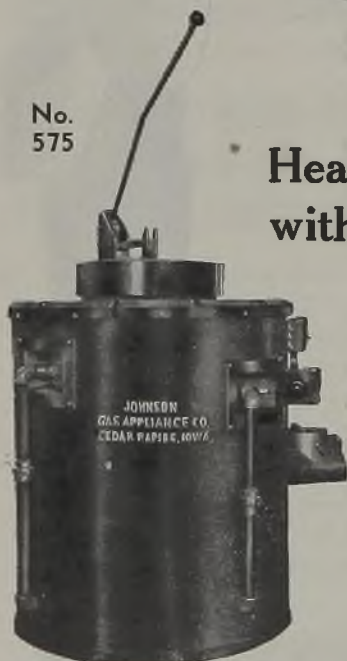
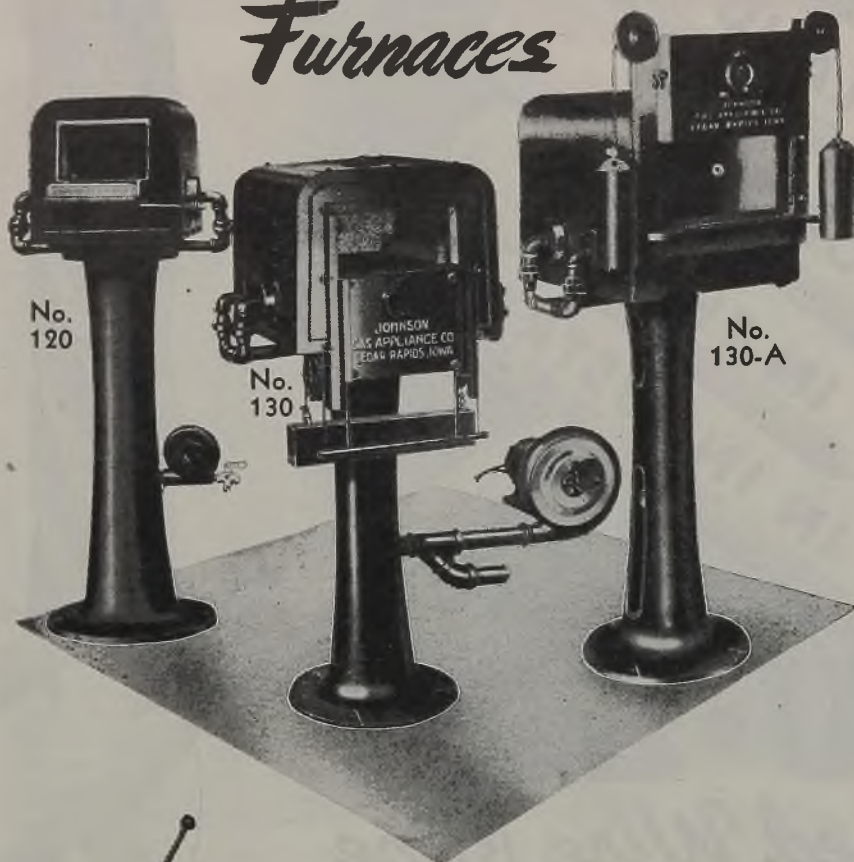
BRIDGEPORT • CONNECTICUT



ESSENTIAL PRODUCTS... TRU-LAY Aircraft, Automotive, and Industrial Controls, TRU-LOC Aircraft Terminals, AMERICAN CABLE Wire Rope, TRU-STOP Brakes, AMERICAN Chain, WEED Tire Chains, ACCO Malleable Castings, CAMPBELL Cutting Machines, FORD Hoists, Trolleys, HAZARD Wire Rope, MANLEY Auto Service Equipment, MARYLAND Bolts and Nuts, OWEN Springs, PAGE Fence, Shaped Wire, Welding Wire, READING-PRATT & CADY Valves, READING Steel Castings, WRIGHT Hoists, Cranes . . . *In Business for Your Safety*

JOHNSON

Furnaces



SPEED UP Your Heat-Treating Operations with These JOHNSON Units

No. 120 Hi-Speed Steel Heat-Treating Furnace

Compact, powerful and remarkably economical to operate. Reaches 1500° in 5 minutes—2300°F in 30 minutes. Complete with G.E. Motor and Johnson blower. \$129.50 F.O.B. Factory.

No. 130 Hi-Speed Steel Heat-Treating Furnace

For clean, fast heating of all types of steel and for brazing carbide tool tips. Carbofrax hearth in 5x7½x13½ firebox. Complete with G.E. Motor and blower. \$248. F.O.B. Factory.

No. 130-A Hi-Speed Steel Heat-Treating Furnace

Features counterbalanced door opening upwards 4-Burner Job for Temperatures 1400° to 2000°F. Complete with G.E. Motor and Blower. \$295 F.O.B. Factory. 6-Burner Job for Temperatures 1800° to 2400°F. Complete with G.E. Motor and Blower. \$325 F.O.B. Factory.

No. 575 for Pot-Hardening and Melting

Automatic lighting device. Fully lined with 8" insulation. 14x20 steel pot. Complete with G.E. Motor and blower. \$400. F.O.B. Factory.

ORDER TODAY

JOHNSON GAS APPLIANCE CO.
626 E Ave., N. W., Cedar Rapids, Iowa

Free

**NEW JOHNSON CATALOG
WRITE ADDRESS ABOVE**



producing either spur or helical gears of the internal or external type. The machines are designed particularly where maximum flexibility as to use (different gear sizes and types) is desired from one machine, or when runs are in job-lot quantities.

Test Bench

Standard Electric Time Co., Springfield, Mass., announces a new test bench for general maintenance, testing and motor repair work. It consists of an alternating current, voltmeter, ammeter, wattmeter and power factor meter with necessary control switches, jacks, etc., so



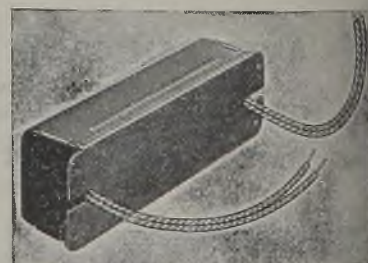
that single or 3-phase circuits can be checked in steps of 5, 25 or 125 amperes. The panel which contains these instruments also encloses direct-current instruments consisting of a voltmeter with provision for using it as an ohmmeter and a double scale ammeter of 150 and 300 amperes. Circuit breakers are provided for incoming power.

A high-voltage insulation breakdown or testing device consisting of a step-up transformer, is built into the unit. Output is connected to a pair of high voltage jacks and insulation leads with test prods. Ballasts and starters are built into the panel so that lamps can be tested by plugging in to the jacks on the front of the panel.

The unit also features a continuity circuit tester with a pilot light for checking windings of motors and other equipment for opens, shorts or grounds. The unit can be furnished complete with a steel bench or without mounting bench.

Ballasts

A new high voltage Tulamp ballast for the operation of the new 40-watt instant starting fluorescent lamps is an-



nounced by General Electric Co., Schenectady, N. Y. It applies 450 volts to the lamp at starting, striking an arc be-

D.O. James

ESTABLISHED 1888

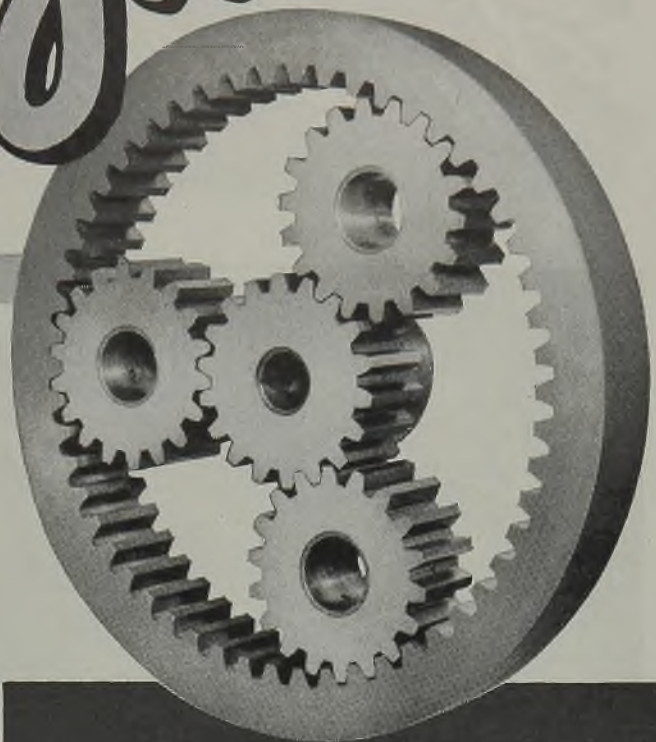
FOR LARGE SPEED REDUCTIONS AND GREATEST EFFICIENCY

SINCE 1903 . . . D. O. James planetary Gear Reducers have been used on many industrial applications where large reductions were needed. The superior gear arrangement of this type of reducer obtains highest ratios and greatest efficiency. They are most compact and occupy very little floor space. The equal balance and similar revolving direction of the rolling contact of the gear teeth produces the maximum reduction with the minimum number of gears.

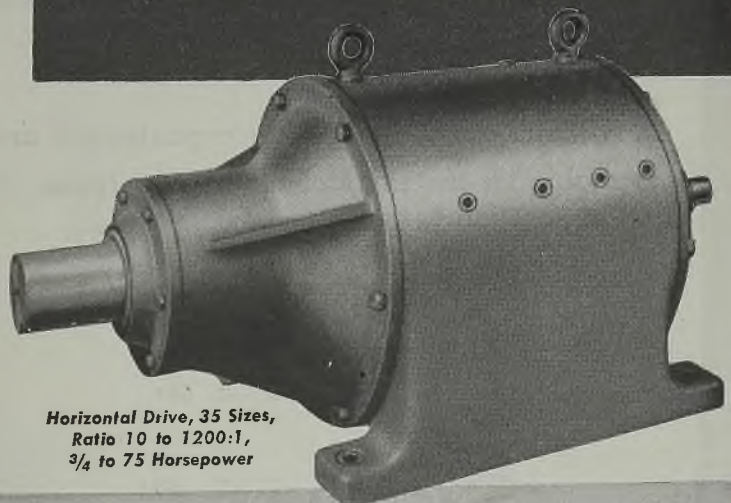
TODAY . . . Modern manufacturing methods and facilities, under the supervision of an experienced operating personnel, assure the utmost efficiency and durability to D. O. James Gears and Gear Speed Reducers.

D. O. JAMES MANUFACTURING
COMPANY

1140 W. Monroe St., Chicago 7, Ill.



PLANETARY GEAR SPEED REDUCER



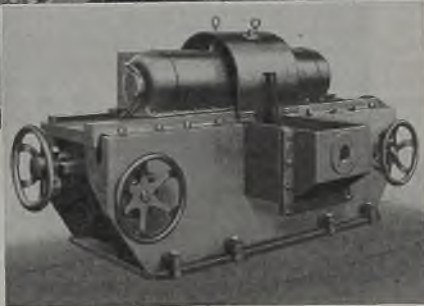
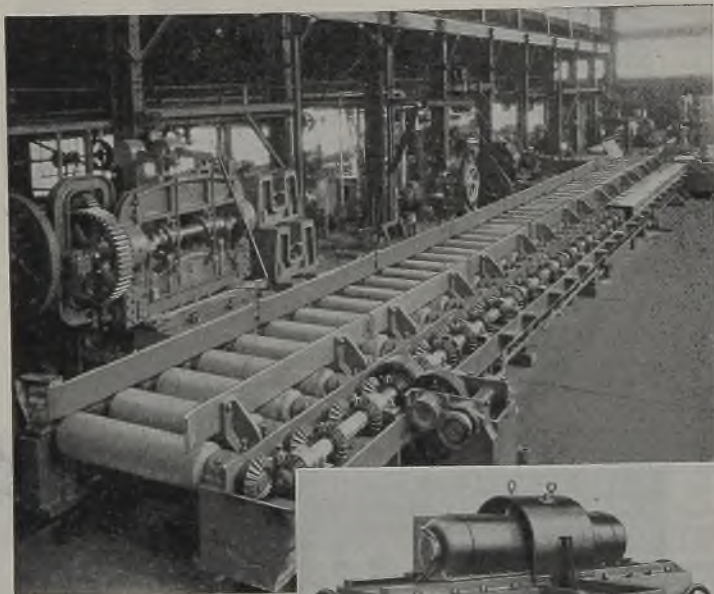
Horizontal Drive, 35 Sizes,
Ratio 10 to 1200:1,
3/4 to 75 Horsepower

56 YEARS MAKERS OF EVERY TYPE OF GEAR AND GEAR REDUCER

SPECIAL MACHINERY BUILT ON CONTRACT

Special Machinery

PRESSES • PUNCHES • METAL-FORMING MACHINERY



THE facilities of the Thomas organization are available for the production of all types of special machinery, both light and heavy.

We also invite your inquiries for contract work, dies, jigs and fixtures. Write for Bulletin 301.

THOMAS
MACHINE MANUFACTURING COMPANY

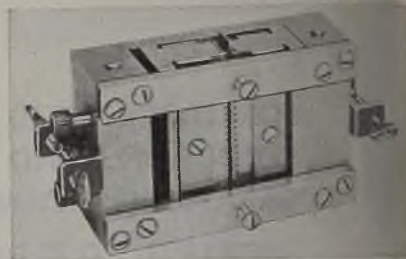
PITTSBURGH, PA.

BENDING AND STRAIGHTENING MACHINES • SHEARS

tween the lamp cathodes, eliminating the need for separate starter equipment. The ballast is available in Tulamp 40-watt ratings for use on 118-volt circuits. It delivers rated watts to the lamp at nominal circuit voltage. Uniform light output is closely maintained even when the circuit voltage varies within the recommended operating range. Special filters for suppression of radio interference are incorporated. The ballast is housed in a universal cast that allows the leads to be brought out either the end or the bottom, permitting great flexibility of installation and complete utilization of present fixture designs.

Jig for Supporting Material To Be Tested

To determine compression yield strength in aircraft design a new jig has been developed by Baldwin Locomotive Works, Southwark Division, Philadelphia. It is possible to test a single



thickness of sheet in compression, supporting the sheet in the jig with a multiplicity of small rollers. The extensometers are attached to the edges of the sheet. The testing of material in single sheet form simplifies the technique of testing.

Grinding Gage

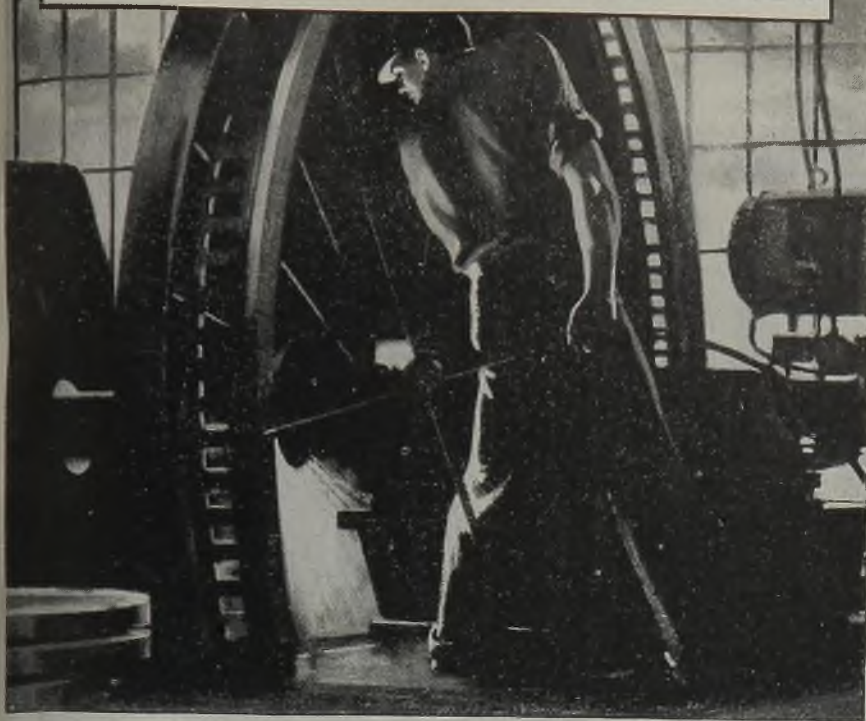
An improved Pratt grinding gage, which continuously measures the diameter of external cylindrical jobs while work is in progress and automatically indicates the point at which the correct



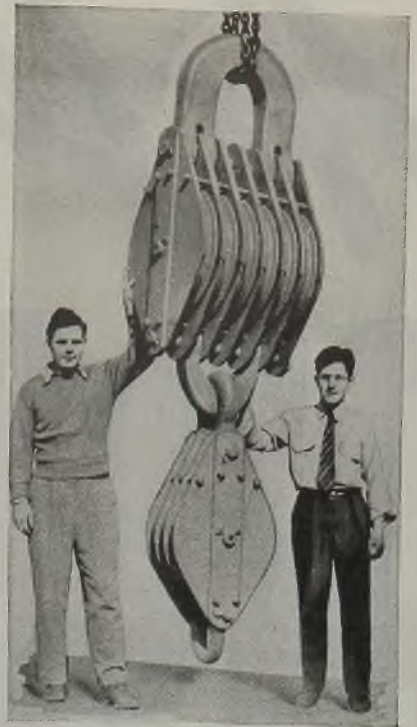
diameter is reached, is announced by American Diamond Tool & Gage Co., 7523 Fenkel avenue, Detroit 21. It provides a continuous visible check on out-of-roundness and the amount of error. Perfect roundness and accuracy of diameter within 0.0001-inch can be maintained. The gage is adapted both to

IN THE NEWS

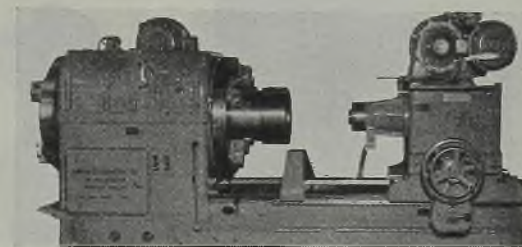
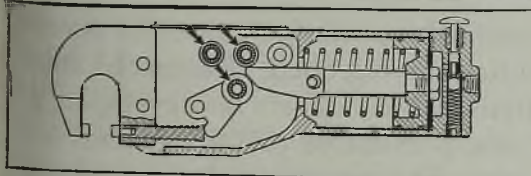
WITH TORRINGTON BEARINGS



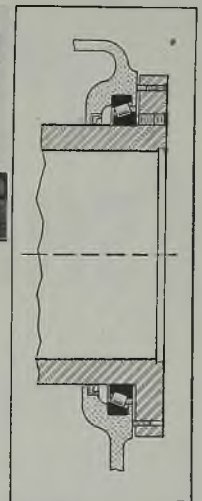
ALL IN THE DAY'S WORK typifies the attitude of Torrington engineers when they undertake the design and manufacture of anti-friction bearings for new or unusual applications. The skilled workman shown in the illustration is grinding the race for a precision bearing 10 feet in diameter, with a tolerance of two-thousandths of an inch. When you need counsel on standard or large, custom-built bearings, **TURN TO TORRINGTON.**



LIFTING 125-TON LOADS is the job of these tackle blocks designed and built by the Downs Crane & Hoist Company. With one block employing six sheaves, the other three, they are used in tandem to reeve the 19 parts of one inch wire rope required to sustain the load. Two NCS Needle Bearings, supplied by Torrington's Bantam Bearings Division, were installed in each of the sheaves which revolve on a 3" hardened and ground shaft, with the pin hollow bored for pressure lubrication. NCS Needle Bearings combine the advantage of high load capacity and compact design with ease of installation.



MILLING THREADS in 8" howitzers and 155 mm. guns is part of the important work performed by this Master Thread Miller, manufactured by the Smalley-General Company. To provide the essential accuracy at high speeds, and to take up the very heavy radial and thrust loads, both main and milling spindles are mounted in Tapered Roller Bearings, 30" O.D., as shown in the accompanying cross-section. Eccentricity and face run-out of these bearings is .0005 maximum—an example of the ability of Torrington's Bantam Bearings Division to build precision bearings for heavy-duty applications.



THIS CINCINNATI PNEUMATIC Squeeze Type Riveter, with a 3-ton compressive force, manufactured by the Schauer Machine Company, provides an interesting application for Torrington LN Needle Bearings. Selected because of their compact design and high load capacity, the bearings were installed, as shown in the accompanying cross-section, at the points where pressure is extremely high.



TORRINGTON BEARINGS

STRAIGHT ROLLER • TAPERED ROLLER • NEEDLE • BALL

THE TORRINGTON COMPANY • BANTAM BEARINGS DIVISION

SOUTH BEND 21, INDIANA

At Last!—a line of

PREVENT



SHELL ENSIS RUST PREVENTIVES

For Coating Metals



FOR YEARS AMERICAN INDUSTRY has paid tribute to demon rust to the tune of \$1,000,000,000 a year. Rusting of lubricated surfaces has been "put up with" as a necessary evil.

Shell scientists and engineers, working with steam turbine manufacturers, did the "impossible" . . . developed a rust-preventive turbine oil.

Using the wealth of knowledge gained by developing and perfecting this oil, Shell's Research Laboratories then focused their efforts on developing a similar line of rust-preventive oils for general industrial purposes. The result is the new Shell Tellus Oils for machine lubrication and the new Shell Ensis Rust Preventives for coating metals.

The new Shell Tellus Oils are not designed to remove rust. They will not eliminate all existing rusting conditions that may be present in your machines. But where moisture is a factor, the new Shell Tellus Oils, because of the special rust-inhibiting qualities built into them, afford unequalled protection against the formation of rust . . . and without

valuable

Industrial products to

RUST!

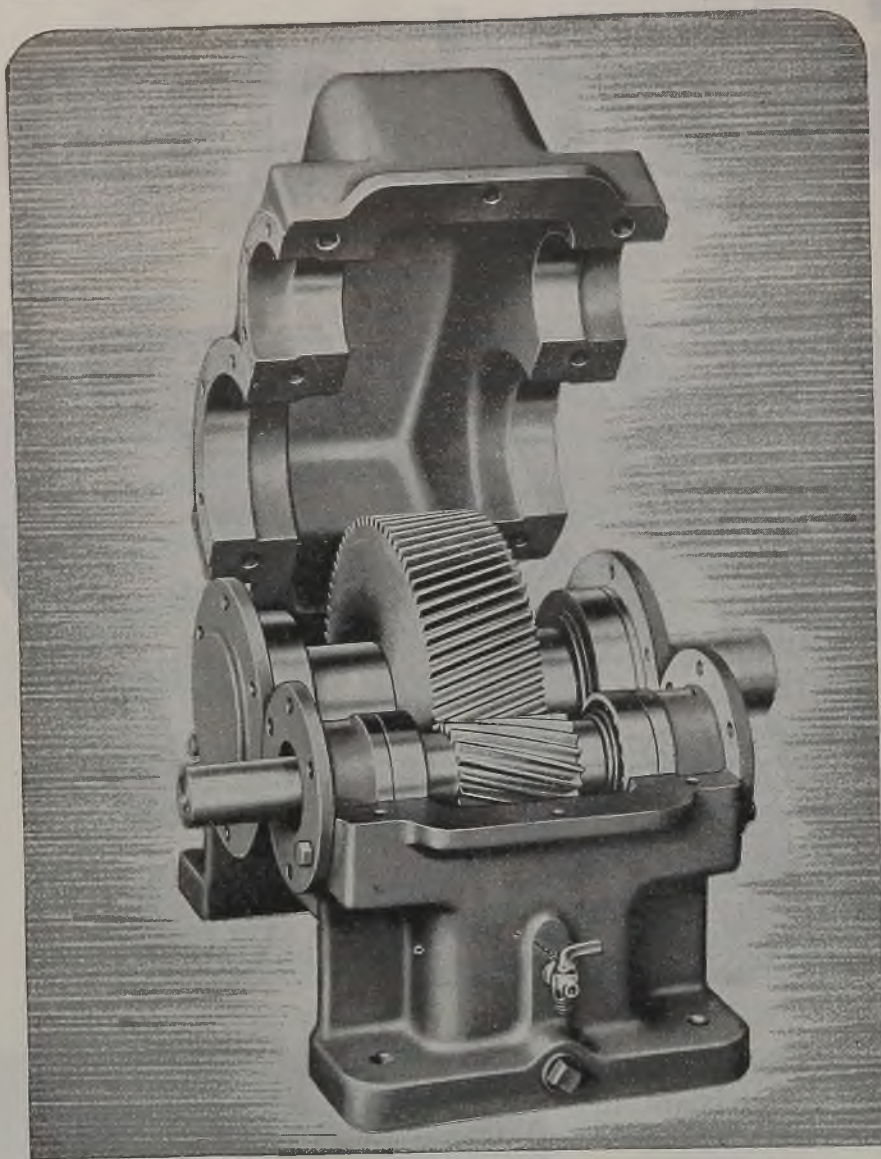
characteristics. They form a protective film that coats the metal, making it highly resistant to water and moisture. Shell Tellus Oils also have superior oxidation stability.

The new Shell Ensis Rust Preventives cover a complete line of oils, coatings and compounds. They are available in a number of grades, designed to give protection against the dangers of exposure, which range from the extreme effects of rain and snow during outdoor storage, to the mild humidity conditions encountered in the factory between machining operations. The protective coatings formed by Shell Ensis Rust Preventives graduate from the extremely thin, transparent oil films that need not be removed, to the heavy, abrasion-resistant coatings which will withstand severe weathering conditions over long periods of time.

Call in the Shell man now! After a thorough study of your operation he will recommend the Rust-Preventive Product best suited to your specific conditions. Write, wire or phone Shell Oil Co., Inc., 50 West 50th Street, New York 20, N.Y. or 100 R. Street, San Francisco 6, Calif.



**SHELL
TELLUS OILS**
For Machine Lubrication



SIMPLICITY OF DESIGN AND RUGGED CONSTRUCTION *that produce Long Life*

★ Horsburgh & Scott Helical Speed Reducers are engineered for simplicity of design with every part ruggedly built from the finest materials. These features plus precision manufacture and assembly are your guarantee of better speed reducers that last longer...it will pay you to investigate these single, double and triple Helical Speed Reducers.

Send note on Company Letterhead for Speed Reducer Catalog 39

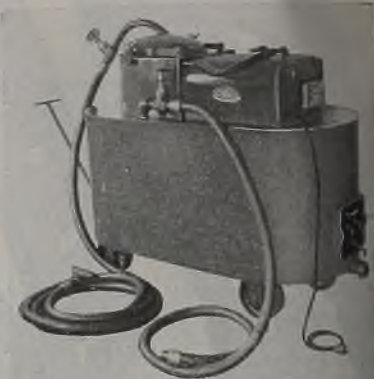
THE HORSBURGH & SCOTT CO.
GEARS AND SPEED REDUCERS

5112 HAMILTON AVENUE • CLEVELAND, OHIO, U. S. A.

straight and tapered work. The work is automatically measured while stock is being removed, thereby saving the time of further calipering. At no stage of operation need the machine be stopped for hand calipering. The standard model measures diameters from 5/16 to 27 inches. Special gages for side wheel grindings are made to meet individual specifications.

Tank Cleaner

Model 20-T sump tank cleaning machine, a portable unit designed for handling by one operator, consists of a 100-gallon tank mounted on two 8-inch roller bearing rigid casters and swivel-tongue 8-inch roller bearing wheels for easy movability. The precision rotary vacuum pump, driven by



a 1/2-horsepower motor creates a vacuum in the large tank, which in turn creates suction in the hose that is put in the sump tank which pulls all sludge, chips, old coolant or oil into the sludge basket. The clean oil or coolant collects in the tank proper. When the tank becomes full, a float control activates the automatic vacuum controls on the pump unit shutting it off. At the same time the pilot light goes on indicating that the tank is full. The sludge basket is removed easily to empty and the tank is emptied through a drain in the bottom. It is also possible to reverse the connection on the vacuum pump so that pressure may be produced in the tank proper and thereby empty the tank through a 1 1/4-inch gate valve and discharge hose. Pump and motor unit are mounted on top of tank sets on special slides and by removing one screw it may be lifted from one tank to another making one dump unit serve several tanks. This tank cleaning machine is manufactured by W. R. Carnes Co., 2066 Helena street, Madison 4, Wis.

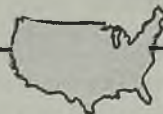
Measuring Gages

Metrical Laboratories Inc., 417 Detroit street, Ann Arbor, Mich., announce the development of precision external indicating gages, using the flow of air as the measuring medium and operating in connection with the metricator instrument. These gages can be made in either



the Molybdenum Corporation offers you a new catalog

Molybdenum, Tungsten, and Boron, in their industrially useful and available forms, and chemical compounds of these elements, are the subjects treated of in the new catalog of the Molybdenum Corporation. Users or potential users of such products are likely to find the book of interest. Write for your copy.



AMERICAN Production, American Distribution,
American Control—Completely Integrated.
Offices: Pittsburgh, New York, Chicago, Detroit,
Los Angeles, San Francisco, Seattle.
Sales Representatives: Edgar L. Fink, Detroit; H. C.
Donaldson & Co., Los Angeles, San Francisco, Seattle.
Works: Washington, Pa.; York, Pa.
Mines: Questa, N. M.; Yucca, Ariz.; Urad, Colo.

MOLYBDENUM

CORPORATION OF AMERICA
GRANT BUILDING
PITTSBURGH, PA.



*Speeding War Production



*Army-Navy "E" Award to
Mall Tool Company
Chicago, Illinois

Mall FLEXIBLE SHAFT
Tools
REG. U.S. PAT. OFF.
Made with
KEYSTONE Wire

Like the strong, sinuous arm of a trained athlete . . . delivering power to the exact spot . . . adaptable to thousands of positions and uses . . . these are speed-production advantages of Mall Tools, made with special Keystone flexible shaft wire.

Important to the war effort is the use of Mall Flexible Shafts in the control of aircraft fuel pumps, tachometers, generators, super-chargers, gun turrets and other vital parts where accurate, positive control is absolutely necessary.

We are proud that special Keystone wire fully measures up to these important applications.

KEYSTONE STEEL & WIRE CO., Peoria 7, Illinois

Special Analysis Wire
for All Industrial
Uses



Coppered, Tinned,
Annealed,
Galvanized

the indicating ring or indicating snap gage type depending on the size of the external diameter to be measured. Size variations as small as 0.000025-inch can be detected and for parts requiring an extreme degree of accuracy, the amplification can be sufficiently increased so that parts can be sorted into groups of 0.000010-inch size difference without any effort on the part of the operator.

Indicating rings have been used to advantage for the gaging of various ex-



ternal diameters and are of particular value in connection with indicating plug gages in the gaging of mating parts for selective fits. The total range covered by these gages at an amplification of approximately 4000:1 is 0.002-inch. For the measurement of parts ground in a centerless grinder, the use of indicating rings containing a set of three equally spaced measuring orifices make it possible to obtain an accurate indication of the extent of a "three-cornered" out-of-round condition often found in parts centerless ground.

Marking Unit

Designated as Airgrip marking unit, Jas. H. Matthews & Co., 3942 Forbes street, Pittsburgh 13, has developed a new method for marking delicate and precision parts having a ground or mirror surface that cannot be marred or distorted. Marking of metal, glass, fiber or plastic parts is accomplished by means of a short blast of fine grit material against rubber or celluloid stencil masks upon which the part to be marked is placed. The desired marking is cut into the stencil and the resulting mark is a light clear-cut impression, without liquid to cause rust and without burrs. Suitable fixtures are made to hold parts

BUILT BY **MORGAN**
Engineering

MORGAN 10-TON SOAKING PIT CRANE

HANDLING SLAB INGOTS IN A WEST COAST STEEL PLANT

Illustrated is a Morgan 10-Ton, 7-Motor, 81' 0" Span Soaking Pit Crane with 15-Ton Auxiliary Hoist. Morgan superiority of design and construction is built into every part to insure many years of profitable service. It is equipped with fabricated welded trolley and bridge trucks and anti-friction bearings throughout. Trolley is of the worm operated type which simplifies the construction and lowers the cost of maintenance.

THE MORGAN ENGINEERING CO.
ALLIANCE, OHIO. 1420 Oliver Building, Pittsburgh

DESIGNERS • MANUFACTURERS • CONTRACTORS • BLOOMING MILLS • PLATE MILLS • STRUCTURAL MILLS • ELECTRIC TRAVELING CRANES • CHARGING MACHINES • INGOT STRIPPING MACHINES • SOAKING PIT CRANES • ELECTRIC WELDED FABRICATING CRANES • STEAM HAMMERS • STEAM HYDRAULIC FORGING PRESSES • SPECIAL MACHINERY FOR STEEL MILLS



The Challenge OF A GREATER POST-WAR NATIONAL INCOME

● The average of estimates by economists forecast a post-war national income about 50 percent above pre-war years. With such a target to aim at, manufacturers and distributors are today making plans for reconversion and an increased postwar production.

● One of the major factors in such planning is the all-important item of equipment. It must be efficient, capable of maximum production, quick to install, easy to service. Qualified to meet every requirement are Roper Rotary Pumps. Case histories prove that they

Save up to 50% of Installation Time
Save up to 52% of Installation Space

Whether it be for factory production, transfer jobs or as an integral part of a mechanism you will find that the simple principle of Roper Pumps rewards users with an efficiency unattainable in more intricate designs.

Roper Rotary Pumps have only 2 moving parts . . . equal size pumping gears operating in a case with wear-free clearance. Internal pressure is equalized at all points . . . all shock and thrust is absorbed by a sliding joint which connects the gears.

Ropers give you smoother, quieter, longer service.

GEO. D. ROPER CORP.
ROCKFORD, ILLINOIS



Send for
Bulletin 1048

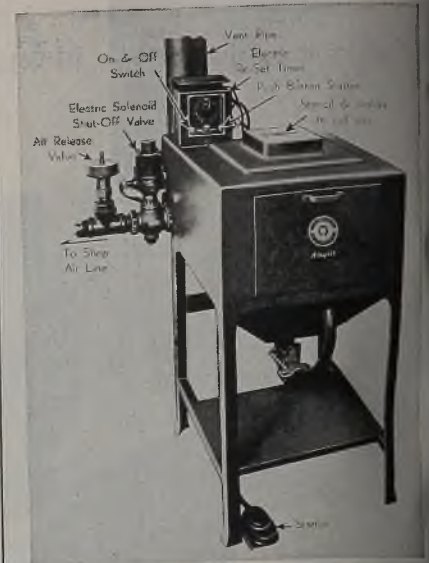
A complete summary and digest of factual information concerning pumps and pumping problems.

ROPER

Rotary PUMPS

so they can be handled quickly by the operator. Parts can be marked as fast as they can be handled by the operator.

The unit is operated by air pressure and is similar to sand blasting except

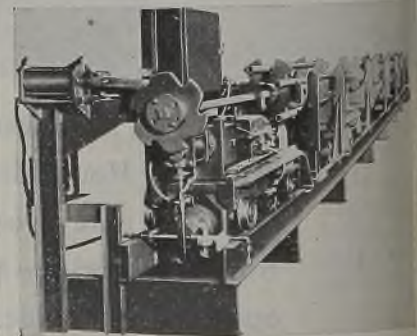


that it is constructed for very fine work. It operates most successfully on a volume of air at low pressure, from 5 to 8 pounds at the nozzle, and requires approximately 30 cubic feet of air per minute while in operation.

The unit is equipped with an electric solenoid valve and a timing unit which enables the operator to fix the length of the blast so that parts may be marked uniformly and with greatest legibility. The length of blast can be determined by experimenting with a few pieces in order to arrive at the correct time for the best possible results.

Automatic Reaming and Burring Machine

For handling tubes up to 6 inches outside diameter and lengths from 3 to 60 feet or longer a new combination automatic reaming and burring profiler



has been developed by Pines Engineering Co., Aurora, Ill. The head assemblies which consist of the spindles and chucks are mounted on heavy cars suspended on flanged wheels which are anchored to the channel iron track. One car can be moved to position for processing any length of tube desired. Tubes



PUTTING AN ABSENTEE *Back to Work*

When you are faced with the problem of an absentee machine—equipment that has been put on the inactive list because of a fracture in a heavy part—you'll find Thermit welding a fast, dependable way to get it back into action.

For by this simple process you can restore broken high tonnage parts, so that they are as good as new—, within a few days. And there is no limit to the size of a weld... nor does it matter whether the part is cast or forged.

Thermit welding also provides an ideal method for the fabrication of crankshafts, machine frames, housings, ship stern frames, or similar heavy-duty units. By fabricating such parts from smaller castings or forgings, you minimize shipping

and handling problems, and eliminate the risk of having to remake very large castings because of possible defects.

Repairs or fabrication by Thermit welding may be done in your plant by your own crew under the supervision of M & T engineers, or at one of the Metal & Thermit plants located at Jersey City, N. J., Chicago, Ill., Pittsburgh, Pa., and So. San Francisco, California.

For details, send for your copy of "Thermit Welding" today.

THERMIT
Welding 

METAL & THERMIT CORPORATION. 120 Broadway, New York 5

ALBANY • CHICAGO • PITTSBURGH • SO. SAN FRANCISCO • TORONTO

It takes the best TO MAKE THE BEST

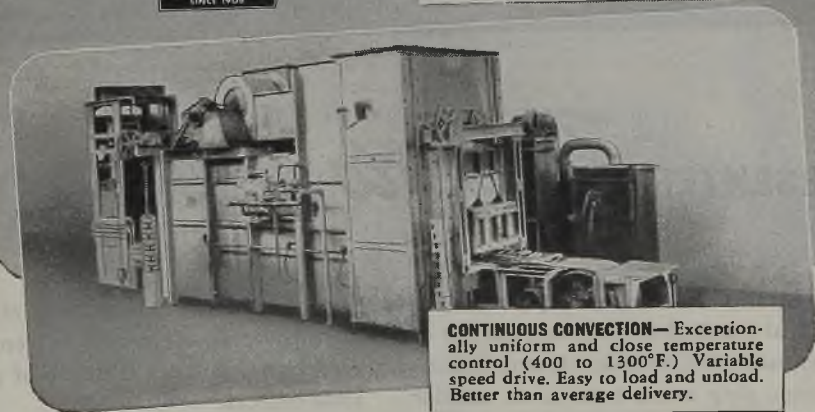
PLAN NOW FOR POST-WAR PRODUCTION



CONTINUOUS WALKING BEAM—Heat treats material up to forty feet in length with minimum effort and maximum safety.



CONTINUOUS BRIGHT ANNEALING—Equipped with woven wire belt, cooling chamber, atmosphere unit and variable speed drive for heat treating stampings.



CONTINUOUS CONVECTION—Exceptionally uniform and close temperature control (400 to 1300°F.) Variable speed drive. Easy to load and unload. Better than average delivery.

FURNACE DIVISION

R-S PRODUCTS CORPORATION

104 Berkley Street • Philadelphia 44, Penna.

ANNEALING CONVECTION ROTARY HEARTH SALT BATH FORGING
CONTINUOUS CONVEYOR PLATE AND ANGLE HEATING METAL MELTING CAR HEARTH

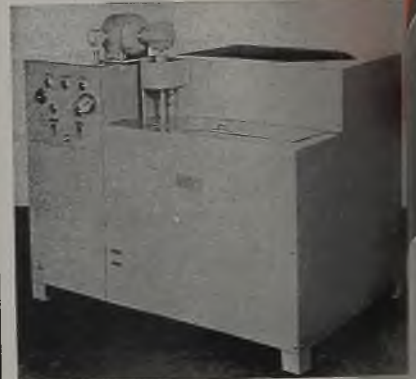
R-S Furnaces of Distinction

BUY WAR BONDS

are fed to and from profiler by an automatic reel feeding mechanism which selects tubes from storage rails regardless of diameter. The indexing mechanism, automatic, self-centering type chuck and the spindle advance are all actuated by hydraulic cylinders. The control panel houses the relays, motor starters and other electrical accessories for automatic cycle operation. Production of 200 to 400 tubes per hour can be obtained on end facing and burring operations and 100 to 200 where an additional operation of inside reaming is required. The same type profiler also can be used for threading, flaring, burring, turning, boring and chamfering pipe and tubing.

Melting and Dipping Tank

Youngstown Miller Co., Sandusky, O., offers an ethyl cellulose melting and dipping tank that incorporates all requirements set up by manufacturers and ordinance for control of this material. Model 60, shown here, has a capacity of



100 pounds of plastic per hour. Units are available with small capacity, in larger sizes and with various dimensions of the dipping compartment. Indirect heat is employed. Thermostatic control is maintained over both the heat exchange medium and the plastic to insure that neither rises over their maximum allowable temperature. The plastic is melted and preheated to proper temperature for dipping before entering the dip tank. Extremely close control and uniformity of temperature is obtained with low heat input surface temperature. The plastic is circulated in such a way as to have constant level in the dipping tank and continual removal of surface film that tends to form, and air bubbles which arise from the dipping of certain shapes.

Cable Splicing Rig

Structurally a self-contained unit, the Car-Bro cable splicing rig, manufactured by Carlinghouse Brothers, 2416 East Sixteenth street, Los Angeles 21, is designed to facilitate all the necessary operations in the splicing of cable.

Any standard splicing vise may be attached to the stand, which is supported by a ball-bearing revolving base. Directly above the splicing vise is a quick-

KENNAMETAL CENTERS

*in your
Lathes and
Grinders*

... help sustain high production, and precision

Kennametal centers outlast high speed steel centers 50 to 100 times, because the nib is made of special, very hard, non-galling grade of carbide. Increased production rates can thus be sustained—jobs keep turning on Kennametal centers, while steel centers are being removed for grinding many times—40, 50, or even 100.

Chatter due to center wear is eliminated and accurate machining thereby maintained. Costs are reduced—fewer centers need to be reground—less idle time of machine and operator for replacements.

The unique ability of Kennametal centers to keep work running true makes them well suited for precision jobs on grinders, and, when teamed with Kennametal lathe tools, they help to assure such accurate turning that grinding operations can often be eliminated.

Kennametal centers are stocked in standard sizes—Morse, Brown & Sharpe, and Jarno tapers. Separate, accurately molded nibs are available for those who wish to make their own centers. Catalog 44 describes them. A copy is yours for the asking.



KENNAMETAL Inc., LATROBE, PA.



IS YOUR PROBLEM ONE OF

EFFICIENT WAREHOUSING?



Since handling of material is the principal operation in warehousing, the proper selection of handling equipment is of prime importance. Baker Trucks make four distinct contributions to warehousing efficiency: 1. They increase storage space by tiering. 2. They cut handling costs. 3. They speed movement of materials. 4. They do the work of 8 to 10 men.



A leading industrial engineer was given the job of designing a large model warehouse for the world's largest paint manufacturer. Baker Trucks and Tractors were specified to bring about top efficiency in sorting, storing and shipping the more than 100,000 items handled in this warehouse. Fork Truck illustrated at left is stacking drums on pallets three high.

A Baker Material Handling Engineer was called in to make a survey for a large food warehouse. Upon his recommendation a Baker Fork Truck plus a conveyor system was installed. Operating costs were reduced from \$6.68 to \$4.98 per ton—a saving of 25.4%. Gross savings amounted to \$153.00 per week or \$7,956.00 per year. (See illustration at right.)



Carloading and unloading is an important warehouse function. The Baker Hy-Lift Truck with telescoping uprights, (see illustration at left) enters a box car door with ease and tiers material inside the car, conserving shipping space. Savings in loading operations are reported as high as 75% over former methods.

A large chemical manufacturer supplements his inside storage with yard storage of large drums. The Baker Fork Truck (right) is stacking the fourth and fifth tier of drums to conserve space. The same truck is also used to tier pallet loads of bulk materials in sacks inside the warehouse, and for loading products in box cars or highway trucks.



A printer and publisher faced with the need for doubling his storage space avoided additional warehouse rent by installing a Baker Hy-Lift Truck Tiering skid-loads of paper stock, books and magazines multiplied the effectiveness of available space and on rental savings alone paid for his truck in 18 months. (Left)

A large stevedoring company uses Baker Crane Trucks to move crated machinery, motor cars, newsprint rolls, paper pulp and other manufactured products in warehouse and on or off shipboards in the quickest possible time and at the lowest cost. This company has reduced handling costs 18% to 20% through the use of Baker Trucks. (Right)



WRITE FOR YOUR COPY

Plant and production managers, traffic managers, superintendents, purchasing agents and any others concerned with material handling will find the new Baker Catalog No. 52 a valuable reference.

BAKER INDUSTRIAL TRUCK DIVISION of The Baker-Raulang Company

2167 WEST 25th STREET • CLEVELAND, OHIO
In Canada: Railway and Power Engineering Corporation, Ltd.

Baker INDUSTRIAL TRUCKS

opening jaw-type vise supported by a tension member. The gripping vise is rapidly actuated by spinning a large heavy rimmed wheel. Any desired tension is put on the cable between the two vises by vertical adjustment of the tension member through a double-acting screw provided with a hand wheel. The cable is easily untwisted for splicing by revolving the splicing vise stand.

The unit may be set up, bolted to a column or post, or lashed to a tree and be working in 10 minutes. Provision is made for mounting either vertically or horizontally by means of mounting pads. Overall size is 96 x 45 inches; weight 250 pounds. A perforated shelf mounted on the back of the splicing vise stand holds Marlin spikes and other hand tools. Hooks are provided on the vertical member for other tools. The rig is portable or can be permanently installed.

Metal Washer

Monorail-Spray washer, a new and improved design in metal washing equipment is announced by Metal Washing Machine Division, American Foundry



Equipment Co., 555 Byrkit street, Mishawaka, Ind. It is designed to handle metal parts which must be rotated while they are passing through the cleaning chamber, such as intricate circular parts or those with many ports, crevices or openings. A monorail conveyor is provided to carry the work through the path of well-positioned power sprays. Parts are suspended from hooks and can be rotated while passing through the cleaning stage. Large access doors are provided to enable the removal of the spray system when periodic cleaning is necessary. The unit is so constructed that additional units such as drying and rust-proofing sections may be added to the machine to suit variations in production setups.

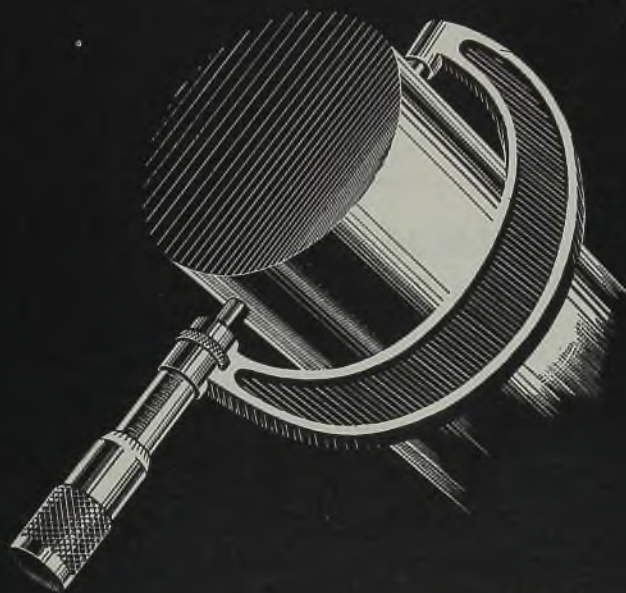
Tube Bender

Designated as Leonard-Douglas Bender master, a new manually operated tube bender which will produce 900 to 1000 bends per hour has been designed by Douglas Aircraft Co. and is now being

EXAMPLE OF *Service* :

A customer writes: "... we have achieved a production rate of 500 L.V.T. amphibian tank axles per day, which is a record in production, considering that these axles are ground to .0006 of an inch tolerance.

We employ 50 people, and this is a rate of 10 axles per day per man. We achieved this record by using Cities Service grinding oil for our grinding operation, Chillo #93 for use in drilling and tapping—and your Sentry #2 as spindle oil."



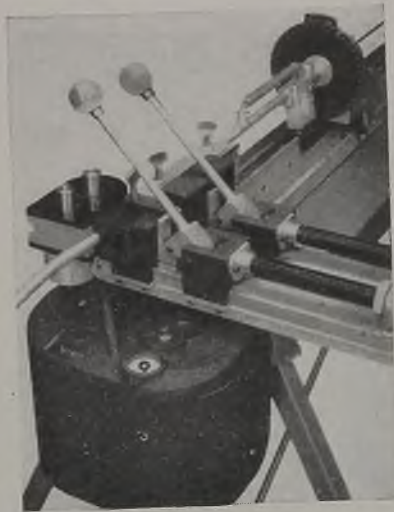
More and more, it's service that counts ...
and *Cities Service* means good service!



CITIES SERVICE OIL COMPANY

ARKANSAS FUEL OIL COMPANY

manufactured by Leonard Precision Products Co., Garden Grove, Calif. It will handle nonferrous tubing from $\frac{3}{8}$ to 1½-inch outside diameter, producing from one to 10 different bends in a single 9-foot length of tubing. These



bends can be produced to any specified degree of angle up to 180 degrees and at any radial angle. Special models for tubing up to 20 feet are available. Set-up time of the machine averages 7 to 15 minutes. The machine cam arrangement and automatic stops are adjusted according to specifications on the job ticket.

Control Instruments

Addition of three new instruments to its line has been announced by Wheelco Instruments Co., Chicago 7. Designated as Inputrols, two of the instruments are designed to control input of power, heat or flow of liquids or gases to any process equipment. The third, a Throttrol, is designed to correct variations in heat requirements of furnaces and process equipment by positioning a valve in the fuel line.

Inputrols are offered in automatic and manually set models. The basic elements of the instruments are a mercury switch mounted on a carriage, a rotating horizontal cylindrical cam driven by a small synchronous motor and a spiral on which the mercury switch carriage is mounted. In the automatic model, which is used with a pyrometer, the spiral is turned automatically to position the mercury switch at the proper point along the rotating cam. In the manual tool, this spiral is set by hand to the input point desired by the operator. The scale is illuminated and in terms of per cent of maximum input.

Throttrol is a simplified valve-positioning device for use with any control instrument having a high and low contact. It corrects variations in heat requirements due to changes in load, control settings, air and fuel pressure, British thermal unit valves and combustion efficiency.

Lift Truck

Designed to meet short distance transportation as well as stacking and tiering problems, the new dual purpose "75" lift truck has a working speed of up to 12 miles per hour either forward or backward, ability to turn in its own length of 117 inches, an overall width of 60 inches and a capacity of 7500



pounds. The unit operates on three large pneumatic tires and easily negotiates rough floors or outside unimproved storage areas. With conventional automobile controls, it can go anywhere from a standpoint of tractive effort that an automobile truck can and will climb comparable inclines. The height of the lift is 108 inches from the ground to the under side of the load but this distance can be changed on special orders. This lift truck is manufactured by Williamette Hyster Co., Portland, Oreg.

Unique Design of Weld Joint Permits 100% Penetration on First Pass

IN SUPPORT of his claim that many parts heretofore thought impossible to join by welding can be welded without distortion where joints are properly prepared, Russell Meredith of Meredith Welding Co., Los Angeles, submitted the accompanying illustrations in a contest sponsored by the Hobart Brothers Co., Troy, O. They show how thick-walled tubing (approximately 0.750 wall thickness) may be joined by an ingeniously designed joint.

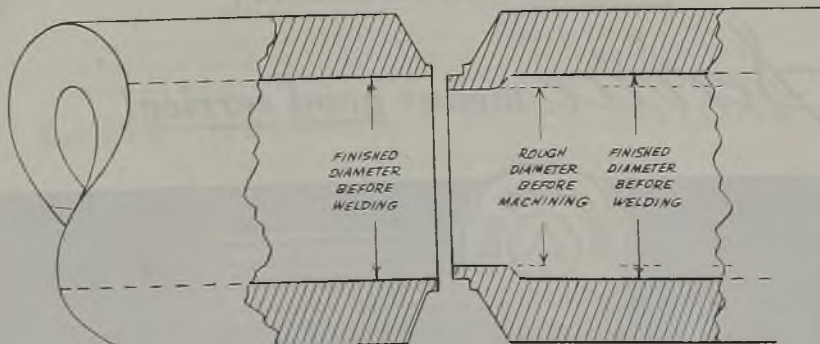
One length of tubing, with thickness specified above, is prepared for a groove

with a 40-degree bevel angle all around one edge, leaving a small root face 0.050-inch thick around inside edge of pipe wall. This serves as the female seat of the joint and is shown by schematic drawing below. Also shown here is the male seat of the joint made from pipe with wall thickness of 0.80-inch and a slightly smaller inside diameter. This seat also acts as a backup plate on inside wall of tubing and permits 100 per cent weld penetration without leaving icicles on inside of tube.

Edge preparation for the male seat also

starts with making a 40-degree bevel for the weld groove but leaving a two-step root face, the lower leg of which is 0.250-inch long, 0.093-inch thick and with radius of 0.187-inch at point where male seat rises to meet inner wall of tube. As may be seen from diagram, this seat is actually what is left of original inside diameter after thicker-walled tube is machined to give it a finished inside diameter equivalent to that of the first piece of tubing, with the difference that cutting operation is halted 0.250-inch from end.

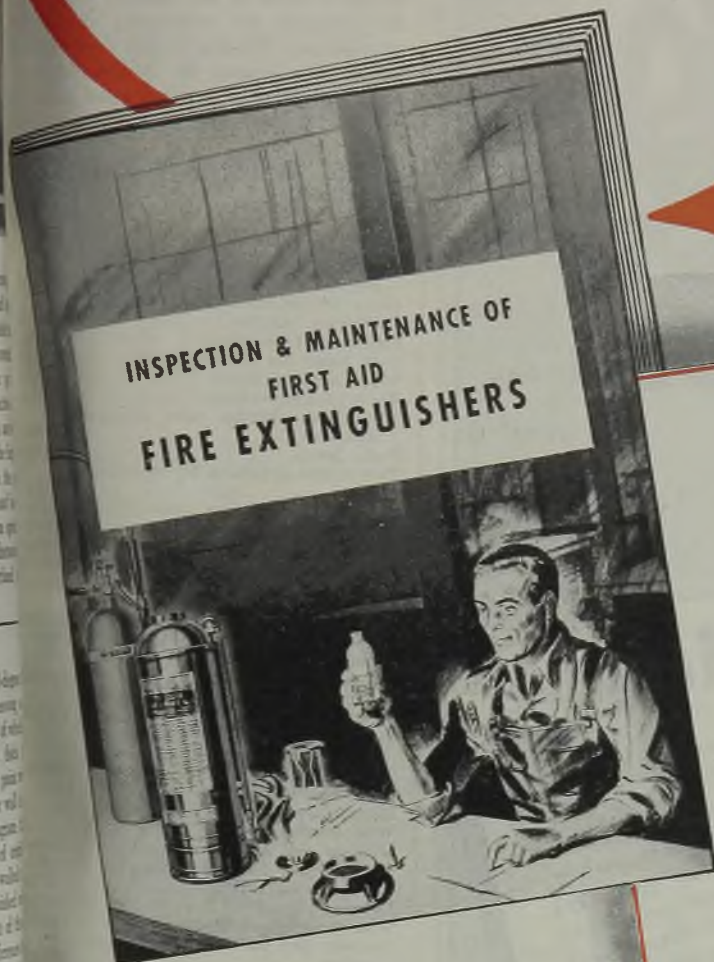
Illustration at right, below, is an enlarged view of longitudinal section through welded joint showing complete penetration achieved. Male seat is removed in final machining operation, leaving parallel walls on inside.



MACHINING DIAGRAM



Let this **FREE BOOK** help you keep
your fire-fighters ready for action!



NEGLECT of your extinguishers may leave them damaged, clogged, under-charged — *unprepared* at the critical moment when you need them. Only careful examinations at fixed intervals can insure the full effectiveness of your equipment at all times.

To make it easy for you to organize your own maintenance system, Walter Kidde & Company has issued this booklet. The panel at the right gives some idea of its scope. Take the first step toward better fire protection now — write for your free copy of this booklet!

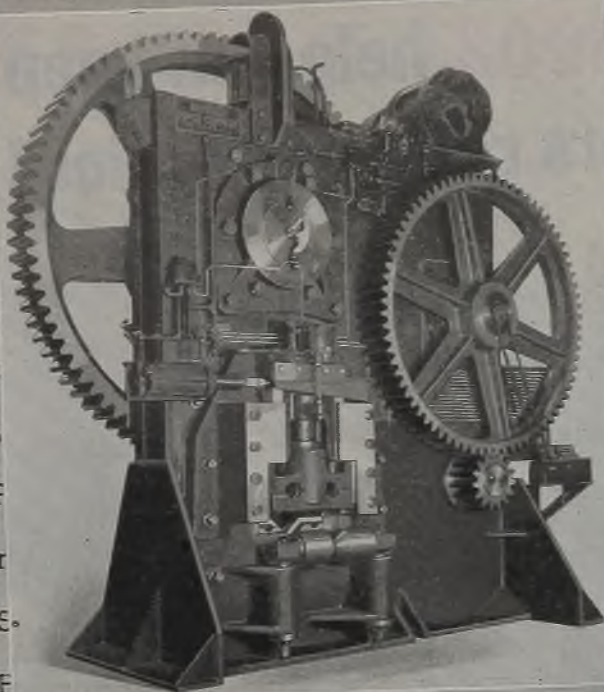
PARTIAL LIST OF CHAPTERS

- WHO'S IN CHARGE?
-
- KEEPING RECORDS
-
- WHAT KIND OF EXTINGUISHERS?
-
- MARKING LOCATIONS
-
- MARKING THE EXTINGUISHERS
-
- INSPECTION OF EXTINGUISHERS
-
- VAPORIZING LIQUID EXTINGUISHERS
-
- CARBON DIOXIDE EXTINGUISHERS
-
- SODA-ACID EXTINGUISHERS
-
- FOAM EXTINGUISHERS



WALTER KIDDE & COMPANY, INC., 140 CEDAR ST., NEW YORK 6, N. Y.

H. Haskel Mfg. Co., American Forge Co., Pack
r Car Co., Allis Chalmers Allis Co., Brandt
Mfg. Co.



In Service

Cutting billets for all the companies listed here, plus many more, Buffalo Billet Shears are ready to go to work for you—reducing costs, giving greater production with present man-power, turning out uniform pieces for drop hammers, twenty-four hours a day. Sturdy, fool-proof and economical to operate Buffalo Billet Shears save money in any production program where they can be used. Write for Bulletin No. 3295.

BUFFALO FORGE COMPANY
158 Mortimer St.
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.
Buffalo, N. Y.

"Buffalo"

**BILLET
SHEARS**

ALIEN PATENTS

CLASS NO. 205
METAL DRAWING

STEEL presents the concluding section of a list of enemy patents of interest to the metalworking industries. Many of these are available on a nonexclusive royalty-free basis under simple licensing terms. Copies of any patents listed may be obtained by addressing the Commissioner of Patents, United States Patent Office, Washington 25. Include 10 cents for each patent, specifying serial number.

LIST OF ENEMY PATENTS

DESCRIPTION	PATENT NO.
Apparatus for making conical tubular bodies	2054870
Guide for the mandrel shafts in tube drawing benches	1879743
Cushioned push bench	1959425
Push bench for drawing tubes	2024185
Metal drawing bench	2024186
Tube pushing bench	2096243
Means for driving tube drawing benches	2140633
Push bench	2219995
Process and apparatus for expanding tubes	2284863
Apparatus for drawing hollow blanks	1767845
Drawing press	1886935
Tube drawing bench	1889314
Push bench mandrel guide	1889320
Drawbench	2190889
Drawing process for production of round rods	1952560
Method of making grooved sleeves	1985833
Production of pipe conduits for chemical purposes	2198149
Method and apparatus for welding tubes	2017397
Multiple wire drawing machine for drawing fine wires from suitable material	1693223
Wire drawing machine	1907311
Multiple wire drawing machine	1914833
Wire drawing machine	1976204
Multiple wire drawing machine	1999944
Multiple wire drawing machine	2062272
Wire drawing machine	2127300
Drawing bench	1961556
Wire drawing machine	1648511
Drawing ring for wire drawing machines	1688115
Method of machinery for drawing wire	1924863
Metal working	1949780
Metal drawing process	2258833
Mandrel bar guide	1874999
Push bench	1960338
Push bench guide	1979557
Method of apparatus for the production of seamless tubing	2074227
Multiple wire drawing machine	1727666
Process for soft coating metals to be submitted to cold deformations	1894166

LIST OF PATENTS FROM ENEMY-OCCUPIED COUNTRIES

DESCRIPTION	PATENT NO.
Metal drawing press	1942003
Device for manufacturing elastic joints	2032444
Mandrel guide in push benches	2005550
Method of flaring tubes	2047544
Method of manufacture of rectangular tubes	1719744