From Games to Gages Is the Conversion Story of One Alert Producer, See P. 30

CONTENTS

Volume 110—No. 22 STEEL June 1, 1942

NEWS

FEATURES

TECHNICAL

PRODUCTION

MARKETS

ACCURACY BEGINS IN THE BEARINGS

. . . and Morgoils are proving it under War Service conditions

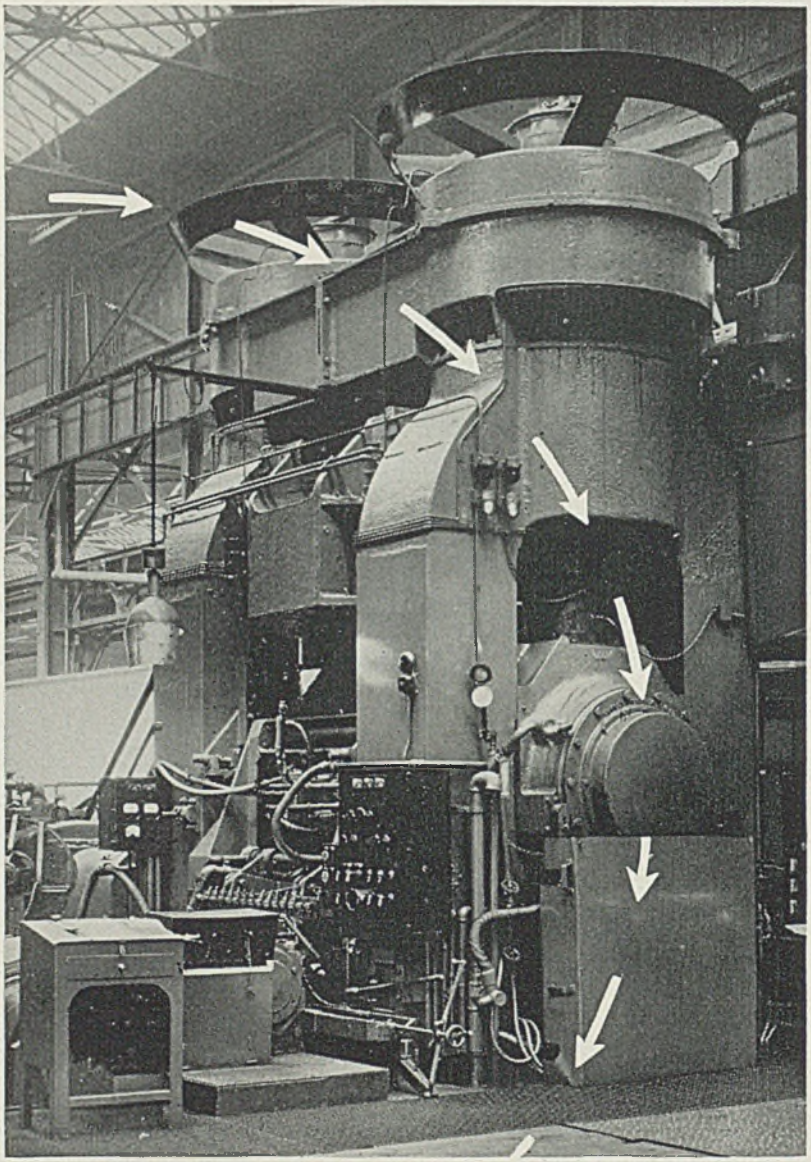
Mills equipped with Morgoil Bearings are rolling (1) foil *one-quarter of a thousandth of an inch in thickness* at speeds up to 600 ft. per minute; (2) hot strip steel *94" wide* at speeds in excess of 2000 ft. per minute; (3) No. 5 wire rods *to a ± .005 in.* diameter at speeds of over 4000 ft. per minute . . .

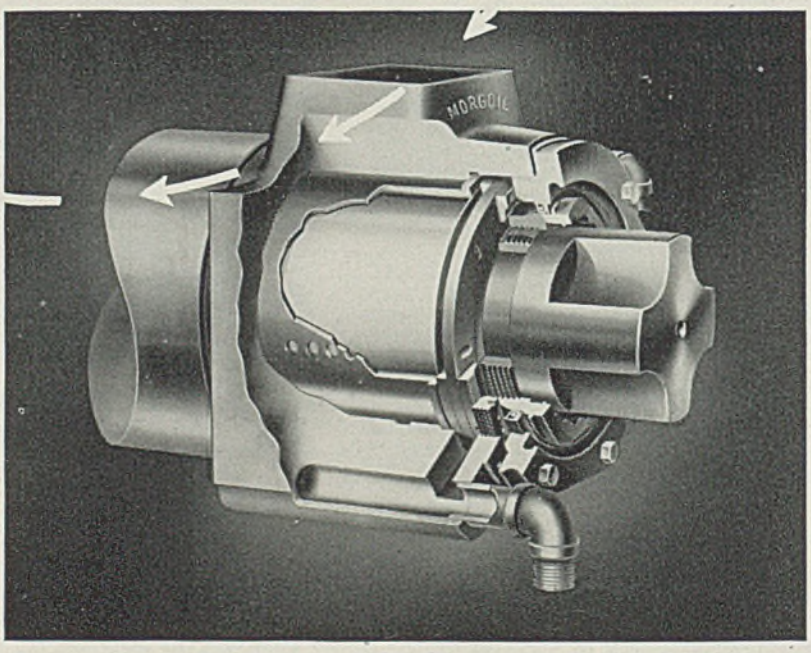
These performances are made possible by the absence of metal to metal contact and complete freedom from wear in the bearings. Morgoil Bearing design is based upon the well-known action of an oil film under pressure between two highly finished surfaces. Load-carrying ability of Morgoil Bearings at all speeds is proved under severe service conditions: for instance—the world's largest and most powerful 4-high reversing cold mill, shown here.

Morgoil Bearings have been installed in many existing mills, replacing bearings of other types. If you are interested, we shall be glad to see what we can do for you.

MORGAN CONSTRUCTION COMPANY
Worcester, Massachusetts

MORGAN
WORCESTER
ENGINEERS AND
MANUFACTURERS





R-100

MORGOIL BEARINGS

HIGHLIGHTING

this issue of STEEL

NEWS Now that industry has gotten over the hump in converting to war production the emphasis is being placed on effective use of our material resources. "Anyone who wastes materials very soon will be a traitor", warns Donald M. Nelson (p. 32). Various directives have been issued and many more are planned. Coal shipments on the Great Lakes have been restricted to aid iron ore movement (p. 43). More nonessential construction is under ban (p. 42). Export goods no longer may be shipped to seaboard until shipping space is available. A new order will require segregation of scrap to conserve alloying elements. Excess inventories will be purchased by the government (p. 33); it will start in steel soon with the purchase of tool steels and high alloy steels. Tantalum has been added to those metals under full allocations control (p. 39). WPB has taken over distribution of many types of industrial equipment such as fans, motors, compressors, conveyors, hand trucks (p. 37).

To prevent "pirating" of workmen they are to be "frozen" to their jobs (p. 40). War Manpower Commission reports women can do 80 per cent of war jobs (p. 45).

PRODUCTION Last week it became definitely apparent that the program to increase steelmaking capacity by an additional 10,000,000 to 15,000,000 tons of ingots is to be sharply curtailed. The war can be won with present steelmaking facilities, says Stanley B. Adams (p. 32) but he predicted that steel products will be distributed under a complete allocations system.

While the major job of converting industry to war production has been accomplished or is under way, the time will soon come when many managements that have not yet converted must take action or fade out of the picture. This week's pictorial feature on conversion (pp. 30-31) shows how a small plant located in a loft building has gone from games and orange squeezers to gages, dies and bullet punches.

T. D. Jolly (p. 35) tells the dramatic story involved in the gigantic aluminum production program, while Col. George S. Brady looks for an active demand for both aluminum and magnesium after the war (p. 32).

Two new turbine plants have been placed in production (p. 55).

Steel production last week continued at 99 per cent of ingot capacity (p. 39). The first government-owned blast furnace has been lighted (p. 54); a new plate mill is operating in Alabama. Consumers are urged to build up scrap inventories this summer in anticipation (p. 33) of a "long and hard" winter.

TECHNICAL Pulverized coal now competes successfully (p. 62) with oil and gas in high-temperature furnaces where moderate ash deposits are permissible. Fully automatic controls eliminate firing difficulties.

One company has developed exceptionally effective methods (p. 64) to convert green hands into precision machine operators quickly. Gerald E. Stedman tells how more than 70 per cent of its present precision workers have been trained by these methods, and 99 per cent of supervisory force upgraded from the ranks.

A new manual arc-welding technique (p. 70) doubles speed of fillet and V-butt welding in many applications; produces stronger joint with less weld metal, according to C. M. Taylor.

An explanation of the many factors involved in handling inspections of war products (p. 75) is particularly valuable at the present time.

E. W. Deck describes (p. 81) improved flame descaling methods and equipment which are able to reduce surfacing time and costs. Flame-jet velocities are raised 50 to 70 per cent to speed rate of heat transfer, thus increasing effectiveness of scale removal. Gases are preheated.

Control work is emphasized as one of the most important factors in maintaining peak production in a porcelain enameling plant (p. 86). Principles involved are applicable to many different types of processing operations.

Mechanical handling devices used with an automatic shell-cleaning machine (p. 88) greatly speed the cleaning of shell and bomb bodies.

MARKETS Fabricated structural steel awards were larger in April than in any month since 1929 (p. 113). OPA has made certain adjustments to enable iron and steel warehouse distributors to function more smoothly. The definition of No. 2 heavy melting steel has been somewhat liberalized. Dock operators at upper lake ports (p. 43) are permitted to add certain costs to railroad fuel prices; one iron ore producer has been granted relief from the price ceiling.

These Plants Can Take on More War Work

They Have Men and Machines Available for Immediate Production

Numerous plants throughout the Middle West are listing their available facilities for war work with Inland Steel Co.

Brief summaries of these facilities are listed below to help bring manufacturers in contact with "prime" contractors or Government agencies—thus speeding all-out war production.

Write or wire Inland for names and addresses of any of the following plants. Because our list of available war work plant capacity is growing daily, we suggest that you get in touch with us even if the types of plant and equipment you require are not listed.

IS-39 Iowa oil heating equipment mfr., fl. sp. 40,000 sq. ft. Has nearly 100 experienced emp., all available for war work contracts. Equip. includes sheet metal and welding dept., stamping, forming, rolling, rough machine work, casting, grinding, polishing, structural iron formation, pressure vessels, tanks, etc.

IS-40 Wis. mfr. of stampings and metal specialties. Has 31,000 sq. ft. of mfg. sp. with 75 emp. working 8 hr. a day. Desires prime and subcontract stamping work. Equip. includes 36 punch presses (incline and vertical), double end disc grinders, degreasers, spot welders, riveting mach., plating dept., spray booths, gas fired baking ovens, squaring shears, and power press brakes.

IS-41 Ohio sheet and plate fabricating shop specializing in redesigning machine bases and construction equip. to shear, form, weld, torch cut, punch, notch, grind, finish and assemble steel bars, plates, sheets 16 ga. ½". Company long established, very well equipped and staffed to handle any type or quantity of specialized steel fabrication.

IS-42 Thirty-four-year-old metal office furniture mfr. (Mich.) with a complete line of shears, presses, spot and arc welders, and finishing room equip. Now working one shift 30% war work, has 120,000 sq. ft. of fl. sp. with plenty of labor available. Excellent shipping facilities.

IS-43 Ill. sheet steel fabricating plant, cap. 16 ga. to ¼", emp. 150 men, seeks highly rated sub-contract work. Facilities for shearing, forming, pressing, and welding. Press brakes to ¼" x 4'—0" to 27'—0" lg., presses from 5 to 500 t., hot dip gal. kettles 24'—0" lg.

IS-44 Iowa agricultural and hardware specialties mfr. has complete equip. for stamping, drawing, forming, and assembling of sheet metal products. Modern plant including 10' cap. squaring and circular shears, punch presses, press brakes, air riveters, spot, arc, and butt welders, also dip or spray lacquers, air drying finishes, special tank dept., fabricating 16 ga. and lighter. Doing some Government work now.

IS-45 Minn. machine shop and grey iron fdry. emp. 120 has 2½ acres fl. sp. including several modern planers, 3 new high-speed turret lathes, a 48" double head boring mill, a 20 ft. bed engine lathe, gear cutters, drills, forging and welding shop include 2 steam hammers and 2 cast iron heat treating furnaces.

IS-46 Largest fabricator of steel plate in upper Miss. Valley has available cap. on two four-column, 300-ton hyd. presses for bending, flanging and forming.

IS-47 Well equipped sheet metal mfg. plant (Minn.) with 2—12' long, 2—10' long, 1—7' and 1—4' power press brakes with 150—10' and 12' long dies for same. Shears and rolls, drop presses, punch presses, stake riveters, electric arc and spot welders, complete blacksmith and tool shop, all in first-class condition to produce sheet metal products 30 ga. to 10 ga. incl. Large well equipped hot-dip gal. plant in connection.

IS-48 Large Wis. mfr. of enameled, stainless and cast iron steel ware, and special metal fabrication, desires sub-contract war work on following equip.: 10 double geared toggled draw presses, 2 geared double crank presses, 2 single geared toggle draw presses (fl. sp. 17,000 sq. ft.), trim bead and spinning dept. includes 54 different kinds of lathes, oval trimming bead, spin lathes, large, small and automatic (fl. sp. over 17,000 sq. ft.). 26 various punch presses including horning and wiring and inclinable power (fl. sp. 10,000 sq. ft.), 25 gas and 2 percussion welders, also spot welders, polishing lathes, and complete tool maintenance and pattern dept., cleaning and pickling, enameling and burning.

Dedicated to Victory

INLAND STEEL CO.

STEEL

June 1, 1942

THE NEW CHALLENGE: HOW MUCH FROM HOW LITTLE?

Production in the American arsenal for the United Nations is passing from one phase to another. In the judgment of WPB officials, the tooling-up job — converting plants and constructing new facilities — while not finished by any means, is progressing so satisfactorily that major attention now can be focused upon other problems.

These problems stem out from the necessity of getting the greatest possible output of war goods from the facilities and materials now at hand or in sight. They embrace efficiency in operation, conservation of materials, utilization of substitutes and salvage of waste. These constitute a second phase of the war production job.

If American industry is to do as well in the second phase as it is doing in the first, it must shake off all traces of the national trait of carelessness in the use of its resources. The abundance of most raw materials during many decades has dulled our sense of economy. Now we must employ our energies to the problem of doing as much as possible with the least drain upon stocks of virgin scarce materials.

This can be done if every company will discipline its organization to frugality in the use of materials and to the systematic salvage of waste.

Some companies are doing this effectively now. A machine tool builder, the Bullard Co., has perfected salvage operations which net annually 25,000 gallons of lubricating and cutting oils, 75,000 pounds of nickel, 35,000 pounds of chromium and enough turnings and borings to produce 15,000,000 pounds of iron and steel briquettes.

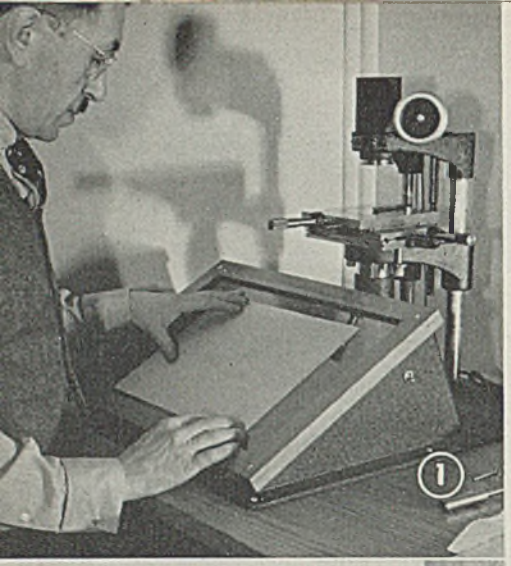
A single plant of E. I. duPont de Nemours Co. has a salvage campaign which in one month reclaimed 200,000 pounds of scrap iron, 19,000 pounds of lead, 10,500 pounds of copper, 6000 pounds of brass, 3500 pounds of aluminum, 3500 pounds of stainless steel, 500 pounds of monel metal and 1073 pounds of rubber.

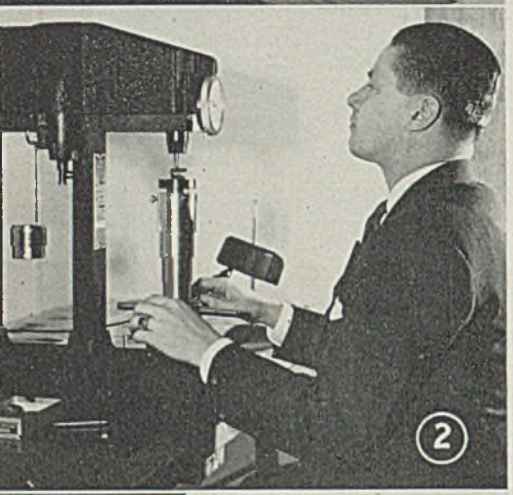
An eminent metallurgist points out that if we could achieve complete scrap recovery of 3.5 per cent nickel steel, we could produce twice the tonnage of nickel-bearing ingots that would be possible if all new nickel were used.

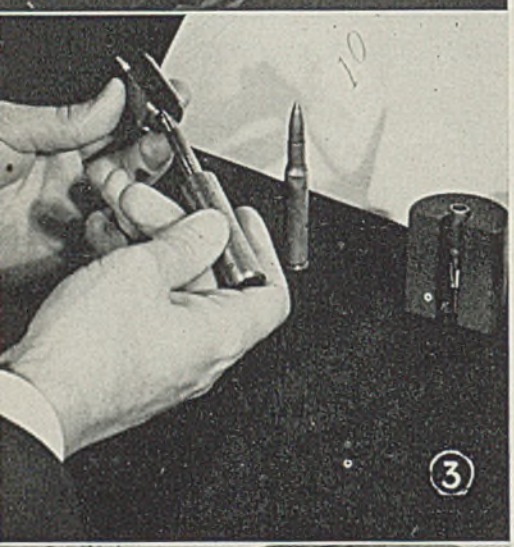
Here is a new game for American ingenuity! How much can we make with how little of new scarce materials?

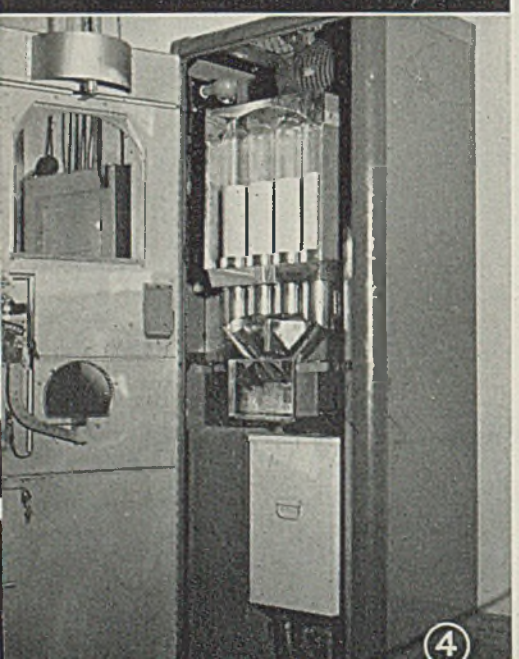
E. L. Shaner

Editor-in-Chief









★ ★ ★ ★

"Second-Story" Arsenal Goes

FROM GAMES TO GAGES

From metal games, orange squeezers and automatic drink dispensers to the manufacture of gages, dies and bullet punches is the story of this foresighted producer. Now war work enables him to run his plant 23 hours a day, six days a week; to increase the number of his employes from 12 to 75

★ ★ ★ ★

MANUFACTURING metal games for children or orange squeezers for housewives does not sound to a layman like the best sort of training for war production. Yet with democratic flexibility a firm that used to turn out these gadgets has changed to the most precise and difficult type of work for the armed services, the manufacture of gages and dies and bullet punches.

The firm, now occupying three floors of a drab loft building, was about to go on the market with a new soft drink dispenser for movie lobbies and crowded theaters 18 months ago.

Housewives had not started registering for civilian defense, but already the shadow of the future was cast across American industry. Orange squeezers were of steel, the games were of steel stampings; and the soft drink dispenser used these metals and a number of others, too. In fact, it used the same general type of metals that go into a tank.

The president of this small company, which had but 12 employes, happened to have a background that caused him to spot the shadow of the future. For years he had been a top-flight tool designer and machinist for a large motor company. Twenty-three years ago, in the last war, his factory had made bullet dies, punches and cartridge machinery. He knew civilian and military production, he knew they both used the same metals and that in an all-out war program there would be inevitable shortages for civilian goods.

Associated with him was a business man of foresight and courage, able and willing to put necessary

Fig. 1—President of the company now producing gages for cartridge makers is here shown checking a contour gage on an optical comparator. Such gages must be accurate to 2/10,000 of an inch to meet ordnance specifications

Fig. 2—Here the company vice-president is shown testing the hardness of the steel in a chamber gage which his company has made. These gages are produced from especially tough and hard alloy steel

Fig. 3—These are some of the gages, punches and dies manufactured by the converted plant for use in production of .30-caliber cartridge parts. Photos from Office of Emergency Management, by Gruber

Fig. 4—This is the automatic soft drink dispenser which the company had developed. Now it and other peacetime products including game boards and orange juicers are out and the plant is making precision tools and gages, brass quadrants and the like

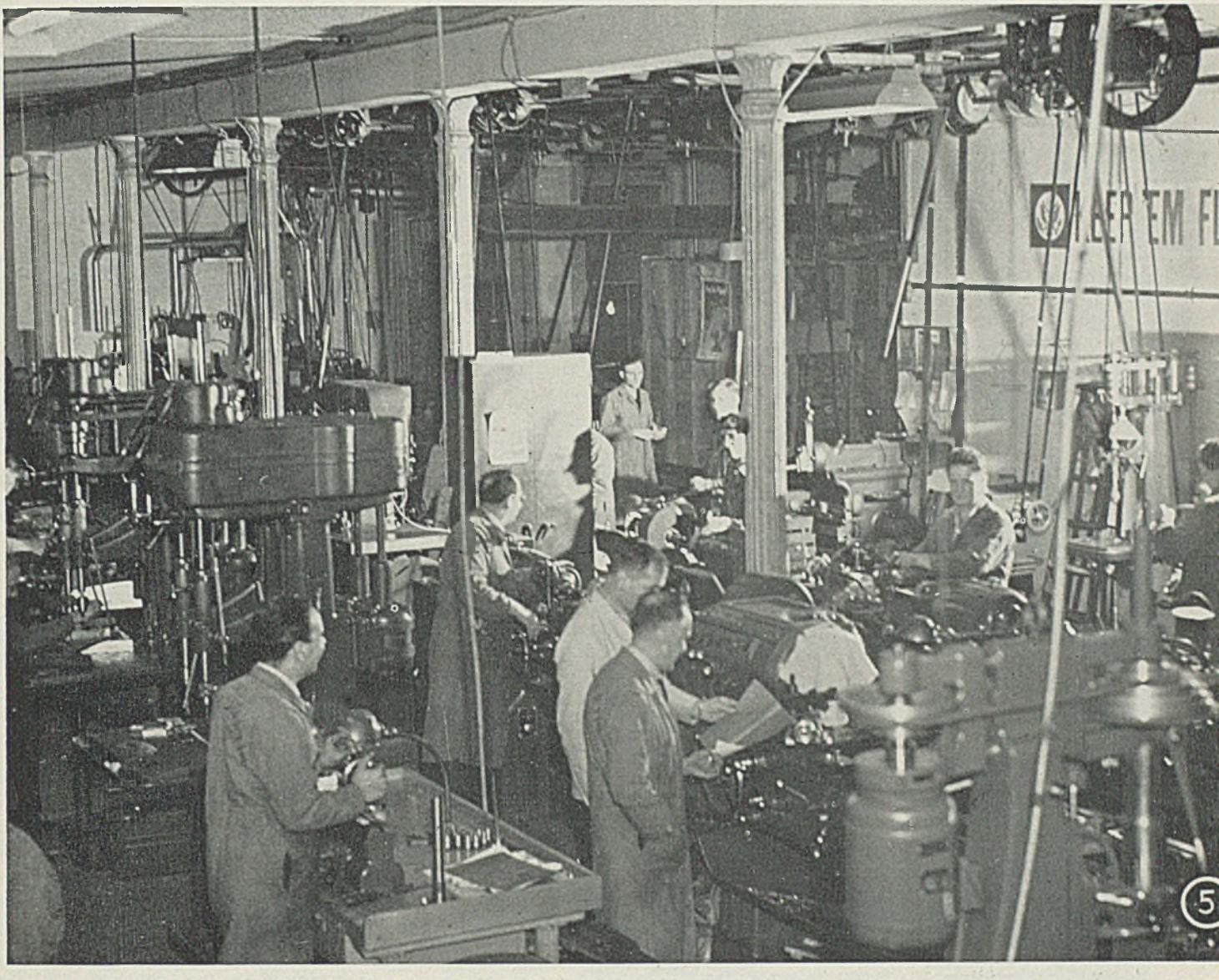


Fig. 5—Busy little shop gets into war work, jumps its workers from 12 to 75. Here is shown a portion of the plant, now 100 per cent in war production

capital behind the firm. Together they decided that children could do without metal games, that housewives could use old-fashioned glass reamers for their oranges, and that soft drinks could wait until after the war for a new dispenser. In short, they converted to armaments.

A few months after they had received their first arms orders, they learned of the establishment in their state of a regional office of the Office of Production Management, now a field office for the War Production Board. Down to the office they went in May, 1941, to see what assistance they could get. Engineers listened to their idea with enthusiasm. Here were experienced management with engineering skills, adequate machinery and a nucleus of highly skilled toolmakers. The field office put the firm in touch with procurement offices of the armed services, and contracts were quickly forthcoming.

Today a chrome model of the soft drink dispenser stands in dusty splendor in a corner outside the main office. Come peacetime, it may be put back into production.

The products that superseded it are not large, but they play a great role in the Army's arsenals, where dies and other items, must be right to 2/10,000 of an inch, a space you can't figure with a school ruler. What is needed is a great deal of measuring and that is what this firm helps do. It makes gages to measure tools that make the tools of war; gages to check on other gages; gages for cartridges. Then there are dies to shape bullets and slender rods of alloyed steel being turned by high-speed grinders into bullet punches.

Some of the work is by hand—painstaking, prolonged operations that require all the skill of highly-trained tool and gage men. Much of the production is by machine, where there is often a dramatic contrast between employes in their 50's and 60's, baldheaded or gray-haired, bending over the shining new millers and grinders and borers. New men have been taken on as needed; the payroll is now 75. Men who know machines are easily taught the special techniques for war work.

Many of this firm's contracts are of such importance and secrecy that they cannot be discussed publicly. It can be said, however, that there is now a backlog of half a million dollars worth of work and that production goes on 23 out of 24 hours a day, six days a week.

When members of the staff are asked what they consider the most important element in this conversion, the answer is this:

"First of all, there must be a conversion of thought and engineering practice. Production for war demands exacting qualities of excellence. Delivery schedules are strict, tolerances are close. Despite this, we've tried to maintain a flexibility that enables us to adjust to any demands. Right now, for instance, we're ready to go into a seven-day-work week and a greatly expanded program."

More Complete Control Over Steel Distribution Predicted by WPB Expert

✦

Purchasing agents in New York told 86,000,000-ton capacity enough to win war . . . More production from available materials urged by Nelson. Warns heavier demands are ahead

✦

NEW YORK

THE WAR can be won with a steelmaking capacity of approximately 86,000,000 tons, Stanley B. Adams, assistant chief, WPB Iron and Steel Branch, told members of the National Association of Purchasing Agents in convention at the Waldorf-Astoria here May 25-28.

The steel industry has enough lodestones around its neck now, he said, without adding 10,000,000 to 15,000,000 tons of additional capacity.

Mr. Adams predicted distribution of steel products will be completely controlled on a total allocation system. Priority ratings have become ineffective as indicated by estimates that A-1-a ratings account for more than the entire production.

Under the projected closer control of steel distribution, the entire industry will be treated as one company. No large inventories in the hands of consumers will be permitted. Control will be as complete as in the case of pig iron, which, Mr. Adams said, has been the finest single job of allocation in the WPB.

(C. E. Adams, retiring chief of the WPB Iron and Steel Branch, told the American Iron and Steel Institute meeting in New York, May 21, that overall allocation of steel products would be "unwise and impractical." His observation was based on the difficulty of obtaining a much larger and experienced personnel to administer the program.)

Strip mills are being converted to plate production rapidly, the WPB official said. United States Steel Corp.'s Irvin works now is rolling only plates and tin plate and soon will discontinue the latter. Jones & Laughlin Steel Corp.'s strip mill is rolling only plates.

Plea for conservation and efficient utilization of materials was voiced by Donald M. Nelson, WPB chairman. Anyone who wastes materials very soon will be a traitor, he declared, emphasizing that purchasing agents must take the lead in directing the wise use of supplies available. Not only will it be traitorous to waste materials but it also will be treasonable to use critical materials for purposes where a substitute is available.

The United States will be using 3,000,000 tons of copper a year by 1943, the WPB chieftain said. This contrasts with consumption of only 250,000 tons a year by Germany.

While lauding the achievements of industry highly, Mr. Nelson warned that still heavier demands would have to be met.

Materials Are Limiting Factor

Materials, he said, are the limiting factor in our war production program. Today orders are being placed on a huge scale.

"It is a production man's paradise," he declared, "but you will have to be good to get all the materials required.

"Production is coming fine, but don't lose sight of the fact that we really didn't get started until last fall and that the Axis powers had a long head start."

However, he added he believed American ingenuity will do the trick. This is not a young man's war or an old man's war, he asserted. It is a smart man's war, with the opposition plenty smart.

Mr. Nelson advised the purchasers not to allow themselves to become overly optimistic or underly optimistic. Just remember, he said, that the country with the greatest production and inventory wins.

Col. George S. Brady, chief, Materials Statistics Division, Board of Economic Warfare, predicted the United States' war production effort would go down in industrial history as "the most magnificent co-operative task ever done by a whole democratic people in this machine age."

Colonel Brady declared there is no danger of over-capacity in aluminum and magnesium. By the end of 1942 aluminum output will be five times that of 1939 and magnesium production will be 60 times the 1939 rate.

"If, after this war, we go into the world wide carrying of mail and express packages by airplane the number of replacement planes alone needed every year will keep every aircraft plant busy.

"We have been talking about substitutes for aluminum. We say we will be using aluminum and magnesium as substitutes for other metals, even in ships. We have hardly touched the possibilities of aluminum alloying."

Lack of ships to bring in chromium has made it necessary to question uses. Executives asked: "Why is it necessary to use stainless steel containing 18 per cent of scarce chromium for hand wheels for machine tools. They could be convinced that a 3½ or 5 per cent nickel steel is needed for high strength ordnance parts, but they naturally ask why such steels containing scarce strategic materials should be used where the strength is not needed."

"High strength steels of 75,000 pounds per square inch as rolled, suitable for a wide range of uses, can be made with not over 1 per cent of chromium and nickel.

"In normal times we have been wasteful; to use a high-chromium, high-nickel steel for the average mechanical part is like wearing a full dress suit to a barbers' clambake."

Colonel Brady described the tin situation as serious and said present conservation measures are inadequate. "One of the great accomplishments of the year was the changeover in the steel mills from dip tin plating to electrolytic."

A new iron and steel scrap order will be issued soon requiring the segregation of alloy materials, Frank Vigor, chief of the raw ma-

terials section of the Iron and Steel Branch said. The order will cover industrial producers and dealers.

Mr. Vigor advised scrap consumers to build up inventories during the summer months in anticipation of a "long and hard" winter.

L. J. Martin, assistant chief of the Bureau of Priorities, said the WPB would go after excess inventories of steel products as well as copper and aluminum. Notices have been sent to 100,000 holders of copper in partially fabricated and unfabricated form and it is expected that between 200,000 and 350,000 tons, or requirements for three months of war production, will be recovered.

The copper program, he said, is resulting in a loss of about $65,000,000. If 21 cents a pound is paid for copper alloy and the material is worth only 12 cents, the difference of 9 cents a pound has to be "swallowed."

The steel buying program will start with the most strategic materials, such as tool steels and high-alloy steels. These probably will be purchased on a value basis.

Mr. Martin said too many cases of off-heats of steel had come to his attention. Unfortunately these usually do not meet war contract specifications but "fortunately" can be used for some other purposes by steel company customers. This situation must be checked, he said.

8200 Companies Now Under Production Requirements Plan

Priorities as such are out, according to John H. Martin, who also is assistant chief of the Bureau of Priorities. "Leap-frogging" of ratings, of course, is out at the same time. The latter has resulted in constant moving up in ratings so that the bulk now are in the high A brackets.

The Production Requirements Plan, which will largely replace the priorities system, will provide closer control of all materials. In effect, he stated, it will be a "yes" and "no" system.

According to Charles M. Schoenlaub, acting chief of the Production Requirements Section, 8200 companies now are operating under the plan. Within the next few months, he said he expected PRP would cover practically all phases of WPB activity. Only essential civilian requirements will be covered, in addition to war equipment needs. Nonessential civilian needs are out for the duration.

Walter D. Fuller, president, Curtis Publishing Co., Philadelphia, and chairman, National Association of Manufacturers, asserted that the country's methods of advertising and selling have stood it in good stead in the present emergency.

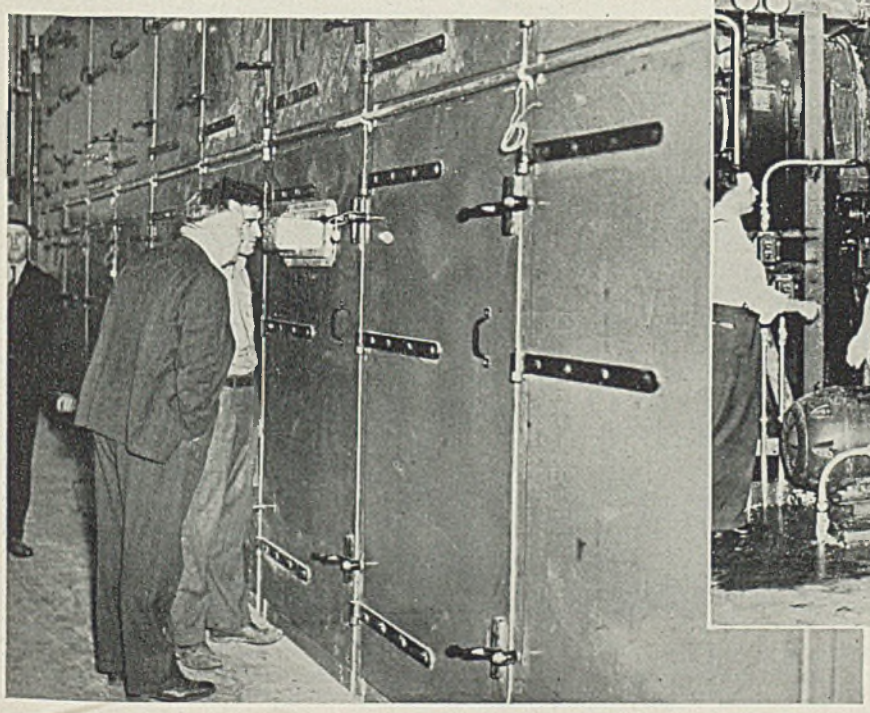
By creating demand for the products of American factories, advertising and selling have created the necessity which mothered the invention of mass production.

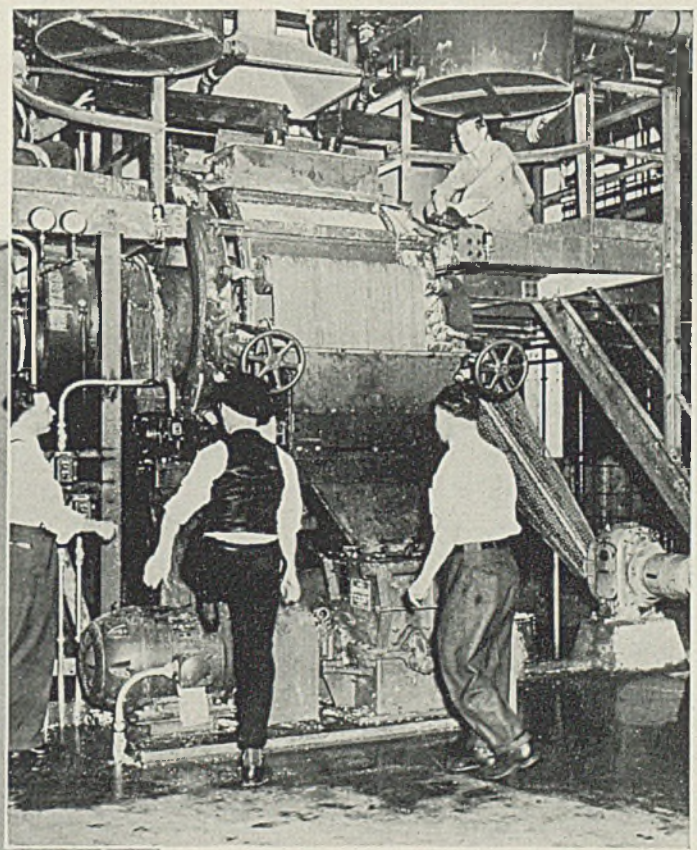
"Our persuasive selling way," he said, "has built so soundly and substantially over the years that now, in this great crisis, we have the machinery, the capacity and the know how to do the job."

Discussing taxation and anti-inflationary measures, Mr. Fuller pointed out that President Roosevelt has advised against wage and salary increases as an anti-inflationary step and should be given every support in this position. The speaker believed the government has taken steps in the right direction to control inflation with ceilings on prices and increased taxes. These, he said, are the walls and a ceiling but what is needed now is

How Steel Figures in Production of Synthetic Rubber

ALTHOUGH demand for steel and other critical materials for immediate production of direct war goods may force the suspension of projected expansion of copper and steel producing facilities, it is expected the synthetic rubber plant program will be carried through to completion. One such plant, Goodyear Tire & Rubber Co.'s Chemigum factory at Akron, O., has just started production. Below, two employes watch the first batch of the synthetic rubber pass through a drying machine on a conveyor belt. At right, the Chemigum rolls from an intricate maze of reactors and tanks in the new plant. All is earmarked for military use





a firm foundation of wage control. He believed controls can be devised which will permit enough flexibility so that individual incentive may be maintained.

"With consumer incomes for 1942 at $117 billion, an increase of $22 billion over 1941, with 1943 incomes estimated at perhaps $125 billion or more, and with probably not more than $60 billion of consumer goods available in 1943," he said "we are well on our way to inflation unless some of this excess purchasing power is drained off."

The speaker advised business to overlook no effort in correcting the public's misunderstanding of war profits. A recent survey by the National Association of Manufacturers, he said, indicates that profits have not been extreme in spite of a few isolated cases. Of 1013 completed naval contracts, for example, 15.7 showed no profit at all. In 14.2 per cent of these, the contractor suffered a loss and in 1.5 per cent he broke even.

"You may know that the records show that in the last few months, the speaker pointed out, "$160 millions has been returned to the government voluntarily on contracts that could not be properly estimated at the time they were let. But the public is not conscious of the fact that the majority of industry is turning back all amounts above a reasonable profit," Mr. Fuller concluded.

Steel, Copper Expansion Programs May Be Suspended, Says Henderson

EXPANSION of steel and copper producing facilities may have to be suspended because "we may have to eat our seed corn this year," Price Administrator Henderson told the convention.

The materials necessary for new construction, he explained, may have to be used in direct war materials this year instead of getting ready to produce more war goods in 1943. The drive now is for production in 1942.

Mr. Henderson said shortages of power and transportation are at hand and will have to be rationed. The power system, he said, may falter because it has been producing at a maximum rate and greater demands are in sight.

He warned the time is nearing when plant managers may feel helpless because they have the facilities to produce but are unable to obtain enough transport for raw materials of finished products.

To relieve these power and transportation bottlenecks whole new facilities are necessary and the construction of these takes a lot of time.

SPAB, which gave way to WPB only four months ago, worried about production lines, Mr. Henderson said. Production worries now are largely solved. Industry has demonstrated that it can convert raw materials in any amount.

The price administrator said the production of consumer goods hit a peak in August, 1941 and predicted such production would be down 24 per cent by the end of 1942. The discomforts and annoyances to date have been petty in comparison with those to come.

Speaking of compliance with price regulations, Mr. Henderson said: "We are keenly aware that in times like these public accusations of criminal wrongdoing in connection with the war effort may be sufficient to destroy a business.

"You may be assured, therefore, that in any case in which OPA has recommended criminal prosecution, we have satisfied ourselves beyond any reasonable doubt that criminal proceedings are appropriate and necessary."

David Ginsburg, OPA general counsel, said the OPA legal staff had no members of the "crackdown" school, and that honest errors of misinterpretation were not confused with deliberate violations.

"We have suggested that persons guilty of technical price violations, as a token of good faith, simply make a donation to the United States Treasury in the amount of the over-charge."

Field inspection by "hard-hitting professional" investigators will increase, Mr. Ginsburg said. These include employes of the Federal Trade Commission, the Tariff Commission, Department of Justice and other agencies.

"Soon we hope to enlist the help

TWO STAINLESS STEEL MURALS for the United States Naval Academy at Annapolis, Md., depicting harbor scenes of Hong Kong and London Pool, were dedicated recently. The Armco stainless sheets for the murals, each 6 x 18 feet, were supplied to the artist months before Pearl Harbor

of state and local police and other state law enforcement agencies."

Paul G. Hoffman, president, Studebaker Corp., South Bend, Ind., said that "if OPA fails, industry fails." He praised Mr. Henderson as a "tough-minded realist" who was willing to look a fact in the face and act.

Prices will be held at the March level, as provided in the OPA General Maximum Price Regulation. "There is no doubt about this," said John E. Hamm, senior deputy administrator, OPA.

Answering questions at a forum of the NAPA, Mr. Hamm said that speaking for himself, and he believed for most members of OPA, the OPA is convinced that war is no time to take away the gains of labor.

He quoted the answer given recently by Bernard M. Baruch, chairman of War Industries Board in 1917-18, to a question about the 40-hour week in wartime—that taking away social gains in wartime does not help morale. He pointed out the 40-hour basic week does not prevent work above 40 hours but rather governs the cost of overtime pay.

Dr. K. W. Taylor, secretary, Canadian Wartime Prices and Trade Board, Ottawa, Canada, said that Canada did not encourage the marketing of new goods now. Thus the question does not arise often of how to price goods now that were not offered for sale or produced at the time Canadian maximum prices went into effect.

Sylvan L. Joseph, New York, regional OPA director, said that where the use of substitutes raises the cost of goods above ceilings all costs should be brought to the regional office for consideration of a higher price. No prices may be raised automatically without appeal to the OPA. This applies also to goods which were incorrectly priced in March.

Annual Aluminum Production Rate To Exceed 2 Billion Pounds by End of '43

BY THE END of 1943, United States output of aluminum will be at an annual rate of 2,100,000,000 pounds, six and one-half times 1939 production, T. D. Jolly, director of purchases and chief engineer, Aluminum Co. of America, told the purchasers.

"Each of several new plants will produce more aluminum than the entire nation made at its World War I peak—and still there will not be a pound available for civilian use."

Mr. Jolly described the growth of the expansion program of his company and said that Alcoa is building for the Defense Plant Corp. a total of 15 plants in eight states.

"With our own program, this gives us a total of 35 major projects now under way. These bring our total acreage of floor space put under roof since Jan. 1, 1940, to 335 acres."

Major item of consideration in the expansion of aluminum production is electricity.

"To produce the 2,100,000,000 pounds of aluminum will require annually more electricity than was consumed in 1940 in 27 of the 48 states. Yes, the aluminum industry in one day will draw more current than a city of 60,000 homes in one year.

"This large amount of electricity means considerable planning and investment in power developments. Power comes from three sources: (1) Company-owned hydro plants; (2) government-owned hydro plants; and (3) from steam and hydro plants of privately-owned public utilities. For every dollar we have invested in plant and equipment at our large Tennessee Works, there is another dollar invested in the mountains in hydro plants. In addition, we are drawing from TVA there as well.

"It is interesting to look back and see how conditions and purchasing problems have changed in the comparatively short time we have been engaged in this expansion program. It started before we even thought of serious shortages of materials; then came the defense program and voluntary priorities on some materials.

"Then, as defense developed, so did mandatory priorities. And I might add, we can well appreciate the meaning of priorities, since the aluminum industry was the first to be placed on priorities! Then came allocations, restrictions, and prohibitions on the use of materials, and frozen price levels.

"In the case of our company expansion program, it was cheaper and quicker to expand existing plants near old ones in order to utilize the supervision and experience of our existing personnel in developing new operating organizations. We are building today an aluminum industry seven times the size of our peacetime industry and that spreads our personnel pretty thin.

"The first Defense Plant Corp. sites were selected four to six months before Pearl Harbor. OPM recommended the locations after a study of markets, source of raw material, power and labor. The actual sites were selected on the basis of accessibility, foundation conditions, and surroundings.

"Because of the enormous quantity of power required and the shortage of materials, it has been necessary to locate the new plants so as to consume the least possible amount of copper in transmission lines. This reverses the old theory of locating aluminum plants in sparsely settled areas where a plentiful supply of power is available at low prices because there are few if any customers. Under present conditions, there is a greater amount of power available in the large metropolitan districts than in any other.

"Since it has been officially announced, it is all right to say that the largest aluminum metal-producing plant in the country is now under construction about ten minutes by automobile from this hotel. A unique feature of this plant will be its pure silver busbar and silver-wound transformers. The conservation Branch of WPB solved our copper purchasing problem by arranging this substitution.

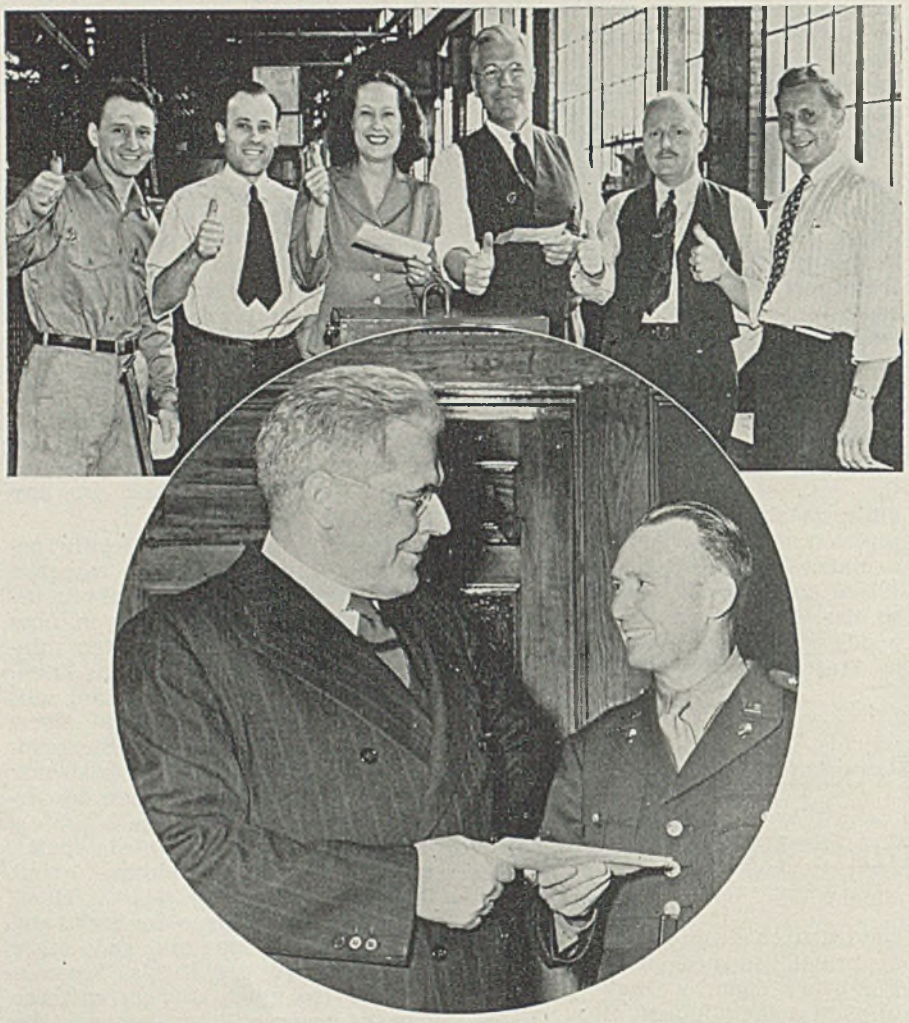
"The government-owned metal-producing plants require about 36,000 tons of copper busbar. If we add the requirements for light and power wiring, motors and other miscellaneous uses, this becomes entirely too much copper for these days of heavy military demand. On the new program, the United States Treasury will loan DPC silver from the vaults at West Point. It will be fabricated by the copper companies and shipped to us ready to install. Present plans call for the use of about 13,000 tons for heavy busbar. At the end of the emergency it is to be returned to the Treasury.

How Standardization Helps

"Before we started building for the government, we decided that it would be necessary to standardize buildings and equipment as much as possible in order to complete our construction and obtain production as soon as possible. This has paid big dividends, not only on our work, but has spread out and benefited many people who never heard of us.

"For example, we have purchased from one crane manufacturer since January 1, 1940, one hundred and seventy-five cranes, all of the same span and capacity. The only change in specifications for these cranes was on a few motors, which had to be 50 cycle. The crane builder was able to set up a production line system and claims 50 per cent more efficiency than if he had the shop filled with miscellaneous specification cranes. The foundries sup-

(*Please turn to Page* 125)



CLOSE co-operation between management and employes at Lincoln Electric Co. was illustrated recently when Mr. Lincoln personally matched a $4000 contribution raised by the workers for a "Buy a Bomber for MacArthur" campaign in Cleveland. Mr. Lincoln is shown above with a group of workers ready to turn the checks over to the campaign's sponsor. Below, Capt. H. M. Reid, Cleveland ordnance district, presents Mr. Lincoln with a letter of appreciation from the chief of ordnance, Washington, for the co-operation of the Lincoln School of Arc Welding in training ordnance inspectors

Lincoln Defends Bonus System; Tells How Co-operative Effort Reduced Costs

WASHINGTON

PRESIDENT Roosevelt's "great speech on the abundant life" in 1933 sparked his idea for increasing production and reducing costs by incentive bonus payments to employes, James F. Lincoln, president, Lincoln Electric Co., Cleveland, told the House naval affairs committee last week.

Testifying before the committee, Mr. Lincoln, whose company holds millions of dollars worth of war contracts for welding equipment, declared the bonus system had saved the government $35,000,000 through increased worker efficiency and lower costs.

He said he had started the system back in 1934 "with my tongue in my cheek," but discovered it worked so well by bringing out the genius of employes and cutting costs that the concern was able to outsell its competitors.

He added that wages of his workers were kept low purposely so that the company could "skate through a tough period without going broke," but that the extra compensation through bonuses made his employes better paid than those of other companies doing similar work.

Rep. Carl Vinson, Georgia, chairman of the investigating committee, commended Mr. Lincoln for cutting costs and increasing efficiency, but asserted that a ceiling should be raised over bonuses "because they have the effect of evading corporate taxes."

No Tax Evasion Attempt

Edmund M. Toland, counsel for the committee, contended the Lincoln company would have paid $4,438,916 more in taxes for the period 1939-41 inclusive had it not been for the bonuses and the establishment of a $1,000,000 trust fund. Mr. Toland told the committee the company had paid out $5,143,234 in bonuses during the last three years, or nearly twice the $2,681,562 paid in salaries during that period. He introduced photostatic copies of checks showing bonus payments running from $3000 to $5000 for $30 to $45 a week workers and from $10,000 to $50,000 for officials and higher salaried executives.

Mr. Lincoln flatly denied the bonus payments were an attempt to evade tax payments as charged by Mr. Toland.

"You question the size of the bonuses," Mr. Lincoln said. "I don't blame you. In 1933, if you had told me that I would be paying bonuses of 100 per cent of the salaries and still be reducing the unit costs, I wouldn't have believed you either. But that is what happened."

Mr. Lincoln challenged figures introduced by committee counsel purporting to show wide differences in manufacturing costs and selling prices. The figures, he said, did not include many items of expense and insisted the actual profit was close to 10 per cent.

A pamphlet, signed by Mr. Lincoln, was distributed at the hearing. It said: "We pledge ourselves to pass on to our customers the reduction in costs made possible by better manufacturing methods, wide distribution and technical advances in production."

Selling prices have been reduced more than 6 per cent, the statement said, "because of more efficient operation made possible by the marvelous co-operation and ability of our organization."

Mr. Lincoln explained that a $1,000,000 trust fund had been established at the end of 1941 for the termination salaries of workers who might lose their jobs after the war work was over.

Mr. Toland told the committee the Lincoln company had not replied to questionnaires sent out by the committee in its investigation of naval contracts.

"If we answered all the questionnaires we receive," replied Mr. Lincoln, "we wouldn't have time to do much else."

WPB Extends Its Authority Over Many Types of Industrial Equipment

WASHINGTON

WPB has assumed control over the distribution of many types of general industrial equipment so that they will be directed into war channels.

The order, L-123, affects such machinery as passenger and freight elevators, electric motors of more than one horsepower, industrial fans, industrial compressors and pumps, and a number of other classes of machinery used generally in various industrial operations. Some types of machinery within these classes are covered by other WPB orders and are therefore not restricted under L-123.

The order provides that no one may accept any order for or deliver any equipment listed in the 14 classes set forth except upon a preference rating of A-9 or higher or upon specific authorization of the Director of Industry Operations.

Manufacturers may ship machinery to distributors only to fill approved orders actually received by distributors or to replace machinery delivered by a distributor on an approved order.

Manufacturers and distributors who have orders on their books which do not fall within the approved classification may appeal to WPB for permission to dispose of those orders by listing them, giving the name of the prospective purchaser or lessee, a complete description of the machinery and its value, the use for which it is intended, and other pertinent data.

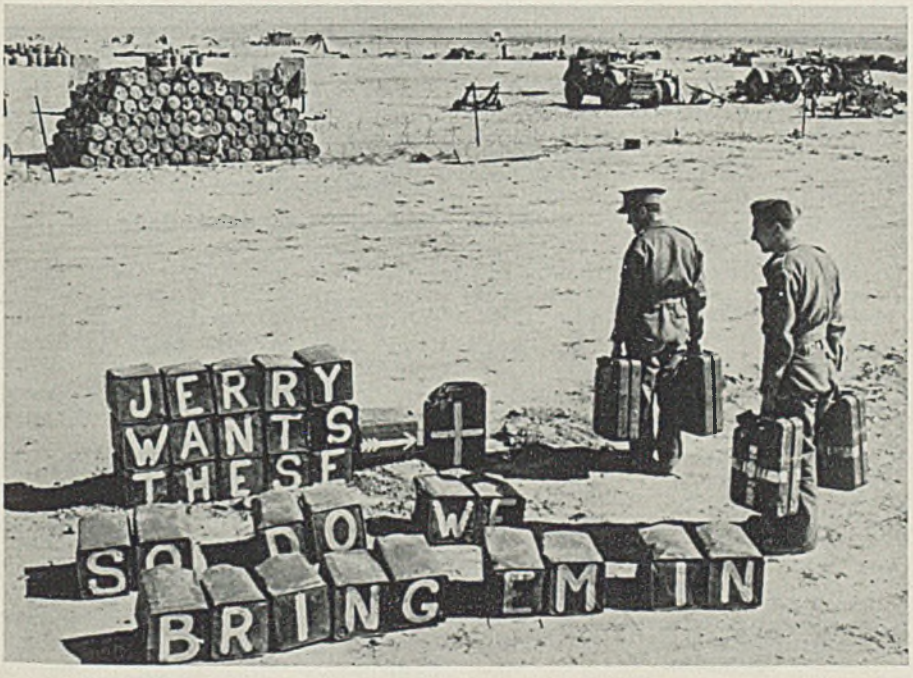
Restrictions contained in the order do not apply to deliveries of repair parts worth less than $1000 for use in maintaining a single piece of existing equipment, or repair parts worth more than $1000 in cases where an actual breakdown or suspension of operations has occurred as a result of damage to machinery.

Order Covers Many Types

Classes of machinery covered by the order:

1. Conveying machinery for the mechanical handling of materials, except farm elevators, or fuel conveying equipment used in the operation of steam generating boilers above 100 pounds pressure, which are to be used for any purpose.
2. Mechanical power transmission equipment, which means: Open and enclosed gearing for transmitting one-quarter horsepower and over except high speed turbine type gears; Mechanical drives and parts for transmitting or handling one-quarter horsepower and over.
3. Industrial fans, except forced or induced draft fans used in the operation of steam generating boilers above 100 pounds pressure, which are to be used for any purpose.
4. Industrial blowers.
5. Turbo blowers.
6. Industrial compressors and vacuum pumps, mechanically operated, all types except "critical compressors" defined in General Limitation Order L-100, refrigeration compressors, and units having a displacement of less than one cubic foot per minute.
7. Industrial pumps, mechanically operated, including centrifugal, power reciprocating, turbine, deep well turbine, rotary, cam, screw, gear, valve and jet types; but not including pumps for farm use as defined in General Limitation Order L-26, measuring and dispensing pumps, vertical submerged reciprocating or turbine type pumps used in oil wells for petroleum production, or boiler feed pumps used in the operation of steam generating boilers above 100 pounds pressure, which are to be used for any purpose.
8. Electric motors, one horsepower and over.
9. Industrial hand trucks, other than highway.
10. Stationary steam engines, except marine engines and engine generator sets.
11. Industrial air washers.
12. Industrial heat exchangers, except for use in refrigeration, air conditioning, steam electric generation, and for domestic use.
13. Passenger or freight elevators (including residence elevators, home lifts, elevettes, and similar equipment), inclinators, electrically operated passenger elevating devices appurtenant to stationary stairways, and power operated dumbwaiters.
14. Electric controls, manual and magnetic, including safety switches, for motors one horsepower and over.

Drive for Scrap Goes on Near Fighting Fronts



NEED for reclaiming scrap of all kinds—iron, steel, nonferrous metals, rubber and all other war materials—has been impressed upon the armed forces as well as civilians. In most camps of the United Nations scenes like the above, where British soldiers are collecting water cans in northern Africa, are familiar. NEA photo

Auto Graveyards Yielded 350,000 Tons Scrap in April

Auto graveyards supplied 350,000 tons of scrap metal from junked cars during April, WPB announced, exceeding 1941 monthly average by 200,000 tons. Recovered metal included 6000 tons of copper. Scrap shortage for 1942 was estimated at 6,000,000 tons.

Scrap consumption in April is estimated by the Institute of Scrap Iron and Steel as 4,672,000 gross tons, second to the record melt of 4,840,000 tons in March. In April, 1941, consumption totaled 4,406,000 tons. In first four months this year consumption was about 18,378,000 tons.

REVISIONS AND ADDITIONS TO

PRIORITIES – ALLOCATIONS – PRICES

as published in Section Two of STEEL, April 20, 1942

"M" ORDERS

M-9-c-1 (Amendment): **Copper**, effective May 23. Permits shoe manufacturers to use findings containing copper, if in stock March 31 and no steel or non-metallic findings available.

M-19 (Amendment): **Chlorine**, effective May 22. Date for filing orders with producers advanced to 10th of month preceding month in which delivery sought. Inventory restrictions revised to permit acceptance of delivery in smallest practical unit.

M-21 (Amendment): **Iron and Steel**, effective May 25. Permits persons other than producers to deliver nails, bale ties, black or galvanized welded pipe up through 3½" OD, merchant quality fence wire, woven wire fence, poultry netting, barbed wire, staples, fence posts, gates, and corrugated roofing and siding on ratings lower than A-10 or unrated orders, unless restricted by any other order. M-21-b (Warehouses) amended similarly on same date.

M-21-f (Amendment): **Shot and Bullet Core Steel**, effective May 26. Adds steel for 90 mm. armor-piercing and semi-armor-piercing shot to other steels placed under complete allocation by original order.

M-24 (Amendment): **Iron and Steel Scrap**, effective May 23. Removes inventory restrictions to permit accumulation of stocks beyond immediate needs by scrap consumers.

M-34 (Amendment): **Toluene**, effective May 22. Orders maximum production from oil processors and coke oven operators. Forbids disposal of oils containing toluene until maximum amount of toluene extracted or unless purchaser can do extracting.

M-45 (Amendment): **Sheet Steel**, effective May 25. Expands allotments of steel sheets for making drums for export shipment to include cold rolled as well as hot rolled material.

M-101 (Amended): **Mica**, effective May 23. Forbids use of muscovite or phlogopite (amber) block mica of a quality better than "heavy-stained" in any product for Army and Navy which is not war implement, after June 1, 1942. Any use after July 1 subject to authorization by WPB.

M-156: Tantalum, effective May 22. Provides for complete allocation. Users apply for allocation by filing PD-487 by 20th of each month, also a report on PD-488. Application for June shipment due June 1. Processors of tantalum ore report by June 27 and the 27th of each succeeding month, on PD-489.

"L" ORDERS

L-5-d: Domestic Mechanical Refrigerators, effective June 15. Restricts disposal of new units by manufacturers to fill orders for Army, Navy, Maritime Commission, Panama Canal, to Defense Supplies Corp. or other RFC agency, or upon certificate of transfer issued by Director of Industry Operations.

L-33 (Amendment): **Portable Lamps, Shades**, effective May 25. Adds auxiliary ballasts and starter switches to parts in which iron and steel and other metals may be used. Restricts thickness of insulation in lamp cords to $\frac{1}{64}$-inch on No. 20 A.W.G.

L-39 (Amendment): **Fire Protective Equipment**, effective May 21. Permits manufacture of carbon dioxide extinguishers in accordance with established specifications of armed services and Maritime Commission, with deliveries limited to orders rated A-1-j or higher. Permits manufacture of brass fire hose couplings for Maritime Commission.

L-41-a: Construction, effective May 23. Directs stoppage before June 6 of all construction costing $5000 or more which is primarily for public amusement, except children's playgrounds and strictly temporary construction.

L-60 (Amendment): **Pistols, Rifles, Shotguns**, effective May 26. Releases for sale to the public certain types of firearms not needed by armed forces or for other essential purposes. Other arms continue frozen in hands of dealers and wholesalers.

L-63 (Amendment): **Suppliers' Inventory**, effective May 23. Permits dealers to base inventory calculations on sales during preceding quarter, rather than on second preceding month.

L-67 (Amendment): **Lawn Mowers**, effective May 22. Permits production until June 30 at full 1941 rate, provided excess over original order quota (50% of 1941 rate) is filled by fabricated iron or steel in manufacturer's possession prior to March 31. All manufacture prohibited after June 30.

L-72-a: Razors and Blades, effective May 23. Freezes stocks of safety razors in hands of manufacturers and jobbers, except those in transit or for Army or Navy.

L-79 (Amended): **Plumbing and Heating Equipment**, effective May 23. Permits shipment until June 30 of equipment against orders received no later than April 16, when original order became effective. Permits delivery of equipment until July 31 for completion of projects started between Aug. 1, 1941 through April 9, 1942; equipment on A-10 or better rating; items costing no more than $5 if part of an order totaling no more than $10; oil burning furnaces replacing other similar equipment and installed for the purpose of reducing fuel oil consumption; cooking and heating stoves and water heaters if no other equipment for these purposes available.

L-91 (Amended): **Laundry Equipment**, effective May 22. Adds pressing machinery used by custom tailors or pressing establishments to restrictions of original order on production and sale. Rebuilt or reconditioned machinery valued at more than $100 also covered by order.

L-101: Passenger Carriers, effective May 21. Prohibits production or delivery of new trolley cars and commercial motor buses except in accordance with specific instructions issued by Director of Industry Operations.

L-117 (Amendment): **Heavy Power and Steam Equipment**, effective May 25. Limits the order to equipment designed only for other than marine use.

L-123: Industrial Equipment, effective May 26. Restricts sales and deliveries to orders rated A-9 or higher. Does not apply to repair parts worth less than $1000 for single piece of equipment or parts worth more than $1000 in case of actual breakdown. Covers conveying machinery, mechanical power transmission equipment, industrial fans and blowers, turbo blowers, industrial compressors and pumps, electric motors 1 horsepower and over, industrial hand trucks, stationary steam engines except marine engines and engine generator sets, industrial air washers and heat exchangers, passenger or freight elevators, electric controls for motors 1 horsepower and over.

L-134: Instruments, Valves and Regulators, effective May 26. Establishes specifications for 28 specific items forming component parts of industrial processing instruments, valves and regulators. Limits use of instruments containing chromium and nickel to certain operating conditions. Prohibits deliveries against orders rated below A-10. Restricts manufacturing and deliveries in accordance with specified uses. Does not apply to instruments containing no nickel or chromium, or instruments made before May 26.

"P" ORDERS

P-19-a (Amendment): **Defense Project Material**, effective May 23. Prohibits delivery of material under ratings assigned by this order, except that which will be physically incorporated into defense construction projects.

P-54 (Amendment): **Trucks, Trailers, Buses**, effective as of May 1. Extends order to June 30. Limits deliveries on A-3 rating after that date to producers who have filed, prior to June 1, application for assistance under Production Requirements Plan. Applies to materials going into manufacture of buses and truck trailers and bodies and cabs of medium and heavy trucks.

P-89 (Amendment): **Chemical Plants**, effective May 22. Assigns A-1-c rating to chemical producers to obtain 30% of regular maintenance, repair and operating suplies, A-3 for remaining 70%. Suppliers allowed A-1-c rating to be extended to replenish stocks.

PRICE SCHEDULES

No. 4 (Amendment): **Iron and Steel Scrap**, effective May 26. Revises specification for No. 2 heavy melting steel to include scrap 5 feet long. Previous limit was 3 feet, excepting car sides.

Rating for Materials for Buses, Trucks Extended

The A-3 preference rating made available under Preference Rating Order P-54 for deliveries of materials going into the manufacture of buses and truck trailers, and bodies and cabs for medium and heavy trucks has been extended until June 30, WPB announced.

Under Amendment No. 4 and Extension No. 6 to the order, however, no deliveries of materials can be made on the A-3 rating after June 30 unless producers have filed, prior to June 1, an application for assistance under the Production Requirements Plan.

The A-3 rating, under the terms of the amendment, may be used only for delivery of material to be physically incorporated into passenger carriers, truck trailers and

For additional revisions and additions please see STEEL of April 27, p. 30, May 4, p. 46, May 11, p. 55, May 18, p. 46, May 25, p. 42.

bodies and cabs for medium and heavy trucks, provided existing limitation orders or other directions by WPB permit such production. The rating cannot be used to obtain material going into the manufacture of medium and heavy trucks, but merely for bodies and cabs for these types of vehicles.

The rating may be used by a producer or a supplier, but cannot be used to obtain deliveries of materials on purchase orders placed after July 1 or on purchase orders calling for deliveries after July 31.

Tantalum Placed Under Full Allocation Control

Tantalum, the entire output of which is going into vital war uses, has been placed under complete allocation control by the Director of Industry Operations so flow of the metal may be channeled among the various users.

Order M-156 provides every person who wants tantalum must file, by the 20th of each month beginning this month, a report on Form PD-488 and have an application on Form PD-487. To receive an allocation for June, a user must have filed these reports by June 1. Processors of tantalum ore must report by June 27, and the 27th of each succeeding month, on Form PD-489.

Showers Instead of Tubs To Save 10,000 Tons Steel

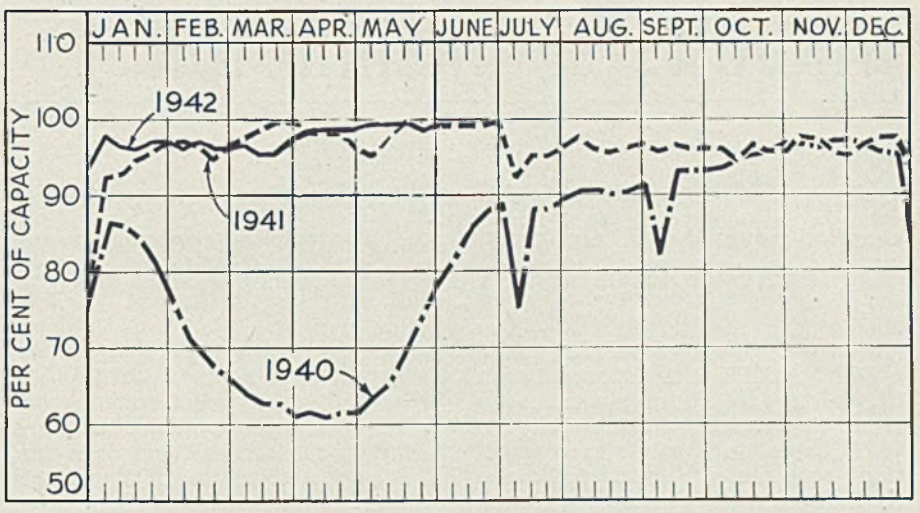
Substitution of showers instead of bath tubs in temporary war homes being constructed by the Federal Public Housing Authority will divert about 10,000 tons of steel to direct war manufacture, according to estimates by FPHA. This would be equivalent to the amount required for 750 thirteen-ton tanks.

The substitution order will affect 60,000 housing units and was made necessary by recent restrictions on the use of steel imposed by the WPB.

Watch Industry To Produce Precision War Instruments

Possibility of converting part of the watch industry to the manufacture of aviation and navigation instruments was discussed at a recent meeting of the jeweled watch manufacturers industry advisory committee.

The watch industry already is producing such special instruments as chronometers, used in ship navigation; elapsed time indicators, used in blind flying and in airplane navigation; and stop watches, which are valuable in troop maneuvers, gun-fire observation, and numerous other uses.



PRODUCTION . . . . Steady

PRODUCTION of open-hearth, bessemer and electric furnace ingots last week was unchanged at 99 per cent. Three districts gained, three declined and six were unchanged. A year ago the rate was 99 per cent; two years ago it was 78½ per cent, both based on capacity as of those dates.

Chicago—Moved up 3 points to 107 per cent, a new all-time record, 1½ points above the previous mark. Scrap supply is slightly larger than current needs consume.

St. Louis—Continued at 98 per cent, with 27 of 28 open hearths in production. This rate is expected to continue for some time.

Buffalo—Shifting of furnaces for repairs last week balanced and the rate remained at 90½ per cent, with 39 of 43 open hearths producing.

Central eastern seaboard—Due to floods retarding operations of Bethlehem Steel Co. at Bethlehem, Pa., production was down 5 points to 91 per cent for the week. By midweek normal operations were practically restored after being brought to a standstill the previous Saturday.

Detroit—Declined 1 point to 92 per cent.

Cincinnati—Increased 3½ points to 95 per cent, with only one open hearth idle. The same rate is scheduled for this week.

Cleveland—Advanced 2½ points to 94 per cent, all producers making slight gains.

Birmingham, Ala.—Unchanged at 95 per cent. Pig iron output has been increased by blowing in a new stack in this district.

New England—Dropped 5 points to 95 per cent after two weeks at capacity.

Pittsburgh—With pig iron supply still restricted steel production remained at 94 per cent.

Wheeling—Maintained production at 78 per cent for the second week.

Youngstown, O.—With 74 open hearths and three bessemers in production the rate remained at 94 per cent for the sixth week. The holiday caused no interruption. Scrap supply is better but a pinch still is felt. This week production is scheduled for the same rate.

District Steel Rates

Percentage of Ingot Capacity Engaged In Leading Districts

	Week ended May 30	Change	Same week 1941	Same week 1940
Pittsburgh	94	None	100.5	79
Chicago	107	+ 3	100.5	83
Eastern Pa.	91	— 5	96	71
Youngstown	94	None	97	58
Wheeling	78	None	88	79
Cleveland	94	+ 2.5	96	82
Buffalo	90.5	None	93	70
Birmingham	95	None	95	85
New England	95	— 5	90	56
Cincinnati	95	+ 3.5	92.5	64
St. Louis	98	None	98	57
Detroit	92	— 1	92	74
Average	99	None	*99	*78.5

*Computed on basis of steelmaking capacity as of those dates.

Foundry Equipment Sales Index Down in April

Foundry Equipment Manufacturers' Association, Cleveland, reports index of net orders closed on new equipment in April was 1307.7, compared with 1352.7 in March and 636.6 in February. This is second highest the index ever reached.

Total sales index was 1089.3 in April, 1122.3 in March and 567.9 in February. Index for repairs in April was 423.1, in March 428.8 and in February 361.4.

Indexes are percentages of monthly averages of sales to metalworking industries, 1937-39.

WINDOWS of WASHINGTON

By L. M. LAMM *Washington Editor, STEEL*

Transportation Committee created within WPB to advise on preferential movement of war traffic . . . Government contractors may be required to obtain workers through U. S. Employment service

WASHINGTON

FORMATION of a Transportation Committee to obtain information from the various divisions of the WPB as to anticipated transportation requirements and to make recommendations with respect to preferential movement of traffic within the United States was announced last week by J. S. Knowlson, Director of Industry Operations.

Chairman of the committee is E. B. Stern, New Orleans, who since last October has been OPM and WPB representative to the Board of Economic Warfare. Mr. Stern will devote full time to the committee, whose other members represent interested divisions and branches of WPB.

They are: Dr. Reavis Cox, Division of Civilian Supply; H. W. Dodge, Materials Division; Dr. William Y. Elliott, Stockpile and Shipping Branch; John J. Fennelly, Division of Industry Operations. Additional members may be appointed from time to time.

Mr. Stern was formerly president of the New Orleans Cotton Exchange, and director of the Atlanta Federal Reserve Bank. He was a member of the firm of Lehman, Stern & Co., New Orleans cotton merchants.

Recommendations of the committee will be submitted to the Director of Industry Operations, who may transmit them in the form of certifications, instructions and directives concerning preferential movement of materials to the Office of Defense Transportation.

Will Clear Preferred Freight

When transportation facilities are inadequate to move all freight ready to be shipped between certain points within a definite period of time, the Transportation Committee will determine on the basis of information obtained from various divisions of WPB which types of freight should be given preference, and will so inform the Director of Industry Operations. The Director will then transmit the recommendations to the ODT for appropriate action.

Functions of the Transportation Committee, as outlined in an administrative order issued by the Director of Industry Operations, are as follows:

The chairman, with the advice and assistance of the committee, shall: Obtain from appropriate divisions of WPB estimates of probable transportation requirements and, after correlation, advise of these estimates in order that plans may be formulated by the ODT to handle such requirements.

Make recommendations to the Director of Industry Operations concerning the issuance of certifications, instructions, and directives covering preferential movement of such materials as conditions require; or, in the event of actual or anticipated acute transportation shortages, recommend programs for the curtailment or elimination of transportation for certain traffic not considered essential to the war effort.

Provide a clearing house for all domestic transportation problems involving the WPB, and problems between the WPB and the ODT.

War Manpower Commission To "Freeze" Workers to Jobs

To combat the "acute problem of pirating" skilled workers, the War Manpower Commission last week announced it would soon require some war plants to hire certain employes only through the United States Employment Service.

Action of the commission, headed by Paul V. McNutt, would be to "freeze" factory workers to their present jobs in certain areas.

A commission spokesman refused to comment on the effect the step would have in stabilizing wages.

"Pirating," he said, "has become acute. The pirating usually is done by a plant offering more money to a worker in another plant. This practice, the commission has found, causes instability and slows down production."

The practice, it was said, is especially marked in the aircraft industries.

In recent weeks, however, many employers in advertising for skilled workers have warned men not to apply if they were currently engaged in war production.

Job Placement Advanced Sharply During April

More than half a million jobs in factories, shipyards, and offices, and 50,600 jobs on farms were filled by the United States Employment Service during April, Paul V. McNutt, chairman of the War Manpower Commission, said last week

Both agricultural and nonagricultural placements by United States employment offices rose sharply in response to rapidly expanding war and food production efforts, Mr. McNutt said. In all, 605,200 placements were made—19 per cent more than in March.

Volume of industrial and commercial placements has increased steadily under the impetus of the war program, with almost 1.8 million jobs filled during the first four months of this year. April nonagricultural placements were 25 per cent greater than in the same month last year and almost double the number in April, 1940.

As a result of the spring pick-up, farm placements rose for the second successive month and were 42 per cent greater than in March. Most states shared in the increase.

With the increase in placements, there has been a continuing decrease in the number of individuals available for jobs. By the end of April, the number of job seekers registered in the active files of United States employment offices had dropped to 4.4 million—4 per cent below the previous month, and 14 per cent below the number in April, 1940.

Adams May Continue as Iron, Steel Consultant

Reese Taylor, who last week began his duties as chief of the WPB Iron and Steel Branch, has asked the retiring chief, C. E. Adams, to continue as a part-time executive consultant to the branch, informed sources said.

It is also reported Don N. Watkins, chief of the construction unit and the refractories and fluxes unit of the Iron and Steel Branch, has resigned, effective soon.

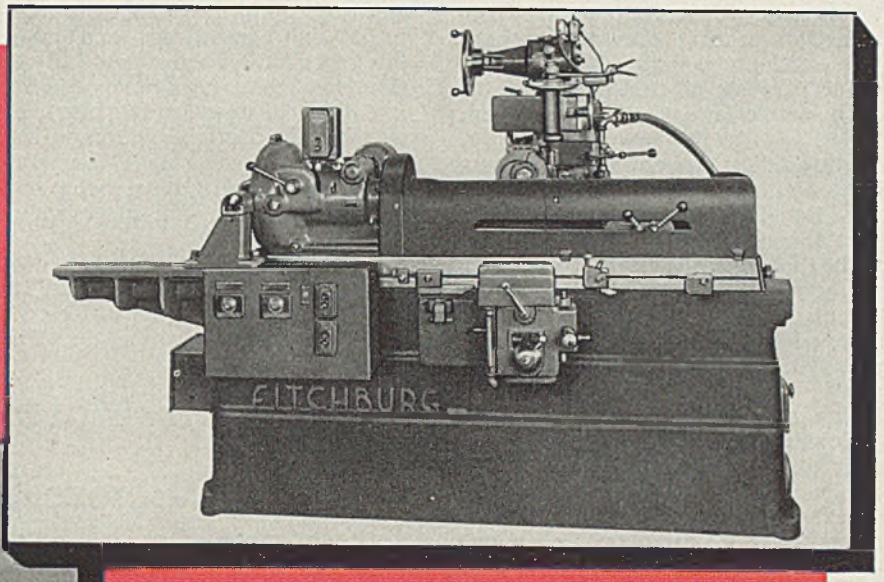
WPB Halts Construction For Amusement Purposes

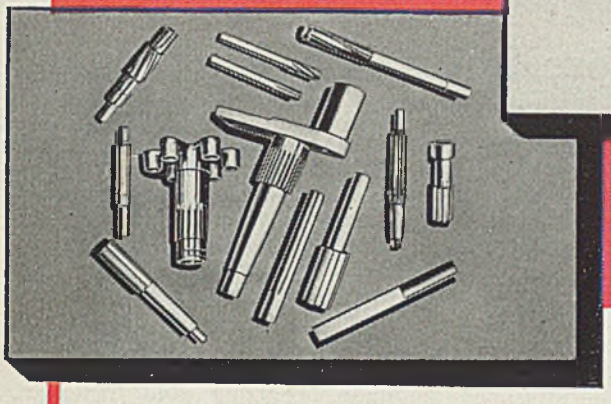
To free more material and equipment for the war program, WPB has ordered all construction costing $5000 or more which is primarily for the amusement of the public to be stopped before June 6. Construction already underway is included.

The order L-41-a exempts only playgrounds for children, strictly

FITCHBURG

Automatic Closed Cycle Grinding





Assures

ACCURATE SPLINES

Fitchburg formed wheel grinding method with automatic closed cycle, produces splines and gears with finer finish — higher degree of accuracy — higher speed in operation, resulting in smoother product performance.

Fitchburg technique also permits new operators to be quickly trained to produce accurate work — an important factor in speeding war production.

Fitchburg Grinding Equipment is in successful use in the largest industrial plants in the United States. Every day it is saving man hours.

If you have any work of this character let Fitchburg engineers show you how to speed production by this modern grinding method.

Write today for this catalog showing wide range of successful operations.

FITCHBURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U. S. A.

Manufacturers of — Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.

temporary construction, and construction costing less than $5000. To continue construction of any other projects of this type, specific authorization must be obtained from WPB.

The action taken was forecast last month when Conservation Order L-41 placing all construction under rigid control, was issued with the warning that projects already under construction would be examined carefully by the WPB and stopped if the material and equipment to be used in completing them could be put to more effective use in the war program.

Construction for both the outdoor and indoor amusement of the public is affected by the new stop order. Included are amusement parks, stadia, race tracks, movie theaters, arenas, baseball parks and the like.

Other kinds of nonessential construction, not covered by the order, may be halted by subsequent orders, the WPB warned, to free additional material and equipment for war production.

In many instances where construction is stopped, immediate steps will be taken by the WPB to requisition the materials and equipment.

Oil Tank Manufacturers Granted Allowance for Extra Seams

Manufacturers using sheet metal materials of a size requiring extra lengthwise seams in the production of domestic fuel oil storage tanks are granted an allowance to compensate them for the increased production costs by Amendment No. 1 to Revised Price Schedule No. 96, domestic fuel oil storage tanks.

Allowance is similar to one in effect for manufacturers who use materials requiring extra transverse seams and allows manufacturers to add 75 cents for each pair of extra lengthwise seams.

Manufacturers of domestic fuel oil storage tanks currently are having difficulty in obtaining sizes of materials which would enable them to produce the tanks without the extra seams, transverse or longitudinal, and the allowances were granted to compensate them for the costs incurred by the additional welding operations.

Technical Data Available on National Emergency Steels

Technical information on the national emergency steels is accumulating and is available to industry, it was announced last week by the Metallurgical Section, Iron and Steel Branch, and the Bureau of Industrial Conservation, who are cooperating on the proposed new specifications.

Increasing use of the steels has made them more readily available at mills and warehouses and numerous tests have been made. In addition, steel companies have been making physical tests on the new steels as they are produced. Some of the tests have been made on single heats, but others have been made on several sizes and after various heat treatments.

To make the information available to industry, the American Iron and Steel Institute has collected all existing data, published them in loose leaf form. Included are curves showing the hardenability characteristics of all NE steels and the mechanical properties of a number of the compositions. Present data will be supplemented from time to time as testing of the steels continues.

National emergency steels are made in accordance with new specifications designed to conserve scarce alloying elements.

ODT Halts Movement of Export Goods To Ports Before Ships Are Available

WASHINGTON

SHIPMENT of export goods to United States ports before shipping space is available will be prohibited by a new control system set-up last week by the Office of Defense Transportation.

The system became effective June 1 and applies to shipments originating both in the United States and Canada.

Purpose of the plan, already in partial operation, is to prevent congestion at the ports and at the same time to make possible the swift and efficient loading of ocean-going vessels.

Loading of the ships will be facilitated by maintaining banks of export goods in the port areas so that all types of shipments will be available at all times.

The new plan is designed to prevent congestion and delays which handicapped overseas shipping in the first World War.

After the new regulations go into effect, no export shipments by any governmental agency will be permitted to move into a port area until block permits authorizing such movement have been issued by the chief of transportation in the War Department.

Permits will be required before any overseas shipment of commercial goods may be moved into a port area. In order to obtain a unit permit, the shipper must first obtain a license and priority number from the Office of Export Control, Board of Economic Warfare, Washington. Present holders of licenses from the Board of Economic Warfare do not require new licenses. For the present, at least, materials moving under so-called "general licenses by BEW designation", may continue to move without application to the Board of Economic Warfare.

The shipper then must obtain a definite space booking from the ocean carrier, and this booking must be approved by the War Shipping Administration and, if the shipment is to be handled by a British or British-controlled ship, by the British Ministry of War Transport.

Commercial shipments originating in Canada will be handled by ODT block permits the same as shipments involving governmental agencies.

Instructions have been issued by the ODT to all domestic carriers—common, contract and private—describing the methods by which shipments into United States ports are to be handled.

Applicants for block permits will submit their applications through the procuring agencies with which their governmental contracts were negotiated, while all Canadian requests will be forwarded directly to the ODT.

Carriers Held Responsible

Unit permits for shipment by rail will be issued by G. C. Randall, manager of Port Traffic, Association of American Railroads, 30 Vesey Street, New York, and by his field officers.

Unit permits for shipment by truck will be issued by the field offices of the Division of Motor Transport of the ODT, and unit permits for barge line shipments will be issued by the ODT's Division of Inland Waterways, Washington.

It will be up to carriers hauling shipments of export goods into areas to make sure that such shipments are properly authorized and marked and to make daily reports to the ODT. The shippers are cautioned to mark all export papers the same day shipment is made.

Separate regulations have been established for shipment of less-than-carload, bargeload or truckload lots. There are no restrictions on such shipments by or for government agencies, and shipment of other goods for Cuba, the Dominican Republic and Puerto Rico may move without restriction through Tampa, Fla. All other such shipments must bear the License and the number of the steamship contract.

Coal Shipments on Great Lakes Restricted To Aid Ore Movement

WASHINGTON

TO ASSURE maximum capacity for the transportation of iron ore, the Office of Defense Transportation has issued an order prohibiting certain Great Lakes coal movements.

ODT recently banned, with few exceptions, all Great Lakes grain shipping to bring more vessels into the ore traffic.

The coal order, General Order No. 9, which became effective June 1, forbids lake carriers, unless authorized by special or general permits, to move coal from any Lake Erie port to: (a) Any port on the Detroit and St. Clair rivers south of and including Port Huron; (b) the Chicago area; (c) any port on Lake Erie and Lake Ontario, and connecting and tributary waters.

Simultaneously, Joseph B. Eastman, ODT director, issued a general permit, worked out in co-operation with the Office of Solid Fuels Coordination, to allow vessels of the self-unloading type to move coal to: (1) Any Canadian port on Lake Erie, Lake Ontario, or on the Welland Canal; (2) any port on the Detroit and St. Clair rivers; (3) any port in the Chicago area. These self-unloaders, of which there are 37 under United States registry, are equipped with a belt-conveyor device for unloading, and are not considered suited to ore transportation.

The general permit further provides that the Chicago area, Buffalo, and United States ports on Lake Ontario, Lake Erie, and the Niagara river may now receive by vessel up to 50 per cent of the total coal tonnage received by water in 1941.

The general order prohibits railroads from accepting or handling coal destined for Lake Erie transshipment except as provided for in the general permit just issued.

The order defines any vessel "whether or not self-propelled, having a gross register of 1000 tons or more, documented under the laws of the United States . . . which transports, or is capable of transporting cargo in bulk" as coming under its provisions. ODT is given authority to determine a vessel's cargo-carrying capabilities.

General Order No. 9 and its accompanying general permit, will make available Great Lakes shipping facilities for an additional 2,000,000 tons of iron ore.

Estimates based on the 1941 water borne coal movement into the Chicago area indicate that the rail carriers will be required to adjust their facilities to handle by all-rail routings at least 2,225,000 tons of this cargo during 1942.

All applications for further general or special permits are to be handled through the ODT office in Cleveland.

Regulation of Lake Coal Shipments To Increase Costs

PITTSBURGH

Increased costs to industrial coal consumers in the Detroit, Buffalo and Chicago districts are expected as a result of the order issued by ODT covering movements of coal on the Great Lakes.

Issuance of the order has been protested by producers in the Pittsburgh district. Informal protests were filed when the ODT first began to consider issuance of such an order but were disregarded inasmuch as the ODT indicated the order would not concern producers but would be exclusively concerned with consumers.

Local coal sellers do not expect the order to affect demand for coal in this area inasmuch as virtually all the coal shipped from here to the affected points is for metallurgical purposes and therefore cannot be replaced by coal from other districts which may have a more favorable rail freight rate. The order does not affect the heavy shipments of coal which normally go from Western and Central Pennsylvania to the Lake Superior districts, nor does it affect those consumers situated on the west bank of Lake Michigan, including Milwaukee.

Dock Operators Permitted To Add Handling Charges to Mine Prices

Dock operators on the upper Great Lakes are permitted by OPA to add specific handling and storage charges to mine prices plus transportation charges in determining maximum prices for the sale of railroad fuel, as the result of Amendment No. 2 to Maximum Price Regulation No. 122 solid fuels delivered from facilities other than producing facilities dealers.

Specifically, the action, effective immediately, allows any dock operator on the west bank of Lake Michigan or on the United States side of Lake Superior to add the actual handling charge in effect during the December 15-31, 1941 period. However, the maximum charge allowed for handling is set at 55 cents per ton.

The action conforms with trade practices in the sale of railroad fuel and treats the dock operators on a basis comparable to other handlers of railroad fuel.

The maximum price for sale of solid fuel to railroad consumers in the sales covered by the amendment now is the price at which the fuel was purchased at the mine, plus the actual cost incurred in transporting the fuel from mine to dock, plus the handling and storage charges permitted by the amendment.

Iron Ore Producer Granted Relief from Price Ceiling

Moore, Crago, Duluth, Minn., have been granted relief by OPA from its ceiling prices under Maximum Price Regulation No. 113, covering iron ore.

OPA said that from a study of the concern's books for 1939, 1940, and 1941, it appears impossible for it to operate at 1941 selling prices, which are the ceiling prices.

It was emphasized that the ore to be sold by Moore & Crago would be mixed by the buyer, another merchant-producer of ore, and resold at his own ceiling prices, so that the cost to the consumer of the ore would not be raised. The firm sold only 30,000 tons of ore in 1941. Plans, however, had been made for an extension of operations and an increased output prior to the issuance of Maximum Price Regulation No. 113.

Idle Storage Buildings To Be Used by Government

Acquisition of millions of additional square feet of storage space, when and where required by any government agency, without the erection of new buildings, is embraced in the Office of Defense Transportation's group warehousing plan for 40 of the nation's largest cities.

Expanded scope of the program, under which idle buildings of small manufacturers and other business enterprises will be utilized for storage purposes, was revealed by Joseph B. Eastman, ODT Director, in announcing the signing of ODT's first group warehousing contract with the Federal Emergency Warehouse Association, Philadelphia.

This association, Mr. Eastman said, was recently formed by Philadelphia merchandise warehouse operators who, under the terms of their contract with the government, have pooled their facilities to make available 400,000 square feet of storage space to meet government needs.

Production of copper in Chile in 1941 amounted to 453,594 metric tons which far exceeded all previous records, according to a report to the Department of Commerce.

Steelman Respects Murray, Pressman; Does WLB Speak "Harvard English"?

ST. LOUIS

PHILOSOPHIES and facts involved in the current national labor situation were explained to the Illinois Bankers Association here by Clarence B. Randall, vice president, Inland Steel Co., Chicago.

Excerpts from his address follow:

"In the face of war, we in steel were ready. The T.N.E.C. (Temporary National Economic Committee) some years ago said the trouble with steel was its idle capacity, the fact that it carried long obsolete plants. Those obsolete plants and excess capacity are today winning the war.

"Steel's conversion to war came in the autumn of 1939 when the first allied purchasing commissions arrived. Pearl Harbor came late in steel's war effort. . .

"Today we no longer run our own business, we are a branch of the government—and are proud to be a government branch . . .

"Fifty-five per cent of Inland's production today is on government directives. The remaining 45 per cent is on A-1-A priorities with no production below that rating. Our old customers no longer get our products. We are shipping to the Pacific coast to yards which won't be in business after the war, or if they are would be entirely outside of our territory. We no longer produce the remunerative lines."

Inland is now producing three times as many plates for shipbuilding as in any record month before the war, he said in reference to criticism that a lack of plates holds up shipbuilding. For two years, Inland has produced each month in excess of its rated capacity, or more than 100 per cent.

Ore Expansion "Impossible"

He pointed out that during World War 1 a top total of 66,000,000 tons of iron ore were shipped over the Great Lakes, that this year 89,000,000 tons will be shipped. Expansion of physical facilities is impossible because such expansion would take away from munitions too much steel capacity. Such expansion would require two to three years and would require steel for new mines, new ships, new railroad cars, new blast furnaces. "All the government hopes for is that we can hold to our present level of capacity."

After describing the recently concluded three months of testifying before a three-man, fact-finding panel of the War Labor Board, he said he had come to have a great respect for Philip Murray, Lee Pressman and other CIO leaders, believing them able and honest. "And we have an honest difference of opinion."

Referring to the demand for a flat dollar-a-day wage increase for steel workers, he remarked: "Inland steel's entering wages of 72½ cents an hour are received by less than 10 per cent of those on the payrolls. The average hourly earnings of all Inland workers is $1.036 an hour, the average annual salary of all full time workers for 1941 was $2003."

Recalling the President's address giving his seven-point anti-inflation program, Mr. Randall said:

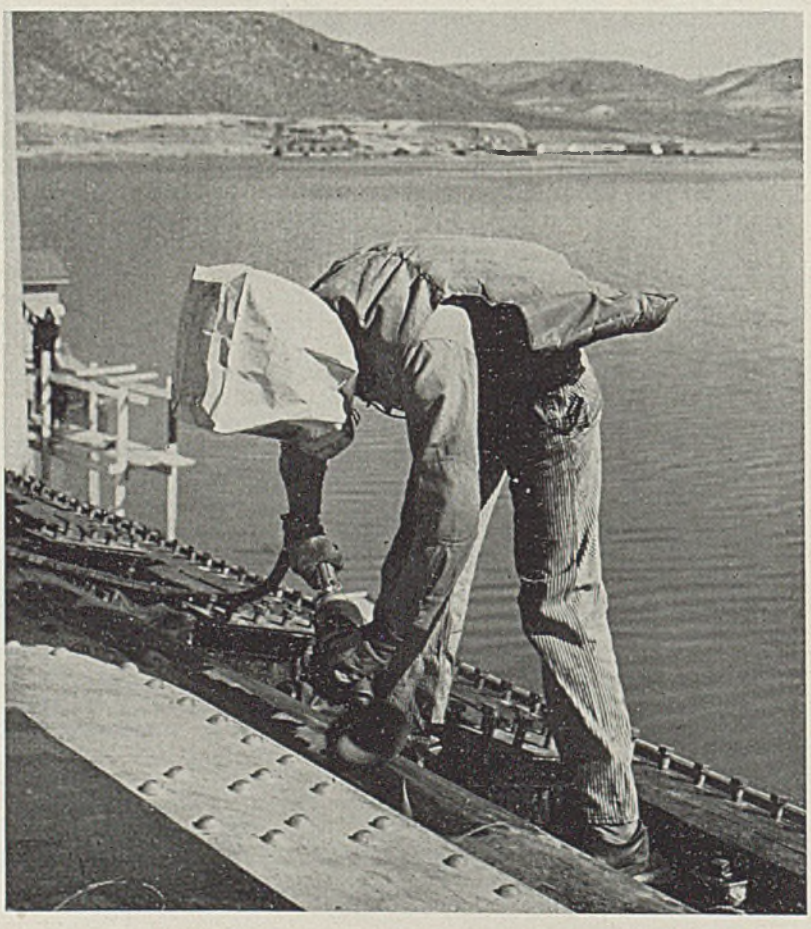
"I thought it was clear. The President speaks Harvard English and I speak Harvard English. He said 'We must stabilize wages.' The synonym for stabilize is not 'add to'. In his radio address he said: 'Do you work for wages. . .you will have to forego any increases for the duration.' The synonym for forego is not 'get'. It remains to be seen if the WLB speaks Harvard English."

Mr. Randall reviewed some of the physical violence which has accompanied such dues picketing at Inland's Indiana Harbor plants.

"The WLB should see dues picketing in action before it imposes so-called voluntary check-offs on basic industry." Workers used to be beaten up by union picket lines every three months to bring in the union dues, but under the new maintenance of membership formulas they only have to be beaten up once—to get them to sign the card.

In referring to union maintenance, Mr. Randall said:

"It is the antithesis of democracy to say that a man can't get out of a union once he is in. The only way a worker can express his disapproval of union leadership or actions is by withdrawing. The right to strike against bad leadership is his only protection and he is helpless without it. Union leaders want a perpetual charter of support from men who cannot withdraw."



✦

"Finishing Touch" on Coulee Dam

HEADGEAR and safety belt are standard equipment for this workman removing rust from the hinge of a gate in the spillway section of Grand Coulee Dam, Washington. Bureau of Reclamation photo

80 Per Cent of War Jobs "Could Be Done by Women"

WASHINGTON

A SURVEY of occupations in 21 key war industries indicates that 80 per cent of the jobs could be done by women, according to Paul V. McNutt, chairman War Manpower Commission.

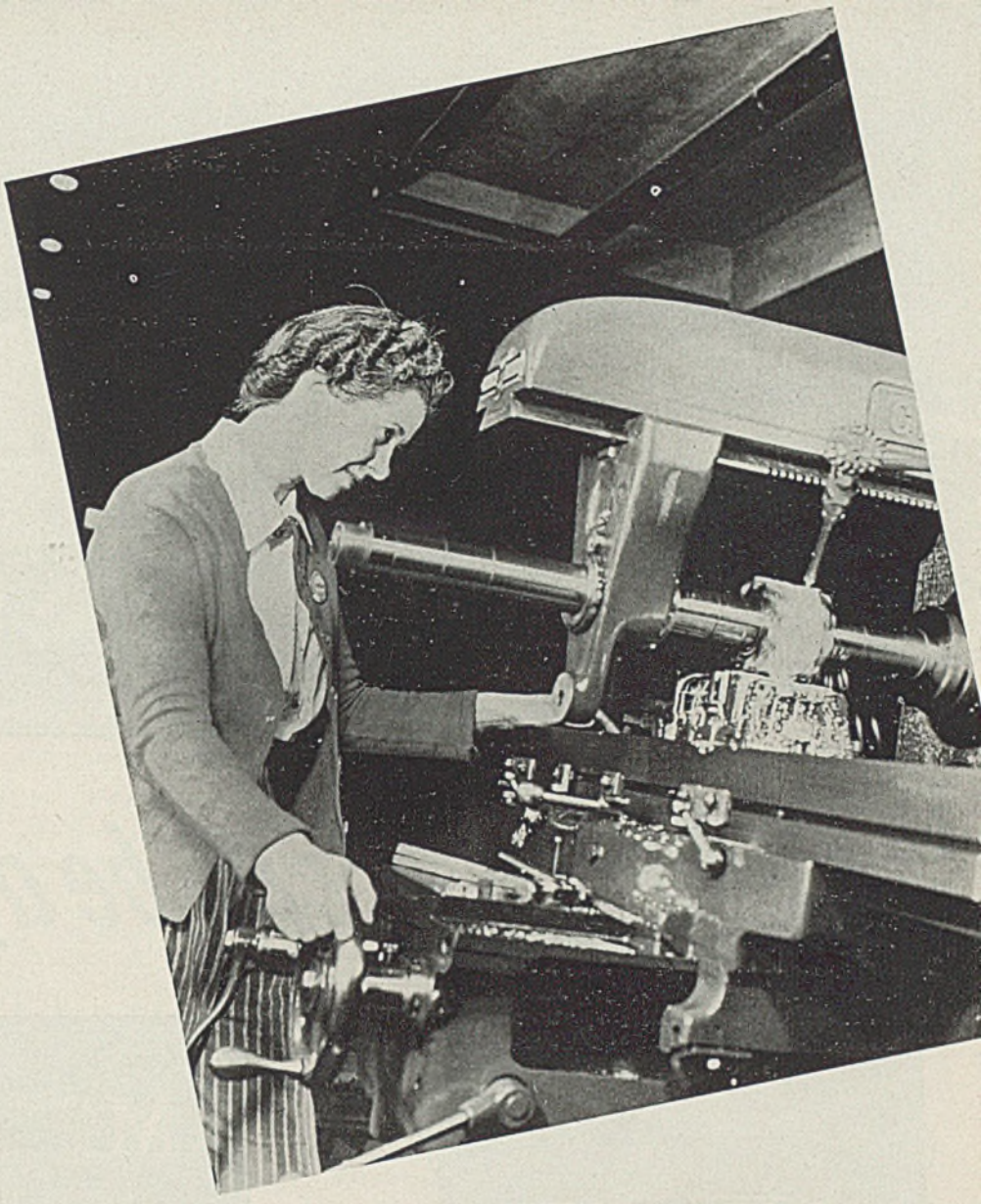
The study covered 1859 jobs in war industries, and also 937 non war jobs. It was made by the occupational analysis section, U. S. Employment Service, to determine those jobs in which women may be successfully employed.

War industries covered were: Manufacture of aircraft and parts, air transportation and service, aluminum products, munitions manufacture, automobile, motorcycle, truck and tank manufacture, and equipment, communications, electrical machinery, firearms, industrial chemicals, iron and steel and their products, machine tools, machine models and patterns, foundries, professional and scientific instruments, railroad equipment, shipbuilding and repairing, utilities, and petroleum production and refining.

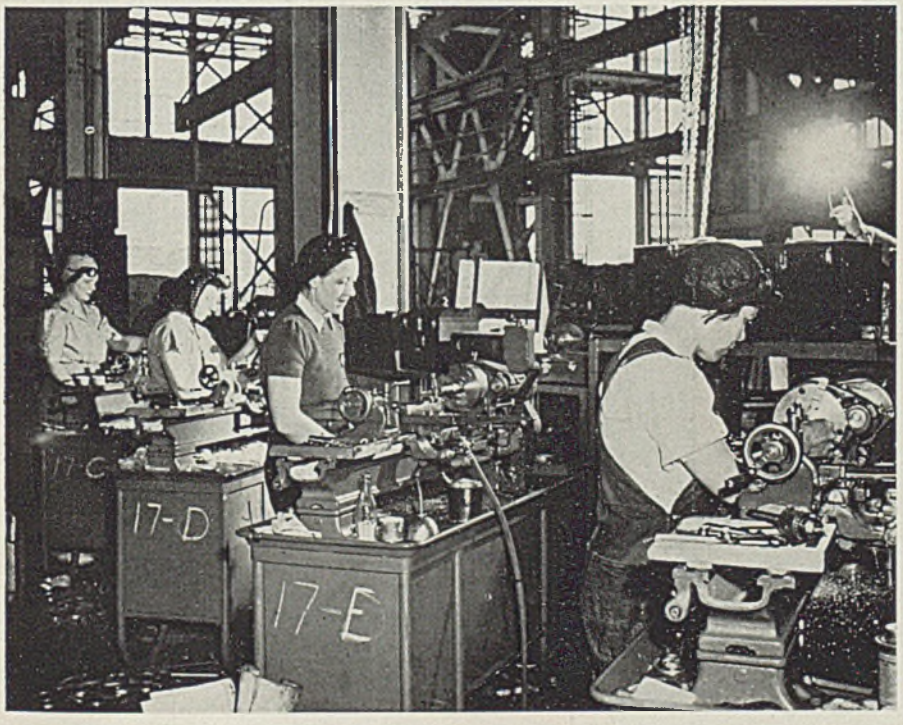
Among the occupations which women are performing satisfactorily are a wide variety called for in the manufacture and assembly of parts for motors, radios, recording instruments, and airplane gages. Development of new machinery now makes possible the employment of women even in the manufacture of heavy shells and other types of munitions. Methods formerly used made it necessary to employ men only.

Even in the ship and boat building industry, it was found women could be satisfactorily used as boilermakers' helpers, draftsmen, machinists' helpers, blueprint machine operators, and flash welders. It was also found that women could be satisfactorily employed in foundry work as casting cleaners, finishers, and polishers, as machine core makers and facing mixers.

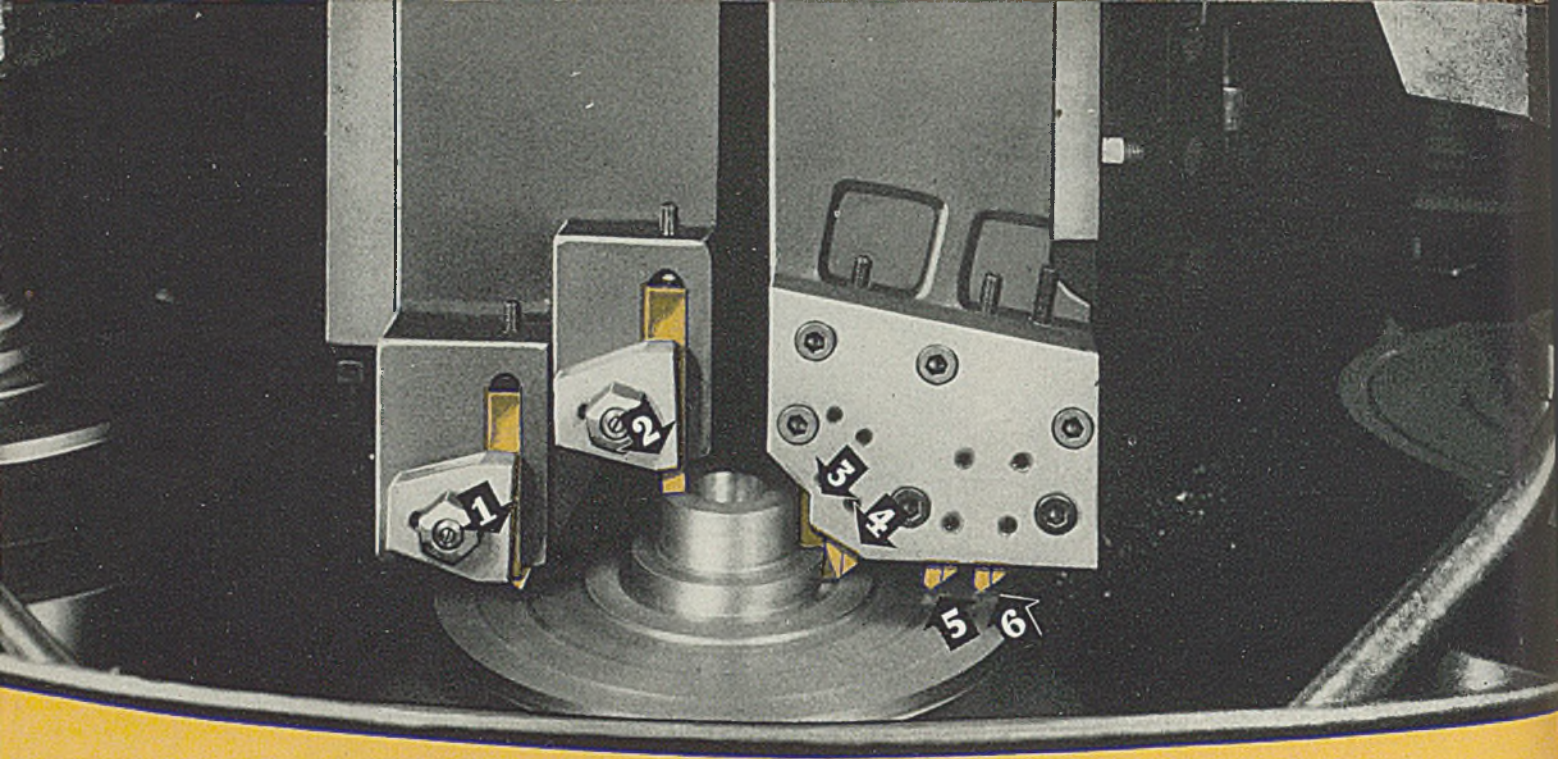
In many cases it would, of course, be necessary for women to be trained for the work. Free training for women in war production work is being rapidly expanded in many areas, Mr. McNutt said.



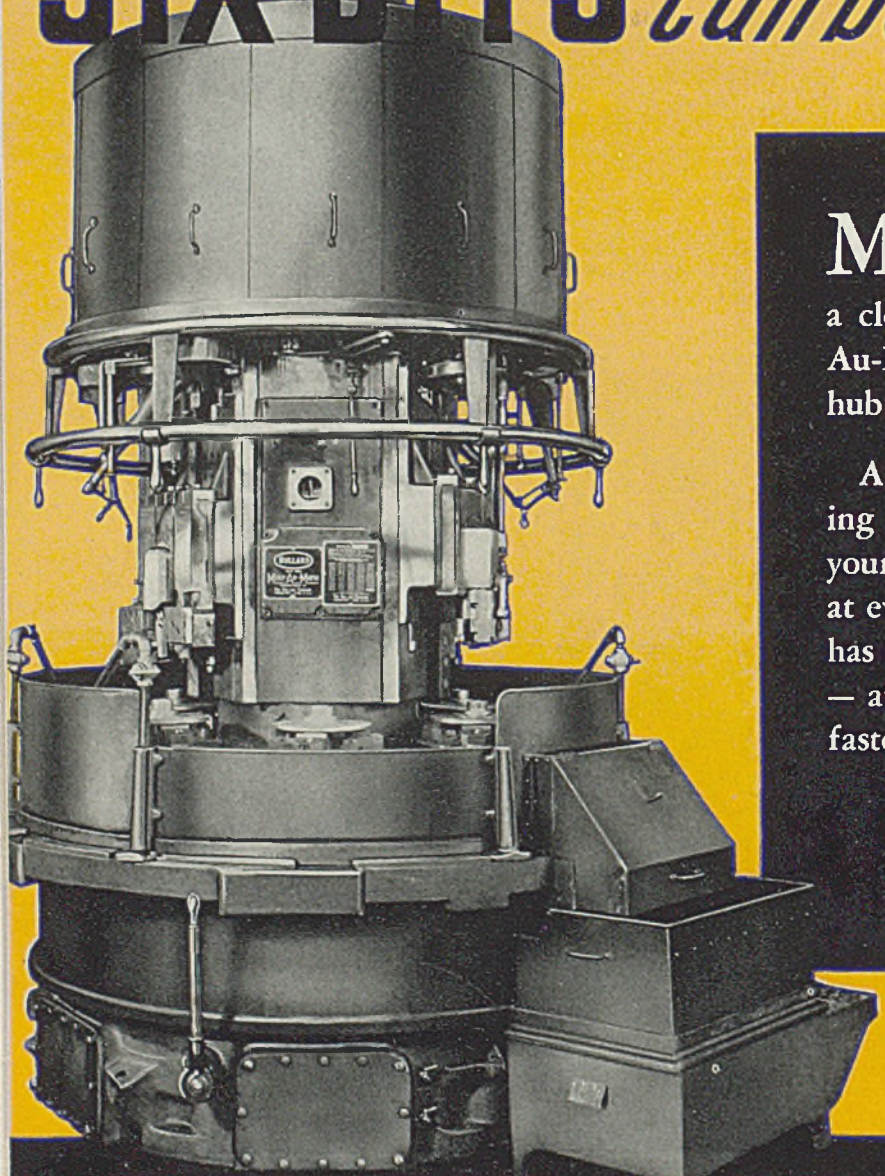
SHAPING impulse blades for steam turbines at Westinghouse Electric & Mfg. Co.'s new Merchant Marine Works. The $26,000,000 plant was dedicated recently after unusual speed in construction. See page 55



KEEPING the ships abuilding in one of the country's great yards—at Mare Island, Vallejo, Calif.—are these women workers. After intensive training courses they now operate precision lathes, and have released men for active duty with the armed forces. NEA photo



"SIX BITS" can be a Whole Lot!



MAYBE not much in a bank, but the story is different here! It is a close-up of the stations on a Mult-Au-Matic which is set up to machine hub plates.

A Mult-Au-Matic has seven working and one loading station — with your choice of speeds, feeds and heads at every station. And as noted here, it has the power to drive six bits or more — at any or every station if that's the fastest and best way to handle the part.

ONLY MULT-AU-MATICS HAVE ALL THESE FEATURES

1. 8 Stations
2. Independent Speeds and Feeds at Each Station
3. Horizontal Chucks
4. Minimum Floor Space
5. Automatic Operation
6. Easy Changeover
7. Continuous Flow Lubrication
8. Interlocking Safety Devices
9. Easy Tooling

THE BULLARD COMPANY

BRIDGEPORT, CONNECTICUT

By A. H. ALLEN *Detroit Editor, STEEL*

MIRRORS of MOTORDOM

Automobiles designed by aeronautical engineers, built in aircraft plants, more likely prospect for "after the war" than is a nation taking to wings . . . Kindelberger kindles a comeback

DETROIT

WHEN they have nothing more serious to worry about, some of the directing heads of the motor industry knit their collective brows and agitate themselves over how the aircraft industry is going to put the nation off the roads and into the air, once the war is over, leaving thin pickings for anyone trying to sell automobiles. Hundreds of thousands of trained pilots will be coming back from the battlefronts and will have no use for motor cars anymore, preferring to do all their traveling by air.

The vast airplane plants, tooled up for mass output of fighter planes, will have to keep on making something after the shooting stops. The government will see to that, to avoid throwing thousands of men out of work and creating a postwar collapse. The WPB will be converted to the CPPB (Conversion to Peacetime Production Board) and public funds will be loaned to keep the nation's productive machinery in action.

So the worry warts on bad days see the motor industry saying goodbye to five-million car years because the whole nation will be up in the air.

Granted that air travel will receive a tremendous fillip after the war, it is this observer's opinion that the greater danger to the motor industry lies in the aircraft industry undertaking the mass production of automobiles, not airplanes. And they will be automobiles designed by aeronautical engineers, something vastly different from the cars now on the roads.

Designs May Be Ready Now

Look at it this way. Here is a new industry, employing close to three quarters of a million working people, suddenly slowed down by the cessation of war. Treasuries will be bursting with contingency funds now being set aside for the future. Plant equipment will be almost brand new. Demand for automobiles should be good. What more natural than to pull out some of those blueprints for a new type of motor car and rush it into production? It is a good bet that some of the aviation companies even now have some of these designs on the shelf waiting the postwar period.

So the motor companies, instead of worrying about competition from airplanes, had better consider the possibility of a flock of new cars appearing from the plants of the aviation industry. There is not going to be the overnight abandonment of automobiles in favor of airplanes that some people imagine. That will take a good many years and a good deal more improvement in the economy and safety of aircraft. Meanwhile Douglas, Martin, Boeing, Consolidated, Republic and the other aircraft companies can be considered ripe prospects for eventual membership in the Automobile Manufacturers Association.

"Just Like Confucius"

Detroit is still looking for the explanation of the blast which J. H. Kindelberger, president of North American Aviation, recently directed at the automobile industry by way of newsmen to whom he was speaking at Kansas City. In substance, he said that the auto industry had not produced any airplane assemblies after 16 months of preparation; that their production methods were unsound on aircraft work; that their costs were out of line; that it was a mistake ever to have drawn the auto industry into aircraft production, etc.

Mr. Kindelberger certainly knew that some of these statements were incorrect. Furthermore his own company is closely tied to General Motors Corp., and why he should point an attack of this sort at the automotive industry is a mystery. He is said to have told associates afterward, "Like Confucius' mother say, 'Confucius talk too damn much.'"

When the aforementioned newsmen, touring the arms production plants of the country, came on to Detroit they were given a whirlwind trip through a dozen or more plants in this area. Chrysler Corp. set up a special display of war products it is making—trucks, tanks, guns, engines, airplane fuselages—24 separate projects in all. One of the newer items was a power plant for the M-4 tank, comprising five 6-cylinder Chrysler automobile engines positioned radially about a central crankcase and the five crankshafts geared to a central driveshaft. The combination delivers around 500 horsepower, and represents a highly ingenious adaptation of a standard automotive product to a special installation. One difficulty with the installation is that an unusually large radiator is required, being nearly 5 feet square. Servicing the assembly in the field would not be the simplest matter either, and there is considerable question around Detroit whether the army will go ahead with any mass production of the unit. Only a handful has been built so far.

A second unpublicized Chrysler project is a novel type of marine tractor, powered by a 6-cylinder Chrysler marine engine. Essentially, the device comprises a welded steel tank or caisson on which is mounted the engine and a short propeller shaft which through a rack and pinion arrangement can be raised or lowered to clear obstructions in shallow water. The tractor is used much as a tug would be, to move barges and other equipment around in docks and harbors.

Chrysler also is building air raid sirens powered by automotive engines. They are built in several sizes, the largest being so powerful that a wooden horn first tried with the device actually crumbled to pieces under the impact of the noise from the generating unit. Principle of the siren is the impingement of a blast of air on a rapidly rotating cylinder comprising closely spaced steel blades and resembling the fan of a blower.

To Speed Scrap Movement

To intensify industry-wide co-operation with the national scrap salvage campaign, the Automotive Council for War Production is working on a program to speed the immediate movement of the maximum amount of iron and steel and other scrap from the motor plants. P. O. Peterson of Studebaker has been named chairman of a committee to prepare details of the program, other members including J. D. Porter of Federal Motor Truck, B. D. Kunkle of General Motors, Ray Ayer of Chrysler, J. E. Padgett of Spicer Mfg. Co. and J. F. Page of Packard.

Nearly 198,000 pieces of production equipment have been listed by 127 plants in the automotive and allied industries with the machine tool and equipment service of the Automotive War Council. Now classified as to size, type, specific characteristics and current use are 150,-

000 of these units, of which 66 per cent are now operating on war work, 3 per cent are earmarked for early use, 13 per cent are still available for transfer to other manufacturers, 9 per cent are being studied for possible war production, and 9 per cent are at work under government authorization on production of replacement parts. As the latter complete their quotas they are reclassified and in most cases added to the total used in direct war work.

Next Monday, June 8, the Detroit section of the Society of Automotive Engineers and the Engineering Society of Detroit are sponsoring a technical discussion on aircraft subjects and an exhibit of aircraft parts at the Rackham Memorial. Exhibit is being arranged by the Ford Motor Co. and will include U. S. aircraft engines, Axis engines and parts. It will include the No. 3 Wright engine, the Liberty engine used in World War I, a model of the Ford experimental design liquid-cooled aircraft engine, an 8-cylinder adaptation of this engine now in production, a French Gnome rotary engine used in the last war, a Pratt & Whitney R-2800 engine, a German Daimler-Benz engine and a Japanese engine from Pearl Harbor.

Parts display will show changes made in designs and methods by Ford, and the application of automotive manufacturing methods to attain quality production and mass output. Included will be centrifugal steel castings developed to replace steel forgings, and other steel castings which may replace aluminum forgings and castings. Airframe parts, and a breakdown to show how transportation and reassembly of airframe parts have been simplified by regrouping subassemblies into partial assemblies, also will be shown. In conjunction with the exhibit, Ford also has arranged to have on hand for inspection the special trailer equipment being used to transport large subassemblies of aircraft to distant plants for assembly (STEEL, April 27, p. 39).

With deliveries of its antiaircraft cannon for the Navy seven months ahead of schedule, Pontiac now is operating a gun training school to furnish instructors and observers for navy training centers. D. U. Bathrick, general sales manager, is director of the school, and instructors are being selected from Pontiac's field personnel. Eventually the school will be extended to cover instruction on the 40-millimeter antiaircraft gun to be built for the army.

Cadillac is drawing on its supply of service experts to instruct army personnel in the maintenance of combat vehicles the division is producing. Program is under the direction of D. E. Ahrens, general sales manager.

In the second 15-minute practice blackout in this area Sunday, all Pontiac plants participated, making what OCD officials believe was the largest industrial trial blackout in the midwest. Most other war plants in this section continued work, but Pontiac officials felt that the experience gained by the personnel more than made up for the few minutes of production which were lost. Sirens and departmental bells announced the blackout at 10 p.m., with a 3-minute warning. Employes were assigned in each department to turn off lights and all machinery was stopped. Employes remained at their machines until the all-clear signal.

Prospects of gasoline rationing this summer have knocked the used-car business into virtual unconsciousness, with scant hope of any relief. When rationing went into effect in the East, hundreds of used cars were moved to the middle west and prices slumped from $100 to $150 in many sections. Before any requisitioning of privately owned cars is resorted to, government transportation authorities might well consider buying the thousands of used cars now available on dealers' lots. They are going begging now.

Bedaux Co. Inc., Chrysler building, New York, has issued a booklet entitled *More Production, Better Morale,* outlining methods of scientific management to increase production without adding materially to equipment or manpower. It offers a program for American industry, including operations planning and scheduling, job evaluation and classification, training of supervisors and workers and other factors.

No Tire Shortage Here

KEY to efficient operation of the American railroads is consistent repair and maintenance of more than 2,000,000 freight cars and 400,000 miles of track. For this task 1,190,416 railroad employes have been deferred from military service. About 80,000 freight cars in service are repaired each day in railroad shops. Supply of steel tires and other steel products for this work so far has been reported adequate. NEA photo

FROM AN ORIGINAL DRAWING BY ORISON MACPHERSON

SKILLED CREWS SET A FIGHTING PACE PRODUCING WAR STEELS

Like the Navy in action, crews of skilled men are setting a fighting pace in the production of fighting steels. Broadsides that flare against the sky, night and day, tell that here in the steel works a battle is being waged and won — for it is on the home front that tools for victory must first be forged. These men of steel know their first-line duty is working on the important job of making steel — the job that years of experience and skill fit them to do. In all divisions, all departments, men and management also know that the more steel produced and delivered now — every hour of every day — the earlier the enemy will be defeated. So they do their fighting by producing steel for planes, tanks, guns, ships and shells at a pace that breaks all records and breaks them again and again.

Thousands of J&L employes are buying War Bonds on voluntary allotment plan. In many divisions subscriptions have reached 100%

JONES & LAUGHLIN STEEL CORPORATION

AMERICAN IRON & STEEL WORKS • PITTSBURGH, PENNSYLVANIA

PARTNER TO INDUSTRY IN WAR PRODUCTION

J&L STEEL

Canada To Build 4-Motored Bombers; Twin-Engined Plane To Fly Atlantic

TORONTO, ONT.

CANADA'S aircraft industry has been handicapped considerably by frequent changes in types, C. D. Howe, minister of munitions and supply, told the House of Commons. Output could be much higher, he said, if the industry could settle down to fixed types, as three plants now are out of production, retooling for new styles. Nevertheless, the industry is making tremendous strides and production is increasing every week. While details could not be released, large four-motored bombers will be made in a Toronto plant now retooling. It will be the product of associated aircraft companies and will be assembled in an annex to a plant of the National Steel Car Corp. Ltd.

A "secret plane" is being built at a De Havilland plant, a two-motored craft capable of flying the Atlantic. It is all-Canadian, except for the engines. Mr. Howe stated it is "still the belief of the government that better use could be made of productive capacity than construction of airplane motors, which can be obtained elsewhere."

Steel drums will be manufactured in Canada in only four sizes, and painted in only one color, under an order by the administrator of fabricated steel. The sizes are 10, 25 and 46 gallons, imperial measure; grease drums, 100 pounds. Prohibited sizes in stock may be sold.

Minister of munitions and supplies announced that his department has placed six contracts with St. Catharines Steel Products Ltd., St. Catharines, Ont., with value of $4,454,000, for three types of armor piercing and semi-armor-piercing ammunition.

Wartime Prices and Trades Board has issued an order prohibiting use of any metal other than gold or silver in the manufacture of more than 100 articles for consumer use, ranging from advertising novelties and asparagus tongs to shoe horns, soap dishes and spittoons. The order parallels that issued by War Production Board in the United States.

Alloy Steel Committee Named

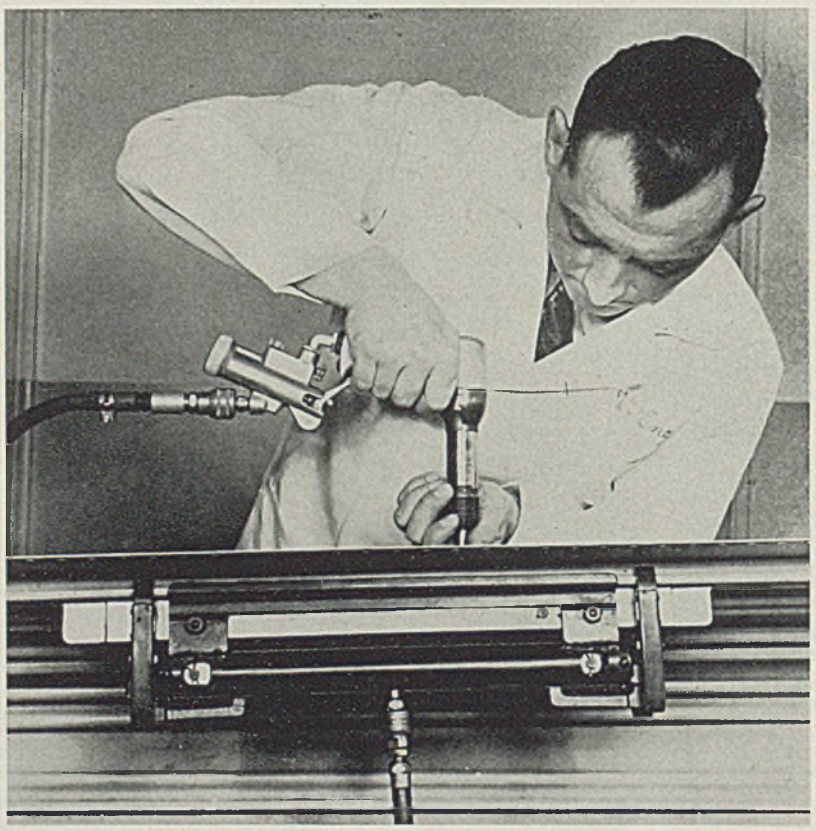
The department of munitions and supply has announced appointment of a technical advisory committee on alloy and special steels. F. B. Kilbourn, steel controller, said the committee will have the task of recommending changes in alloy steel specifications to conserve scarce metals. It includes J. G. Morrow, chairman, chief metallurgist of Steel Co. of Canada Ltd., Hamilton, and technical adviser to department of munitions and supply; Major-General A. E. Macrae, military technical adviser to the department; T. Hardy, metallurgist for Atlas Steels Ltd., Welland; F. A. Looseley, manager of Dominion Foundries & Steel Ltd., Hamilton; H. Biers, adviser of the metals controller, Ottawa; and Brigadier G. B. Howard, deputy-inspector-general of the inspection board of the United Kingdom and Canada.

Since the outbreak of war production of alloy and special steels in Canada has been increased by more than 600 per cent and plans are under consideration to double present electric furnace capacity. Atlas Steels Ltd., Welland, Ont., is laying foundations for three new 20-ton electric furnaces.

Canadian customs regulations have been amended to allow free importation of iron and steel containers for miscellaneous products, providing an equal number has been exported. The order was issued by the national revenue department to meet general shortage of containers and requires that export of usable containers must be made under customs supervision and importation must be at the same port at which the exports were made.

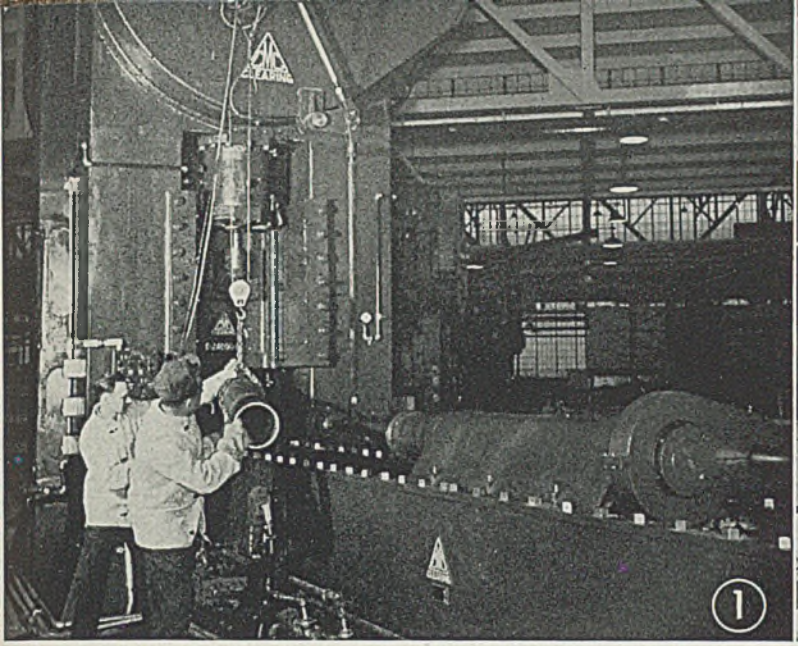
Canadian imports of steel and iron products in March were valued at $35,202,000, slightly less than $35,365,000 imported in March last year. Vehicles constituted the largest item, valued at $9,160,000, followed by machinery, except agricultural, $6,938,000; rolling mill products, $6,846,000; farm implements, $2,271,000; engines and boilers, $1,748,000; pigs, ingots, blooms and billets, $1,070,000.

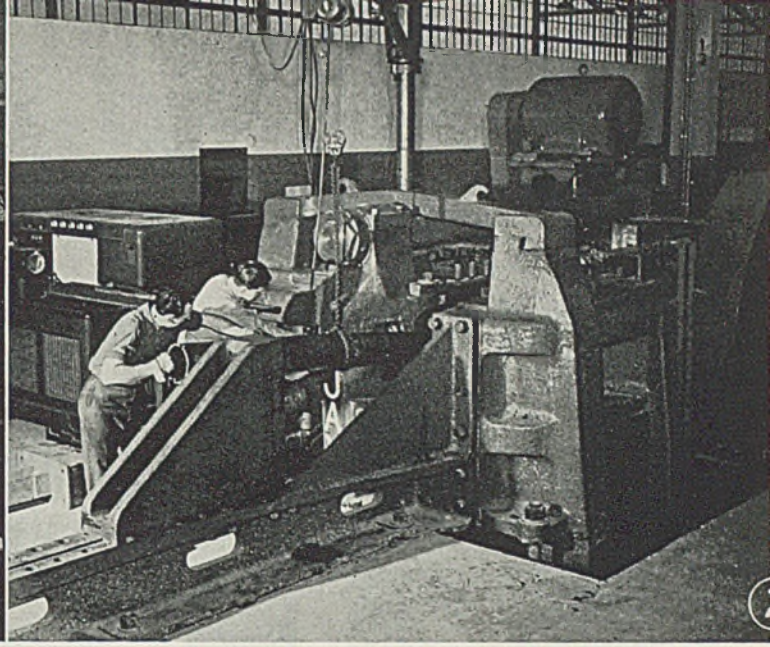
Rivet Bucking Bar Used in Wing Fabrication

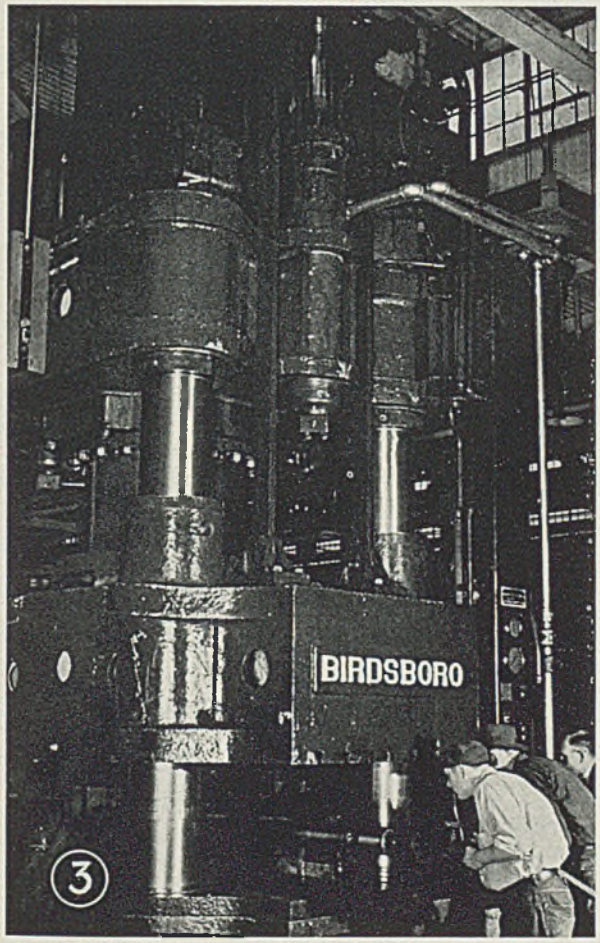


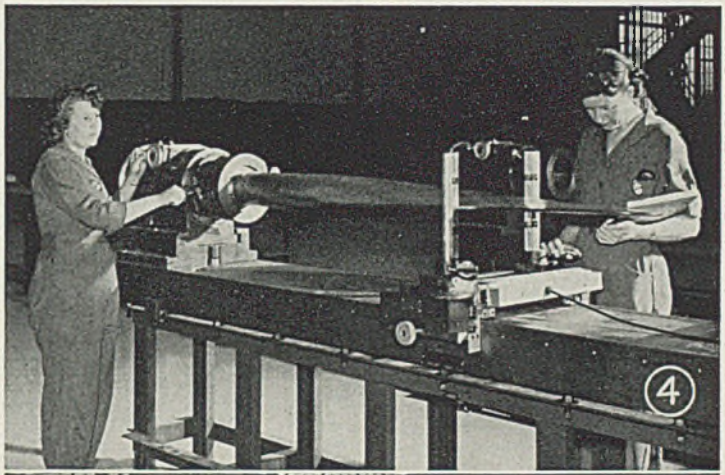
This automatic bucking bar for riveting aircraft structures has been developed by product research division of Murray Corp. of America, Detroit, to permit "noiseless riveting" and to eliminate need for "backing-up" operator.

The bar bucks and aligns rivets exactly and can be extended to buck rivets for an entire assembly such as a leading edge structure for an airplane wing. This enables several workmen to rivet an assembly at one time without removing it from the fixture, thus accelerating production. By means of special valving and pneumatic connections on the riveting gun and bucking bar, the operator is relieved of the responsibility of determining when the rivet has been driven home, action of the gun ceasing automatically when the operation has been completed.









Bomber Propeller Blades Formed from Steel Tubing

UNIQUE method of processing chrome-molybdenum steel tubing into propeller blades for bombers, culmination of four years of development work, is illustrated in these views in the new plant of American Propeller Corp., Toledo, O., subsidiary of Aviation Corp.

After honing and turning the steel tubing, it is later swaged at one end in a battery of four 500,000-pound swaging presses, reported to be among the largest of their type ever built, one being shown in Fig. 1.

The swaged tube subsequently is heated by electric induction and formed in the forging machine, Fig. 2.

Later the steel blade, filled with gas to insure proper shaping, is subjected to further forming operations in the press, Fig. 3. After a multitude of other operations completed blades are gaged and checked as shown in Fig. 4.

Numerous heat treating, annealing, X-ray and related operations are interspersed at various stages during the process. The exhibit in Fig. 5 shows six steps in the transformation of the tubing into a blade. In the group, left to right: William F. Wise, president of American Propeller; Brig. General A. W. Vanaman, commanding general of Wright Field, and Brig. General K. B. Wolfe, head of the production division, United States Army Air Forces.

MEN of INDUSTRY

Henrik Ovesen

H. Sturgis Potter

E. G. Haven

D. R. Shoults

HENRIK OVESEN, until recently chief engineer, Division of Contract Distribution, Office of Production Management, has joined Lukens Steel Co., Coatesville, Pa., as consulting engineer. He will supervise certain engineering and construction to be carried out in connection with the war program. From 1925 to 1935 he was associated with Youngstown Sheet & Tube Co., Youngstown, O., as chief engineer, after which he engaged in consulting engineering work.

♦

H. Sturgis Potter, has been transferred from the Indianapolis branch of Carpenter Steel Co. to the main office at Reading, Pa., and appointed assistant manager of tool steel sales.

♦

Gunnard A. Eliason, formerly assistant open hearth superintendent, Great Lakes Steel Corp., Detroit, has been appointed metallurgist with the engineering department of Chrysler Corp., Detroit, headquarters at the Highland Park plant.

♦

Ralph W. Porter, president, Swindell-Dressler Corp., Pittsburgh, has been elected president and chairman of the board, Industrial Furnace Manufacturer's Association.

♦

Joseph D. Glatz, Chicago, sales engineer for Harnischfeger Corp., Milwaukee, recently was made chief, crane unit, tools branch, War Production Board, Washington, succeeding **Sidney Buckley,** president, Shepard-Niles Crane & Hoist Corp., Montour Falls, N. Y., resigned.

♦

Otto Z. Klopsch, vice president, Wolverine Tube Co., Detroit, was elected to the board of directors, Copper and Brass Research Association at its annual meeting in New York, May 22. He succeeds **H. W. Steinkraus** on the board. For other officers, previously announced, see STEEL, May 25, p. 42.

♦

Edward G. Haven has been appointed manager of sales, aviation division of General Electric Co.'s industrial department, and **David R. Shoults** has been named engineer of the same division. Since 1936 Mr. Haven has been engaged in engineering and sales activities of the aviation division, while Mr. Shoults has been with the industrial engineering department since 1928.

♦

R. S. Elberty Jr. has been appointed experimental engineer, T. W. & C. B. Sheridan Co., 135 Lafayette street, New York.

♦

O. Clifford Grimshaw has been appointed district freight agent, Pennsylvania railroad, Chicago. He has been associated with the railroad 20 years in Pittsburgh and Chicago, specializing in rate construction.

♦

Col. Donald Armstrong, chief of the Chicago Ordnance District, has been nominated by President Roosevelt for promotion to brigadier general in recognition of meritorious service.

♦

H. J. Mokate, since 1940 manager of sales, secondary products division, Carnegie-Illinois Steel Corp., Pittsburgh, has been appointed assistant to vice president, Scully Steel Products Co., Chicago, and **Andrew Verschuur,** assistant general manager of sales of Scully, has been promoted to manager of sales of the Chicago district. Mr. Mokate has been associated with United States Steel Corp. subsidiaries about 22 years, while Mr. Verschuur began as an office boy with Scully Steel & Iron Co. in 1894.

♦

Arthur W. Kimbell, the past 14 years vice president and general manager, United-Carr Fastener Corp., Cambridge, Mass., has been elected president, succeeding **Sinclair Weeks,** who has become chairman of the board.

♦

Joseph Grundy Shryock, president and chief engineer, Belmont Iron Works, Philadelphia, was the recipient of an honorary degree of doctor of science in engineering at the commencement exercises of Pennsylvania Military College, Chester, Pa., May 19.

♦

William M. Denny has been named manager, contract service department, General Electric Co., Schenectady, N. Y., succeeding **Frederick P. Wilson,** who has retired after 51 years' service. Since 1929 Mr. Denny has been assistant manager of the department he now heads.

♦

Robert C. Onan, formerly advertising manager, Lindberg Engineering Co., Chicago, has been appointed district sales manager for northern Illinois, Iowa, Wisconsin and Minnesota territory, with headquarters at 606 West Wisconsin avenue, Milwaukee.

♦

Harold A. Knight, formerly associate editor, STEEL, has been appointed associate editor, *Metals and Alloys,* New York, replacing **H. R. Clauser,** who recently enlisted in

the Army. Mr. Knight at one time was metals editor for the *New York Journal of Commerce* and also was on the editorial staff of *The Iron Age.*

♦

R. A. Hasenstab, district freight agent in St. Louis, for the Canadian Pacific railroad, has been transferred to Chicago in the same capacity, succeeding the late G. H. Keusch. **J. H. Decker** succeeds Mr. Hasenstab at St. Louis.

♦

Laurence H. Chase has been named a research engineer, Battelle Memorial Institute, Columbus, O., and has been assigned to the division of organic chemistry. He formerly was associated with Carnegie-Illinois Steel Corp., Clairton, Pa.

♦

Herman W. Steinkraus, heretofore vice president and general manager, Bridgeport Brass Co.,

Herman W. Steinkraus

Bridgeport, Conn., has been elected president, succeeding **Ralph E. Day,** who has resigned because of ill health. Mr. Day will continue as a director. Mr. Steinkraus has been associated with Bridgeport Brass since 1926.

♦

William J. Austin, manager of the Chicago office of the explosives department, Hercules Powder Co., has been appointed director of purchases, with headquarters at Wilmington, Del. He succeeds **Kurt W. Jappe,** who will become manager of detonator operations, explosives department. **Frank W. Roman,** assistant manager, explosives department, will replace Mr. Austin as manager of that office.

♦

Osborn Mfg. Co., Cleveland, has established an "expanded war-effort, brush-engineering field service", to co-operate with war plants. **Page A. Mead,** Delmar, N. Y., will cover eastern New York state; **Paul A. Malling,** Fairlawn, N. J., will serve New Jersey; **William F. Short,** Hamburg, N. Y., Buffalo and western New York state; **Max Sherwood,** Chicago; **Gilbert B. Pecsok,** New York; and **Ralph B. Jones,** Cleveland.

♦

Bertram Bredy, since 1925 Chicago representative of Thompson Wire Co., Boston, and for three years general manager of the company's Chicago plant, has resigned to devote his entire time to his own company, Bertram Bredy Co., Chicago, dealer in steel, brass and copper products and alloys.

Metalworking Advisory Committees Appointed

New industry advisory committees appointed in the metalworking field last week included:

House Trailer

Francis Palms, chief, House Trailer Section of the Lumber and Lumber Products Branch, WPB, is government presiding officer.

Members are: D. D. Arehart, Palace Travel Coach Corp., Flint, Mich.; Wilbur J. Schult, Schult Trailers, Elkhart, Ind.; E. H. Becker, Glider Trailer Co., Chicago; George F. Miles, Vagabond Coach Mfg. Co., Brighton, Mich.; H. L. Bartholomew, Indian Trailer Corp., Chicago; E. E. Raymond, Raymond Products Co., Saginaw, Mich.; W. E. Case, Main Line Trailer Co., Los Angeles; H. D. Platt, Platt Trailer Co. Inc., Elkhart, Ind.; Charles R. Smith, Travelodge Corp., Tulsa, Okla.; R. J. Miller, Miller Auto Cruiser Co., Bradenton, Fla.

Brass and Bronze Ingot Makers

H. O. King, chief, WPB Copper Branch, is government presiding officer.

Members are: L. Chapman, H. Kramer & Co., Chicago; Leo Halpern, Federated Metals Division, American Smelting & Refining Co., New York; George Avril, G. A. Avril Smelting Works, Cincinnati; Melvin Butter, Harry Butter Co. Inc., Dorchester, Mass.; W. J. Bullock, W. J. Bullock Inc., Birmingham, Ala.; David B. Rosenthal, Eastern Iron and Metal Co., Los Angeles.

Brass and Bronze Foundries

H. O. King, chief, WPB Copper Branch, is government presiding officer.

Members are: B. J. Flaherty, Johnson Bronze Co., Newcastle, Pa.; Damon Wack, National Bearing Metals, New York; L. M. Nestlebush, Falcon Bronze Co., Youngstown, O.; N. H. Schwenk, Cramp Brass & Iron Foundries Div. Baldwin Locomotive Works, Philadelphia; J. P. Jefferis, Janney Cylinder Co., Philadelphia; William C. Hardy, Wm. A. Hardy & Sons Co., Fitchburg, Mass.; W. V. Storm, Western Brass Works, Los Angeles; W. C. Peare, E. A. Williams & Son, Jersey City, N. J.

Antifriction Bearing

George C. Brainard, chief, WPB Tools Branch, is government presiding officer.

Members are: S. F. Wollmar, SKF Industries Inc., Philadelphia; H. O. K. Meister, Hyatt Bearing Division, General Motors Corp., Harrison, N. J.; A. C. Davis, Marlin-Rockwell Corp., Jamestown, N. Y.; Fred Hughes, New Departure Division, General Motors Corp., Bristol, Conn.; William E. Umstattd, Timken Roller Bearing Co., Canton, O.; F. O. Burkholder, Ahlberg Bearing Co., Chicago; S. A. Strickland, Bower Roller Bearing Co., Detroit; R. B. Nichols, Bantam Bearings Corp., South Bend, Ind.; G. A. Strom, Strom Steel Ball Co., Chicago; C. H. Talcott, The Torrington Co., Torrington, Conn.; R. F. Moyer, Standard Machinery Co., Providence, R. I.; George Carleton, Nice Ball Bearing Co., Philadelphia.

Universal Electric Tool

E. P. Waller, chief, Industrial Specialties Group, is government presiding officer.

Members are: E. E. Morrison, Albertson & Co., Sioux City, Iowa; L. J. Walker, Chicago Pneumatic Tool Co., New York; R. L. Hamilton, Dumore Co., Racine, Wis.; A. W. Mall, Mall Tool Co., Chicago; D. J. Riddings, Porter-Cable Machine Co., Syracuse, N. Y.; H. F. Tideman, Signal Electric Mfg. Co., Chicago; L. M. Knouse, Stanley Electric Tool Division, Stanley Works, New Britain, Conn.; E. W. Ristau, Skilsaw Inc., Chicago; Steven Scace, Speedway Mfg. Co., Cicero, Ill.; D. G. Black, Syntron Co., Homer City, Pa.; George E. Smith, U. S. Electrical Tool Co., Cincinnati; Kennedy H. Clark, James Clark Jr. Electric Co., Louisville, Ky.; O. P. Wodack, Wodack Electric Tool Corp., Chicago; Neil C. Hurley Jr., Independent Pneumatic Tool Co., Chicago; J. F. Willey, Louisville Electric Mfg. Co., Louisville, Ky.

DIED:

Gosta Lofberg, 46, president, Uddeholm Co. of America Inc., New York, in that city, May 12. Mr. Lofberg had been associated with the company since its organization in 1925, except for three years from 1934 to 1937, when he was president of SKF Steels Inc.

♦

Cary D. Waters, president, C. J. Tagliabue Mfg. Co., Brooklyn, N. Y., May 9, in New York.

♦

Harry F. Ellis, 64, vice president, White Tool & Supply Co., Cleveland, for 24 years, May 21 in that city.

♦

Clarence A. Esslinger, manager, Burchall Products Inc., New York, manufacturer of precision instruments, May 19 at his home in West Englewood, N. J.

♦

Charles J. Klinka, 73, for 25 years owner of the Banner Iron & Wire Works, Milwaukee, May 18, in that city.

♦

Walter S. Rockwell, 92, chairman of the board, W. S. Rockwell Co., New York, May 21 at his home in Morristown, N. J. Mr. Rockwell founded the business in 1888 and was its president until 1932.

♦

George C. Blackmore, 76, president, Automatic Gas Equipment Co., Pittsburgh, in that city, May 20.

♦

Walter H. Thomas, president, Straight Line Foundry & Machine Corp., Syracuse, N. Y., recently.

Republic Completes Giant Blast Furnace in South for War Emergency

COMPLETED five weeks ahead of schedule, Republic Steel Corp.'s new blast furnace "Somewhere in the Southeast" was lighted last Thursday. Only 119 days elapsed between Jan. 30, when the first piece of steel was swung into position, and when the furnace was blown-in.

It is the first of those authorized by the government in the emergency program to be completed, and will be followed early next fall by Republic's second new blast furnace.

Gov. Frank M. Dixon applied the torch. In the group were federal, state and local officials; representatives of Republic, including R. J. Wysor, president, and C. M. White, vice president in charge of operations; contractors and subcontractors, and many "off-shift" steelworkers.

In addition to the furnace, there will be a new battery of by-product coke ovens, boiler plant, generating unit, 3-mile-long 60-inch water line, a huge gas washer, precipitators in which the dust from the furnace is washed, separated from the water and fed back into the furnace as raw material. A portion of these facilities are already completed.

The new unit is a cylindrical steel giant reaching 130 feet above the ground level. Because of the high humidity, or amount of moisture in the air in the Deep South, the furnace has been air-conditioned to avoid blowing 18 tons of water into it daily. Designed by Republic engineers, who also had charge of construction, it is expected to exceed rated capacity by a substantial tonnage. Rated capacity was not disclosed.

News reports printed in Birmingham, Ala., and press dispatches from that city stated specifically where this furnace is located, but complying with censorship rules, Republic's official copy placed it "Somewhere in the Southeast".

New Tennessee Mill Adds 50% to Plate Capacity

Tennessee Coal, Iron & Railroad Co., Birmingham, Ala., started production May 26 in its new 140-inch four-high plate mill, which will add approximately 50 per cent to the company's plant output. This mill is part of an extension program announced in November, 1940, including a new blast furnace and battery of coke ovens which have been completed and placed in service.

Lone Star Steel Co. Plans Enlarged Plant

Enlarged plans for the blast furnace and steel plant of the Lone Star Steel Co., Daingerfield, Tex., will call for an expenditure of $21,500,000 in addition to the $15,850,000 already provided. Several weeks ago the Defense Plant Corp. approved an allotment of $14,500,000 for the construction of a blast furnace plant on a 4500-acre site near the Daingerfield operations.

The additional funds will be used to build a steel plant in connection with the blast furnace plant.

Engineers under the direction of John V. W. Rynders, New York, consulting engineer for the Defense Plant Corp., are making a survey of the site.

Hydraulic engineers from the State Land Office are surveying waterways in the Daingerfield area to find a location for a 1500-acre reservoir for the plant's water system.

Crews of the Austin Bridge Co., which has been awarded a pit-digging contract, are taking tests from the company's ore fields; samples have been sent to Cincinnati for analysis.

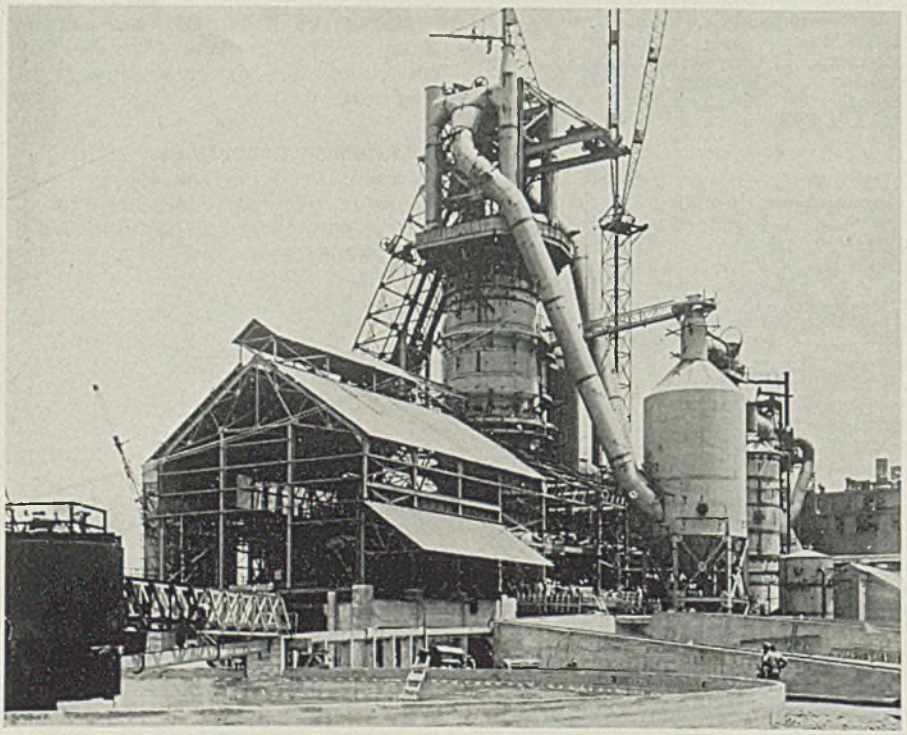
New plant for processing tin cans, being constructed at Houston, Texas by Defense Shredded Steel Co. of Los Angeles and financed by Defense Plant Corp., will be completed in July, according to H. H. Johnson, a company official. Capacity will be 800 tons of cans daily from Houston and south Texas areas. It will employ 50 men. Firm is building similar de-tinning plants in Dallas and Kansas City.

Columbia Steel Builds 30,000-Ton Steel Foundry

Columbia Steel Co., San Francisco, will start work June 1 on a steel foundry to cost more than $6,000,000, on property adjoining its works at Pittsburg, Calif., to add 30,000 tons annually to its steel casting capacity. The plant will be constructed at the expense of the government, and products will be used mainly by the Navy and Maritime Commission. Equipment will include two 25-ton basic open-hearth furnaces and a 6-ton electric furnace. Completion is planned for March 1, 1943.

Columbia in first four months of 1942 produced 3.4 per cent more finished steel than in the corresponding months last year, which previously had been its peak output. Its foundries at Pittsburg and Torrance, Calif., working almost wholly on ship castings, increased output approximately 25 per cent in the same period.

Domestic production of manganese ore containing 35 per cent or more manganese in February was 9500 gross tons, shipments 9600 tons and producers' stocks at end of month 1300 tons, according to the Bureau of Mines.



AMONG the new modern blast furnaces built at government's request for the war emergency is this Republic Steel unit, blown in last week

New Turbine Plants Begin Production; Striking Examples of Industrial Speed

PHILADELPHIA

AMERICA today has more active shipbuilding capacity than all the rest of the world combined, and despite the magnitude of the President's goal of 23,000,000 deadweight tons of merchant shipping by the end of 1943, "we'll do the job."

This was the assurance given by Admiral Howard L. Vickery, vice chairman, United States Maritime Commission speaking at the dedication of Westinghouse Electric & Mfg. Co.'s new merchant marine plant here May 22.

"No shipbuilders of any nation ever tackled so big a job before, Admiral Vickery said, but added that the country's capacity to build will not only be an important factor in winning the war but afterward will restore this country to a dominant place in world commerce.

Admiral Vickery headed a group of government officials attending the impressive ceremonies, which also attracted many industrial leaders.

Ellis L. Spray, manager of the Westinghouse merchant marine division, described the speed with which the plant had been erected. First turbine parts were being manufactured just 65 days after the first steel columns were erected on Armistice Day, 1941. During construction an average of 200 tons of steel was put up daily, with peak days reaching more than 400 tons.

The plant was built at a cost of $26,000,000 with funds supplied by the Defense Plant Corp.

Layout includes 519 machines. Appropriation for the machines and tools, six costing more than $200,000 each and 45 more than $50,000 each, was about $17,000,000.

The dedication ceremonies were conducted from a rostrum erected on the production line with the speakers platform sandwiched in between an 18-foot horizontal planer and a 100-inch vertical boring mill.

Preceding the dedication was an inspection tour of the plant led by Mr. Spray and A. W. Robertson, Westinghouse chairman, who later addressed workers and visitors.

General Electric's More Than Two Months Ahead of Schedule

General Electric Co.'s new turbine plant shipped its first C-3 cargo ship turbine May 21, more than two months ahead of schedule. It is part of a $50,000,000 expansion project for the Maritime Commission. Location is withheld as a military secret. Production is expected to be one-third larger for the year than originally planned.

Site was a barren swamp when General Electric was advised June 10, 1941, that the commission would require more turbines. A lease agreement was signed July 9 with the Defense Plant Corp., and on July 15 ground was broken.

Construction workers labored 24 hours a day, working at night under floodlights, through the fall and winter to drain and clear the ground. Before the factory structure was complete three shifts of production workers, many of whom had never done turbine work before, began work on machines protected from the weather by tarpaulins and heated by salamanders.

Erection of the 2800 tons of steel which went into the building was begun Nov. 7, and was completed on Dec. 7. With only a portion of the building enclosed with siding and roof, the work of moving in machine tools was started.

The original force of 200 men, engaged "around the clock" in three shifts, worked in a "tented city" to get production under way. The building was formally occupied Feb. 12.

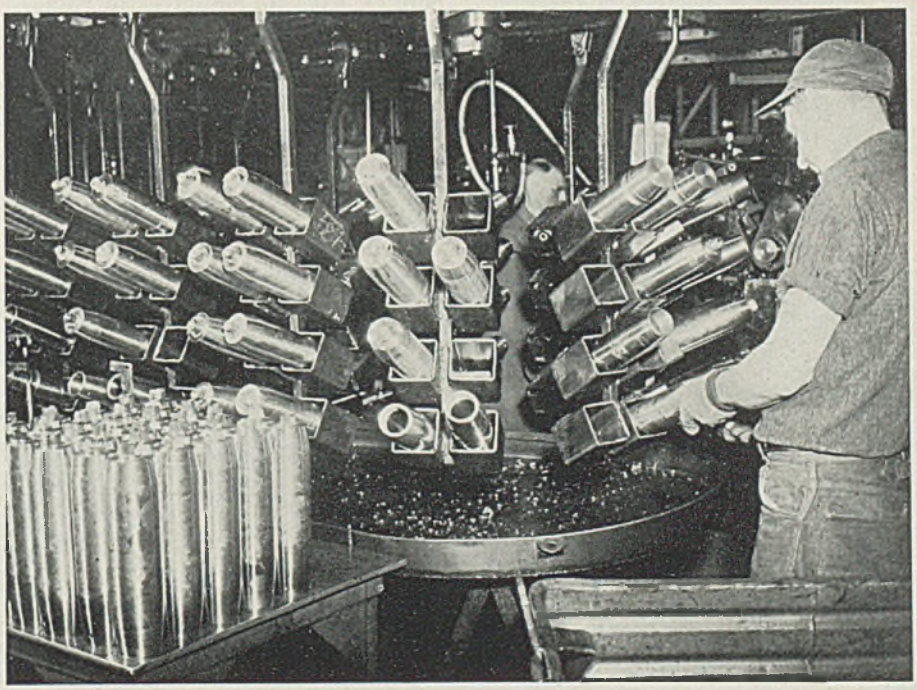
For the manufacturing program nearly 300 machine tools ranging in size from small milling machines and drill presses to huge 16-foot vertical boring mills weighing 220,000 pounds were required. These were obtained from 100 or more suppliers, extending from Providence, R. I., to Rising Sun, Ind. Forty manufacturers supplied jigs and fixtures.

The labor force has been increased to more than 900 persons, working three shifts, 24 hours a day, seven days a week. The men forming the nucleus were drawn from departments which were producing peace time products.

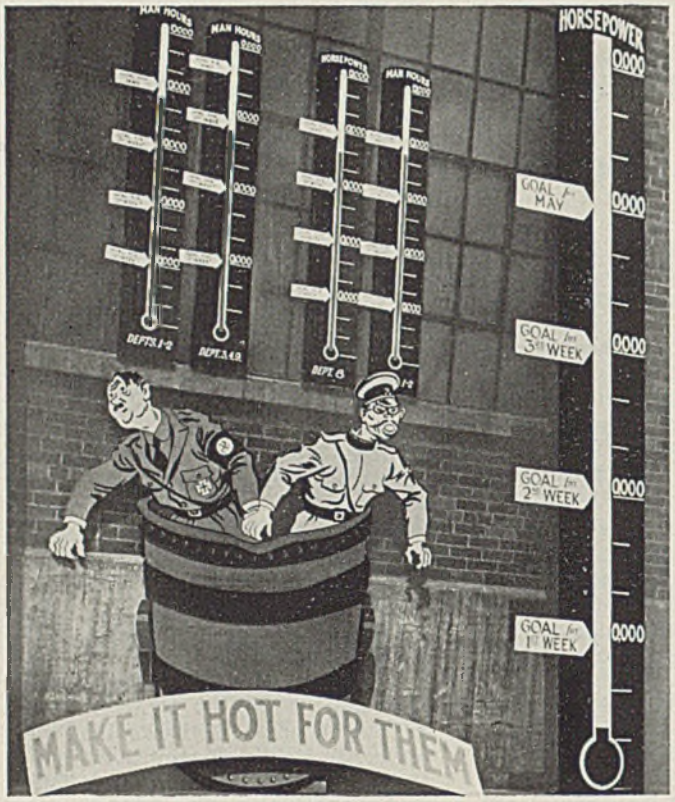
"Mikado" Now "MacA"

Built first for the Japanese government in 1897 by Baldwin Locomotive Works, Philadelphia, the powerful freight locomotive known as the Mikado is identified by "MK" on the cab. Since Pearl Harbor the symbol has become unpopular with trainmen. Central of Georgia railroad officials initiated a movement to rechristen this type of engine the MacArthur, in honor of the Army's hero. The "MK" is now "MacA".

Tilted Cellular Rack in Shell Conveyor



MATERIAL handling equipment plays fully as important a role as does machining equipment in speeding up production of shells. In this middle-western factory, converted to war work, 75-mm shells are moved along the line from machine to machine in welded steel tilted cellular racks suspended from overhead conveyor chain. Note progressive steps in machining as revealed by shells in various cells. Some have merely been rough machined, while others have been finish machined and their noses bored, trimmed and threaded. Wide World photo, approved by War Department



Scoreboards and Posters Spurring War Production

WAR production drives, employing score boards, posters, suggestion boxes, work simplification programs and other news to keep up workers' enthusiasm, are becoming the rule rather than the exception in metalworking plants.

Often they are administered by labor-management committees. When one plant hits upon an idea that increases output, the personnel generally is anxious to share it with others. Illustrated are a few that have been adopted recently.

Harnischfeger Corp., Milwaukee, has erected large wall posters, "The Ten Commandments of War Production," at right above, as a feature of the company's "Beat the Schedule" campaign.

Cooper-Bessemer Corp., Mt. Vernon, O., asks its employes to "Make It Hot" for Messrs. Hitler and Togo, upper left. Large thermometers keep the employes informed on how "hot" it is by registering production of diesels for the Navy and huge compressors for chemical plants.

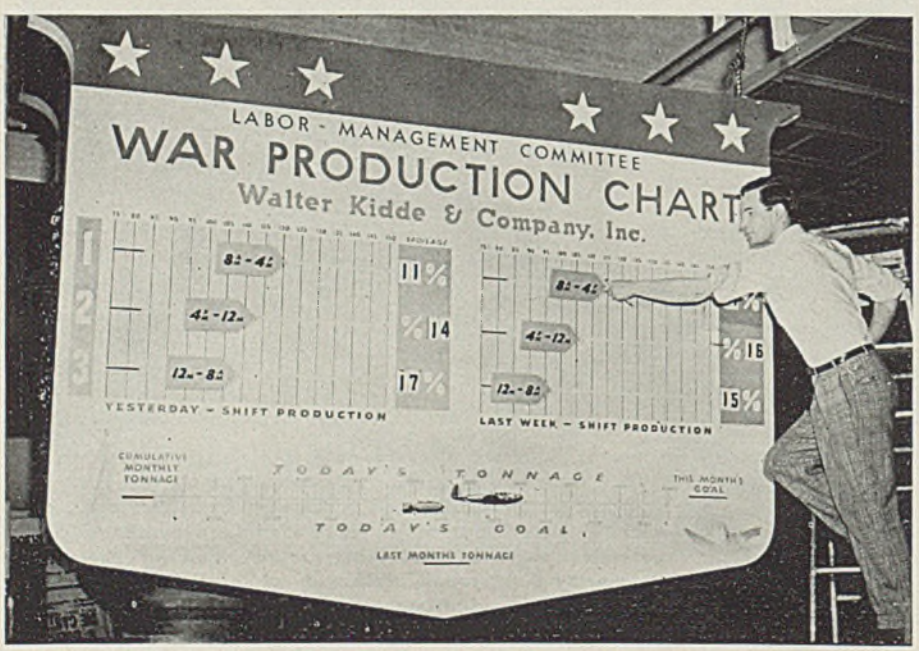
Walter Kidde & Co., makers of fire extinguishers for warplanes, tanks and naval vessels, use large animated score boards, below, to show overall production as compared with previous period and with quotas requested by the WPB. Each shift has its special indicators.

Labor-management committees in five Cleveland plants of Ohio Crank shaft Co. have organized a "Victory Corps of Production Plus" to step up company's production of crankshafts and other Army and Navy items. As part of the program, news boards have been erected in the plant, and cash awards are made for best suggestions for increasing output.

Join "Soldiers of Industry"

At Perth Amboy, N. J., a "Soldiers of Industry" movement was launched at a recent farewell dinner for employes of the American Smelting & Refining Co. Organized rather spontaneously, under the slogan, "We Will Produce," the idea appealed to workers in other plants in the area. Now at least ten have joined the movement, including International Smelting & Refining Co., General Cable Co., Perth Amboy Dry Dock Co., Welin Davit & Boat Co., Chesebrough Mfg. Co., Du Pont Co., United States Metals Refining Co., Raritan Arsenal and National Lead Co.

Regular musical programs, interspersed with war news and plant announcements, feature a production drive by Columbia Steel & Shafting Co., Carnegie, Pa. Studies in plants where such a system has been installed show a 6 to 11 per cent increase in output. Standard light classics and popular hits by "name" bands are used.



Army-Navy Star Awarded Machine and Tool Builders

FIRST Army-Navy Star flags were presented to two Cleveland machine and tool firms for outstanding production May 22. Awards were won by Cleveland Twist Drill Co. for its tremendous increase in production of cutting tools and by National Acme Co. for its achievements in speeding up output of multiple spindle automatics.

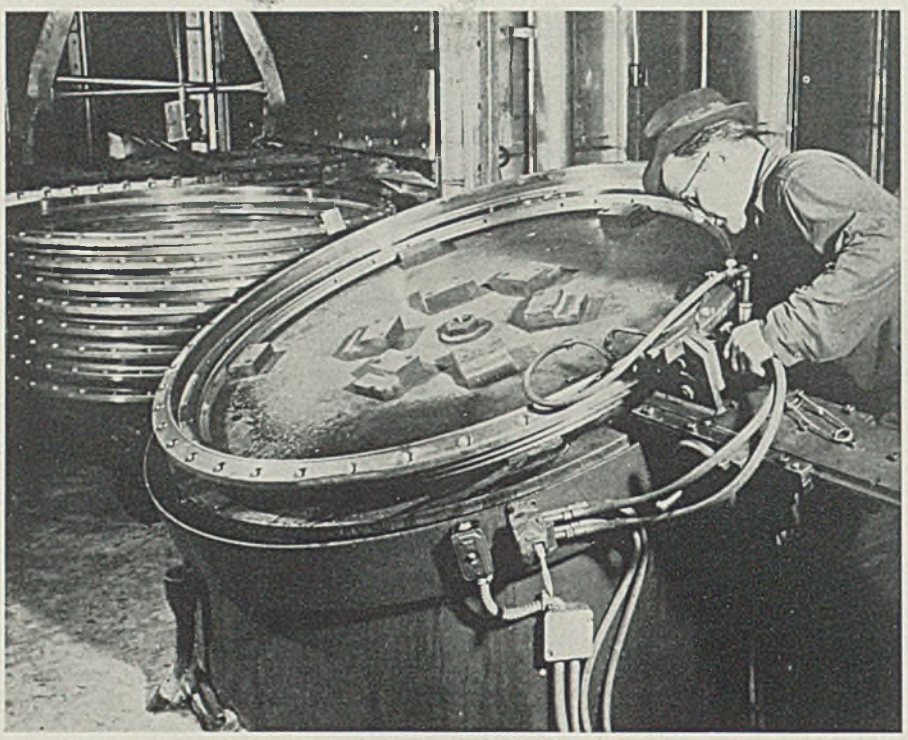
High ranking Washington officials attended the ceremonies, including James V. Forrestal, Under Secretary of Navy; Col. S. E. Reimel, Army-Navy Munitions Board; Capt. E. D. Almy, Co-ordinator of Machine Tools, U. S. Navy; Capt. E. R. Henning, U. S. Navy Machine Tool Commission; and Albert Stedfast, assistant chief, WPB Tools Branch.

Mayor Frank Lausche of Cleveland presided at both functions. In addresses at both plants Under Secretary Forrestal remarked that in facing the hundreds of men and women who are doing the actual production work he "got the feel of that rolling power which will make Mr. Hitler rue the day that he saw the dawn of life".

Colonel Reimel, representing Robert P. Patterson, Under Secretary of War, made the presentation addresses, while the Army-Navy star flags were delivered to the recipients by Captain Almy. Upper photographs show Jacob D. Cox, president, Cleveland Twist Drill Co. and Clarence Stiegelmeyer representing the employes, accepting the flag from Captain Almy, and unfurling it before the audience.

Lower photograph (left) shows part of the crowd of 4500 which witnessed the presentation ceremony in a recently completed new section of the National Acme plant. Insert at right shows Fred H. Chapin, president of this company making his acceptance speech, with guests of honor seated behind him. Michael Bizovsky spoke in behalf of the National Acme employes.

Executives of Cleveland Twist Drill Co. entertained the visiting officials at luncheon while National Acme was host at dinner — these gatherings being at the Union Club in Cleveland.



FLAME-HARDENING tank-turret rings: The operation is automatic, the ring revolving past the stationary hardening unit in the foreground. Turntable is tilted to facilitate disposal of quenching water, which directly follows the oxyacetylene heating flames. Only a fractional-horsepower motor is used to drive the unit. Photograph, courtesy Linde Air Products Co., New York

◆ ◆ ◆

Weirton Liberalizes Vacation Plan; Pays Former Employes Now in Service

WEIRTON, W. VA.

FORMER Weirton Steel Co. employes who are now serving in the country's armed forces are due for a pleasant surprise from home, it was announced jointly last week by the Weirton Steel Co. and the Weirton Independent Union.

As a result of negotiations between the company and the union over a new vacation plan, according to T. E. Millsop, company president, a check in the amount of $25 will be sent to each employe who entered military service prior to Jan. 1, 1942. Former employes who have entered the service since Jan. 1 will receive vacation pay to which they would have been entitled had they remained as employes during the year 1942. Checks will be sent by registered mail to more than 1000.

An estimated $750,000 will be paid out this year by Weirton Steel in vacation money for employes who are on hourly, piece-rate or tonnage rates. Total since the plan was inaugurated in 1936 will be over $3,000,000.

Details of the new "optional vacation plan" for hourly, piece-rate and tonnage employes also were announced. To be eligible for a vacation, as in former years, an employe must be on the payroll as of July 1, and must have completed at least one year of service. The new plan outlines vacation credits as follows:

One year's service and less than three years' service, 2 days of 8 hours each.

Three years' service and less than five years' service, 5 days of 8 hours each.

Five years' service and less than ten years' service, 8 days of 8 hours each.

Ten years' service and less than fifteen years' service, 10 days of 8 hours each.

Fifteen years' service and over, 12 days of 8 hours each.

The schedule of vacation credits this year in general is the same as outlined in last year's plan, with the principal exception that employes with five years' service and less than ten years' will receive 8 days instead of six. Approximately 5200 employes will thus be given two extra days of vacation.

As in prior years, the purpose of the vacation plan is to provide the equivalent in vacation pay to eligible employes working on an hourly, piece-rate or tonnage basis, who prefer to work rather than to take time off for vacations and those employes who wish to take the allotted time off. This year, because of the country's need for steel, it is anticipated employes will voluntarily offer to work should their taking time off cause any interruption in the flow of steel to the country's war machine.

Vacation pay for hourly employes will be determined by dividing the amount of money earned during the pay periods designated (below) by the number of hours worked in those pay periods, multiplied by the number of hours the employe is entitled to, according to his length of service. The pay periods agreed upon for all employes for each department are:

Steel works and sheet mill departments: Money earned during pay periods ended March 14 and March 28.

Strip steel, Weirton tin mill and Steubenville tin mill departments: Money earned during pay periods ended March 21 and April 4.

The amount of vacation pay for piece work and tonnage employes will be equal to the average current earnings per hour as of the pay periods designated, determined by dividing the amount of money earned during the periods designated by the number of hours worked in those periods, multiplied by the number of hours to which the employe is entitled.

Vacation pay for employes who, due to curtailed operations in their respective departments, worked part time during the pay periods designated on jobs at rates lower than their regular job rates, will be determined on the basis of their regular job rates, provided that the employe worked on his regular job some time during the pay periods.

Vacation pay checks for all employes eligible under the plan will be available at the time office of each plant during the two week period, starting Thursday, July 2 and ending Wednesday, July 15. Any employe desiring to receive his vacation pay check at any time other than this period, but prior to Dec. 31, 1942, must notify his foreman and the time office before July 15 as to the date on which he desires to receive his check.

Employes eligible for vacations who prefer to work will receive their money in a lump sum.

Revival of the Norwegian iron industry and production of a superior quality of electro-steel at the lowest cost in Europe are expected to result from a new "pressure reduction" process developed in Norway, according to Department of Commerce reports.

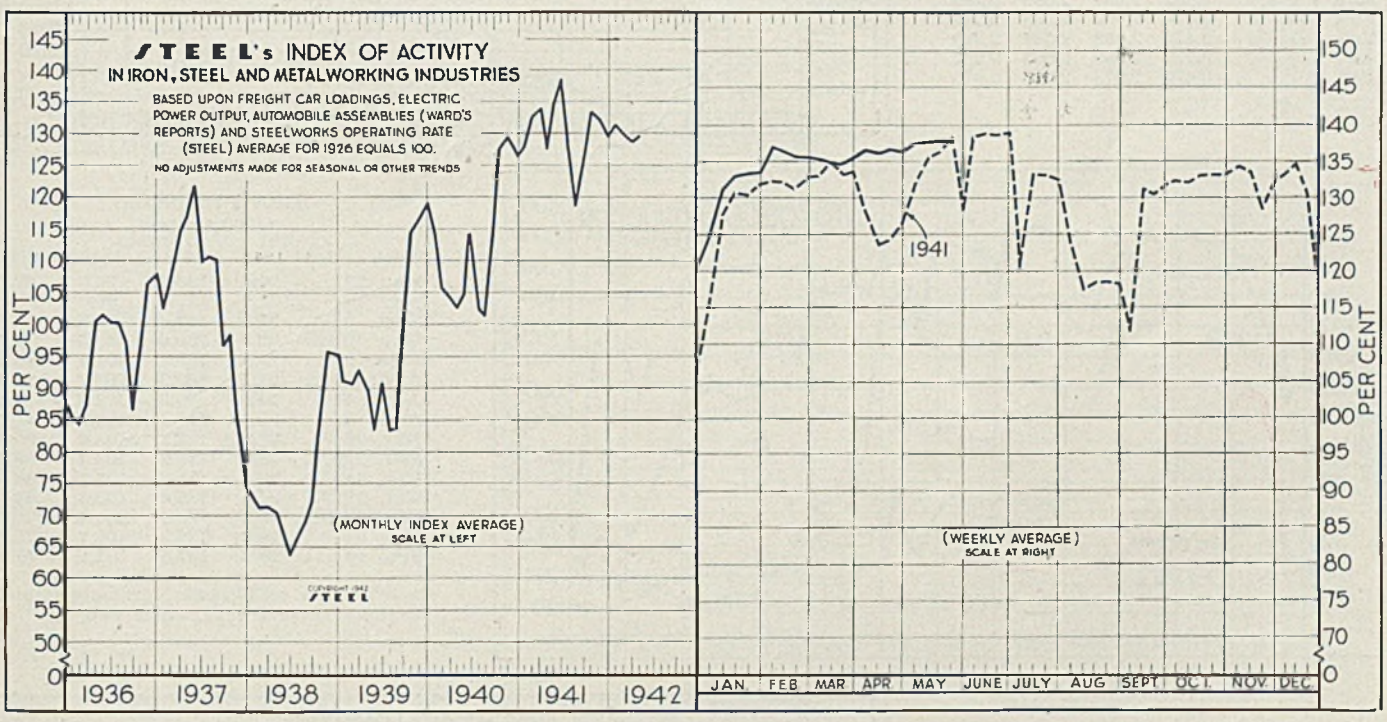
Index of Activity Remains Unchanged

CURTAILMENT of war plant construction that cannot be completed by middle of 1943 is not expected to reduce this year's volume of building expansion to marked degree. Manufacturers of such materials as synthetic rubber, manganese, magnesium and other essential raw materials will not be restricted in this respect, regardless of the completion date.

Problem of converting industrial capacity to war output will be just as great over the remaining months this year as it has been since our entry into the war, according to National Industrial Conference Board, New York. By the end of March the total value of all completed war production amounted to only $18.7 billion, or less than 15 per cent of the existing war production load. War commitments were further increased by $19 billion during April, with production completed in the month amounting to about $2.5 billion. At the April rate of output, unfilled orders are equivalent to 2½ years of production load, it states. And even at a maximum war production rate of $6 billion monthly, the present volume of unfilled orders is equal to a whole year's output.

STEEL's index of activity in the iron, steel and metalworking industries held unchanged at 137.9 for the week ended May 23. Increase in electric power consumption and in truck and automobile production offset slight declines in steelmaking operations and revenue freight carloadings.

The national steel rate eased to 99 per cent during the week ended May 28, compared with the 100 per cent level recorded in the week a year ago. Electric power output rose to 3,379,975,000 kilowatts during the latest period, a gain of 11.5 per cent over the week last year.

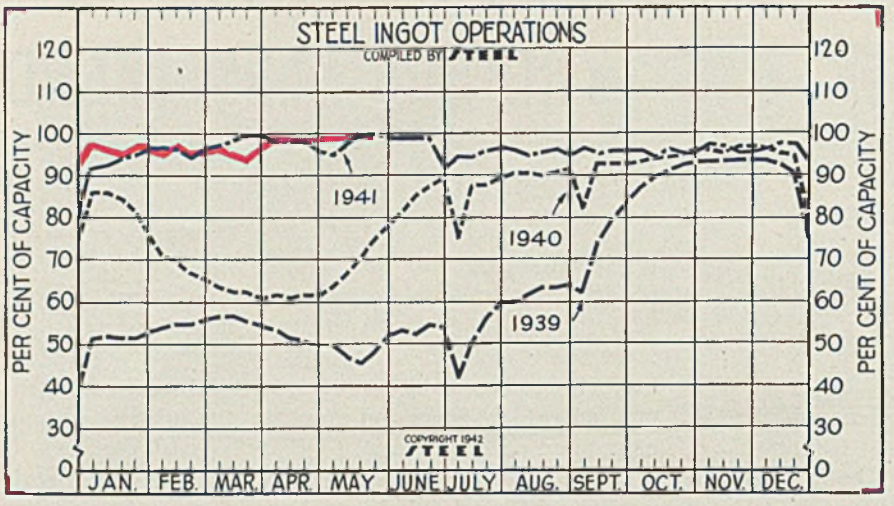


STEEL's index of activity remained unchanged at 137.9 in the week ended May 23:

Week Ended	1942	1941
Mar. 21	134.7	133.5
Mar. 28	135.8	133.9
April 4	136.7	128.9
April 11	136.1	123.8
April 18	136.6	124.2
April 25	136.3	126.5
May 2	137.2	132.6
May 9	137.5	135.9
May 16	137.9	136.1
May 23	137.9†	138.6

†Preliminary.

Mo. Data	1942	1941	1940	1939	1938	1937	1936	1935	1934	1933	1932	1931
Jan.	131.3	127.3	114.7	91.1	73.3	102.9	85.9	74.2	58.8	48.6	54.6	69.1
Feb.	129.6	132.3	105.8	90.8	71.1	106.8	84.3	82.0	73.9	48.2	55.3	75.5
March	128.6	133.9	104.1	92.6	71.2	114.4	87.7	83.1	78.9	44.5	54.2	80.4
April	129.5	127.2	102.7	89.8	70.8	116.6	100.8	85.0	83.6	52.4	52.8	81.0
May	.....	134.8	104.6	83.4	67.4	121.7	101.8	81.8	83.7	63.5	54.8	78.6
June	.....	138.7	114.1	90.9	63.4	109.9	100.3	77.4	80.6	70.3	51.4	72.1
July	.....	128.7	102.4	83.5	66.2	110.4	100.1	75.3	63.7	77.1	47.1	67.3
Aug.	.....	118.1	101.1	83.9	68.7	110.0	97.1	76.7	63.0	74.1	45.0	67.4
Sept.	.....	126.4	113.5	98.0	72.5	96.8	86.7	69.7	56.9	68.0	46.5	64.3
Oct.	.....	133.1	127.8	114.9	83.6	98.1	94.8	77.0	56.4	63.1	48.4	59.2
Nov.	.....	132.2	129.5	116.2	95.9	84.1	106.4	88.1	54.9	52.8	47.5	54.4
Dec.	.....	130.2	126.3	118.9	95.1	74.7	107.6	88.2	58.9	54.0	46.2	51.3



Steel Ingot Operations

(Per Cent)

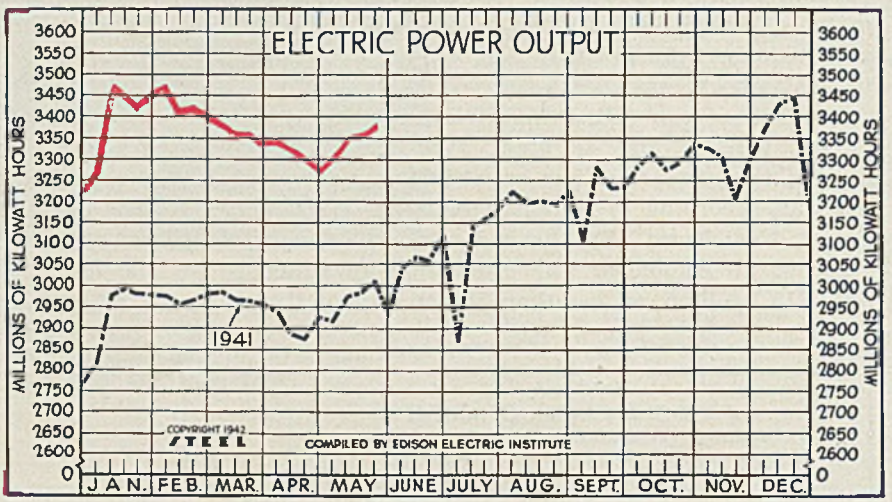
Week ended	1942	1941	1940	1939
May 23....	99.0	100.0	75.0	48.0
May 16....	99.5	99.5	70.0	45.5
May 9....	99.0	97.5	66.5	47.0
May 2....	99.0	95.0	63.5	49.0
April 25...	98.5	96.0	61.5	49.0
April 18...	98.5	98.0	61.5	50.5
April 11...	98.5	98.0	61.0	51.5
April 4....	98.0	98.0	61.5	53.5
Mar. 28....	97.5	99.5	61.0	54.5
Mar. 21....	95.5	99.5	62.5	55.5
Mar. 14....	95.5	98.5	62.5	56.5
Mar. 7.....	96.5	97.5	63.5	56.5
Feb. 28....	96.0	96.5	65.5	56.0
Feb. 21....	96.0†	94.5	67.0	55.0
Feb. 14....	97.0	96.5	69.0	55.0

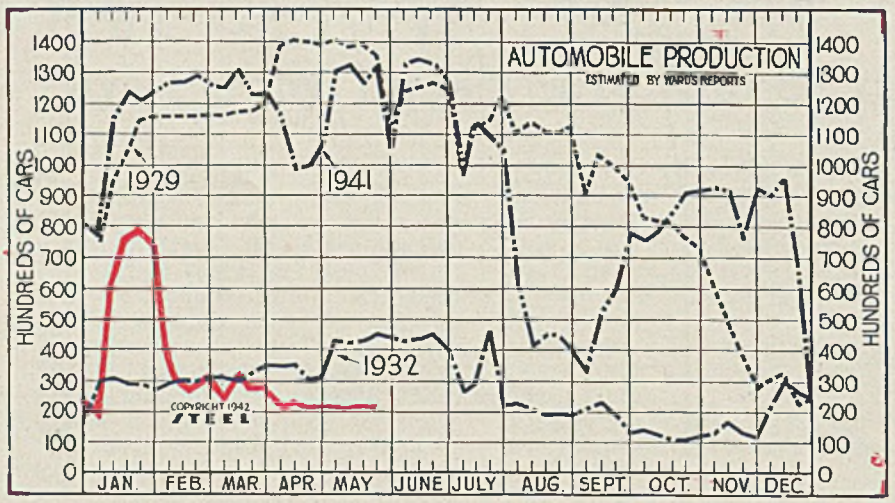
†Since Feb. 21 rate is based on new capacity figures as of Dec. 31 last.

Electric Power Output

(Million KWH)

Week ended	1942	1941	1940	1939
May 23.....	3,380	3,012	2,589	2,778
May 16.....	3,357	2,983	2,550	2,235
May 9.....	3,351	2,975	2,516	2,239
May 2.....	3,305	2,915	2,504	2,225
April 25.....	3,299	2,926	2,499	2,244
April 18.....	3,308	2,874	2,529	2,265
April 11.....	3,321	2,882	2,530	2,235
April 4	3,349	2,938	2,494	2,244
Mar. 28.....	3,346	2,956	2,524	2,272
Mar. 21.....	3,357	2,964	2,508	2,258
Mar. 14.....	3,357	2,965	2,550	2,276
Mar. 7.....	3,392	2,987	2,553	2,285
Feb. 28.....	3,410	2,982	2,568	2,294
Feb. 21.....	3,424	2,968	2,547	2,269
Feb. 14.....	3,422	2,959	2,565	2,297
Feb. 7.....	3,475	2,973	2,616	2,315





Auto Production

(1000 Units)

Week ended	1942	1941	1940	1939
May 23....	21.6	133.6	96.8	67.7
May 16....	21.8	127.3	99.0	80.1
May 9....	21.5	132.6	98.5	72.4
May 2....	22.0	130.6	99.3	71.4
April 25...	21.9	108.2	101.4	86.6
April 18...	21.7	99.9	103.7	90.3
April 11...	23.0	99.3	101.9	88.1
April 4....	22.3	116.3	101.7	87.0
Mar. 28....	28.9	124.2	103.4	86.0
Mar. 21....	28.9	123.8	103.4	89.4
Mar. 14....	30.6	131.6	105.7	86.7
Mar. 7.....	24.5	125.9	103.6	84.1
Feb. 28....	30.1	126.6	100.9	78.7
Feb. 21....	25.7†	129.2	102.7	75.7
Feb. 14....	29.8	127.5	95.1	79.9

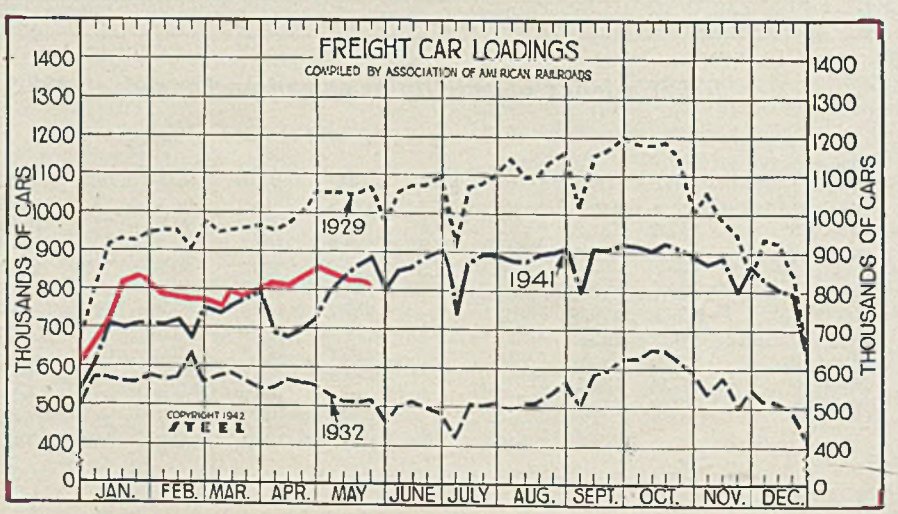
†Canadian trucks and automobiles and United States trucks, since Feb. 21.

Freight Car Loadings

(1000 Cars)

Week ended	1942	1941	1940	1939
May 23.....	830†	866	687	628
May 16.....	839	861	679	616
May 9.....	839	837	681	555
May 2.....	859	794	666	573
April 25.....	855	722	645	586
April 18.....	847	709	628	559
April 11.....	814	680	619	548
April 4.....	829	683	603	535
Mar. 28.....	805	792	628	604
Mar. 21.....	797	769	620	605
Mar. 14.....	799	759	619	595
Mar. 7.....	771	742	621	592
Feb. 28.....	781	757	634	599
Feb. 21.....	775	678	595	561

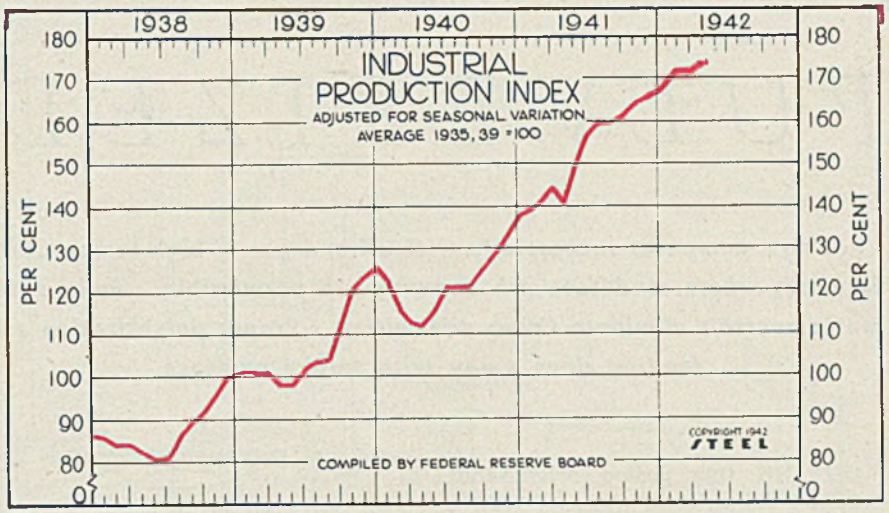
†Preliminary.

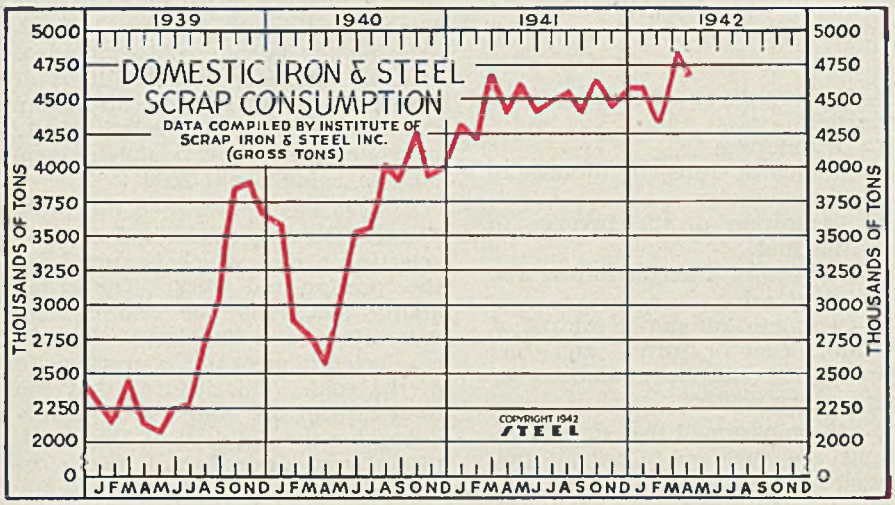


Industrial Production
Federal Reserve Board's Index

(1935-39 = 100)

	1942	1941	1940	1939	1938
Jan.	171	139	122	102	86
Feb.	172	141	116	101	84
March	172	143	112	101	84
April	174	140	111	97	82
May	...	150	115	97	80
June	...	157	121	102	81
July	...	160	121	104	86
Aug.	...	160	121	104	90
Oct.	...	163	129	121	95
Nov.	...	168	133	124	100
Dec.	...	167	138	126	101
Year Ave	...	154	122	108	88





Iron and Steel
Scrap Consumption

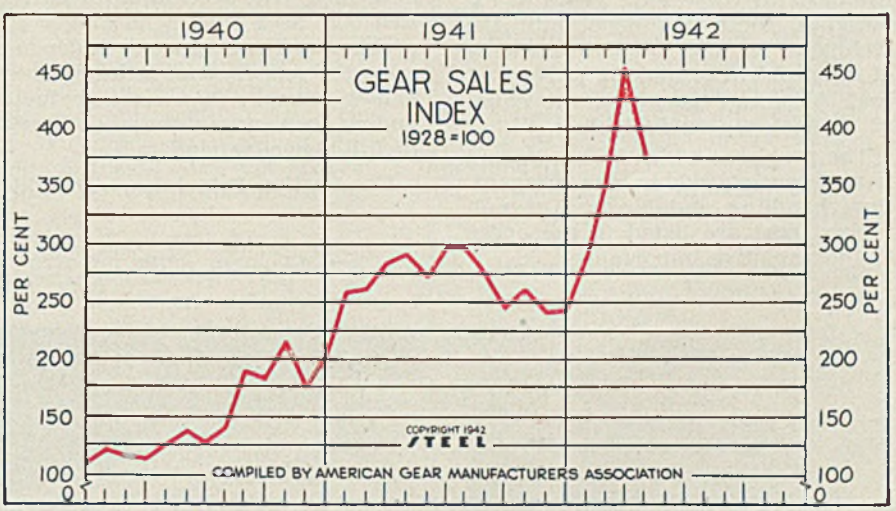
(Gross Tons)

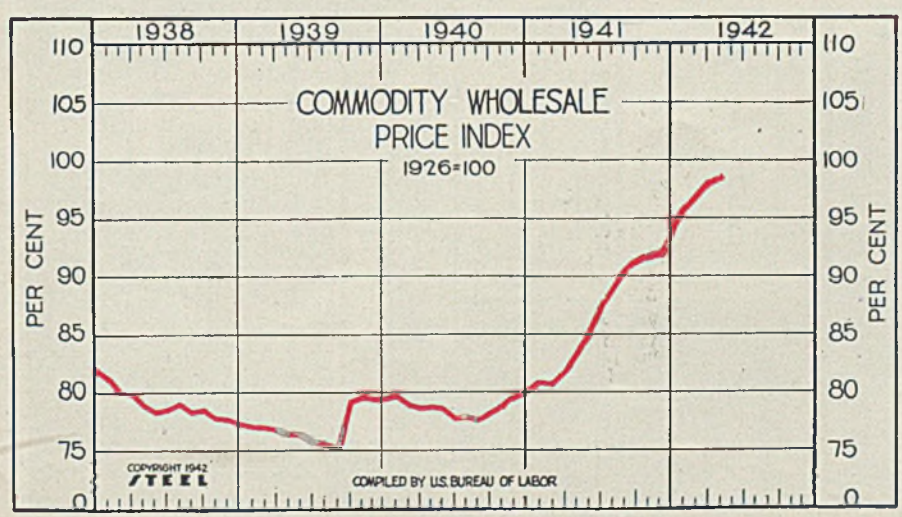
	1942	1941	1940	1939
		(000 omitted)		
Jan.	4,590	4,278	3,581	2,257
Feb.	4,276	4,172	2,812	2,124
Mar.	4,840	4,662	2,728	2,419
Apr.	4,672	4,406	2,548	2,114
May	.....	4,609	3,061	2,079
June	.....	4,406	3,482	2,221
July	.....	4,415	3,526	2,247
Aug.	.....	4,518	3,968	2,675
Sept.	.....	4,392	3,876	3,018
Oct.	.....	4,649	4,233	3,809
Nov.	.....	4,482	3,922	3,858
Dec.	.....	4,634	3,950	3,613
Total	.....	53,623	41,687	32,434
Mo. Av.	.....	.....	3,474	2,703

Gear Sales Index

(1928 = 100)

	1942	1941	1940	1939	1938
Jan.	288	259	123	91.0	93.0
Feb.	353	262	116	86.0	77.0
Mar.	455	288	114	104.0	91.0
April	378	292	128	88.0	74.0
May	...	273	133	93.0	70.0
June	...	299	129	90.0	58.0
July	...	298	141	89.0	67.0
Aug.	...	276	191	96.0	76.5
Sept.	...	243	183	126.0	80.5
Oct.	...	261	216	141.0	72.5
Nov.	...	241	173	126.0	72.0
Dec.	...	243	208	111.0	81.0
Ave.	...	269.6	155.0	103.0	76.0





All Commodity
Wholesale Price Index
U. S. Bureau of Labor

(1926 = 100)

	1942	1941	1940	1939	1938
Jan.	96.0	80.8	79.4	76.9	80.9
Feb.	96.7	80.6	78.7	76.9	79.8
March	97.6	81.5	78.4	76.7	79.7
April	98.3	83.2	78.6	76.2	78.7
May	....	84.9	78.4	76.2	78.1
June	....	87.1	77.5	75.6	78.3
July	....	88.8	77.7	75.4	78.8
Aug.	....	90.3	77.4	75.0	78.1
Sept.	....	91.8	78.0	79.1	78.3
Oct.	....	92.4	78.7	79.4	77.6
Nov.	....	92.5	79.6	79.2	77.5
Dec.	....	93.6	80.0	79.2	77.0
Ave.	....	87.3	78.5	77.1	78.8

PULVERIZED COAL

. . . . now competes successfully with oil and gas in high-temperature furnaces where moderate ash deposits are permissible. Fully automatic controls eliminate firing difficulties. Proper pulverization and feeding does away with smoke nuisance

By C. F. HERRINGTON
Engineer
Amsler-Morton Co.
Pittsburgh

DURING this period, when the facilities for delivery of the normal fuel supplies are overtaxed by the demand of an expanded war production, those factories which are not served by an integrated fuel plant creating furnace fuels from coal must immediately consider the application of pulverized coal to those furnaces which can use this fuel. In many cases this procedure will release important supplies of gas or oil for the many heat-treating and other low-temperature furnaces which cannot use coal.

Pulverized coal is used successfully in hundreds of furnaces and large power plants today. Certain industrial furnace owners who tried pulverized coal during the last war may be reluctant to try it again. However, they should realize that on the basis of these long years of experience, there has been built the technique for the complete mastery of the problem of making pulverized coal, for many purposes, the equal of natural gas or fuel oil.

The problems which had to be and have been solved in the preparation, handling and burning of pulverized coal are listed in the order of their relative importance:

1—Uniformity and fineness of pulverization
2—Dry storage
3—Method of transport to burners
4—Burner design
5—Adaptation of the furnace to burn the fuel
6—Provision for accumulating and removal of ash
7—Complete automatic control of grinding, fuel-air ratio, and fuel supply from electric potentiometer temperature control.

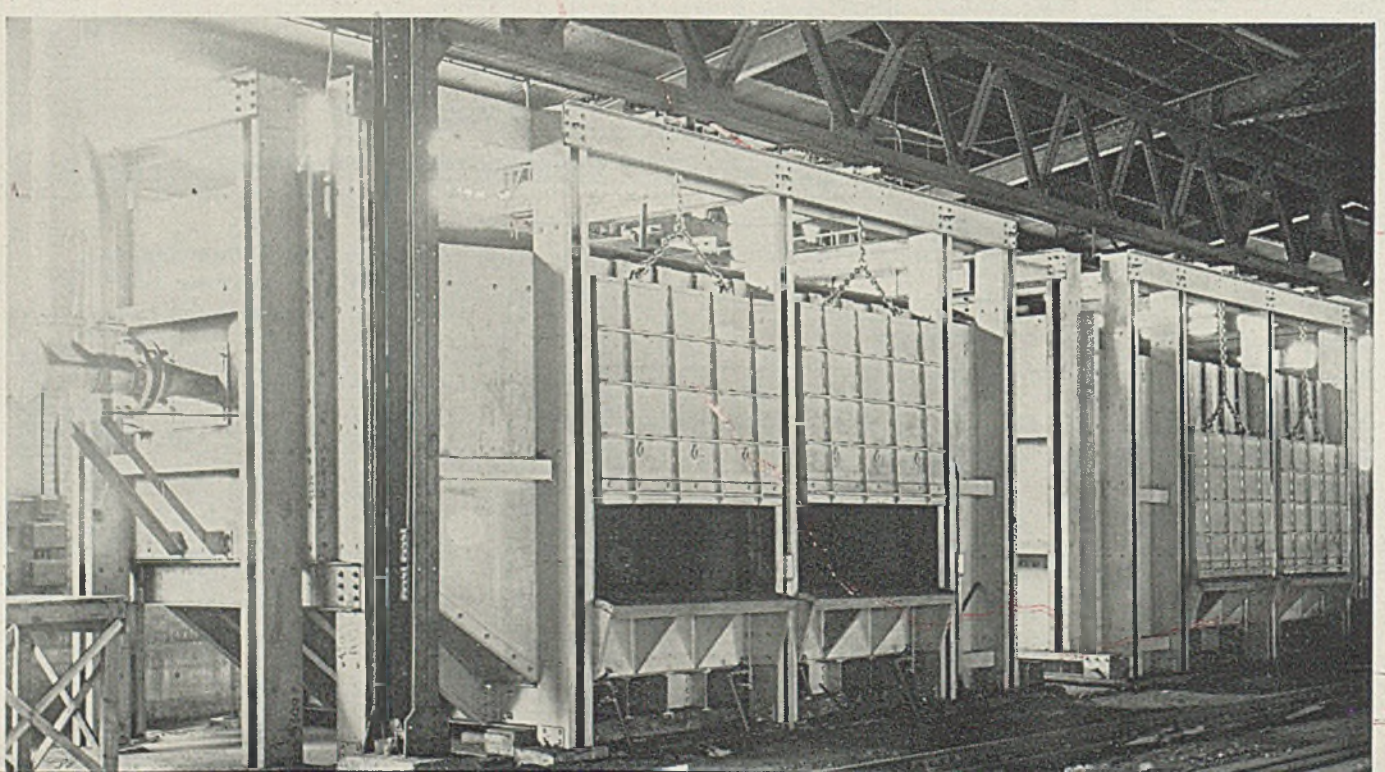
It will be assumed that firing conditions are such as to permit pulverized coal to be used as the furnace fuel. The acceptance of pulverized coal as a fuel is no longer the problem of the engineer. It depends upon the repeal of an attitude which is now no more than mere prejudice and is to some extent a resistance to full-blown patriotism.

Combustion Principles: The chief requisite for burning any fuel is the ability to mix the fuel properly with air in the presence of sufficient heat to cause the fuel to burn at the desired rate. The rate at which heat energy is released from a unit of fuel determines the flame temperature for a given set of conditions. This rate depends upon the molecular resistance to mixing with air and in the case of coal, the problem of fineness is paramount. The importance may be shown by considering the burning of a pound of coal as one piece or as millions of particles ground to pass through a 200-mesh screen—the relative rate of "burnability" or complete combustion being about 3000 to 1.

Science has approached the problem of burning pulverized coal by selecting a coal which is suited for the location and work. The grindability factor for the coal is then determined, and the size of the mill is selected to meet this characteristic of the coal. This insures that the basic unit in the system will be adequate for the delivery of the quantity of coal desired, and in the degree of fineness predetermined for the work.

If it is understood that the grindability of bituminous coals which may be used for fuels varies as much as 100 per cent, then the inexperienced but would-be user of pulverized coal will appreciate the importance of experienced approach

Fig. 1—Two large forge furnaces fired with pulverized coal and employing fully automatic controls



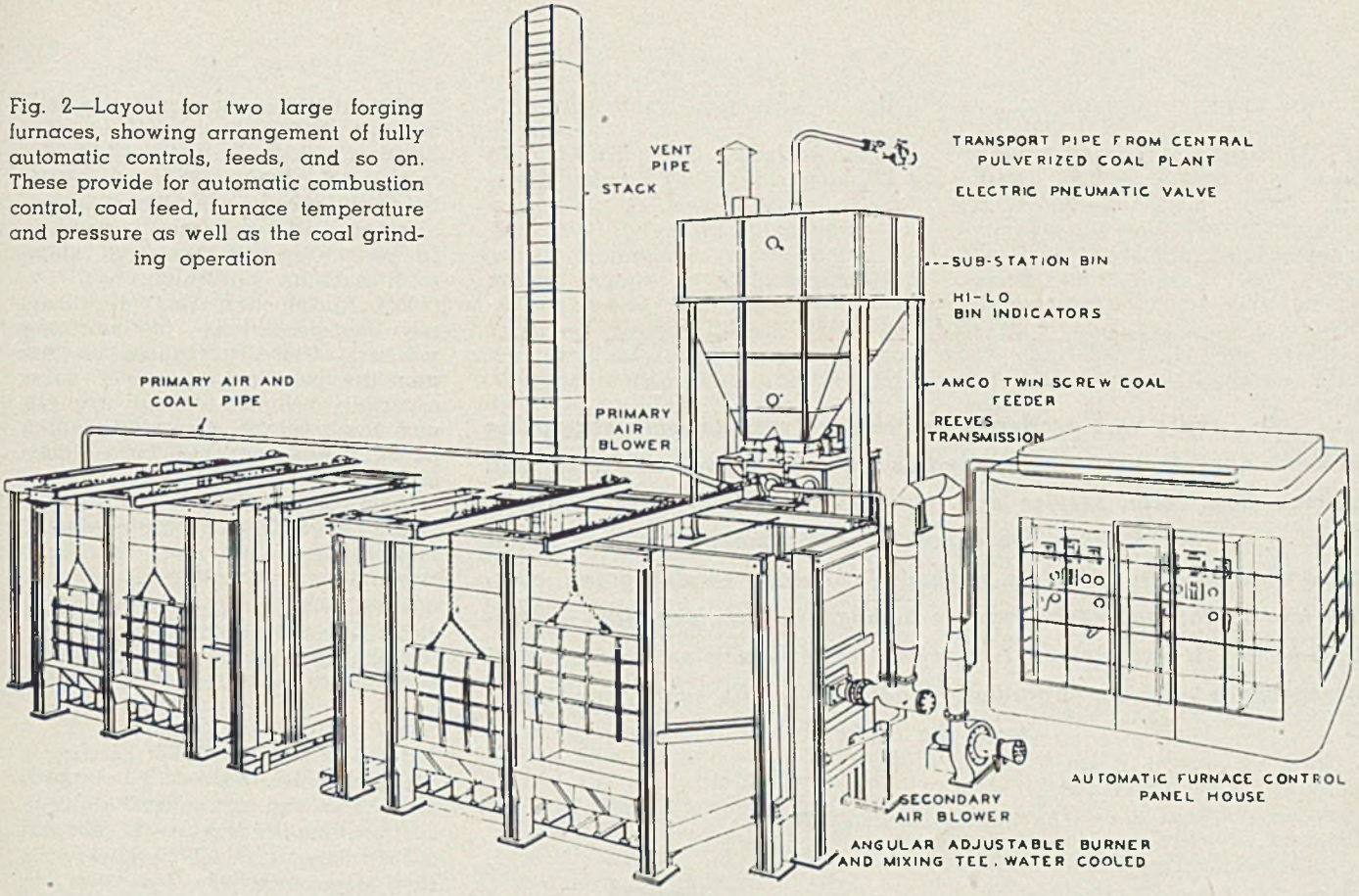


Fig. 2—Layout for two large forging furnaces, showing arrangement of fully automatic controls, feeds, and so on. These provide for automatic combustion control, coal feed, furnace temperature and pressure as well as the coal grinding operation

and understand why trouble can easily develop in ill-chosen systems hastily installed without proper technical control.

Pulverization of Coal: The ideal size of pulverized coal for the best operation in an industrial furnace would be such that all the coal would pass through a 200-mesh screen. In selecting the mill for pulverizing the coal, a unit is chosen which will deliver at least 90 per cent of the total quantity desired in a size that will pass through a 200-mesh screen. This is considered reasonable and dependable practice. The ability of the mill to grind to this fineness 90 per cent or more of the coal must be considered before any subsequent changes are made in the source of the coal to obtain price or other advantages.

Proper pulverization of the coal gives to it practically all the flexibility of combustion and heating advantages which might be obtained from an equally efficient application of any other industrial fuel.

The coal should first be crushed to 3 to 4-inch size before feeding into the impact roller mill for pulverizing. The coal is progressively ground and "lifted" or air floated from the mill. This method of selection assures that only coal of the desired "burnability" will be delivered to the burners. Heavier particles will remain in the mill until reduced to within the lifting power of the "air selector." The air delivered to the mill is also heated and the temperature regulated thermostatically to about 350 degrees Fahr. in order to dry the coal during grinding.

Frequently, the weight of water which must be removed is 100 pounds or over 13 gallons per ton of coal.

The extraordinary success which now prevails in the burning of pulverized coal indicates that these fine points of control—grindability, fineness and dryness—were not appreciated in the early attempts to use pulverized coal.

All plants designed or built under the supervision of the writer in recent years have been equipped with the quiet-running efficient Raymond mills. The two types of pulverized plants in common use are the central-grinding and distributing system and the unit-grinding and direct-feeding system. The choice depends upon the size of the furnaces, the number, their location, and any other factor influencing economy.

Storage of Pulverized Coal: Pulverized coal is delivered from the grinding mill to the storage bins at the furnace by several different methods. In the central distribution system, a grinding plant and shooting tanks are included into which the coal is first delivered and then transported by compressed air to the storage bin at the furnace itself.

This type plant stores lump coal and may operate semicontinuously. Its selection is generally determined by the investment required to serve a large number of relatively small furnaces, coal handling conditions or other considerations which will become apparent from further discussion of these alternate methods.

The large single furnace or power unit is generally equipped with the unit grinding, storage and burning system. The coal is collected from the mill by the air flotation system now widely employed for similar grading of pulverants in the ceramic industry. It is deposited in a bin at the furnace in dried condition and distributed to the furnace burner or burners by low-pressure air, after having been removed from the bin in measured quantity by a special screw feeder.

Transporting the Coal: The central distributing type system is provided with a collector and a "shooting" bin. The coal may be transferred by dried compressed air at the rate of 5 tons per minute from the primary collector bins to the shooting bin. Here the coal is aerated and may then be transported in a few minutes in batches to bins 2000 or more feet distant.

The entire operation of this plant may be handled by a single operator. It is controlled from a central panel board by a series of automatic valves, pushbutton stations, signal lights, and the like. This type of plant is suitable for forge furnaces, small heat-treating furnaces, melting furnaces and units of that type.

The cost of transporting pulverized coal approximately one-third of a mile is about $0.015 per ton. The

(*Please turn to Page* 98)

TRAINING OPERATORS

. . . . to handle war production work involves not only converting present operators to new activities but also converting men and women from farm, service and home tasks to their first industrial jobs. Here are detailed the practices of a company that has developed exceptionally effective methods for quickly turning green workers into skilled operators capable of handling precision war production work. It has trained 70 per cent of its precision workers from green hands and has upgraded 99 per cent of its supervisory force from the ranks

By GERALD E. STEDMAN

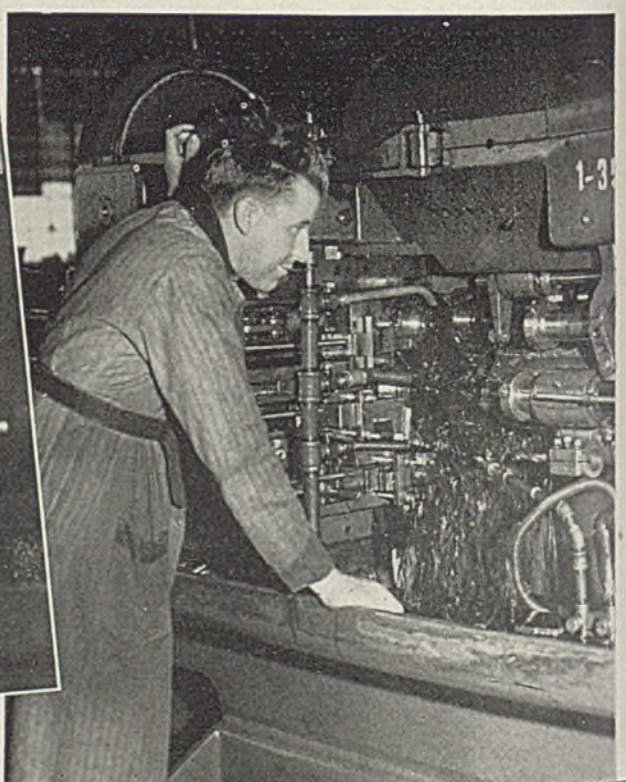
EQUALLY as important as converting machines to war production work effectively is the problem of "converting" men who have been busy at other tasks. Thus *human conversion* deserves and is coming to receive careful attention along with machine conversion.

War production has developed new considerations in selecting workers. Close tolerances on fits and the peculiar shapes of parts especially designed for high strength and low weight (aircraft engine parts, for instance) call for a higher order of worker skill. Such precision requires abilities which are largely *youthful* in nature—speed of mental-motor response, manipulative ability and vigilance.

There was little development of skills through apprenticeship during the depression years, and now the physical abilities needed at the

Fig.1—SCHOOL TEACHER: Because of her experience, Louise Bilbrey was hired to instruct and supervise girl inspectors, important work in precision aircraft manufacture. With no previous shop experience, she was given a brief but thorough training as an inspector and then her ability to direct others was used to advantage. Here she instructs Lucille Adair in operation of a hardness testing machine

Fig. 2—SAILOR: James R. Martin started at the Woodworth plant with no factory, office or business experience for he had been a sailor. He started work in the plant as a sweeper, soon developed an interest in this complicated Conamatic screw machine. After two month's maintenance work, he was made an apprentice and now is developing into an important war production worker



fighting front take priority over a man's skill on a productive machine. Thus green, raw labor that has never been accustomed to factory work is becoming the only dependable reservoir from which to enlist war workers. The demand for youthful abilities is making necessary the increased use of young women on machines, and the urgency of immediate war production requires precision training right on the job itself.

Into America's war plants is flowing a growing stream of unskilled labor—men and women who never before ran a production machine. Automobile dealers, lawyers, jewelers, school teachers, stenographers, waitresses, junior leaguers, housewives and housemaids must be converted into skilled war workers with dispatch as part of the distinguished service alert industrialists can make in the war effort.

The methods used by N. A. Woodworth Co., Ferndale, Mich., war producer of a hundred different precision aircraft-engine parts, in solving the problem of human conversion are particularly noteworthy for their effectiveness. Unusually high production per square foot of factory space is obtained from green workers who start on regular production work immediately. This has spotlighted the precision system of recruiting, training, compensating and upgrading employed by this company.

"This country's production program can be visibly hampered unless we place new workers where they will have an opportunity to orient themselves gradually and to work happily, enthusiastically," N. A. Woodworth, president of the company, says. "That, briefly, is the cardinal function of both our factory management and employment offices today."

Woodworth refuses to pirate skilled labor from other plants. Seventy per cent of its hundreds of precision workers started absolutely green, and 99 per cent of its supervisors were upgraded through the ranks from semiskilled and unskilled beginners. New workers are selected and trained to attain quickly standards of skill of which they may justly feel proud. The company works closely with draft boards, requesting a minimum of deferments. Less than 4 per cent of its employes are of 1-A draft classification, and the male-female ratio of employes will be 6 to 4 by the year's end.

To understand this training system, one must understand the man behind it. Precision is almost a religion with Mr. Woodworth. He applies it not alone to machines but to every element of productive activity. Some 30 years in the precision manufacturing field as founder and long-time president of Detroit's Ex-Cell-O Corp. and as head of a Ford department producing 120 Liberty engine parts during World War I have left their mark.

Among the key men in the plant are E. W. LaMonte, factory manager, and B. E. Larson, employment manager—both completely steeped in their chief's philosophy which has succeeded in placing precision manufacturing on a high-production basis.

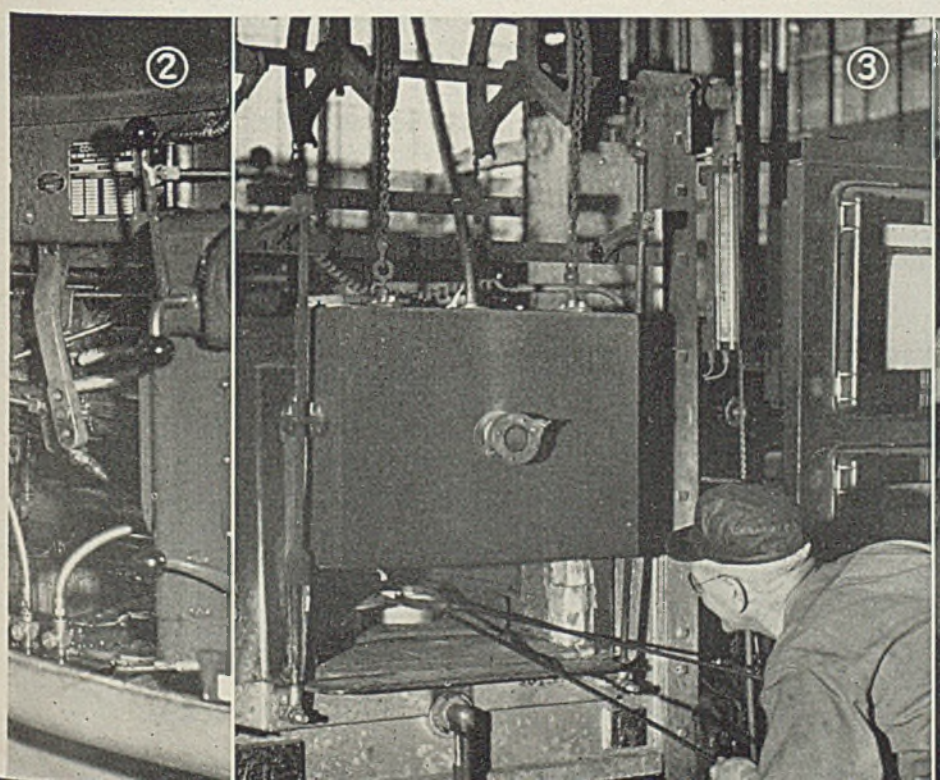
Production at Woodworth can be divided into standard production work and high-precision operations. Both groups are organized for quantity production at quality standards of unusually low tolerances.

Recruiting of new workers is done largely among acquaintances of present workers. A recommendation from a man in the shop is the surest and quickest path to the employment office. Family spirit is encouraged. Being a relative of a work man is no barrier, but no relatives of supervisors or foremen are hired, and no male relative or close acquaintance of a girl worker is hired.

An applicant first fills out a very brief questionnaire listing only essential information. Past experience, education, marital status, age are the only details required. The prospective employe is encouraged to talk freely and openly about his background and the type of work he would best enjoy at the start. Both Mr. LaMonte and Mr. Larson are excellent practical psychologists with keen judgment, capable of obtaining by off-guard observation a clear insight into an applicant's personality, willingness and inherent motivations. Mr. Larson does most of the preliminary interview-

Fig. 3—COOK: Paul Zogas was chef in a Detroit restaurant before he sought war production work. Because he learned to work comfortably in a hot room, while in the restaurant kitchen, and because he understands the importance of heat control, he was placed in the heat-treating department where he now is a good tool hardener

Fig. 4—LINOTYPE OPERATOR: In the case of Doyle G. Hill, there was not much change from a newspaper linotype operator to a screw machine operator. Mechanically minded and adept to operating and controlling a production machine, his conversion to war work was rapid



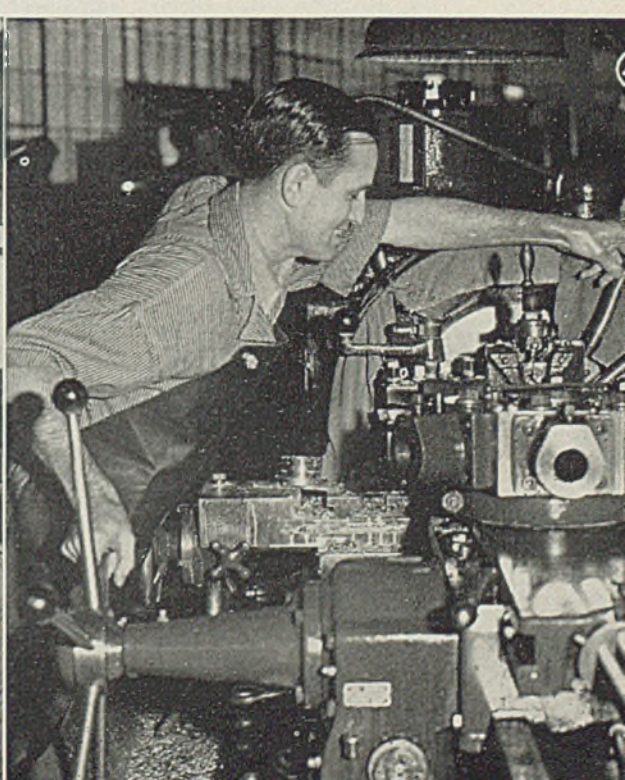


Fig. 5—HOME BUILDER: A year ago, J. C. Llewellyn was building supervisor for a construction company. Today he is supervisor for a department doing a high volume of war work. His training and experience with blueprints and specifications quickly made possible his advancement to this responsible job. Here he explains a blueprint to two women inspectors. Practically all inspection work is handled by women

ing with the help of a staff of assistants.

A system of symbols (apparently idle "doodles" on the application card as the prospect is talking freely) supplies a quick short-hand picture of the applicant for later reference.

No attempt is made to grade applicants in advance by any complicated behavioristic, aptitude, psychological or other tests. The I.Q. and other ratings show up during the first 30 days' performance. If there is anything wrong that cannot be remedied during that time, the applicant is dismissed.

When the applicant is called to work, a slightly more detailed form is filled out. Notations are made on it of possible line of advancement for which the new workers may be fitted. Thereafter, supervisors clear regular progress reports on each new worker, the aim being to advance all workers in the upgrading process as quickly as possible.

Wherever possible, new workers are placed in jobs similar to work they were doing before. A jeweler was assigned to precision inspection; a Kentucky housewife with small-town teaching experience to inspection supervision; a restaurant cook to the heat-treating department where, already accustomed to high room temperatures, he can learn to "cook" metals; an automotive salesman, familiar with engine parts, to shop tests. A builder accustomed to blueprints became a high-production supervisor. These are hints of the myriad civilian activities of those who are entering war production work through this program of human conversion.

An effort is made to solve transportation difficulties by selecting applicants from certain residential groups and putting them on the same shift so they can travel back and forth together. About 300 applicants per day are now being interviewed.

The importance of training women workers was seen early in 1941. Now almost the entire inspection task has been turned over to women. Process inspection has been instituted at the machine by stationing a girl inspector at each production point rather than centralizing all inspection in a department. This has been found to eliminate waste time and motion.

On March 23, 1942, the company placed its first women workers on machine operations on the night shift. Male job leaders stood back of them to instruct. And from the moment they first saw their machines, they started to produce. Each job leader was the previous operator of each machine, ready to start his upgrading climb as quickly as he had effectively trained the woman assigned. Like all new workers, each new woman operator is trained right on the job in actual production.

More and more women are being hired to replace manpower drained by the Army. Most women are not "shop conscious" as yet, but even at this early date many women have been found to be mechanically minded and exceedingly adept. Of the first feminine applicants, 36 per cent were placed on machines. Currently, most women are being used in hand operations on straight grinding, polishing, drill press, and similar standard production operations, but an increasing number are being placed on special machines and in skilled operations. Many are employed as inspectors, as was previously mentioned.

Irrespective of sex, each new worker is started from the bottom and in the same manner. The time before the new worker becomes proficient enough to go it alone varies considerably. In the first 30 days' training, the new worker is especially watched with respect to aptitudes, attitudes, manipulative abilities, vigilance, mental-motor responses.

Right now the heavy emphasis on upgrading is laid on men so they can attain the highest skills as quickly as possible. Woodworth's policy is to "view each new man as a possible factory manager." They all start green, and their promotion is only limited by their abilities, interest, application, study and response to upgrading opportunities constantly before them. Any ambition can find its reward here.

Some 214 upgrading promotions, affording any degree of tangential interest, are open to the free selection and progressing of talent of the new worker. So great is the need for new workers that advancement is as fast as one can become adept in the job he is doing. In standard production operations, the proficient worker becomes a job leader who is responsible for breaking a new worker into his operation before he starts his upgrading climb.

Those ambitious workers who itch

Fig. 6—WOMEN PRODUCTION WORKERS: In addition to handling practically all inspection operations, many women are employed in production work. This view shows a portion of the department devoted to machining small parts. Here experienced operators are shown instructing "trainees", standing back of them and helping them in actual production work—no artificial learning excerises, they learn to do the production operation right on the machine they will run

IT'S UP TO YOU TO GET - -

ENOUGH, SOON ENOUGH!

Here is how your War Production Chief views our problems today:

"If we lose the battle of production—we lose the war."

—Donald M. Nelson

● If you have more than your share of problems brought on by industry's conversion to War work . . . let Carpenter's diversified experience with tool steel problems be of help to you.

Keep in touch with your nearby Carpenter representative. His in-the-shop analysis of your specific problems may enable you to reduce the number of tool repairs, regrindings and replacements that hold up production. He can provide suggestions that will help you make every pound of tool steel worth more in terms of greater output.

Another useful Carpenter tool room help is "Tool Steel Simplified"—a handbook written in shop language to help every man produce more tools and better tools. Over 26,500 copies of this handbook are at work in tool rooms and heat treating departments answering questions like these: *How to make tools that wear longer?; How to be a trouble shooter?; How to prevent size change?* and *What is the relation of design to heat treatment?*

Enlist Carpenter's help in your battle against new problems of higher production and employee training. Call on your Carpenter representative for help with your specific problems.

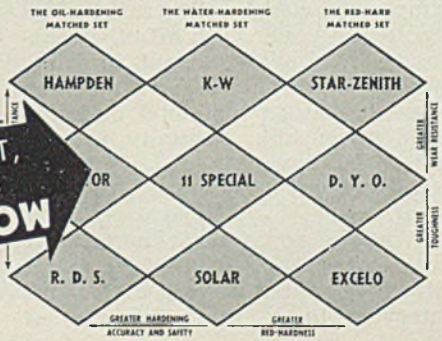
And order your copy of "Tool Steel Simplified". This handbook is being offered at cost . . . $1.00 to tool steel users in the U. S. A. ($3.50 elsewhere). After you have read it, you will want more men in your plant to have copies.

Over 26,500 copies of "Tool Steel Simplified" are now at work in tool engineering departments, tool rooms and heat treating departments. Order your copy now. ($1.00 to tool steel users in the U. S. A.—$3.50 elsewhere.)

THE CARPENTER STEEL CO. • READING, PA.

Carpenter MATCHED TOOL STEELS

IMPORTANT, BEFORE... VITAL NOW



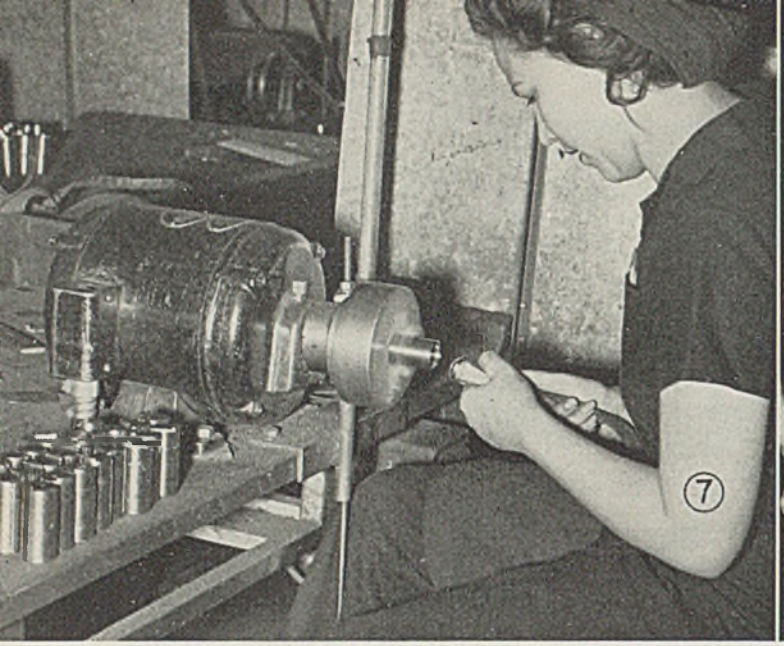


Fig. 7—Women workers are found to be particularly well fitted to handle tasks like this high-speed polishing operation. The work is held in a revolving chuck while the operator applies a strip of abrasive cloth held over a mandrel. Good touch and clear eyesight are required

Fig. 8—Much inspection is done right at the machine where below standard work can often be remedied quickly by the machine operator or the operator can be advised that his production is not right so any machine adjustments needed can be made immediately, thus holding spoilage down. Here a women inspector is checking bolts to be sure that an oversized one will not be fed into the holding device of a continuous broaching machine nearby. A set of three simple "go-no-go" gages are employed

to advance far in their skills voluntarily enlist in courses at the Great Lakes college, an accredited nearby school that offers courses in business administration and engineering. Its president, Clayton G. Ettinger, sent instructors to the Woodworth plant who carefully examined production operations and then built a special engineering course designed to eliminate all idle theory that did not apply. For example, metalworking and stamping were left out because they were not involved here. A hand-tailored course was developed to cover a 15-week period with a 3-hour training period each week. Workers who desire this "plus" training may enroll, the company paying one-half the tuition.

Experience showed that letting the employe pay half the tuition results in enrolling only those really interested in faster progress. Training is on their own time. Two sessions per day, fitted to day and night shifts, have been set up, and the men go to class rooms as they come off each shift. The 12 courses offered cover shop mathematics, shop theory, blueprint reading, metallurgy, foreman training, engineering principles, time and motion study, tool and die designing, and the like.

It is important to realize that production methods devised by Mr. Woodworth for production control and process engineering reduce the time required as well as simplify the training and upgrading of non-skilled labor. Under this system, every operation—no matter how simple—is clearly illustrated step-by-step on paper with all other confusing data or irrelevant information removed. Thus a green machine operator has in his mind only the task given him. Mentally unhampered, he learns this job quickly and is soon ready for further advancement.

Workers perform at a flat day rate for the first 30 days, after which base rates increase at 3-month intervals to a total increase of roughly 40 per cent in the first year. This sliding wage scale or automatic wage increase works exceedingly well, but the system goes even beyond that, for a worker may attain his wage increases sooner than the automatic system provides if he progresses and develops rapidly.

A piece-rate basis is used wherever possible, and workers are permitted to produce as much as they can. A piece price is never cut unless the tooling or processing is changed. Employes know this, and many large pay envelopes result.

Working conditions are unusually favorable from the standpoint of light, air, fatigue, permission to smoke on the job, snack services, safety, handling of grievances, supervision and executive contact. Girls are carefully watched for fatigue, have a 15-minute rest period twice each shift and are under the care of a matron who is a trained nurse. They work day and night shifts as do men.

As in other companies, the new male worker generally has to stay on the job with which he started. Not only is the incentive of a better piecework rate and bonus plan supplied, but the constant upgrading to positions of job leader, foreman and supervisor supplies another important incentive. The company is proud of its policy not to hire outside foremen and supervisors.

It is important that every manufacturer set up some training plan immediately if he has not already done so because from 3,600,000 to 10,000,000 men will be in uniform by year's end. Allotting only ten war workers to produce and convoy the arms and equipment required to provide a soldier with offensive striking power, our potential labor requirements may easily exceed 70,000,000 workers. This means that everyone capable will be in war work within the year.

So it is none too soon to develop precision methods for recruiting, training and upgrading of green labor with no previous industrial experience. From housewives to linotype operators, all who cannot serve actively in uniform will be expected to perform patriotically in production or service industries. With women, machine work is rapidly replacing needle work of the 1917 era as a patriotic symbol.

And the strategy, tactics and technique described above can well be utilized to help solve this problem of human conversion.

NOTICE: For details on the important and highly valuable job instructor training program developed and sponsored by the Training Within Industry Branch of the War Production Board's Labor Division, see STEEL, March 9, 1942, p. 62. This program is one of the most practical yet developed for getting new or old hands quickly into production on war work. The principles explained there are equally applicable to all types of jobs. Its use helps men to "get the hang" of the job, builds worker morale, gives the man a keener interest in his work.

Our Job for 1942

"Our" means Youngstown and all its customers

Work will win this war. Every possible pound of ore must be mined and transported to the furnaces, every possible pound of steel poured from open hearths and Bessemers. Equipment and men will continue to work night and day for Victory.

Where does this steel go? To fabricators who will convert it into material which will be used to win this war. Their equipment and men will work night and day, for Victory.

When we free Americans are willing to work to the limit of our capacity, our triumph over the dictator-driven workers of our enemies will be sure.

THE YOUNGSTOWN SHEET AND TUBE COMPANY
YOUNGSTOWN, OHIO

25-35E

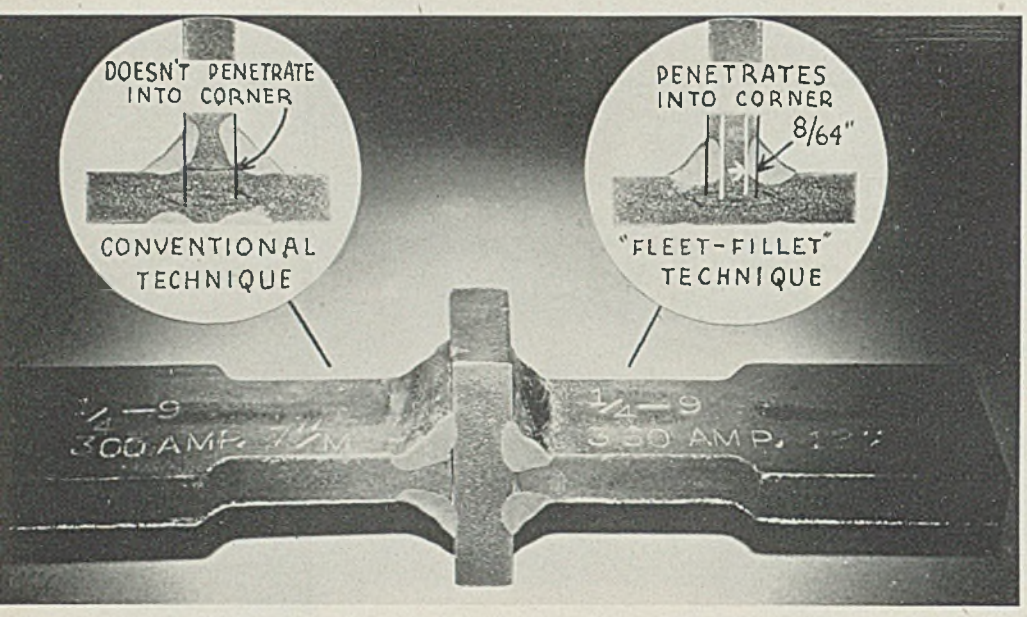


Fig. 1—These two fillet welds shown in upper circles demonstrate the difference between conventional fillet welding and the Fleet Fillet technique. The latter specimens have only 70 per cent as much deposited metal in their cross section yet they are 15 per cent stronger. Large illustration shows how specimens were set up for the welding

NEW WELDING TECHNIQUE

. . . . doubles speed of fillet and V-butt welding in many applications

By C. M. TAYLOR
Vice President
Lincoln Electric Co.
Cleveland

OUTSTANDING feature of the new Fleet-Fillet technique of arc welding is that it permits up to 100 per cent faster fillet welding. Thus it offers an important means for greatly speeding up production of welded ships, tanks, guns and other vital war products. In addition, the technique is reported as cutting costs of fillet welding as much as 50 per cent.

All ideas about welding speeds in production of fillet welds are radically changed by this technique. In a typical case, an arc speed of 65 feet per hour for welding a ⅜-inch horizontal fillet is obtained, which compares with 30 feet per hour using conventional procedure.

Basically, the technique is quite simple, yet it makes possible three important advantages: Faster weld production without increasing operator fatigue; reduction in amount of welding electrode per foot of weld; and lower welding costs.

Fleet-Fillet welding is based on getting penetration at the root of a fillet weld. With proper shielded-arc type electrodes, the penetration into the root of a weld increases with an increase in speed of travel and an increase in current to the extent shown in Table I. It is from the effect of *speed of travel* on penetration that the new procedure is called Fleet-Fillet.

Procedure in applying the new technique consists of four factors: First, hold electrode at an angle as shown in Fig. 2; second, use higher currents; third, advance electrode at higher speed; and fourth, use electrodes recommended for the technique.

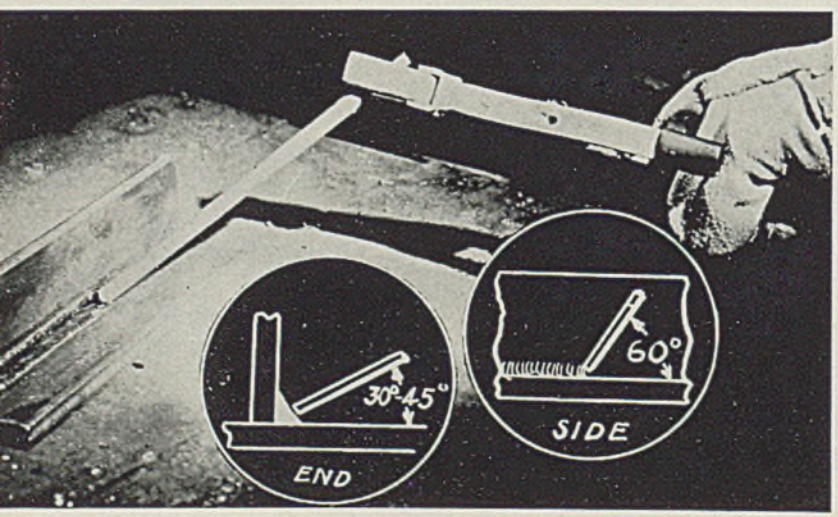
Fleet-Fillet welding strikes an economically practical average between the ideal fillet and the conventional fillet.

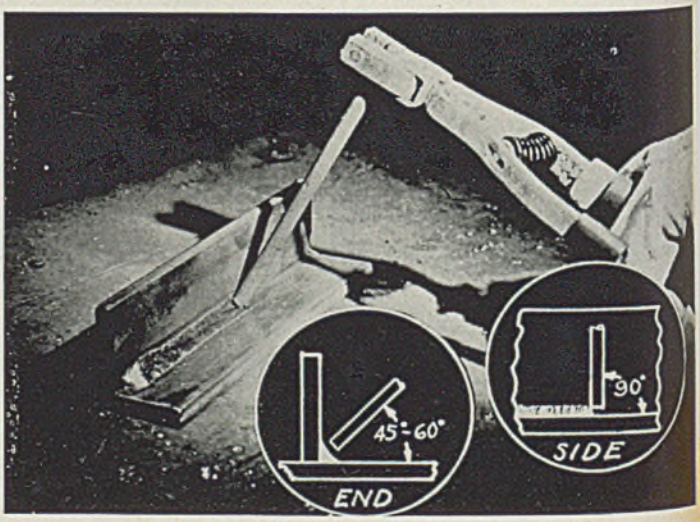
Two practical examples are shown in Fig. 1. At the right here, weld penetration is obtained beyond the corner of the joint, making it possible to maintain the same true, or effective, throat size of weld with less deposited metal.

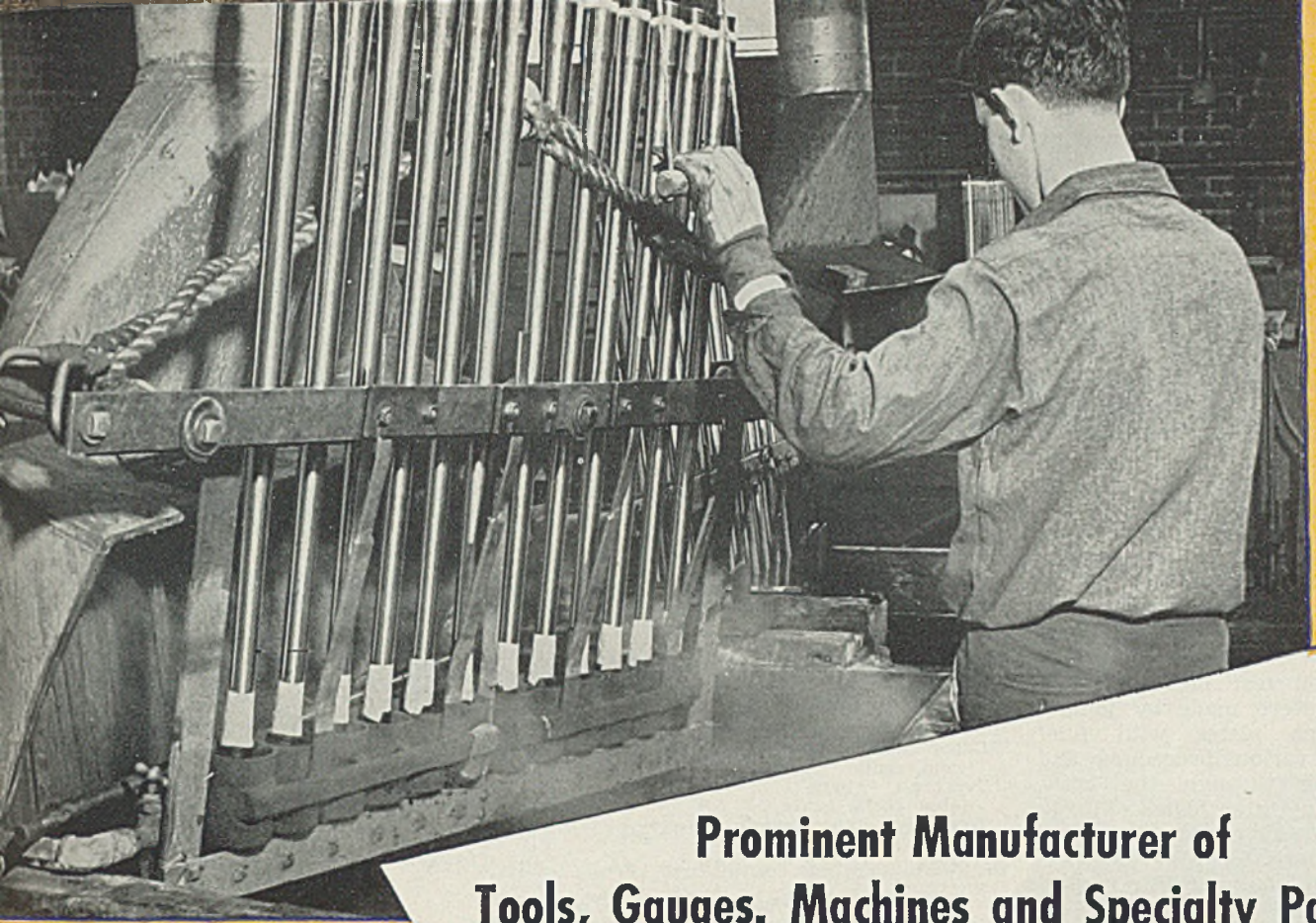
In Fig. 1, compare the upper right and left-hand illustrations and note that the conventional procedure (left) does not give weld penetration beyond the root or corner of the joint, but the new technique, right, penetrates fully 8/64-inch. The net result is a considerable amount of deposited metal is saved in producing a fillet of approximately the same effective size or strength.

Two pairs of fillets, one made by the conventional technique and the

Fig. 2—Fleet Fillet technique involves holding the electrode differently as is shown here. Left, angle of electrode for conventional fillet welding. Right, angle of electrode for Fleet Fillet welding. Note both sides and end angles differ







Pennsalt Cleaner is helping speed the production of Machine Gun barrels in this plant, with fast, efficient stripping and cleaning.

Prominent Manufacturer of Tools, Gauges, Machines and Specialty Parts reduces rejects—increases production—cuts costs

with PENNSALT CLEANERS

This manufacturer of precision parts—many for guns and aircraft—requires metal cleaners with extraordinarily high standards of performance. The extremely close tolerances to which the parts are held—plus the imperative demand for maximum output made the choice of cleaner important.

Pennsalt Cleaners meet the rigid requirements of this plant with notable success. The operations were:—The unusually thorough and uniform removal of oil and buffing compound from steel and zinc necessary before chrome plating . . . the stripping of hard chrome plate from steel, with the positive assurance of no injury to the steel surface . . . and the heavy-duty cleaning of steel prior to cadmium plating.

The illustration above shows machine gun barrels being cleaned. Pennsalt Cleaner is used to clean new barrels before chrome plating and, in reconditioning barrels, to strip chrome from the steel before replating.

In all their exacting duties Pennsalt Cleaners have an outstanding record. Here it is:—*Increased production because of fewer rejects* . . . a reduction in cleaning costs . . . smoother plating surfaces and more efficient stripping, through better conductivity.

A test in your plant under your own conditions will show you why Pennsalt Cleaners have won the confidence and endorsement of so many manufacturers in a wide range of metal cleaning operations. An experienced technical staff is at your service for information or advice, without obligation. Or write fully to our Pennsalt Cleaner Division, Dept. S.

PENNSYLVANIA SALT
MANUFACTURING COMPANY
Chemicals

1000 WIDENER BUILDING, PHILADELPHIA, PA.

other by the Fleet-Fillet technique, are incorporated in the specimen bottom in Fig. 1. The fillet made by the Fleet-Fillet technique has only 70 per cent as much deposited metal as the other, yet it has 15 per cent greater strength.

Interesting particulars of the new technique are shown in Table I. Of particular interest are the tabulated comparisons showing the effect of arc speed on the following factors: Effective throat of weld; the amount of penetration beyond root, or corner; strength of weld; amount of electrode; and welding cost. Note Table I gives comparisons between conventional and Fleet-Fillet specimens welded in horizontal position as well as specimens positioned for downhand welding.

Comparison test pieces covered in Table I were made by joining three ½-inch plates with fillet welds using various procedures and then sawing through the cross formed by the three plates (Fig. 1) to obtain smaller crosses about 1½ inches in length.

In conventional welding procedures, the electrode is held at approximately 45 degrees with the horizontal plate and at approximately 60 degrees to the line of weld with the end pointing backward (see Fig. 2). The arc is held short but the travel speed is generally so slow that the electrode must be held out from the two plates in order to keep the end of the electrode from dipping into the molten pool.

In Fleet-Fillet welding, the average position of the electrode is about perpendicular to the line of the weld at from 45 degrees to 60 degrees with the horizontal plate (see Fig. 2). The arc is so short that the coating practically touches the plate. Lightly resting the coating against both plates is not objectionable. If the coating is forced against the plates, a rough bead is likely to be obtained.

The specimens in Table I were welded with Fleetweld 9 electrode, commonly used for single-pass fillets in either horizontal or flat positions with direct current and with negative polarity. Alternating current may also be used, in which case 10 to 15 per cent higher current is needed to obtain a given effective throat.

TABLE I—Comparison Tests for Fillet Welds Made By Conventional and "Fleet-Fillet" Techniques

	Single-Pass Horizontal (Not Positioned)			Single-Pass (Positioned)			
	Conventional Method	Fleet-Fillet Method	Fleet-Fillet Method	Conventional Method	Fleet-Fillet Method	Conventional Method	Fleet-Fillet Method
Arc speed—inches per minute	7	10	12	6	10	6	12
Size of fillet—as now defined inches	24/64	17/64	18/64	24/64	18/64	28/64	20/64
Apparent throat 0.707 x (size of fillet, inches)	17/64	12/64	13/64	17/64	13/64	20/64	14/64
True or effective throat, inches	17/64	17/64	20/64	15/64	15/64	20/64	20/64
Penetration beyond root or corner, inches	0	5/64	8/64	Missed fusing to corner by 4/64	Penetration, 2/64	No penetration	Penetration, 8/64
Ultimate load of joint in pounds per inch of length	27,000	27,000	Plate failed at 30,000	27,000	27,000	Plate failed at 30,000	Plate failed at 30,000
	Costs						
Pounds of electrode per foot of weld	0.37	0.26	0.26	0.43	0.26	0.57	0.28
Electrode cost per foot of weld, cents*	2.2	1.5	1.5	2.6	1.5	3.4	1.7
Labor cost per foot of weld, cents†	5.8	4.0	3.3	6.6	4.0	6.6	3.3
Overhead, 100% of labor costs, cents	5.8	4.0	3.3	6.6	4.0	6.6	3.3
Total cost—labor, electrode and overhead, cents	13.8	9.5	8.1	15.8	9.5	16.6	8.3

*Electrode cost figured at 6 cents per pound.
†Labor cost figured at $1 per hour with a 50% operating factor.
Note: All electrodes were ¼-inch "Fleetweld 9". Electrode was always negative.

For multiple-pass horizontal welds in Fleet-Fillet welding, Fleetweld 7 electrodes are preferable because their metal does not spread out so easily and can be built up into a more uniform weld structure. Fleetweld 5 electrodes may also be used for multiple-pass welding when specified by codes or other regulations.

The conventional method of building up a multiple-pass horizontal fillet is shown at left in Fig. 4. Here, the beads are laid from the top downward.

By the Fleet-Fillet method, the beads are laid *from the bottom upward* as shown at center in Fig. 4. The idea here is to provide a flat, horizontal surface upon which to place succeeding beads, permitting higher currents, resulting in faster welding. The first bead is laid in the corner at a fairly high current and speed. Subsequent beads are put in with the electrode held at an angle of 70 to 80 degrees with the horizontal plate and line of weld except the beads against the vertical plate, in which case the electrode should be at about a 45-degree angle.

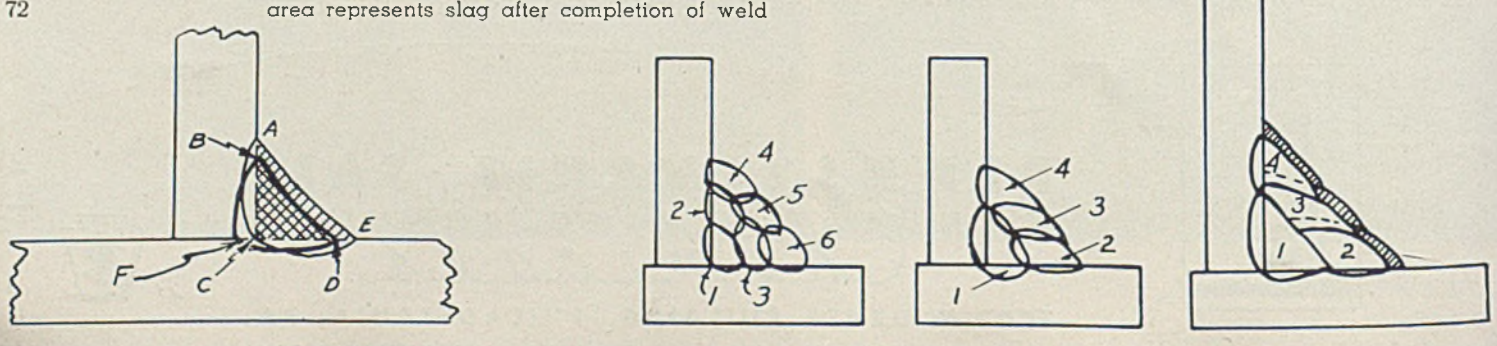
A point of interest in the new technique for multiple-pass welding is that the slag *is to be left on the bead* in order to provide a dam to keep the metal from running off the edge of the previous bead. This is illustrated at the right in Fig. 4. The slag is not removed until after each layer of beads is completed. In other words, for the weld shown at the right in Fig. 4, the slag is removed only after completion of bead No. 1 and bead No. 4.

This procedure not only saves

(*Please turn to Page* 100)

Fig. 3 (Left below)—This diagram compares the penetration obtained. Conventional technique deposits area bounded by points ACE. Fleet Fillet technique deposits area bounded by points BFD. The amount of metal saved is roughly that represented by the area ABDE

Fig. 4—(Right below)—Multiple pass welding differs also. Left, sequence of passes with conventional fillet multipass technique. Center, sequence of passes with Fleet Fillet technique. Right, slag is not removed in latter method, for dotted line above No. 2 bead shows where slag was before bead No. 3 was put on; dotted line above bead No. 3 shows where slag was before bead No. 4 was placed. Cross-hatched area represents slag after completion of weld



Greenlee AUTOMATIC NEWS

PREPARED BY GREENLEE BROS. & CO., ROCKFORD, ILL.

PRODUCTION OF BOLT SPEEDED UP BY USE OF FORM TURNING ATTACHMENT

Greenlee 1⅝" Automatic Turns Out 36 Parts Per Hour

Today the manufacturer using automatic screw machines in the production of the vital munition parts needed for our war effort, can be sure of getting maximum production from his machines by using only the most efficient tooling set up possible for each particular job.

This story of the production, on a 1⅝" Six-spindle Greenlee Automatic Screw Machine, of a connecting rod bolt for an airplane engine, is an excellent example of planning the most efficient tooling to obtain the greatest production possible.

Form Turning Attachment For Turning Long Length

The problem encountered in the production of this connecting rod bolt was that of turning a long length in as few positions as possible to obtain the maximum production. To solve this production problem, a form turning attachment was used which permitted the part to be completely rough turned in two positions and still maintain the short stroke of 1⅛ inches necessary to get a production of 36 pieces per hour.

If the form turning attachment had not been incorporated in the tooling set-up for this part, the production would have been considerably less than it was, since a longer tool slide stroke would have been required to permit the rough and finish turning operations that the finish of this part required.

Production Time Cycle 100 Seconds

The production time cycle for this connecting rod bolt, made from 11/16" square A.M.S. 6310 steel is 100 seconds, or 36 per hour. The spindle speed is 166 R.P.M., resulting in 42 S.F.M. The tool slide feed is .0042 inches per revolution.

Sequence of Operations

In the first position the stock is broken down for the form turning operation, and the thread diameter is rough turned with the roller turner.

In the second position the square section is turned with the form turning attachment, the thread diameter is finish turned, and the end is faced.

In the third position the piece is rough formed under the head, the .365 front bearing diameter is finish turned, and the end is chamfered for the thread.

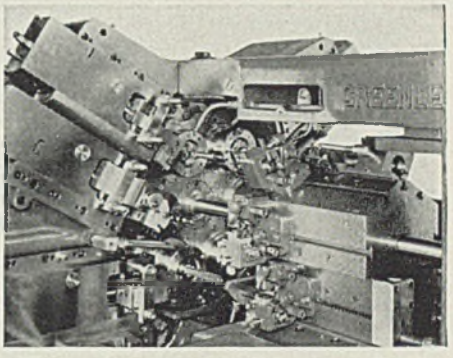
In the fourth position the relief section in back of the thread and the tapered section of the front bearing diameter is formed. The second relief diameter and the second bearing diameter are rough turned in this position with a knee turner ahead of the roller support. The piece is supported on the previously turned thread diameter.

In the fifth position the piece is faced under the head, and the rear bearing diameter and the rear relief diameter are formed. The piece is again supported on the previously turned thread diameter.

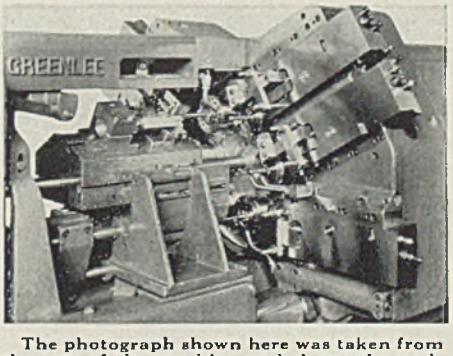
In the sixth position the piece is supported and then cut off.

TO HELP YOU

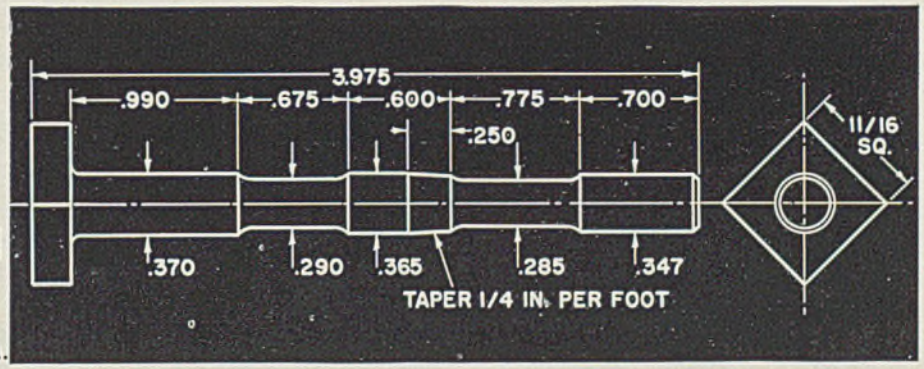
Greenlee Bros. & Co. hopes that the performance data and production stories of jobs now being run on Greenlee Machines presented in these advertisements will be of some help to the metal-working industry in obtaining more efficient screw machine production.



Shown above is a view of the set-up for the production of this part, showing the first, second, and third positions. The photograph was taken just after the machine was indexed and does not show completed operations at the various positions. The form turning attachment described in this story is shown in the second position.



The photograph shown here was taken from the rear of the machine and shows the tooling set-up for this job in the fourth, fifth, and sixth positions.



Greenlee BROS. & CO.
ROCKFORD ILLINOIS U.S.A.

MULTIPLE-SPINDLE DRILLING, BORING, AND TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AIRCRAFT PRODUCTION MACHINERY

DOES EVERY VICTORY ORDER MEAN A NEW PROBLEM?

MACDERMID HAS THE ANSWER—

Special Processes, Chemicals and Compounds for Every Cleaning Problem

★

MacDermid, Inc. will be pleased to furnish the manufacturer with "data sheets" showing the steps of procedure for precleaning basis metals used by others manufacturing specific defense items.

No matter what your finishing problems may be or what items for defense you are manufacturing, today there is a proven process or compound for the precleaning of the basis metals used manufactured by a *specialist* with twenty years experience in this field. When faced with the processing of a new metal or product for defense, consult a MacDermid service engineer and learn the easiest and most thorough way to metallurgically clean your products before finishing or plating . . . Simply phone or write your nearest MacDermid sales office.

★

A Process for Every Cleaning Problem!

MANUFACTURED SOLELY BY

SALES AND SERVICE
from
COAST TO COAST
New York Cleveland Los Angeles
Chicago Detroit St. Louis
Newark Philadelphia
Toronto, Canada

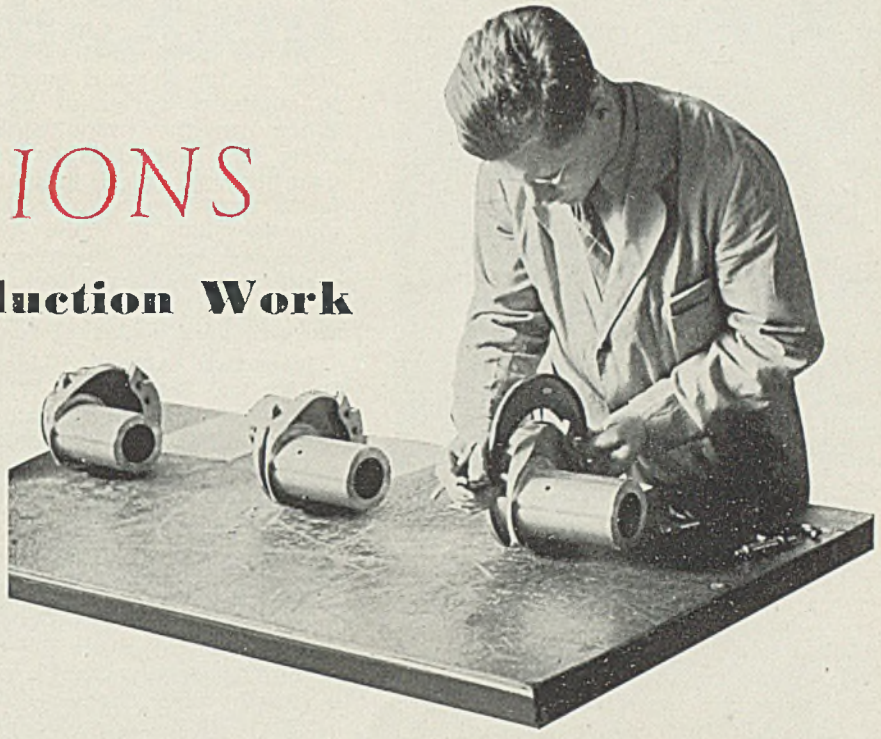
MAC DERMID

INCORPORATED
WATERBURY, CONNECTICUT

How To Handle

INSPECTIONS

In War Production Work



. . . . means how to fulfill your contractual obligations with the least loss from rejected items. But your contract wording can have much to do with the final result—possibly as much as your manufacturing processes themselves. Thus this explanation of the many factors involved in government inspections is particularly timely

Fig. 1—Forged and highly machined sections for radial aircraft engines undergo a large number of precise gaging operations as part of the elaborate inspection procedure. Here an operator is using a large caliper to check a bearing diameter

ALL MATERIALS and supplies purchased by the government are subject to inspection and approval as to quantity and quality before payment. Ignorance of inspection procedures causes delay and loss in the performance of contracts. Familiarize yourself with government inspection procedures and the applicable provisions in your contract in order to facilitate the inspection and keep your production line rolling. By intelligently applying your knowledge of inspection procedures, you can save time and money.

The standard forms of supply and construction contracts give the government the right to inspect materials and workmanship at all times during manufacture or construction and at any place where the manufacture or construction is being carried on. Defective material or workmanship may be refused or its correction required. In this event, you must replace the material or correct the workmanship without charge. If you do not, the government (1) may do so and charge the cost to you, or (2) may terminate your right to proceed and hold both you and your surety liable for damages.

Inspector's Decision Is Final: The government, in the absence of fraud, is bound by the decision of the inspector or superintendent of construction designated by the contract so far as the exercise of discretion and judgment as to the quality and quantity of material or work is concerned. This principle applies where the contract is not definite as to structural details or quantity and quality. For example, contracts sometimes contain a provision that all workmanship, materials, etc., shall be of the "best grade." In this event, the question of best grade is largely a matter of discretion and judgment. But it does not apply where the specifications establish the exact chemical components or other particulars. Neither does it apply where plans establish precise structural details.

Note: Unless the contract authorizes the inspector or superintendent to make changes, he is without authority to order or approve changes, and no action on his part is binding on the government. Do not honor changes in plans or other modifications of the contract unless made by the authorized officer. A contractor acting upon the approval or order of any person or board other than the officer or board properly authorized by the contract does so at his own risk. Even if a person or board authorized to make or approve changes makes as complete an inspection as possible and accepts the product, the government will not be bound if it turns out that the inspectors acted in ignorance of structural departures from the specifications.

The standard form of supply contract contains a provision that "final inspection shall be conclusive except as regards latent defects, fraud or such gross mistakes as amount to fraud." The standard form of construction contract is not as favorable to the contractor. It provides that inspection and acceptance, unless otherwise stated in the specification, shall be final, "except as regards latent defects, departures from specific requirements of the contract and the specifications and drawings made a part thereof, damage or loss in transit, fraud, or such gross mistakes as amount to fraud." Cost-plus-fixed-fee contracts in no way refer to the conclusiveness or finality of the inspection.

It occasionally happens that work approved during the progress of a job by the original inspector fails to satisfy newly appointed government inspectors. *In drafting the contract, watch out for clauses providing for or permitting a change in the inspection officer and requiring the approval of the officer on duty at any time.*

Recommendation: Request a clause clearly limiting the supervision and inspection to one officer or providing that successive inspectors shall be bound by the predecessor's decision.

Conform with Samples: If the

From material in the 115-page booklet, "Producing For War", published by the War Economics Division of the Research Institute of America, 292 Madison avenue, New York. Also known as "Research Institute Analysis No. 20," this publication contains a wealth of information of value to all manufacturers contemplating or already in war production work.

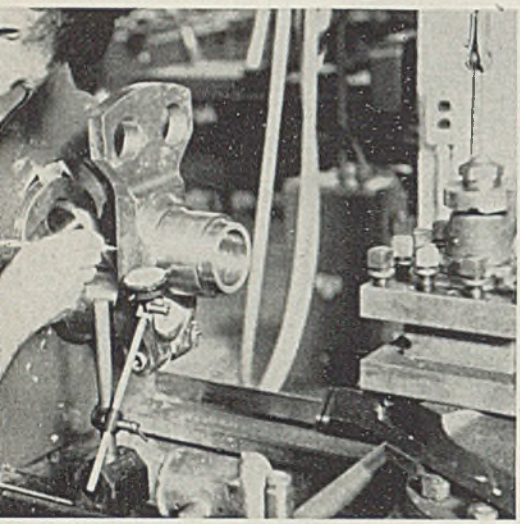


Fig. 2—In this setup, an operator is inspecting the concentricity of a partially assembled crankshaft for a radial aircraft engine. The dial gage point is set against one of the main bearings at the right

contractor submits or receives a sample from which to work, finished products must conform and pass inspection tests before payment will be approved.

Use Letter of Exception: You can avoid delays by using a letter of exception. Many times machinery is rejected because of the inclusion of features such as additional structural reinforcements, not required by the specification, which the manufacturer normally built into the article. The production cost and usefulness of the equipment are often increased by these additional features. Usually the materials are accepted as thus modified, but acceptance is deferred until after investigation. A letter of exception eliminates delay and misunderstanding by stating the features of the product which differs from government specifications. It becomes a part of the contract and must be observed by the inspector. In using the letter of exception, be careful not to alter the specifications *materially*, however, since this will result in the disqualification of your bid. If possible, consult with the contracting officer before submitting the letter of exception.

Waiver of Inspection: If your order is for a small quantity, try to obtain a waiver of inspection. When conditions require the purchase of commercial articles in quantities so small that it manifestly would be uneconomical and unbusinesslike to make the tests prescribed in the specifications, a certificate to that effect by the proper purchasing officer will be accepted as a waiver of tests.

Inspection Affects Bidding and Production Schedules: When bidding, allow for the additional time and cost required by inspection, and take into account the possibility of rejections. Similarly, in establishing production schedules be sure to allow additional time required for inspection.

Who Bears Inspection Expenses: Under cost-plus-fixed-fee contracts, the government bears the expense of the inspection. Lump-sum contracts, however, require that all handling of material for purposes of inspection be done at the expense of the contractor; that all tests be made and all test specimens and drillings for check analysis be furnished by the contractor without expense to the government. However, all costs of handling after unloading, inspection, piling and storing will be borne by the government. If the government directs a change in the place or manner of delivery in writing, you are entitled to reimbursement for any expense so incurred over and above the expense to which you are obligated by the contract, including additional handling, boxing or crating, drayage, freight, parcel post or express charges. In the event that change in delivery instructions results in decreasing your expense in effecting delivery, deduction should be made from invoices rendered.

Types of Inspection Procedure: One of the most important matters to be considered in drafting supply contracts is the point of final inspection. Any one or all of the following three methods of inspection may be agreed upon: (1) Inspection at the contractor's plant or factory (inspection before shipment); (2) inspection during progress of work; (3) inspection after delivery. The point of inspection should be your plant if possible. Otherwise you will be uncertain as to the acceptability of an article for some time after delivery. The government may return it at a later date and charge the expense to you. Additional loss may be incurred because of continued production of an unacceptable product during the period of transit and inspection.

The inspection will be made at your place of manufacture or point of shipment unless specifically provided otherwise in the contract or unless mill or factory inspection is subsequently waived. The Army or Navy purchasing officer will prefer one method or the other depending upon which will operate the more efficiently in the situation presented. Note that the Quartermaster Corps has announced that, wherever possible, contracts will be let f.o.b. point of origin, with final inspection at that place in order to facilitate payment for the order. This will be of particular assistance to contractors encountering difficulty in obtaining adequate financial backing for their war work.

Inspection at Factory: Equipment and supplies, technical apparatus, building materials, metals, tools and hardware, paper and paper products, textiles, and manufacturing or construction materials are usually inspected by this method.

If the contract provides for delivery f.o.b. works, inspection is made before shipment and shipment is then made on government bill of lading. In the event of unauthorized shipment before inspection the right is reserved to return the material to the place of manufacture at your expense.

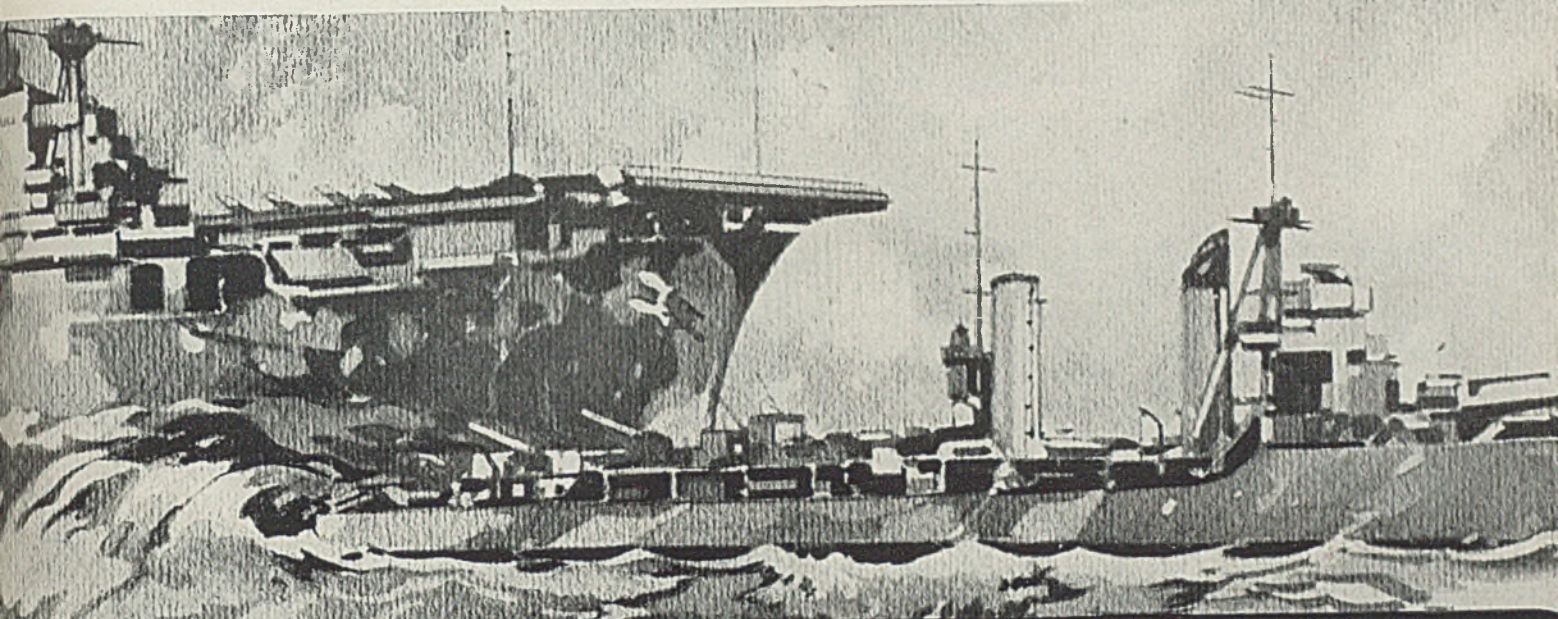
When material is ready for inspection, you should notify the inspector concerned and prepare to send him the requisite number of copies of reports of material shipped. The notice should be given at least 48 hours before inspection is desired. It should be in writing and should indicate the contract or order number and quantity and quality of material to be inspected. You will be charged with any additional expense when articles are not ready at the time inspection is requested. Upon completion of inspection, the inspector will forward certified copies of the report of material shipped to the various offices concerned. An identifying stamp is usually placed upon material which has passed inspection. While inspection at the plant is generally final as to both quantity and quality, the government may

TABLE I—Inspection Hints

1. Is your contract on the Acceptable List of Approved Materials?
2. Know the inspection clauses in your contract.
3. Do you need a letter of exception?
4. Inspection should be at the factory with delivery f.o.b. plant and shipment on government bill of lading.
5. Make inspector's decisions binding on successors.
6. Allow for inspection in fixing prices and production schedules.
7. Be sure the government is responsible for extra inspection costs caused by changes, etc.
8. Take steps to safeguard trade secrets against disclosure.
9. Plan and systematize inspection procedure to save time.
10. Have scales calibrated in inspector's presence.
11. Give notice to inspect and have reports of material shipped ready.
12. Be sure changes in plans and specifications are made by the designated official.
13. Don't divert inspected material to other orders.
14. If inspection is at factory, don't ship until directed.
15. Can you negotiate acceptance after rejection?

ON THE MACHINE-TOOL FRONT!

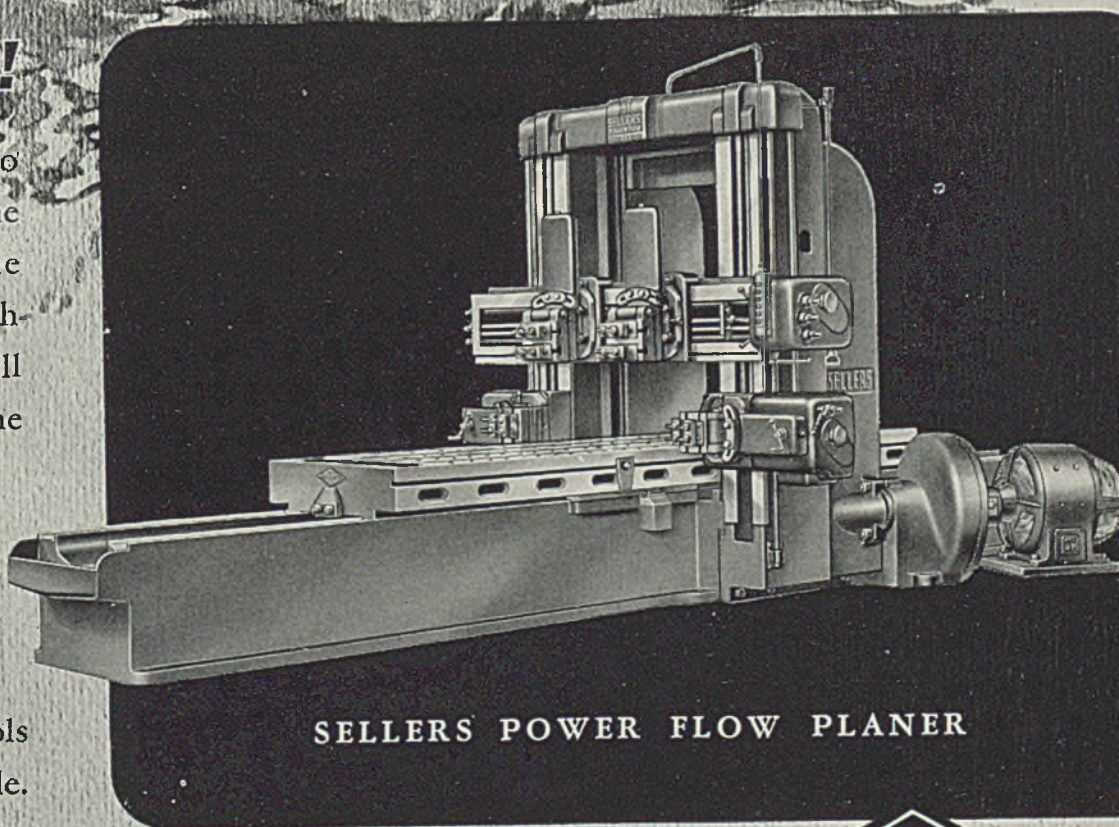
Continuous, Top-Speed Production---



PRODUCE!

THE job that has fallen to the men who operate the machines that produce the weapons and equipment with which our fighting men will avenge Pearl Harbor is of the utmost urgency.

Continuous top-speed production is the best way by which industry can "remember." Sellers' and other great machine tools are helping make this possible.



SELLERS POWER FLOW PLANER

WILLIAM SELLERS & CO., INCORPORATED · PHILADELPHIA

FOUNDED SELLERS 1848

Sellers

reserve the right also to inspect after delivery.

How To Expedite Inspection: Plan and systematize inspection procedure to minimize delay. The inspection officer will willingly cooperate in this matter. Inspection may be accelerated by:

(1) Laying work out on tables so that the inspector will find everything arranged in an orderly manner.

(2) Disassembling parts so that the inspector will not lose time in this operation.

(3) Numbering parts or providing tags so that each part may be properly marked.

(4) Using unused shop space.

(5) Avoiding cluttering up the shop where the inspection is made.

Facilities and Information Required: Under usual inspection clauses, required information must be divulged and you must give the inspector free access to all parts of the plant at all times. He has the right to examine raw material and to witness your manufacturing processes.

All information requested by the inspector must be furnished by the contractor and subcontractor. The contractor may be required to exhibit contracts or orders or to furnish copies of mill or shop orders, material or service orders, omitting price, placed with subcontractors. Additional information as to the manufacturing process also may be required. *If you do not wish to reveal information pertaining to your manufacturing process, be sure to include in your contract a provision that such information need not be divulged.*

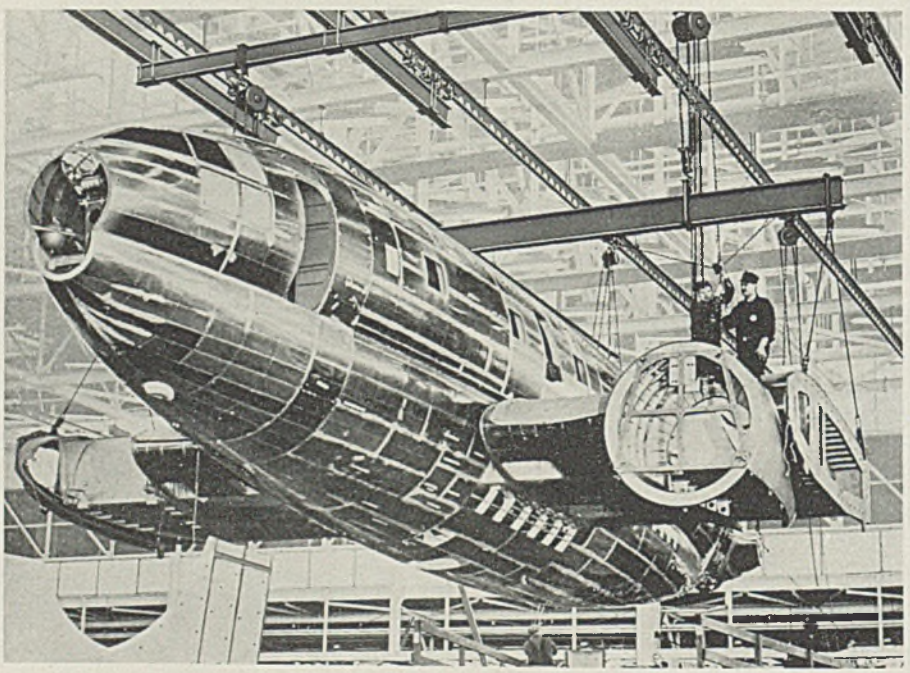
Where useless trips of inspectors are caused by incorrect information given by the contractor, the government reserves the right to charge the expense of such trips to the contractor and to deny inspection at the plant.

Facilities necessary for the inspection are to be provided by the contractor free of expense. If you lack necessary facilities, tests will be made at your expense at some place in the locality possessing the facilities.

Samples and Tests: In choosing samples for test, material of the lowest quality is selected to insure that all material will exceed the minimum quality specified. Samples of liquids, powders, etc., are selected and marked for identification. These samples are taken from containers packed for shipment. The samples are forwarded to government laboratories in containers provided by the contractor. Test specimens of material must represent the fin-

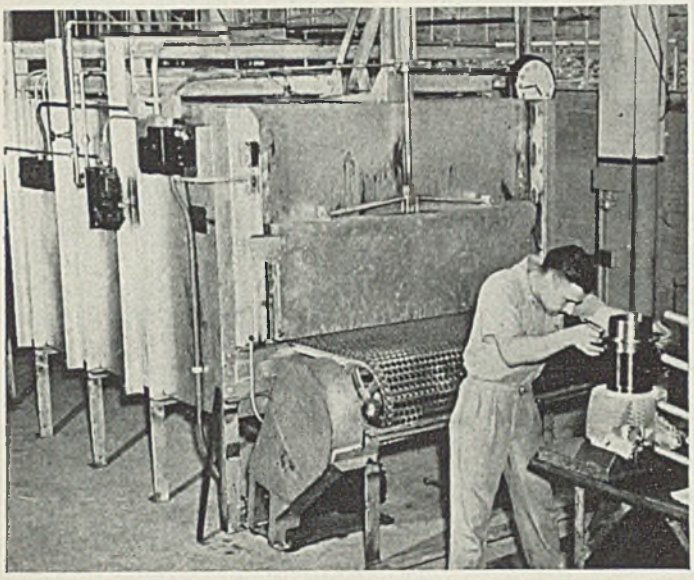
(*Please turn to Page* 101)

Improvised Crane Moves Sky Giant

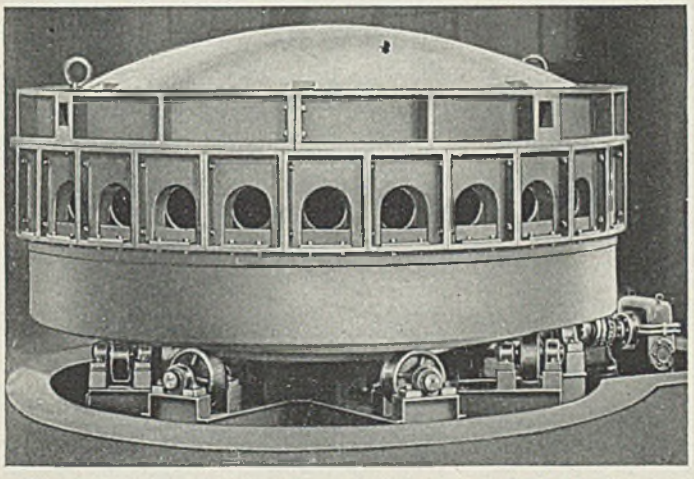


SO RAPIDLY was this Army C-46, ten-ton cargo ship constructed at the Airplane Division of Curtiss-Wright Corp., that a new overhead crane scheduled to be installed in time to lift the plane from its splicing fixture, was not yet in place when the sky giant was ready to be moved. To save time Cleveland Tramrail and Curtiss engineers improvised the above crane from parts intended for other uses, and repositioned the plane within 5 days. The craft had to be raised 16 feet and moved horizontally 50 feet to the final assembly department

If you heat treat metals INVESTIGATE



Above—A MAHR continuous type furnace used in a large aircraft engine plant for heating aluminum heads to 470°.



Above—A MAHR center fired, rotary shell nosing furnace in use for many months giving steady, satisfactory performance.

Below—Modern, high speed shell hardening, quenching and drawing furnace for 75MM, 90MM, 105MM, 155MM high explosive shells.

THESE ADVANTAGES OF MAHR INDUSTRIAL FURNACES—OVENS

- Full range of types and standard sizes
- Quick heat up and uniform treating temperature easily maintained
- Special jobs quickly and accurately designed
- Astonishingly prompt deliveries

Yes, if you heat treat metals, it will pay you to talk with us, because for over a quarter century our engineers have been designing and our factory building—often PIONEERING—the most modern units for every type of heat treating.

Today, when speed AND QUALITY are "must"—when tanks, ships, planes, guns, shells, etc., *must* be right the first time—reliable furnace equipment of known quality should be demanded.

FOR EVERY HEAT TREATING NEED

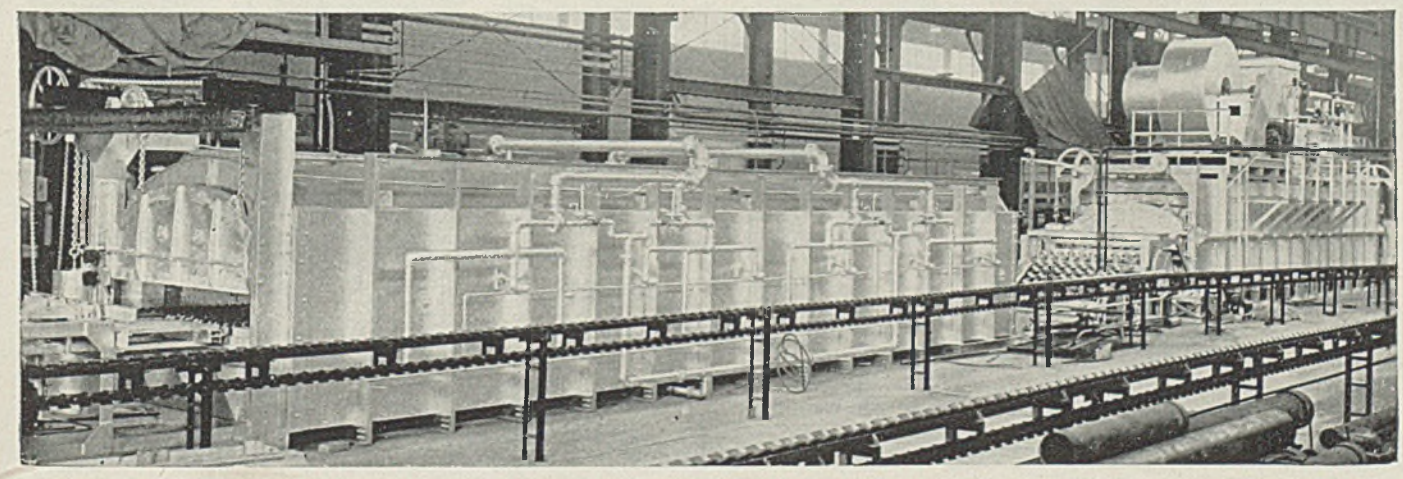
ANNEALING, CARBURIZING, BAKING, HARDENING, FORGING, DRAWING, STRESS RELIEF—CAR BOTTOM, PIT, PUSHER, ROLLER HEARTH, CONTINUOUS, POT . . . . RIVET FORGES, TORCHES, BURNERS, BLOWERS, VALVES.

MAHR MANUFACTURING CO.
DIV. DIAMOND IRON WORKS, Inc.

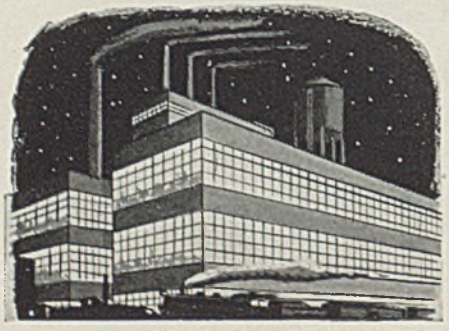
GENERAL OFFICES—MINNEAPOLIS, MINN.
SALES OFFICES IN PRINCIPAL CITIES

WRITE, WIRE OR PHONE TODAY

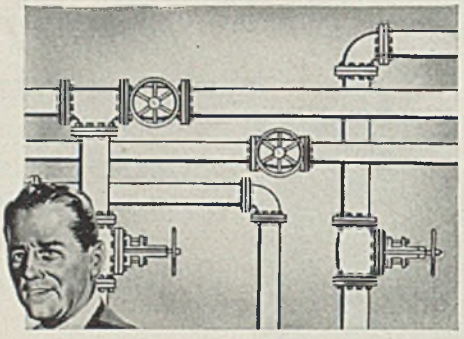
Our engineers will gladly help you select the type unit you need, and we'll give you complete information on any specific request. There's an engineer-representative near you for quick consultation.



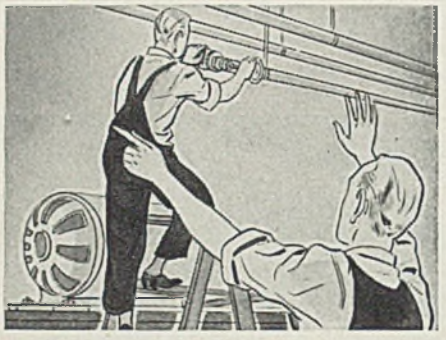
These "Pointers" Made a Tough Training Job Easier!



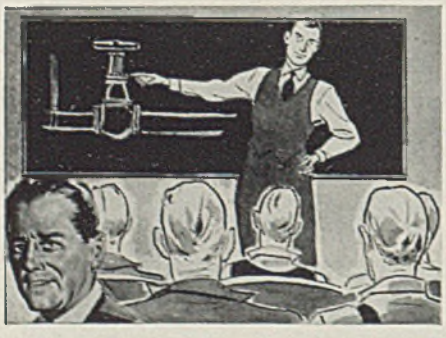
1 With the plant running 168 hours a week, we needed more and better maintenance—day and night. On piping, for example, you can't get away with part-time maintenance and keep production lines running smoothly. It's too important!



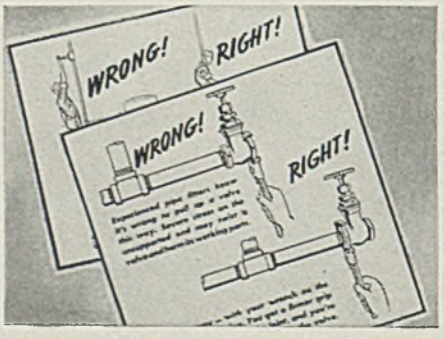
2 Soon enough, we found valves and fittings would have to be handled with unusual care to get every last bit of service out of them. They're vital equipment, and with all the demands of war, deliveries of replacements were being slowed up.



3 Sure, we put on more "maintenance" men, but many had never handled a wrench before. We had to start from scratch in training them. In the past, our veteran crews had the time to teach apprentices, but that was "before Pearl Harbor."



4 You know that piping maintenance is a specialized job. But it's knowing the "kinks" of the trade that makes the difference between good and bad installations. They help speed-up the work as well as step-up efficiency of pipe lines.



5 We had to teach these men the "rights and wrongs" of piping make-up. We had to be sure they knew enough about valves of all types, and when and where to use them. Good piping depends a lot on using the right equipment.

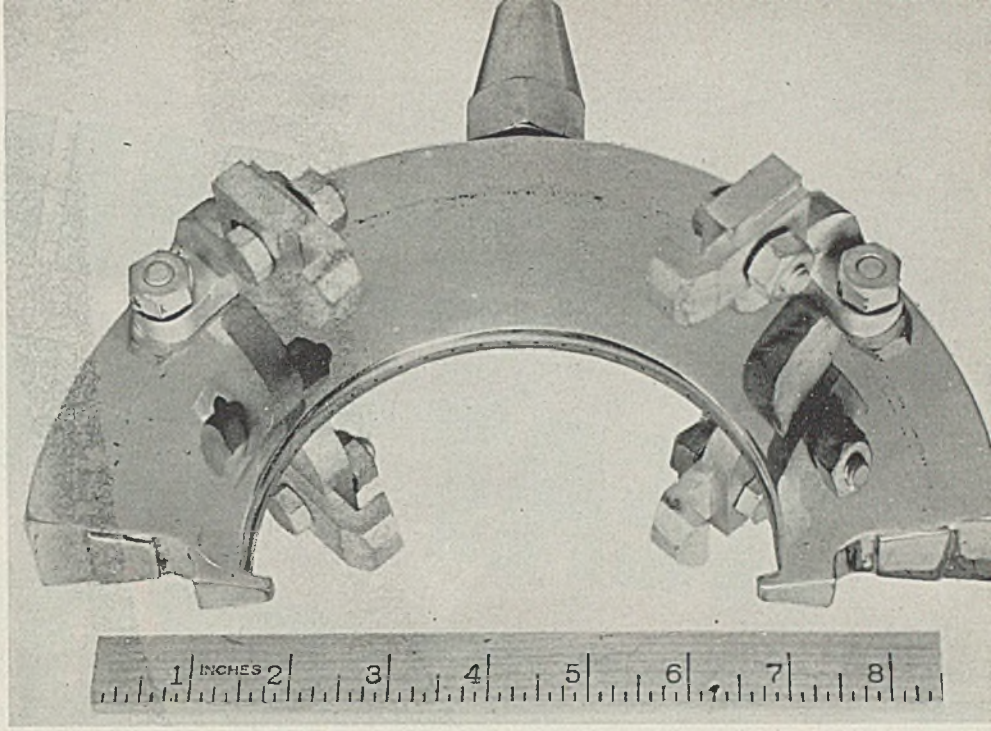
6 These Crane Shop Bulletins made a tough training job easier. They're full of valuable piping pointers. We used them in employee training classes; posted them in maintenance shops; passed them among the men. Even the old-timers use them! **And listen, any plant can get these Bulletins free—through the local Crane Representative.**

CRANE

CRANE CO., GENERAL OFFICES:
836 SOUTH MICHIGAN AVENUE, CHICAGO

VALVES • FITTINGS • PIPE
PLUMBING • HEATING • PUMPS

NATION-WIDE SERVICE THROUGH BRANCHES AND WHOLESALERS IN ALL MARKETS



In flame descaling rounds with this semicircular descaling head the operator works on one-half the longitudinal surface, then revolves the round 180 degrees and completes the other half. The four guide shoes are adjustable to fit the exact size round being descaled

FLAME DESCALING

Minimizes Surfacing Time and Costs

By E. W. DECK
The Linde Air Products Co.
Newark, N. J.

FLAME-DESCALING with oxyacetylene is a method for removing the iron oxide scale which forms on steel surfaces during exposure to oxidizing atmospheres at relatively high temperatures. The process is used in steel mills where it is faster, more economical and generally more suitable than pickling, sandblasting, wire-brushing and grinding for descaling blooms, billets, slabs and plates. It is also being used for descaling forgings and castings to replace bobbing, tumbling, sandblasting, grinding, and, in some instances, machining. Flame-descaling should not be confused with flame-priming, or, as it is often called, flame-cleaning and dehydrating which employs the oxyacetylene flame to remove loose scale and moisture prior to painting.

Various kinds of scale differ in properties and in amenability to removal by the oxyacetylene flame. These characteristics are determined by the chemical composition of the scale, by the temperature of the steel at the time of scale formation, by the length of oxidizing exposure time, and by the nature of the heat and mechanical treatment to which the metal has been subjected. All scales, however, can be classified in two general types.

The type of scale usually found on large blooms which cool from high temperatures in the air after rolling can be described generally as light gray and loosely bonded. Similarly, heavy slabs and annealed plates, and castings have a light-colored and relatively loose scale which has also formed at high temperatures. On the other hand, small billets, light plate, and sheets which are comparatively cool when they pass through the last rolling operation, and also some forgings, have a dark, hard, dense, well-bonded, continuous scale that is not easily removed by any method.

Difficult to Descale

Many of the alloy steels also have been difficult to descale by any method. The reason for this is that some alloying elements in steel do not oxidize as readily as the iron. When scale is formed these elements seem to act as a unifying matrix which holds the oxide mass intact and virtually locks it tightly to the surface of the unoxidized metal. However, encouraging results have been obtained through the use of oxyacetylene flames for removing this type of scale.

Removal of scales with the oxyacetylene flame is based upon the principle of differential expansion achieved through a sudden heating of the surface layer of the scale. By passing a hot oxyacetylene flame over the scale, that portion of the layer nearest the flame is expanded suddenly, and the scale, being brittle, buckles and cracks loose from the surface. The force with which it breaks loose depends upon the suddenness of the heating, and the thickness, strength and bond of the scale. For most effective and efficient flame-descaling, the method of heating should be so fast that a superficial layer or outer skin is raised to an extremely high temperature before any of the heat has an opportunity to soak through and cause the scales to become fused before they pop off. This accomplishes a differential expansion within the scale itself, and it causes buckling to take place while the base layer is still cold and brittle. In some instances, however, heavy scales must be heated clear through so that they expand in relation to the cold base metal.

In order to produce the rapid, sudden heating required for effective and efficient descaling, it is necessary to use special equipment. Mere furnace heating would not be sufficient. Oxyacetylene equipment is now available which accomplishes the required high-heat transfer by two special features made possible through experimental development. The first feature is a specially designed flame-jet assembly which makes possible an increase in flame-jet velocities of 50 to 70 per cent above those normally used in welding. The greater flame-jet velocities cause an increase in the kinetic energy of the gas molecules in the flame impinging on the surface of the metal to be descaled, thereby increasing its transfer of heat.

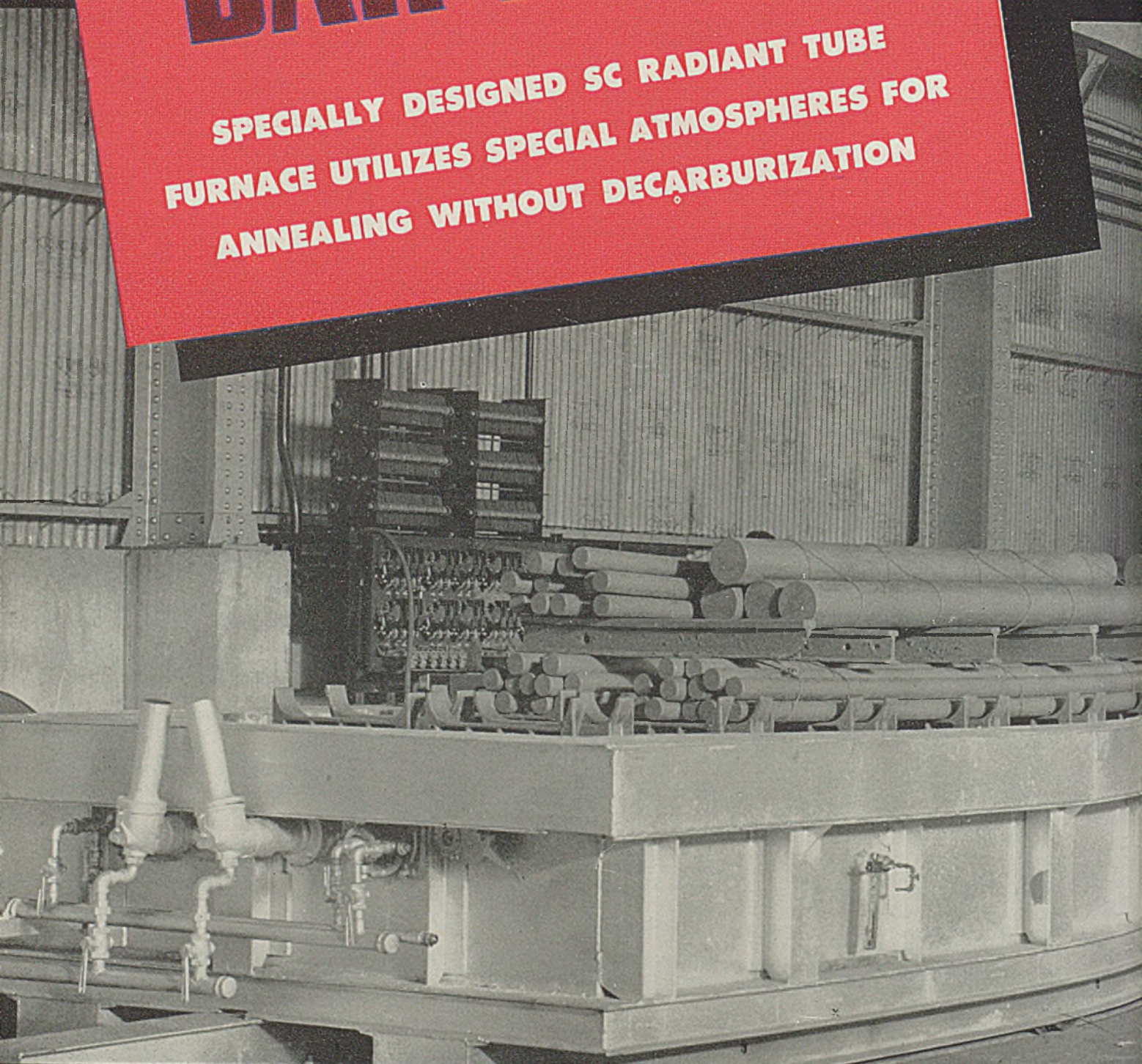
Gases Are Preheated

The other feature of this new equipment consists of a specially designed burner head which preheats the gases prior to their reaching the flame port or point of actual ignition. By means of this preheating, the resulting oxyacetylene flame attains a higher temperature than an oxyacetylene flame for which the gases are not preheated. To accomplish the preheating, the burner head is designed and positioned so as to absorb heat from the outer flame envelope, and this heat is in turn absorbed by the gases as they pass through the head.

Flame spacings and port sizes were determined by actual tests made in the steel mills with laboratory equipment which was modified many times to incorporate the operating features worked out by experiment. These specifications then were combined with numerous functional design features such as lightness in weight, portability, and ease of manipulation. For specific applications, special variations of the

STEEL MILL HEAT TREATS BAR STOCK

SPECIALLY DESIGNED SC RADIANT TUBE FURNACE UTILIZES SPECIAL ATMOSPHERES FOR ANNEALING WITHOUT DECARBURIZATION



AGAIN, Surface Combustion leads with this outstanding heat treating unit for finishing operations in the steel mill. This unit is characteristic of SC organization ability to build equipment to meet specific needs of industry.

Rods and bar stock of high and low carbon steels are being heat treated in this SC Radiant Tube Car Bottom Furnace which utilizes a Char-Mo atmosphere to prevent decarburization. Combined are the car bottom and individual lift-cover features that eliminate furnace doors and increase efficiency. The method of control that is employed makes certain that the gaseous atmosphere will be in equilibrium with the steel at all heating and cooling temperatures. All size stocks can be annealed without scale or decarburization.

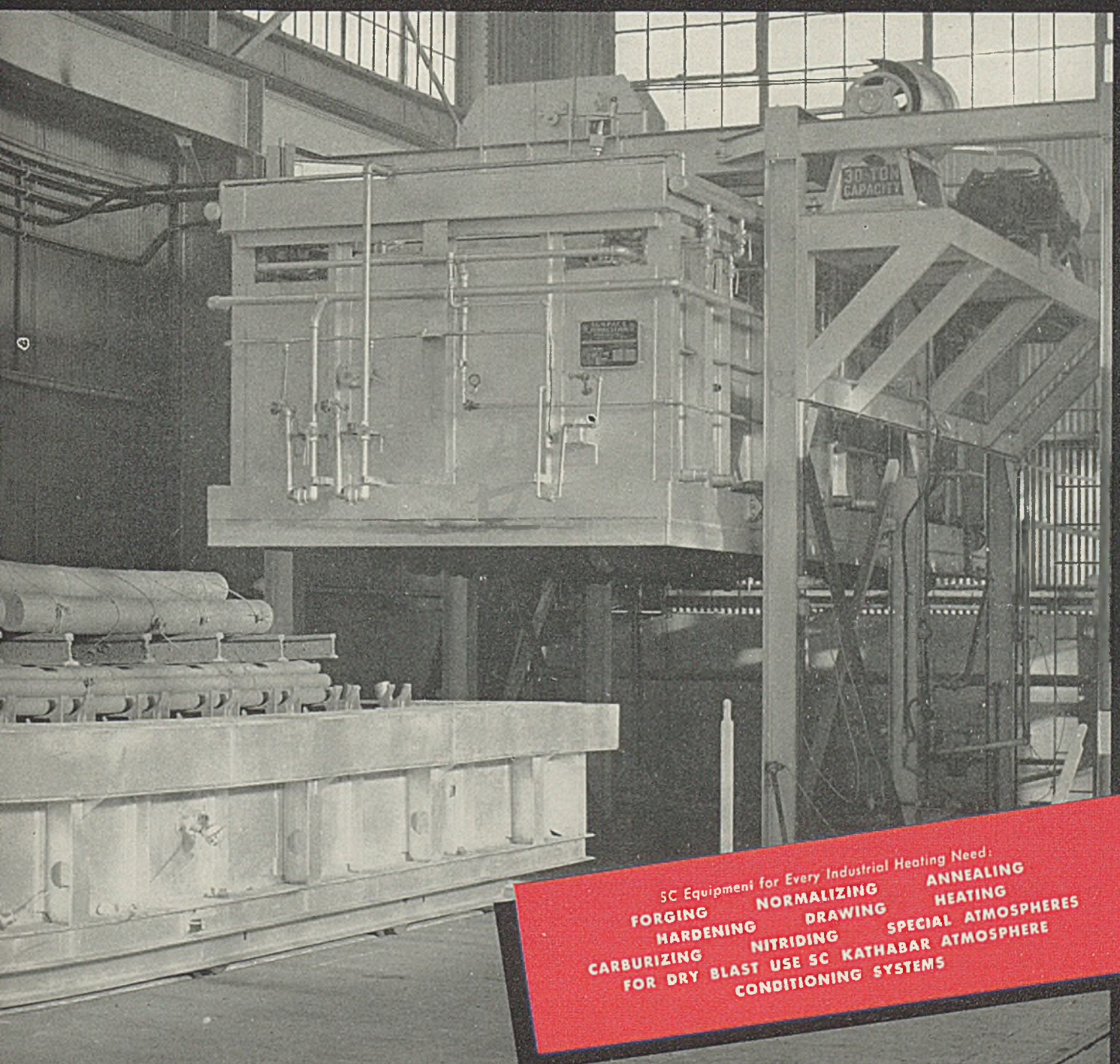
The flexibility and efficiency of use for annealing both plain and alloy steels makes this SC Steel Mill unit both practical and desirable. Whenever equipment is needed for roughing and finishing operations you can depend upon SC experience and facilities to build practical equipment to meet your need.

SURFACE COMBUSTION . . . TOLEDO, OHIO

"SECURITY FOR AMERICA"

SURFACE COMBUSTION

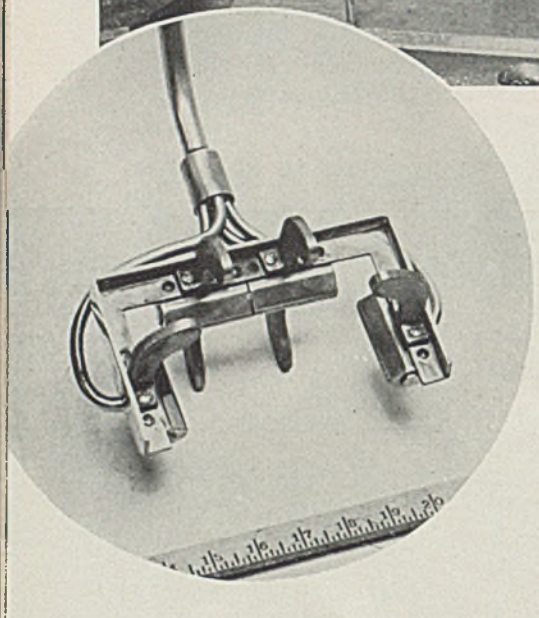
MANUFACTURERS OF INDUSTRIAL FURNACES · JANITROL GAS-FIRED SPACE HEATING EQUIPMENT · AND KATHABAR AIR CONDITIONING SYSTEMS



SC Equipment for Every Industrial Heating Need:

FORGING · NORMALIZING · ANNEALING
HARDENING · DRAWING · HEATING
CARBURIZING · NITRIDING · SPECIAL ATMOSPHERES
FOR DRY BLAST USE SC KATHABAR ATMOSPHERE CONDITIONING SYSTEMS

Upper left—Flame descaling steel plate before application of metal filler as a base for higher-luster finshes proved to be more economical and faster than sand-blasting. It can be accomplished either before or after shape-cutting and machining of the plate



Lower left—This 3-sided U-shaped descaling head was designed for flame-descaling 4-inch billets. Skids on both sides of the flames are provided so that as the operator drags it along the billet, there will be no tendency to let the handle drop, causing the sideheads to descale less than one-half of the side face

general design have been developed. Examples are toothbrush-type heads for short pipe and casting interiors; ramrod types for descaling the interior of long pipes; and 3-sided, U-shaped heads for descaling blooms and billets completely in two passes instead of the usual single pass per side. For some classes of descaling work, wheels have been added to the descaling equipment. For all types, special skids are supplied to prevent damage to the equipment and to maintain the flame at the proper distance from the work. All in all, the equipment is practically as simple in appearance as a welding blowpipe, and can be operated by anyone acquainted with oxyacetylene equipment after only simple instructions.

Machines Are Automatic

In addition to the manual operation of flame-descaling units, automatic descaling machines have been developed and appear to be highly satisfactory for descaling such items as blooms and billets, heat-treated bars, both round and hexagonal, and heat-treated pipe. In work of this sort, the material is continuously fed on roll tables to the descaling setup. The descaling equipment is mounted on a floating frame that follows the camber of the work moving through it. Provision is made for quick adjustment of the equipment to various sizes and shapes of sections being processed.

The advantages of the oxyacetylene process for scale removal are most appreciated in the light of the conditions and circumstances where the method is employed. Consequently, it seems worth while to describe a few specific applications in some detail.

A company engaged in the manufacture of high-alloy steels has discovered that flame-descaling solves a perplexing problem. It so happens that the alloys are extremely hot-short and tend to tear in rolling. Their successful manufacture is dependent to a large extent on a large amount of conditioning. The scale on these steels is so heavy that it is impossible to get a start for flame-scarfing with the starting rod. Consequently, the materials first are descaled and then scarfed. Descaling speeds are 4 to 5 inches per minute for this work.

Another company also has found that flame-descaling solves a difficult manufacturing problem—namely, economical and speedy removal of mill scale from steel plate of 1 to 3-inch thickness before application of metal filler which forms the smooth base for high-luster finishes, such as on machine tools. Previously these plates, which are cut to size and shape by oxyacetylene machine-cutting, and are used in the fabrication by welding of heavy machine bases, were ground down to shiny metal. This grinding, however, was a costly and laborious task because the last rolling of this plate at the steel mill is done at relatively low temperatures, resulting in formation of an extremely hard, dense and tightly bonded scale that quickly wears down the toughest grinding wheels and can be removed by abrasion only slowly. After grinding, the plate surfaces normally were covered in spots with deep grinding marks which required additional expensive processing if they were not to be visible through the finished paint covering.

It was found that no grinding was necessary if the scale was first removed from these plates by oxyacetylene flame-descaling. The descaled metal needed only to be given a buffing with emery paper to render the surfaces sufficiently clean and shiny, and ready to take the metallic filler. The combined operation of flame-descaling and buffing requires only one-tenth the time previously required by the grinding method. The descaling work is now progressing at a rate of 8 to 12 feet per minute, which is slower than normal descaling speeds because of the "worked in," well-bonded condition of the scale, but the net savings in cost of fabricating these machine bases resulting from this application of descaling have been large.

Offers Many Advantages

This same company found other advantages resulting from flame-descaling which are worth considering. In the first place, working conditions are far more pleasant than when grinding was employed, for the discomfort and respiratory irritation caused by the flying sparks, and particles of scale, dust and sand thrown off from the grinding wheels are avoided. Furthermore, since flame-descaling is so efficient and speedy, it can be done at any time between arrival of the plate from the mill and painting of the fabricated base, while grinding must always be done after the shape-cutting, since it would be uneconomical to grind any part of the metal not to be painted. Hence the removal of scale by the oxyacetylene flame can be carried on more or less independently of the other operations, thus eliminating congestion of work at the point of fabrication. Another important advantage is that flame-descaling entire plates before shape-cutting results in improved quality of cuts, because when heavily scaled material is cut, considerable quantities of molten iron oxide are apt to develop at the point of cutting and slide down into the kerf, preventing smooth, even cuts.

(Concluded in Next Week's Issue)

AVAILABLE FOR IMMEDIATE SHIPMENTS

STAINLESS STEEL

at the Lowest Market Prices

Government restrictions and limitations resulted in certain overstocks of Stainless Steel in Standard Coils, Finish #2-B, that we are offering for sale as listed below.

ALL PRICES ARE F.O.B. CARS, OUR LOADING PLATFORM, AS SHOWN BELOW

These items are F.O.B. our loading platform, Chicago, Ill.

STAINLESS STEEL IN STANDARD COILS—FINISH #2-B

Size	Pounds	Chrome Content	Type
.018 x 2 5/8"	2,883	11–14%	#410
.020 x 3 1/8"	9,109	11–14%	#410
.024 x 1 1/4"	11,777	11–14%	#430
.012 x 2 1/4"	654	14–18%	#430
.017 x 4 5/16"	32,453	14–18%	#430
.018 x 3/4"	519	14–18%	#430
.018 x 2 1/4"	7,189	14–18%	#430
.018 x 2 3/4"	3,264	14–18%	#430
.025 x 4 1/2"	17,007	14–18%	#430
.028 x 5/16"	15,280	14–18%	#430
.035 x 3 5/8"	12,296	14–18%	#430
.040 x 4 1/16"	5,610	14–18%	#430
.080 x 13/16"	12,257	14–18%	#430

These items are F.O.B. our loading platform, Chicago, Ill.

STAINLESS STEEL ROUND WIRE IN STANDARD COILS

Cold Drawn Finish

Size	Pounds	Chrome Content	Type
1/4"	26,333	14–18%	#430
#8	21,875	14–18%	#430

These items are F.O.B. our loading platform, Geneva, N.Y.

STAINLESS STEEL IN STANDARD COILS—FINISH #2-B

Size	Pounds	Chrome Content	Type
.025 x 1 3/16"	9,927	14–18%	#410
.030 x 1 3/8"	69,311	16–17%	#440
.033 x 1 3/8"	14,175	16–17%	#440
.035 x 1 3/8"	53,511	16–17%	#440
.033 x 1 9/16"	19,977	16–17%	#440
.035 x 1 9/16"	34,349	16–17%	#440
.033 x 1 7/8"	31,470	16–17%	#440
.035 x 1 7/8"	73,083	16–17%	#440
.033 x 2 1/4"	42,442	16–17%	#440
.035 x 2 1/4"	8,109	16–17%	#440
.033 x 2 1/2"	29,447	16–17%	#440
.035 x 2 1/2"	43,302	16–17%	#440
.046 x 1 1/2"	15,882	16–17%	#440
.046 x 1 7/8"	6,871	16–17%	#440
.049 x 1 7/8"	2,990	16–17%	#440
.054 x 2 1/4"	11,536	16–17%	#440
.058 x 2 1/4"	9,675	16–17%	#440
.054 x 2 1/2"	43,572	16–17%	#440
.058 x 2 1/2"	9,419	16–17%	#440
.054 x 2 7/8"	5,579	16–17%	#440
.058 x 2 7/8"	20,325	16–17%	#440

All purchases of the above materials must be in accordance with W. P. B. orders that govern disposition of this material

This material is offered subject to all Government regulations applying to its sale. Items are offered subject to prior sale.

Write, Call or Wire Purchasing Dept., Berkshire 6000

EDWARD KATZINGER COMPANY • 1949 N. Cicero Avenue • Chicago, Illinois

How To Operate A Porcelain Enamel Plant at PEAK PRODUCTION

. . . . and most efficiently utilize all production facilities without allowing costs to get out of hand involves principles that can be applied to up production in many different types of processing operations. Control work is one of the most important factors

(*Concluded From May 18 Issue*)

SINCE equipment is vital to any successful operation, proper maintenance of it is essential. If equipment is permitted to deteriorate and break down during high production, costs are not counted in repair work alone since the lost production is the all-important item. This means that much more money than necessary can easily be spent on the yearly maintenance budget.

One plan to eliminate breakdown maintenance is to list all vital parts of the plant and have maintenance men submit regularly a written checkup on them in order to anticipate any weak points and make arrangements for replacement parts. This should function similarly to control work on enamels and will save many hours of breakdown time.

It has been found necessary in plants working 24 hours a day to work out a maintenance program whereby each piece of equipment is shut down for the shortest possible time at regular intervals for a thorough checkup without interfering with the flow of production in the plant. This helps prevent breakdowns, though probably it will not entirely eliminate them. Shift foremen may be held responsible for the condition of equipment on their shifts and a form may be furnished them on which to report daily the necessity of any equipment repair or maintenance.

Under present conditions of restricted supply and priorities, it is difficult to keep a furnace tooled properly. One plant has solved this problem by carefully saving all alloy tools as they are broken and recasting its own tools. Of course these tools are not as good as those formerly available from outside sources, but they serve to fill the gap until such time as a more plentiful supply is available.

Furnace wrecks are sometimes a source of delayed production and scrapped material. This item can be reduced amazingly by analyzing each and every wreck for the direct cause and then taking necessary steps to correct the cause. Sometimes it is necessary to correct existing facilities or install additional equipment. A written report on each wreck will aid in correcting sources of wrecks.

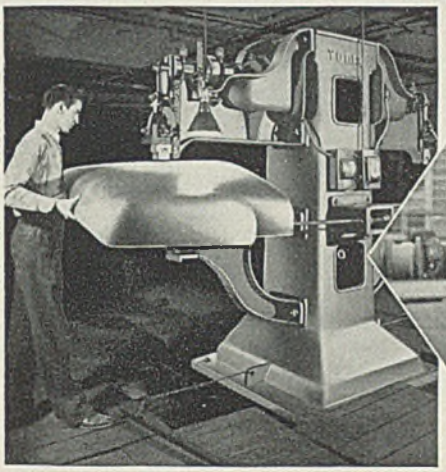
Personnel: The value of successful labor relations is forcibly brought out during peak periods. This is a time when a supervisor must depend on labor to the highest degree. Production depends on each operator's doing his job right. Dissatisfied and disgruntled employes can make life miserable for supervision. It is well to allot a specified amount of time each day to circulating among the workers, talking over personal and shop problems. Detailed explanations to operators as to why certain things must be done is well repaid by better workmanship. Full co-operation from all assistants and group leaders is necessary to help minimize rework and scrap losses as well as to speed processing operations.

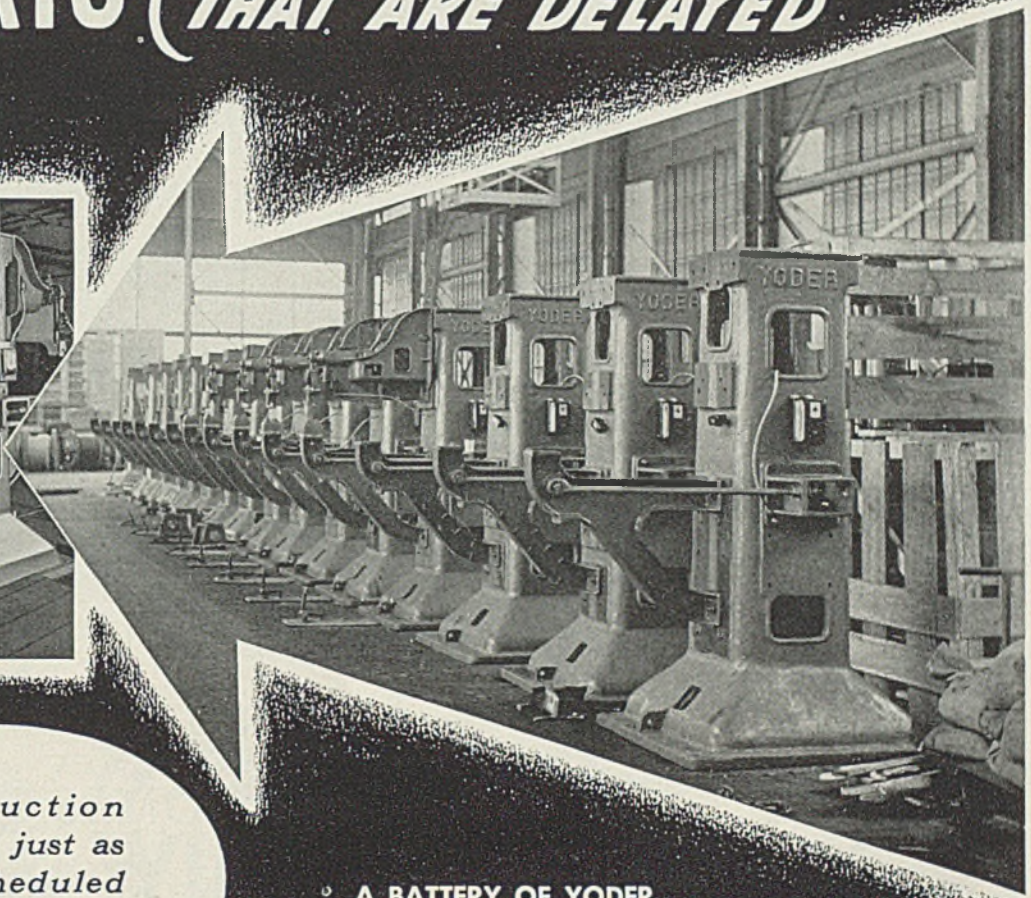
An important problem facing a plant expanding to full-time operation is that of increase in the working personnel of the plant. Formerly hiring new emoloyes was apt to be a rather haphazard procedure, but now it has become advisable to learn a little more about the ap-

(*Please turn to Page 107*)

Abstracted from a symposium at the Sixth Annual Forum of the Porcelain Enamel Institute, Columbus, O., October 1941. Papers were by Clifford Andrews, McCray Refrigerator Co.; Allen E. Apple, Sunbeam Electric Co.; Paul Gerdes, A. J. Lindeman & Hoverson Co.; L. E. Nordholt, Tennessee Enamel Mfg. Co.; F. W. Rozene, American Stove Co.; L. K. Sosey, Seeger Refrigerator Co.

For PARTS { THAT ARE HARD TO GET • THAT ARE DELAYED





★ *A production "chain" is just as near a scheduled performance as it's weakest link.*

A BATTERY OF YODER POWER HAMMERS BEING ASSEMBLED . . .

SHAPE THEM WITH A YODER POWER HAMMER . . . .

WHEN you have flat sheets of dural aircraft stock that must be formed into a variety of shapes . . . .

WHEN it would be a considerable effort to "set-up" for the production of a comparatively few parts . . . .

WHEN the other fellow; over whom you have little control, fails on his promise . . . . .

WE will be proud of our *Yoder Power Hammer's performance.*

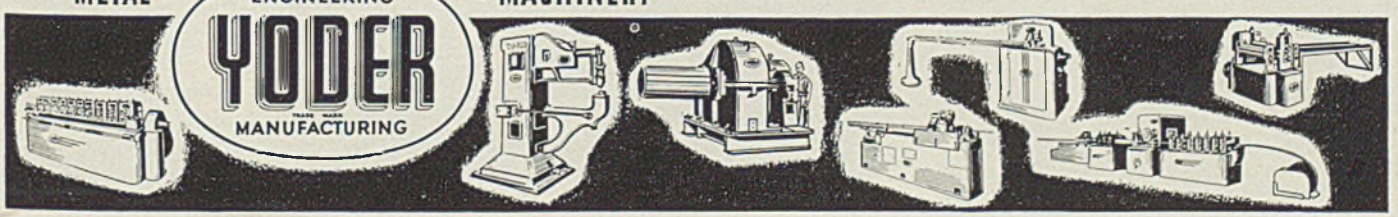
THEY have done it before and can do it again . . . . . for you.

THE YODER COMPANY
5500 Walworth Ave.
CLEVELAND, OHIO

★ *You get the improvements first from YODER* ★

METAL • FORMING • PRODUCTION • MACHINERY ENGINEERING

YODER MANUFACTURING



MECHANICAL HANDLING DEVICES

Speed Cleaning of

SHELL and BOMBS

THOSE HUNDREDS and thousands of shell and demolition bombs we have in store for the Axis powers require special handling nowadays—special handling not only via "air delivery", but also by the huge shell and bomb "infantry" of the United States industrial army.

To the industrial "infantry", special handling means skillful use of such "weapons" as conveyors, overhead cranes and hoists, industrial trucks, tote boxes and other media in order that vital parts on the production line reach the right place at the right time, so the missiles we have in store for our enemies are assembled in the shortest time possible.

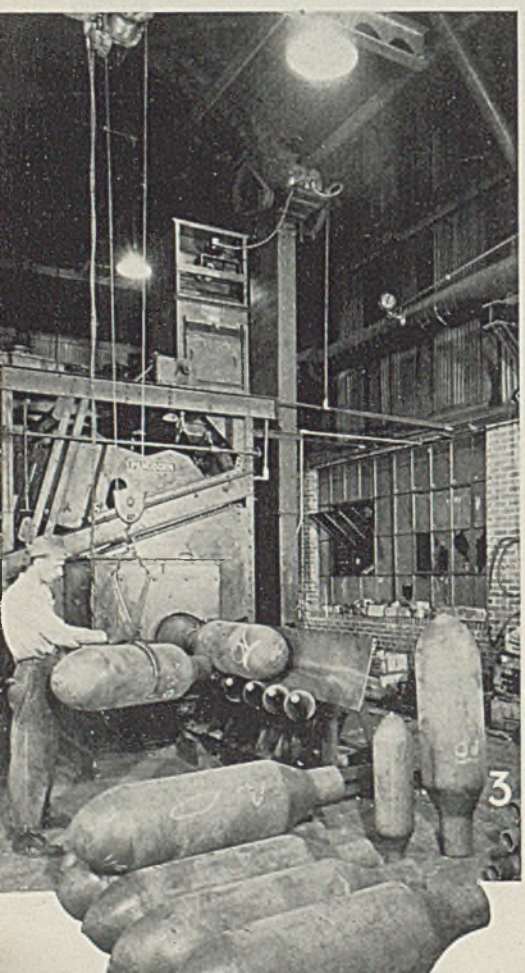


Fig. 1—Blast tank in which steel abrasive is mixed with compressed air under such force as to clean the interior of the bomb shown in the revolving chuck at its right

Fig. 2—Bomb being picked up by a circular lift before being placed into the revolving chuck at its right where another bomb is being picked up by its nose by another hoist running on the same overhead rail

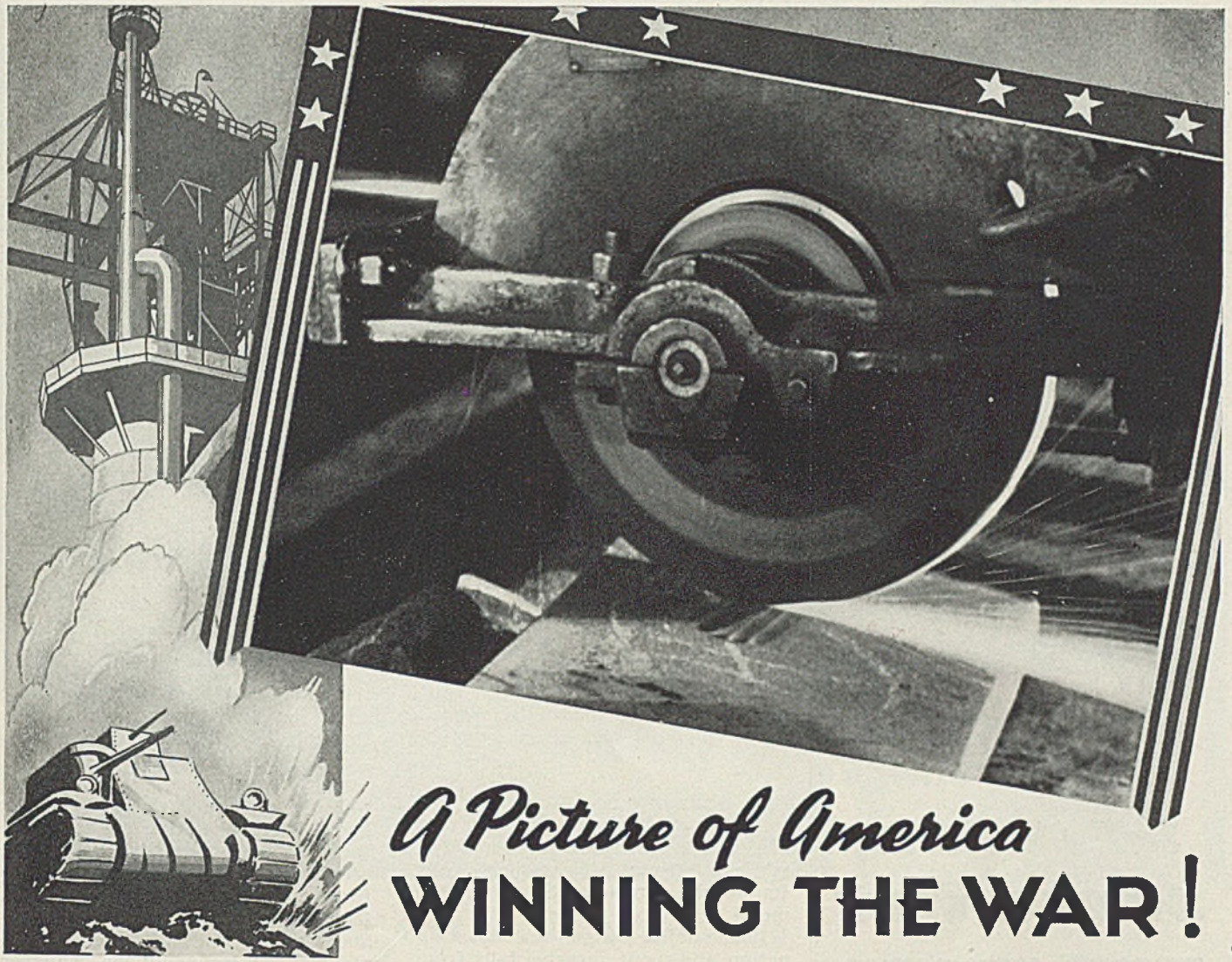
Fig. 3—Here 500-pound bombs are emerging from their final cleaning operation where all dirt and scale is removed from their exterior surfaces. Note how the one bomb emerging from the cleaning machine is pushing the one before it on the special handling device

Some of the accompanying illustrations show just how effectively these industrial "weapons" or conveyors and overhead hoists are being used in the hands of our factory "minute men", and also how automatic mechanical operations are speeding up the production of shell and bombs.

Fig. 1 shows some of the industrial "privates" manning one section of a production line used for cleaning 500-pound demolition bombs.

At this point, the line consists of an overhead hoist traveling on a circular track, positioned to serve the Pangborn blast cleaning machine at its left. The view also shows the machine's blast tank at the left of the worker in the foreground, in which steel abrasive is mixed with compressed air in such a manner that it is carried under a force of approximately 90 pounds per square inch to the nozzle outlets.

The duties of the war workers on this line consist of placing heavy bombs, which already have been annealed and chilled, nose-up in the revolving chuck, better seen in Fig. 2. They first pick up the bomb by means of a circular lift. This



A Picture of America WINNING THE WAR!

THE war is being won in the steel mills--at the blast furnaces, the rolling mills, in the billet grinding departments! Anything that speeds up production, speeds up the winning of the war. That is why the billet grinding wheels you use are important in today's victory effort . . why we suggest you check all of your grinding wheels today!

There are tool sharpening wheels, tool grinding wheels, weld-grinding wheels, surface grinding wheels for tool bits . . all of which play just as important part in the production schedule as the billet grinding wheel shown above. Sterling has a wheel for every steel mill operation, and carries complete stocks in its own and distributors' warehouses all over the country.

Do you have the 80-page Sterling Catalog No. 42? It is an important book for wartime grinding you will be glad to have near at hand. Ask for it today.

Fitting the grinding wheel to your job is the function of a Sterling engineer. He is backed by years of experience in the leading steel mills to recommend the correct Sterling Grinding Wheel for your victory production. Have the Sterling engineer check the wheels you are now using for lasting qualities and speedy performance . . it will hasten the day of victory!

• STERLING ABRASIVES •

THE STERLING GRINDING WHEEL DIVISION
OF THE CLEVELAND QUARRIES COMPANY
TIFFIN, OHIO

THE WHEELS OF INDUSTRY

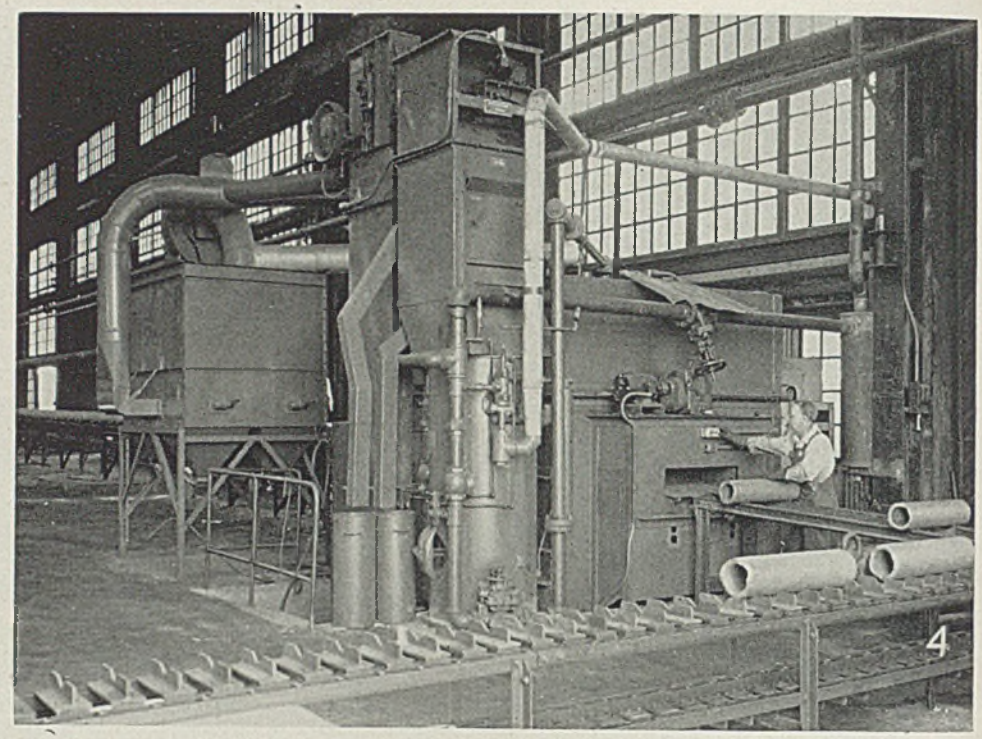


Fig. 4—Discharge end of a Pangborn automatic shell-cleaning machine ejecting shell which have been cleaned both internally and externally

then transports the bomb over and into the cleaning chuck. Once in the chuck, the bomb is revolved while a stream of abrasive cleans its inside surfaces down to the metal.

Incidentally, after the blasting action, the spent abrasive falls from the bottom of the bomb into a hopper with a conveyor trough, where it is picked up by a series of elevator buckets and lifted to the Pangborn separator. In the separator the abrasive is cleaned of scale and dust. The cleaned abrasive then flows to a storage bin where it is ready for the next cleaning cycle.

In examining Fig. 2, one can see two overhead hoists, the second being used to lift the bomb by its nose, placing it in such a position that it can be picked up by another overhead traveling hoist and delivered to the next operation.

Fig. 3 shows some of the 500-pound bombs emerging from their final cleaning operation where all scale and dirt from their exterior surface is removed. The worker here, with the aid of an overhead hoist equipped with a tong-like grab, is stacking the bombs for the next handling procedure.

The equipment in Fig. 4 represents the discharge end of a shell-cleaning installation now operating in a large eastern plant turning out 155-millimeter shell. This unit, with its unit-type dust collector, accepts the continuous run of shell from the conveyor system and blast cleans the outside and interior walls of the shell as they pass mechanically through it. All abrasive here is removed from the shell automatically by an inverting mechanism which raises each one back to discharge level where they are ejected from the machine and picked up by the take-away conveyor. Note the uniform appearance of the shell—free from scale, burned sand and dirt—and also the method used to hold the round missiles on the conveyor to keep them from rolling.

WPB Booklet Explains Principles of Costs

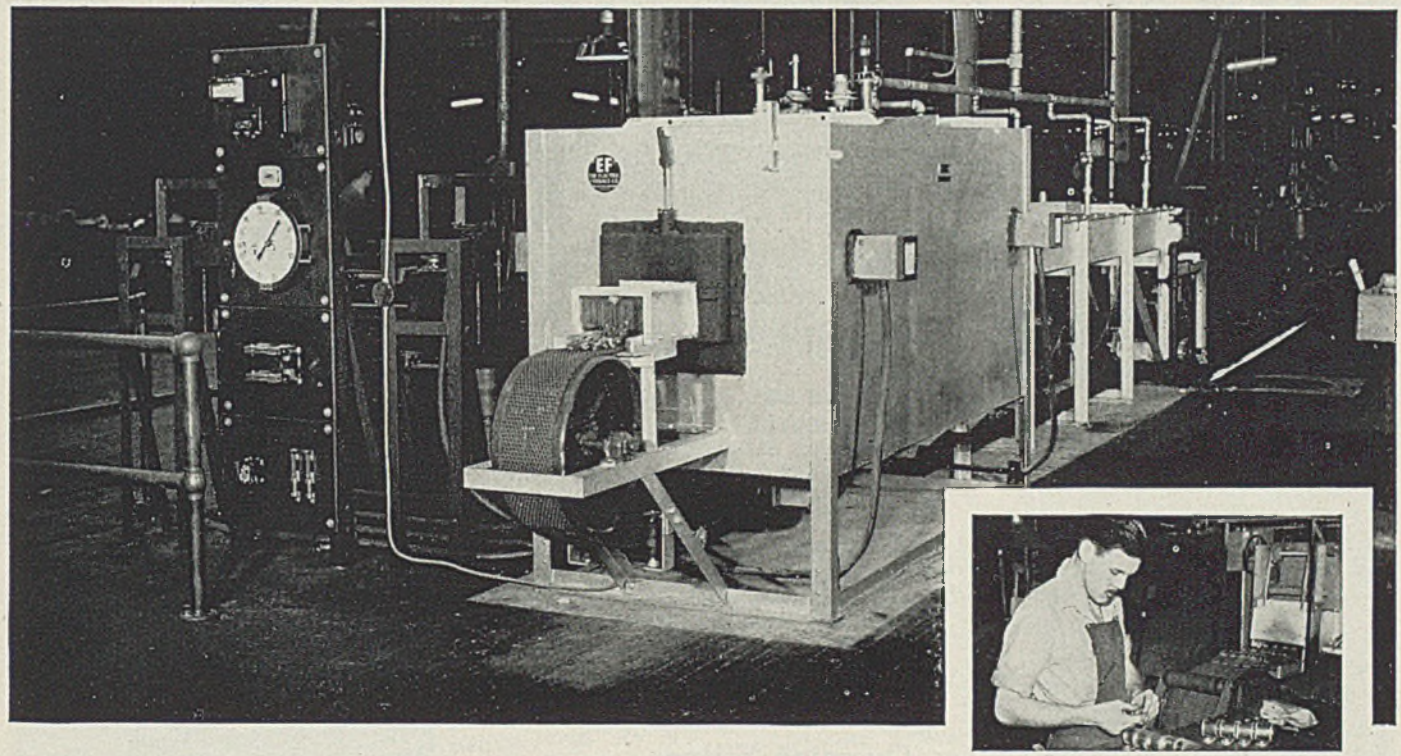
A handbook which explains principles for determining costs under government contracts was released recently by the Accounting Advisory Branch of the War Production Board, Washington.

For some time costs under government contracts have been based on a decision of the treasury originally issued to carry out the profit limitation provisions of the former Vinson-Trammell act. This decision, known as TD 5000, is regarded by government departments as the most satisfactory existing definition of costs. The booklet being issued is not a revision or an interpretation of TD 5000 but explains the principles of costs as covered by TD 5000.

The booklet was prepared under the direction of Eric A. Camman, chief, and Maurice E. Peloubet, assistant chief, of the Accounting Advisory Branch of the WPB. Copies can be obtained from the superintendent of documents, Government Printing Office, for 10 cents each.

EF FURNACES

For Every Industrial Heat Treating Process



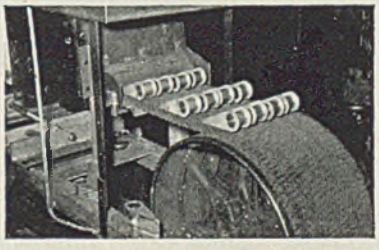
The operator assembles the parts and places them on the furnace conveyors.

MISCELLANEOUS STEEL ASSEMBLIES ARE JOINED

60 to 75% faster at 1/4 the former labor cost by the Copper Brazing Process

"Greatly improved results—neater, stronger joints—60 to 75% faster, at about one quarter the former labor cost," that briefly is the report received from the manager of a prominent midwestern plant after installing the above EF continuous copper brazing furnace for joining some of their steel assemblies.

Within a month after installing their first brazing furnace, a second similar but larger furnace was ordered for joining other products—the illustration at right below shows both furnaces operating side by side, joining all kinds of assemblies,—large and small—neatly, economically and securely.

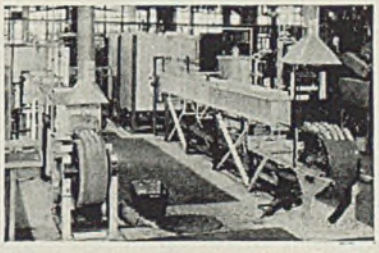


The assemblies are discharged at the other end... all units securely and neatly joined.

Products difficult or expensive to make in one piece can be made in several pieces and joined—thus not only reducing the cost but actually improving the quality and appearance. Products requiring several stampings joined or requiring screw machine parts, forgings and stampings to complete the unit, can be neatly and economically joined right in the production line in your shop.

Any number of joints in the same product or any number of pieces can be joined at one time. The most intricate parts or assemblies are made to actually "grow together," and joints made which are as strong, or even stronger than the original parts. On some parts it is possible to anneal and braze in one operation.

Investigate the brazing process for your products. With slight changes in design you may be able to join your metal parts, neater, cheaper and stronger by this method.



The satisfactory results from the first furnace at left sold the larger furnace at right.

Send for printed matter showing this and other types of EF furnaces.

Investigate the Copper Brazing Process For Joining Your Metal Parts.

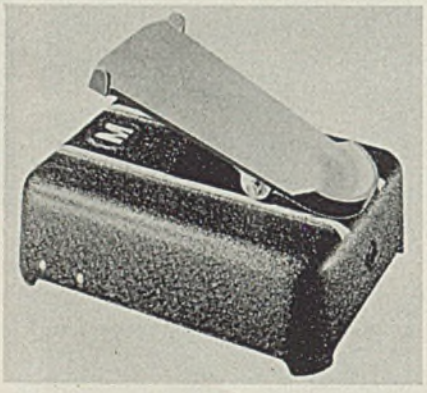
The Electric Furnace Co., Salem, Ohio

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

Industrial Equipment

Welding Controller

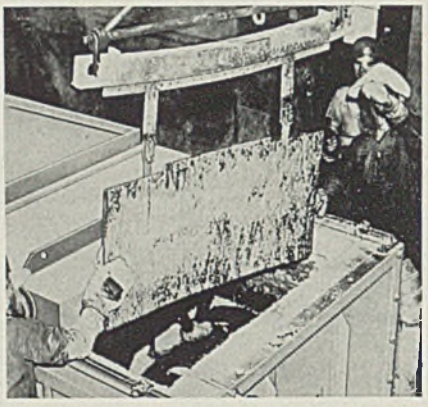
Mullenbach Electrical Mfg. Co., 2300 East Twenty-seventh street, Los Angeles, is offering manufacturers a new direct-current arc welder control which features a resistance unit especially designed to match the saturation curve of the welding machine to which it is applied. Foot-operated, the unit known as the Arctrol, regulates generator output from full-rated current down to snuffing it out completely. Use of the unit is said to eliminate the formation of gas or slag pockets in



the weld puddle. Besides this crater elimination feature, the unit enables operator to adjust the current for different welding positions and thicknesses of metal. Control consists of a 4 x 9 x 12-foot case, auto-type pedal and resistance unit. Connection to the welder is made by a rubber cord and suitable plug which is provided with each unit.

Carburizing Furnace

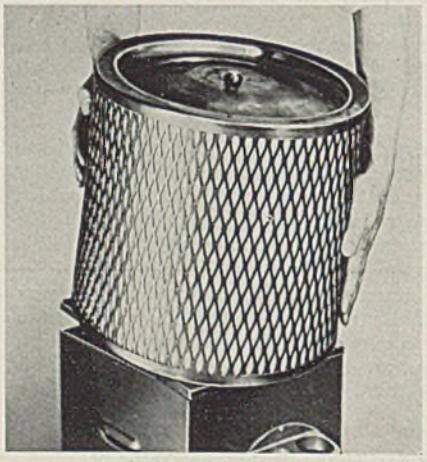
Ajax Electric Co. Inc., Frankford avenue at Delaware, Philadelphia, has developed a new deep-case carburizing furnace which does away with former limitations, set at approximately 0.050-inch case depth. The development is said to produce case depths up to ⅛-inch. It also permits quenching directly from the bath, or transfer to baths maintained at quenching temperature. The process known as "deep-case" carburizing is applicable to tank gears, armor plate, splines, cams, transmission parts and other components requiring heavily carburized cases. Utilizing the electromagnetic effect between pairs of closely-spaced electrodes, thus heating while simultaneously circulating the cyanide salts, the new furnace holds temperatures unvarying by 5 degrees at approximately 1750 degrees Fahr. as required in the new deep-case operation. The furnaces come



equipped with round or rectangular pots, automatic temperature controls and step-down transformers. Sizes range from 35 to 750 kilowatts rating, with pots from 10-inch diameter to 20 feet in length for deep-case carburizing large plate sections and shafts. As shown in the accompanying illustration, the furnaces feature roller type covers which prevent radiation losses between cycles of immersion and removal of charges.

Oversize Filter

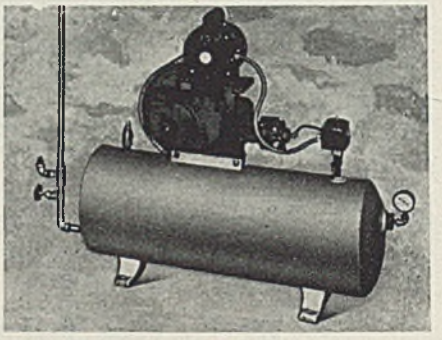
Aget-Detroit Mfg. Co., Book Tower, Detroit, announces a new cylindrical type oversize filter to increase the range of uses of its standard model self-contained dust collector. It is offered as a complete unit that can be fitted on without use of tools. The filter is small enough to obviate any increase in



floor space required. Faster and easier removal of the dust collecting pan, proportionately longer filter life, and an increase of approximately 1500 feet per minute air speed velocity without change in fan or motor are other advantages of the filter. The ¾-inch thickness of spun glass filter material of the filter is held between an inner and outer shell of heavy gage expanded metal. A rod holds the cap and the base plate tightly against the open ends of the shells to seal them. Dust-laden air drawn in through the intake from the grinder enters the cylindrical filter through the base plate. When separated the dust drops back into the collecting pan, permitting the clean air to pass through the filter and back into the room.

Chemical Sprinkler

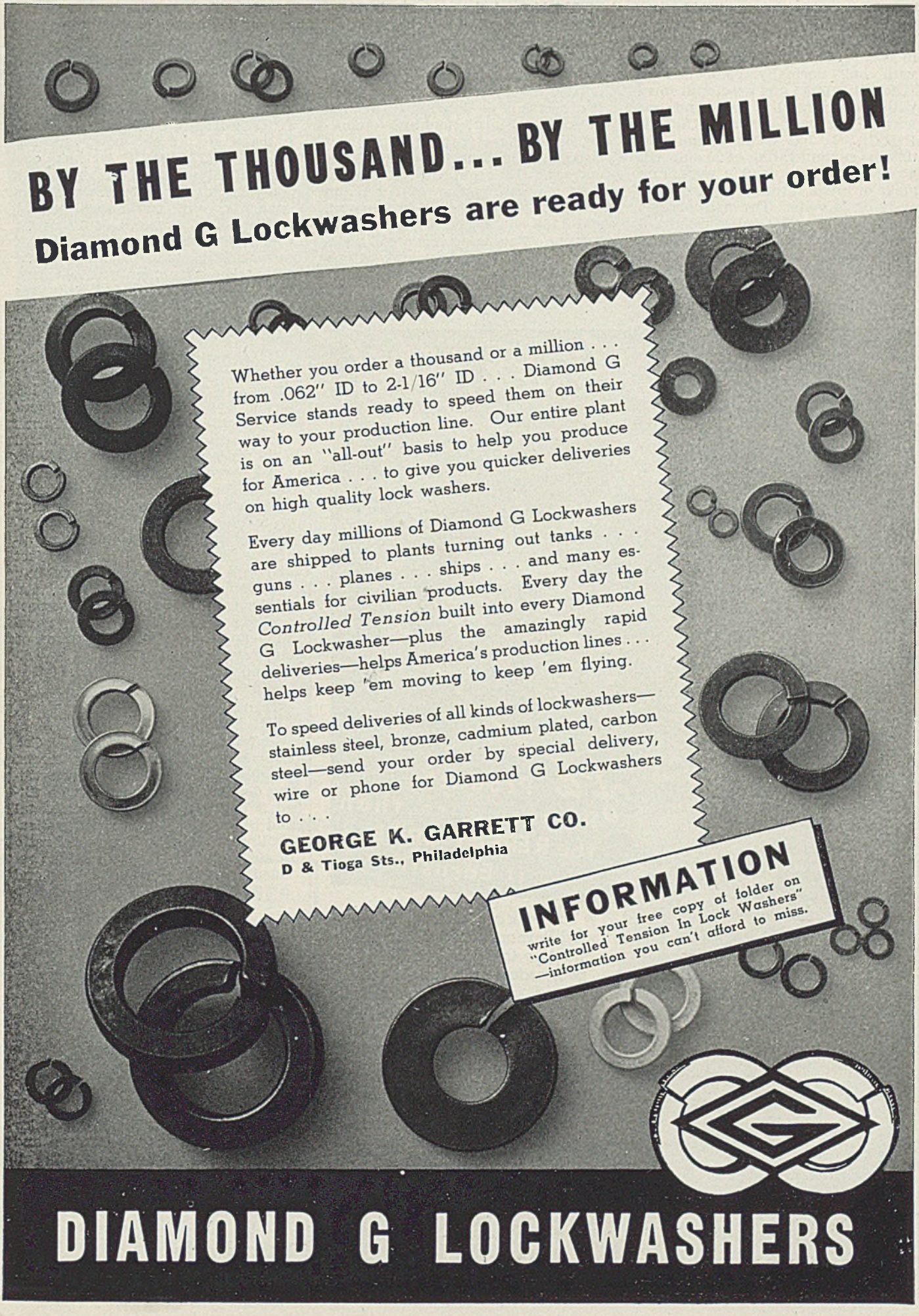
Bancroft Chemical Sprinkler Co., 82 Foster street, Worcester, Mass., announces a new automatic chemical sprinkler designed particularly to extinguish fires at or near furnaces, boilers, oil-burners and hazardous spots in factories. Its operating principle is similar to the standard water-sprinkler system, except that a chemical fire-extinguisher liquid instead of water is used. The liquid, a patented formula, is more effective than water in extinguishing fires, and it is said to be



capable of extinguishing magnesium fires. Air compressor of the system maintains a constant pressure on the extinguishing liquid in the tank and pipe-line by means of a pressure switch controlling the electric motor. In event of fire, heat from the flames melts the fuse-link, causing the sprinkler head to open, thereby permitting the extinguishing liquid, under pressure, to be sprayed upon the fire. Immediately upon contact with the flame or heat, the extinguishing liquid vaporizes forming a heavy blanket of vapor which consumes the heat, displaces the air and stops combustion. Tests have resulted in fires being extinguished in 60 seconds or less, according to the company.

New Relays for Aircraft Service

General Electric Co., Schenectady, N. Y., announces three new relays designed especially for aircraft applications. Consisting of a high-voltage relay, two single-pole relays, two 2-pole and two 3-pole relays,


BY THE THOUSAND... BY THE MILLION
Diamond G Lockwashers are ready for your order!
Whether you order a thousand or a million . . . from .062" ID to 2-1/16" ID . . . Diamond G Service stands ready to speed them on their way to your production line. Our entire plant is on an "all-out" basis to help you produce for America . . . to give you quicker deliveries on high quality lock washers.
Every day millions of Diamond G Lockwashers are shipped to plants turning out tanks . . . guns . . . planes . . . ships . . . and many essentials for civilian products. Every day the *Controlled Tension* built into every Diamond G Lockwasher—plus the amazingly rapid deliveries—helps America's production lines . . . helps keep 'em moving to keep 'em flying.
To speed deliveries of all kinds of lockwashers—stainless steel, bronze, cadmium plated, carbon steel—send your order by special delivery, wire or phone for Diamond G Lockwashers to . . .
GEORGE K. GARRETT CO.
D & Tioga Sts., Philadelphia
INFORMATION
write for your free copy of folder on "Controlled Tension In Lock Washers" —information you can't afford to miss.
DIAMOND G LOCKWASHERS

these units also are applicable to tank installations.

The single-pole relay is available in two forms—a single-circuit form with one normally open contact (CR2791-B100A) and a 2-circuit form with one normally open and one normally closed contact (CR2791-B100C). It has a maximum continuous current rating of 20 amperes at 12 or 24 volts, and a maximum make or break rating of 100 amperes at 12 or 24 volts. The coil operates at 1.2 watts. The relay weighs 3 ounces in the normally open form, and 3.4 ounces in the normally open, normally closed form. Tip travel is 1/32-inch and tip pressure is 40 grams. The relay is 1¾ inches wide, 1⅝ inches deep and 1 5/6 inches high.

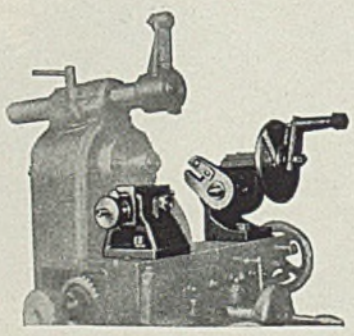
The high-voltage relay (CR2791-D100F) is for use with aircraft radio transmitting equipment. The use of ceramic insulation and double-break contacts permits control of circuits as high as 1000 volts direct current. The contacts have maximum current ratings of 0.020 ampere at 1000 volts direct current, and 0.100 ampere at 500 volts direct current. This relay has a coil wattage of 1.2, a tip travel of 1/16-inch double break and a tip pressure of 25 grams. The contacts are arranged for double-pole double-throw double-break operation. The relay is 2 5/16 inches wide, 1 1/16 inches deep and 1 1/16 inches high.

The 2 and 3-pole relays are provided in two forms. One form (CR2791-B100D, G) has one normally open circuit per pole, and the other (CR2791-B100F, J) has one normally open and one normally closed circuit per pole. These relays have maximum continuous current ratings of 8 amperes at 12 or 24 volts, and maximum make or break ratings of 25 amperes at 12 or 24 volts. The coils operate at 1.2 watts. Both 2-pole forms are 1 25/32 inches wide, 1¾ inches deep, 1 21/32-inches high, and weigh 3.5 ounces. The 3-pole forms are 1 25/32 inches wide, 1¾ inches deep, 1 21/32 inches high and weigh 3.75 ounces. The 3-pole forms are 1 25/32 inches wide, 1⅞ inches deep, 1 21/32 inches high, and weigh 3.75 ounces. All four forms have a tip travel of 1/32-inch and a tip pressure of 28 grams.

All three of these relays are designed for use in a wide range of ambient temperature—from minus 40 to plus 95 Cent. They are suitable for use at rated current at altitudes from sea level to 40,000 feet and are corrosion-proof, meeting the Navy 200-hour salt-spray tests. The contacts remain in the correct position even when the relays are subjected to a linear acceleration of ten times gravity (10G) in any direction.

Tilting Dividing Head

Jefferson Machine Tool Co., Fourth, Cutter and Sweeney streets, Cincinnati, announces a 6-inch tilting dividing head which can be tilted 5 degrees below the horizontal and 5 degrees past the perpendicular lines. It has a worm-wheel ratio of 40:1. Spindle of the head is provided with take up collar for end



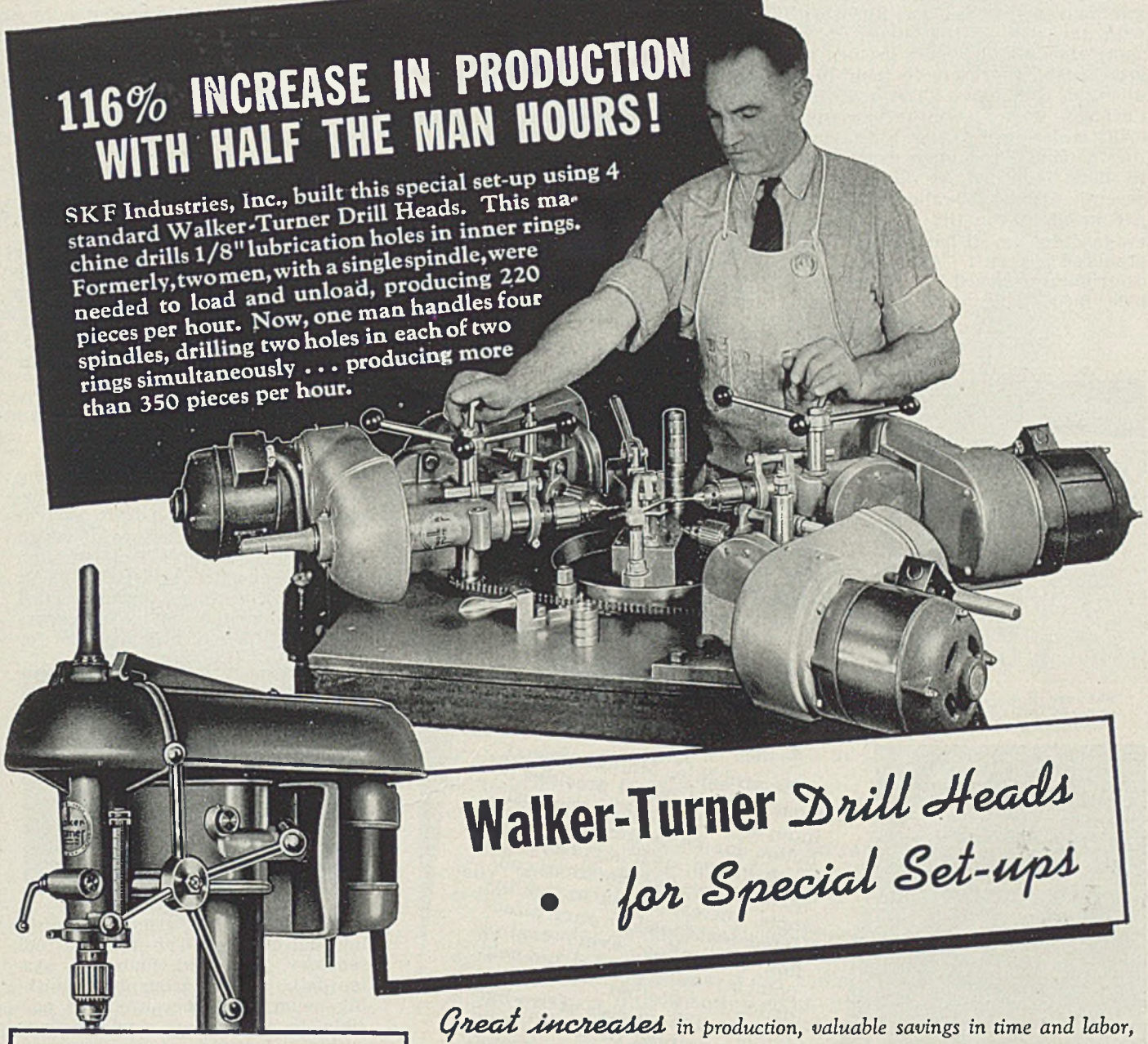
thrust on spindle. The unit includes ½-inch table T slot tongues and three indexing plates dividing all numbers to 50, and even numbers to 100. It is available for either right or left hand mount.

Gun Drills

Carboloy Co. Inc., Post Office box 239 R. Pk. A., Detroit, announces

116% INCREASE IN PRODUCTION WITH HALF THE MAN HOURS!

SKF Industries, Inc., built this special set-up using 4 standard Walker-Turner Drill Heads. This machine drills 1/8" lubrication holes in inner rings. Formerly, two men, with a single spindle, were needed to load and unload, producing 220 pieces per hour. Now, one man handles four spindles, drilling two holes in each of two rings simultaneously . . . producing more than 350 pieces per hour.



Walker-Turner Drill Heads • for Special Set-ups

CONSTRUCTION FEATURES

- One-piece head casting, precision bored to assure correct bearing alignment.
- Six-spline spindle runs on four precision ball bearings.
- Pulley straddle mounted between bearings to eliminate spindle "whip".
- O-1-2" Jacobs Chuck or adapter for No. 1 Morse Taper. Spindle travel 3—5-8".

Great increases in production, valuable savings in time and labor, are gained by using special set-ups incorporating standard Walker-Turner Drill heads.

Countless combinations are possible because these Drill Heads operate with speed and accuracy in any position—vertical, horizontal, tilted or inverted. All parts are interchangeable, permitting adaptation to practically any needs.

Walker-Turner Drill Heads are available *promptly* for plants engaged in war production. Outline your operation and our engineers will gladly assist in working out a practical tooling set-up.

Walker-Turner Co., Inc. 5062 Berckman Street *Plainfield, N. J.*

walker-Turner COMPANY, INC. PLAINFIELD, N.J. U.S.A.

WALKER-TURNER MACHINE TOOLS
FOR METAL, WOOD AND PLASTICS

DRILL PRESSES • BAND SAWS • BENCH SAWS • TILTING ARBOR SAWS • LATHES
JIG SAWS • RADIAL SAWS • RADIAL DRILLS • BELT AND DISC SURFACERS • JOINTERS
SPINDLE SHAPERS • GRINDERS • FLEXIBLE SHAFT MACHINES • CUSTOM BUILT MOTORS

new Carboloy tipped rifle drills for 30 and 50 caliber and 20 millimeter gun barrels. These are furnished with the cutting tip brazed to a short steel shank which in turn is attached by the users to their regular gun drill tubes. The grade of Carboloy selected for the new gun drills is designed to give a free-cutting action. Production experience to date indicates an average of several dozen 50-caliber barrels per grind of the tip, with an average dozen or so barrels per drill produced per shift. Another factor contributing toward life of the carbide drill, it is claimed, is that greater wear resisting qualities results in less wear on the outside diameter of the tip. Since gun drills are tapered back approximately 0.001-inch per inch of length, the entire tip may be used up in gun drilling while still holding to tolerance of about plus or minus 0.001-inch.

A further advantages of the drills is that in case of breakage the barrel may be reclaimed. The drills are designed so they may be placed in production without requiring other changes in equipment with the exception of feeds and speeds at which they are used.

Push-Back Cover for Crucible Furnaces

Stroman Furnace & Engineering Co., 10068 Franklin avenue, Franklin Park, Ill., has introduced a new push-back cover on its gas or oil fired crucible furnaces used for melting brass, bronze, aluminum and other alloys. To operate the cover, a worker need only to insert a hand-cool bar in the lift sleeve; raise the cover slightly and push it to the rear. The procedure is just the reverse in closing it. This type cover is said to allow furnaces to be placed close to each other, to eliminate the use of gloves as the operating bar is removed when not in use.

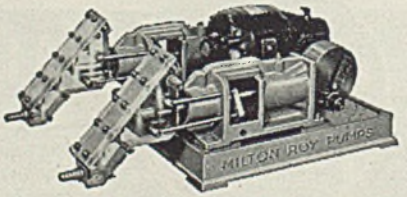
Dust Control System

Kirk & Blum Mfg. Co., Spring Grove avenue, Cincinnati, has developed a new down-draft system of dust control, a feature of which is that dust is carried off through ducts constructed under the floor. Bench-high gratings, through which air is exhausted, enable operators to handle conveniently castings for

sanding, snagging, grinding, polishing and buffing. The machine tool industry, it is said, finds this system to be advantageous in its finishing departments because it is possible to grind and sand castings within a few feet of precision machinery without setting up partitions or curtains. All dust particles are carried down through the gratings as fast as they are released.

Plastic Pump

Milton Roy Pumps, 1300 East Mermaid avenue, Philadelphia, is offering an improved model plastic pump in which the step-valve and inlet and discharge connections are made entirely from transparent

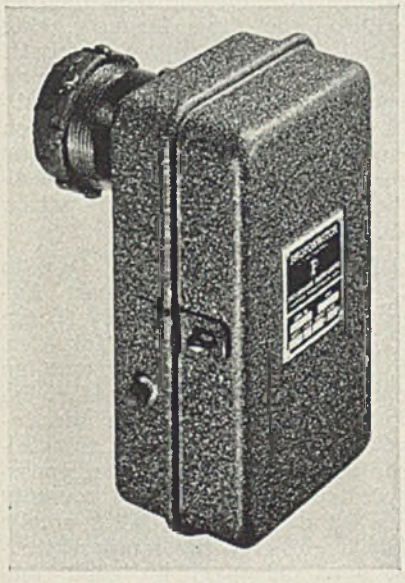


plastics. It is recommended for handling alum solutions, hypochlorites,

weak acids, mineral and animal oils and many other liquids, the Plexiglas valve being unaffected by most inorganic solutions, and by alkalis and oxidizing acids only in high concentrations. The pump has double-ball ground glass checks and adjustable stroke for control of volume from one quart per hour up to maximum capacity.

Blackout Alarm Control

Photoswitch Inc., 21 Chestnut street, Cambridge, Mass., announces a new photoelectric blackout alarm control capable of setting off a factory alarm in event of an air raid. To set off the alarm, the control is placed in a convenient location in order that its eye is trained upon a centrally controlled street lamp. It also is connected to the factory



alarm system indoors. Thus when the street lights are turned out, the alarm automatically is turned on through the control.

Metal Separator

Dings Magnetic Separator Co., 675 Smith street, Milwaukee, has developed a new special inclined portable pulley type separator which can be moved around easily in the shop. Furnished complete with a motor drive and with a motor generator set, its inclined design facilitates shoveling of material upon the endless belt at one end and to discharge it at any required height at the other end into bins and trucks.

While the machine can be used in practically every industry for removing iron from materials, it is most widely applied in foundries for cleaning foundry sand and in the metals refining industry for reclaiming and purifying nonferrous scrap. The head drive pulley used on this unit is a high intensity air-cooled electro-magnetic pulley.

Pulverized Coal

(*Continued from Page* 63)

cost of grinding the coal, labor, depreciation and maintenance of plant is about $0.70 per ton.

Burner Design: Since most industrial furnaces which can use pulverized coal successfully are operated at about 2000 degrees Fahr., radiation is the principal medium of heat transfer. A special pulverized coal burner has been designed which utilizes and enlarges this important radiation factor. It is an adjustable-angle fish-tail type. When supplied with properly conditioned pulverized coal, this burner will deliver a flame equal in heating value to fuel oil or natural gas and have all of the flexibility or controlability of either of those fuels.

This burner has been applied successfully to malleable iron melting furnaces, annealing furnaces, slag melting furnaces, copper smelters, heavy-duty forge furnaces, small forge furnaces, and would be suitable for melting steel in the open hearth. Amber, green and opaque commercial bottle glasses could also be melted with some modifications in furnace design.

Adapting the Furnace: Due to improper pulverization, most furnaces using pulverizing coal in the past, especially batch-type furnaces, required special dutch ovens or some means whereby a source of radiation was made available in the immediate area of the burner to accelerate combustion. Even then, poorly designed equipment frequently caused the furnace to belch smoke while it gathered the required thermal head necessary for good combustion.

Such conditions are no longer tolerated. With fine coal, a good burner and a reasonable burner setting, perfect combustion is now obtained. In all modern furnaces operating at high temperatures, the use of pulverized coal is not distinguishable by any outward sign. *Puluverized coal can now be burned in high-temperature furnaces in competition with any other industrial fuel where moderate ash deposits are permissible.*

There is less danger from the explosion hazard with pulverized coal than with some other fuels. The only place an explosive mixture exists today is in an 18-inch portion of the burner. Every fuel burner has an explosive mixture at some point and must be and is handled accordingly.

Provision for Ash: Proper provision for ash accumulations and their removal makes pulverized coal a very acceptable low-cost fuel. If the furnace volume is correct for other fuels, pulverized coal may be

burned without the furnace ash nuisance in the furnace building. When the coal is properly pulverized there is little ash left in the furnace for a considerable portion of the light ash particles are carried out the chimney.

Automatic Control: Of especial interest to the potential user of pulverized coal is the recent application of fully automatic control of grinding, fuel-air ratio, temperature and furnace pressure control. These ultra-modern advantages are not found in many existing pulverized coal plants, but it is of interest to know they are available. Control of the coal feed adds but one more element to what is virtually standard equipment for similar automatic systems used with gas or oil. These systems have now been in successful use for several years, and it may be said as a result of this experience that the pulverized-fuel-fired furnace can be classified as a precision heating machine.

Fig. 1 shows the general arrangement of the automatic controls for two forging furnaces for heating alloy steels with pulverized coal.

Because of the low prime cost of coal, the location of most industrial plants near coal mines and the low cost of preparation, pulverized coal is perhaps the cheapest and most dependable fuel for many purposes. Some 10,000,000 tons of pulverized coal are used to burn 99 per cent of the 24,480,704 tons of cement produced in this country annually.

In view of 25 years of experience with pulverized coal and an intimate knowledge of the technique of its successful use, the unqualified statement can be made that for most high-temperature heating and melting operations pulverized coal has all the desirable features which formerly were obtained only with gas or fuel oil. Now it adds low first cost as an advantage.

A continuous rail-heating furnace was redesigned and equipped with a unit pulverized plant and complete automatic furnace and coal feed control. This furnace, after being stopped at 3:30 p.m. on the previous day, is relighted at 7:00 a.m. the next morning and delivers steel to the mill at 7:30 a.m. Tonnage is 15 to 20 tons per hour or 80 pounds per hour per square foot of effective hearth area with a fuel rate of 2,500,000 B.t.u. in this direct-fired practice. Fuel consumption has been slightly sacrified in the design of this furnace to increase yield, reduce scale loss and eliminate the former problem of "stickers" which had caused much delay and loss of production. A fuel saving of about 1,500,000 B.t.u. was obtained after replacement of the 18-year-old coal plant and furnace.

Some months ago several extreme-

ly large modern forge furnaces were built and equipped with a pulverized coal system, including automatic controls. This installation has performed so successfully that the furnaces are now being duplicated and a mill of 12-ton capacity per hour is being added to the pulverizing facilities.

Pulverized coal can be used with success equal to other fuels from a thermal and control standpoint on all of the following heating operations: Annealing furnaces, air or malleable iron melting furnaces, bushelling heating furnaces, carwheel heating furnaces, copper anode furnaces, copper-billet heating furnaces, copper cathode furnaces, continuous billet heating furnaces, cement kilns, cement driers, drop forge furnaces, forge furnaces, lead kettles, reverberatory copper furnaces, shell furnaces, tool furnaces, nut furnaces, open hearths, pressed steel heating furnaces, roasting ore furnaces, soaking pits, rivet-making furnaces, bloom heating furnaces, batch-type heating furnaces.

New Welding Technique

(*Continued from Page 72*)

man-hours in the cleaning of the weld, but it facilitates and speeds up the entire welding operation and makes possible a smoother weld. Any number of layers of beads may be built up in this manner.

Regardless of the nature of the fillet welding—whether it be single-pass, either horizontal or positioned, or multiple pass, either horizontal or positioned—the new Fleet-Fillet technique permits welding speeds up to 100 per cent faster than conventional procedure. As a result of these increased welding speeds, the advantages of welding will be still more pronounced than they are now in the production of warships, tanks, guns, and the like for our armed forces.

The technique's full import in war production can be appreciated by considering what arc welding has already contributed to war production—even with the welding speeds heretofore available.

With arc welding, large warships are now produced in 2½ years, as compared with 4 years before the process was adopted. Welded cargo vessels of the "Ugly Duckling" type are being turned out at the rate of a vessel every 3½ days; high-speed submarine chasers at the rate of one a week.

Now the customary welding time for producing naval, military and industrial equipment can be further materially reduced by Fleet-Fillet technique, according to Lincoln. Furthermore, *the cost of welding by the new method is re-*

ported to be 33 1/3 to 50 per cent less than by usual procedure.

Penetration of the weld beyond the root, or corner, of the joint is also reported considerably better and the size of the weld is noticeably smaller, yet strength is equal. Amount of electrode per foot of joint is also materially less. In a typical instance, the new technique required 0.26-pound per foot, as against 0.37-pound by usual procedure.

It is to be remembered that Flect-Fillet welding is easy to apply and that the faster weld production, saving of electrode and reduction in welding costs can readily be obtained in all applications of fillet welding.

War Work Inspection

(*Continued from Page* 78)

ished material. They must not be taken until the inspector has marked the material for identification after final treatment in order to insure that they have undergone the same process as the material represented. No further treatment should be given test specimens after that time. When practicable, test specimens should be of full size and thickness of the material being inspected.

When a chemical analysis of articles or supplies on contracts which provide for *delivery f.o.b. works* is necessary, shipment will not be made on government bill of lading until a satisfactory report of the analysis is received by the inspector from the laboratory. An exception exists where the contract provides for a guarantee. Under contracts which provide for *delivery f.o.b. destination* the contractor may be authorized to make the shipment prior to receipt of report of chemical analysis. In this case the inspector will note that fact on the reports of material shipped and upon receipt of report of chemical analysis will notify the proper offices by letter.

Exact Weighing and Measuring Essentials: Materials must be accurately weighed and measured The measuring or weighing will be witnessed by the inspector. Standard scales must be used which must be accurate and recently calibrated. It is wise to have the inspector present at the calibration of the scales.

Inspection Earmarks Product for Delivery: Material must not be diverted to other contracts or orders or delivered elsewhere than the submission for inspection. Shipment should not be made until the inspector so directs since you otherwise risk nonacceptance at the destination.

Inspection at Factory Final: Unless specifically provided otherwise

in the contract, inspection at the factory or point of shipment is final as to quality. Material accepted f.o.b. your works must not be shipped on commercial bill of lading. No action toward shipment should be taken pending receipt of instructions with the government bill of lading.

If the contractor places orders with a subcontractor for all or any portion of the services or materials contracted for, copies of each such order must be furnished to the inspector. These orders must state all details concerning the material ordered, including the purpose for which it is used. They are considered sub-orders and must contain the number of the original contract. In case material requires special treatment other than machining after leaving the manufacturer's works, the orders must explicitly state the nature of the treatment.

Inspection at Factory May Be Waived: If not otherwise required by the contract, inspection at the place of manufacture or point of shipment may be waived and inspection made after delivery. This is done when the value of the material is small or the distance from an inspection office is great (so that the cost of inspection would be large in comparison with the value of the material), or when for other reasons inspection at destination is desirable. In this case you ship the material at your own risk, subject to inspection after delivery. Inspectors are not authorized to waive inspection of material purchased f.o.b. contractor's works without having first obtained permission from the bureau concerned. The bureau will make necessary modifying arrangements with contractors.

Inspection During Progress of Work: In the case of construction contracts the government may find it necessary to remove or tear out work already completed. If the work is found defective due to the fault of the contractor or subcontractor, the expenses of examination and satisfactory reconstruction must be borne by him. If, however, the work is found satisfactory, the contractor will be allowed, under the terms of the contract, the actual cost of labor and material involved in the examination and replacement plus 15 per cent, and will get an extension of time if the work has been delayed by the inspection.

Inspectors are maintained on each project. This insures that the provisions of the contract are observed and that materials and work are as specified. These inspectors make necessary certifications as to the contractor's right to receive installment payments during the performance of the work. Each contract

contains detailed provisions as to inspection procedure.

A list of specified materials with the manufacturer's name and address must be submitted for approval by the contractor under the general conditions accompanying proposal forms issued by the supervising architect for construction of public works. The trade name or catalogue number may also be required. The right to have the supervising architect select the materials is reserved by the government if lists are not furnished or items are not satisfactory. Material selected or approved by the supervising architect must be used in the work. Selections made by the supervising architect are binding on the contractor.

Inspection After Delivery F.O.B. Plant: In rare cases when it is impractical for articles or supplies to be inspected before shipment, and shipment as government property under a government bill of lading is desired, provision is made in the contract for the acceptance of the articles without inspection before shipment. In this event, you must guarantee to provide an inspection after delivery at destination and to accept the return of articles rejected for failure to comply with specifications. You are also required to guarantee replacement of the rejected articles at the point of destination at your own expense with satisfactory articles or supplies. If the contract contains these guarantees, shipment may be made under government bill of lading (furnished by the inspection officer or under his instructions).

If materials and supplies are to be furnished f.o.b. point of shipment and forwarded on government bill of lading, subject to final inspection and acceptance at destination, the title to the property passes to the government when delivered properly packed to the carrier, subject to the right of rejection at destination of such of the material as does not conform to specifications. Where shipments of this kind are made from the point of origin to the office making the purchase, inspection will be made immediately upon receipt at destination. The goods accepted will be taken upon the stock record account and receiving reports made. Where these shipments are made from the point of origin to a place other than the office making the purchase receiving reports will be executed by the office making the purchase after receipt of evidence of shipment.

Such evidence will normally consist of the original government bill of lading covering the shipment, showing the receipt of the carrier's agent. The office making the purchase will then mail the original bill of lading to the consignee and prepare shipping tickets transfer-

ring accountability for the property to the consignee. In the event the goods are rejected at destination an Over, Short and Damaged report covering the rejected articles will be made out by the receiving officer at destination. In such a case the shipping officer approves the Over, Short and Damaged report unless the rejected articles are subsequently accepted at destination. By such acceptance the shipping officer reassumes accountability for the rejected articles and will obtain credit therefore on his stock record account by filing as a voucher suitable evidence of the collection from contractor of the amount paid on the purchase price of the material rejected and of all charges due the United States in connection with the transaction.

This method is followed only when it will result in some distinct advantage to the government. In all other cases, if it is impractical to inspect material before shipment, awards are to be based on delivery by the contractor at the point of destination. Standardized materials and supplies not specifically manufactured for the government, such as foodstuffs and office equipment and supplies, are usually inspected after delivery. The articles to be inspected are segregated after receipt.

Inspection of Materials Delivered at Destination: Where a contract or purchase order provides for delivery at destination subject to inspection and acceptance upon such delivery, inspection will be made immediately upon receipt at destination by or under the personal supervision of a commissioned officer, except that where a duly accredited inspector is provided for the purpose the inspection and acceptance may be made by him. The certificate of inspection will in every case be executed by the officer or other inspector who actually inspects and accepts the property for the government.

All contracts and orders for material to be inspected at destination must be plainly stamped (original and copies) in prominent letters as follows: "Subject to inspection on delivery."

Actual Performance Criterion as to Acceptable List of Approved Materials: With respect to some articles, it is difficult to determine by inspection the length of life and the efficiency of performance. Specifications will not always insure these two factors. Purchases are therefore sometimes made on a basis of work value as determined by test before inviting bids. Under this method, bids are let on a basis of lowest bid per performance unit. Products which require test before purchase together with the names of manufacturers whose products have been approved are listed on the Acceptable List of Approval Materials by the Navy Department. The fact that your product is listed as approved does not preclude the inspection of deliveries, however. Delivered articles are tested to see whether they conform to prepurchase tests. The following articles exemplify the kind of products purchased under this plan: Abrasive wheels, asbestos high-pressure rod packing, boiler tube brush sets, tools for caulking metal-band and pneumatic, diesel blanks, diesels for cutting, metal-band and pneumatic, dry batteries, flexible metallic rod packing, gasoline fire pots, gasoline torches, hacksaw blades, lubricating oils, oxyacetylene cutting and welding torches, semi-metallic rod packing, tool steel.

Acceptance After Rejection: Since all available material is needed in the present war emergency it is probable that you can negotiate acceptance after rejection at a reduced price unless the material is so inferior as to be useless.

When goods have been rejected by the Army at destination because they are not in accordance with the terms of the contract or purchase order, they may be subsequently accepted at a reduced price (or on

COPPER ALLOY BULLETIN

REPORTING NEWS AND TECHNICAL DEVELOPMENTS OF COPPER AND COPPER-BASE ALLOYS

Prepared Each Month by the Bridgeport Brass Co. "Bridgeport" *Headquarters for BRASS, BRONZE and COPPER*

Versatility of Brass Aids War Production

The adaptability of brass to practically any type of fabrication is proving to be a real advantage in the war production of parts requiring the broad range of physical properties offered by this alloy. Brass, for example, can be subjected to severe cold working, heading, cupping, forming or spinning operations.

From Bridgeport's mills, brass is furnished with the composition and temper to meet Government specifications in the manufacture of stampings, forgings, screw machine items, and deep drawn shells. Both simple and complicated shapes can be readily formed from this versatile metal. Advice on any brass problem is available from Bridgeport's laboratory technicians.

Memos on Brass—No. 29

The correct selection of lubricants is an important consideration in the fabrication of brass. It may mean the difference between high and low production speeds and enters into the cost of the finished article through increased tool life and better appearance of parts, which often results in lower final finishing costs. Any lubricant used must first "wet" and cover the entire metal surface and have sufficient body to remain in place under forming pressures. It must also be easily removed and should not produce staining. In general, a thick-bodied lubricant is required for severe reductions while a thin or light-bodied lubricant is best for lighter operations. Some of the factors to consider in choosing a brass lubricant include the type and severity of cold working, the type of metal working equipment, the quantity of work required, the means of applications, and comparative costs.

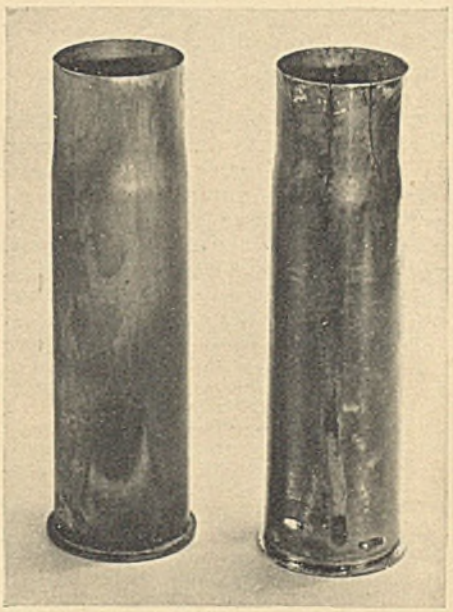
Gun Metal Finish

A gun metal finish may be given to brass if it is polished, buffed, washed, lightly scoured, using water and pumice, nickel plated, black nickel plated, lightly scoured, again black nickel plated, lightly scoured, rinsed, dried and lacquered. A soft steel section wheel and little pumice should be used in scouring the black nickel deposit.

Brass War Materiel Should Have Stress Relief Heat Treatment

Low Temperature Process Advised After Final Cold Working To Eliminate Possibility of Failure from "Season Cracking"

The manufacture of brass war materiel involves for the most part the blanking of discs from cartridge brass sheet and then converting the discs into cartridge cases and small arms ammunition by means of cupping, drawing and intermediate annealing operations. Brass is peculiarly adapted for this type of work for two reasons: first, because its extreme ductility permits deep drawing with the minimum number of operations and tool wear; and secondly, because cold working greatly hardens and strengthens brass with the result that finished cartridge cases are very strong and tough.



Cartridge cases after immersion in a mercurous-nitrate solution for 15 minutes. Note that the case at the left which had previously received a stress relief heat treatment was unharmed, while the other case, which was not treated, cracked at the mouth.

There is one danger to be avoided, however. Cold working operations may induce internal stresses in the finished article. This means that the metal in one part of the piece is pulling against that in another part. As a result, one part is in tension and the other in compression. If these stresses are permitted to remain, the piece may fail in service under certain conditions, such as in the presence of moist ammonia fumes, because of the development of so-called "season cracks" in the metal. Probably the most dangerous stresses are those which are brought about by rather light working.

In the drawing of brass tube it is possible to plan the operation in such a way as to minimize the stresses. Mechanical springing after the final draw will also have the effect of reducing the stresses. But such operations cannot always be relied upon safely.

Relief Treatment

Brass metal workers are able to eliminate this danger, however, by giving the finished article a "stress relief heat treatment." The temperatures employed are below those at which any recrystallization begins. In the case of brass, it is about 270° C. Such a low temperature heat treatment reduces the magnitude of the internal stresses *without bringing about any softening.* This process is often referred to as a "relief anneal." Since the word "anneal" means softening, we believe that it would be less confusing if the term "stress relief heat treatment" were adopted by the metal industry.

Ductility Unaffected

A stress relief heat treatment, unlike normal annealing, does not increase the ductility of the material, and therefore it does not prepare it for further cold working. The primary use of this treatment is to relieve stresses, and this operation should be performed after the final cold working, no matter how slight this may be.

Stress relief heat treatment is usually carried out in furnaces of special design. The time necessary for stress relief in a regular annealing furnace is unusually long because heat transfer by radiation is extremely slow at such low temperatures. The special furnace usually used is one where the hot gas is blown on the work and heat is transferred by conduction rather than by radiation. Salt baths are also excellent in applications where they can be used.

New Circuit Switch Has Bronze Springs

Copper alloys play an important part in the construction of a multiple-contact switch designed recently by Donald P. Mossman. The unit is assembled on a brass frame and has contact springs of nickel-plated bronze.

COPPER ALLOY BULLETIN

ALLOYS OF COPPER

This is the thirty-fourth of a series of articles on the properties and uses of the copper alloys.

COPPER-SILICON ALLOYS

Alloys of copper-silicon have been known and used for the past 50 years, yet it has been only comparatively recently that industry has recognized their merit.

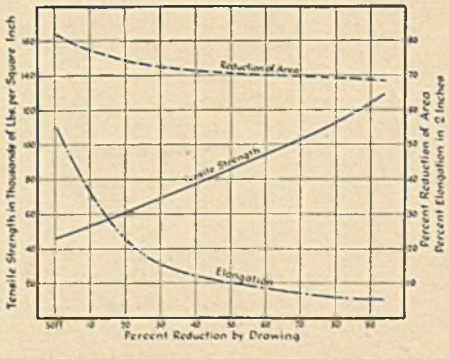
As early as 1885 we find mention of an article on copper-silicon by Vivarez, who refers to the alloys developed by Lazar Weiller and whose work was based on previous experiments made by Henri St. Clair DeVille. In Europe the alloys were first used for telephone and telegraph wires.

The addition of silicon to copper has a marked effect. A quantity as little as 0.2% will cut the electrical conductivity of copper in half. Adding 2% silicon produces a 70% increase in tensile strength alone. Silicon also toughens and hardens copper and increases its resistance to wear.

One of the finest of the copper-silicon alloys is one which contains approximately 98% copper and 2% silicon. The commercial name for this is Duronze* V. Its annealing and drawing characteristics are shown in the charts on this page. Although moderately strong in its annealed condition, it attains a very high tensile strength after severe reduction by cold drawing. Yet its per cent reduction of area remains almost unchanged. This explains its remarkable malleability in its hard drawn condition.

Duronze V is excellent for the manufacture of large headed bolts, screw products, nuts, and similar items that are made by cold upsetting. Hard drawn wire with a tensile strength between 90,000 and 100,000 lbs. per sq. inch can be made into bolts by cold heading and roll threading that average from 110,000 to 120,000 lbs. per sq. inch in tensile strength when finished. If properly headed, such bolts are not weakened by

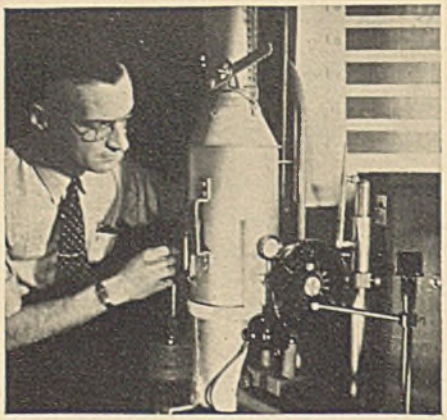
(*Continued in column 2*)



Drawing characteristics of Duronze V

For Better Brass

One of the most accurate, penetrating "eyes" ever developed for metallurgical analysis is the spectrograph shown below. A blinding arc breaks a sample of brass down into its component elements and the results are recorded photographically as bands of color or light intensities. This reveals the elements comprising the particular alloy under inspection—thus enabling Bridgeport control technicians to check and control the traces of impurities which might detrimentally affect the uniformity of the material.

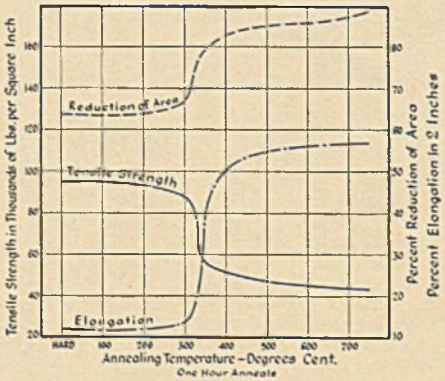


ALLOYS OF COPPER

(*Continued from column 1*)

shearing stresses and do not have to be given a final heat treatment.

Duronze V screw products are ideal for electrical and hardware equipment designed for outdoor construction. Its ease of fabrication, resistance to season cracking and great strength explain its wide use for the manufacture of wire and cable connectors, pole line and marine hardware, bolts, cap, machine and wood screws, upset nuts and similar wire products made by cold heading.



Annealing characteristics of Duronze V

NEW DEVELOPMENTS

A non-acid flux has been introduced which, it is claimed, only makes it necessary to clean new copper fittings in exceptional cases. The liquid is said to contain a solvent action which penetrates oil, grease, or other foreign matter coating the surface of the metal evenly with flux. It is further described as leaving no excess residue and making a bond of uniform strength. **(No. 330)**

A micrometer countersink has been introduced which is said to permit far greater precision accuracy than heretofore obtainable and positive countersinking to pre-determined depths to tolerances of .001. Instant adjustment and accurate micrometer setting is said to enable the cutting of a smoother, more accurate hole for flush rivets and screws without marring metal. Cutters are available at ⅜" and ½" diameter at 82 or 100 degrees. **(No. 331)**

Marking tools are offered for impressing calibration lines, letters, numbers, and data into parts made of steel, brass, bronze, aluminum, cast iron. Characters, lines and graduations are subject to specification for a complete circumference or a portion of one. The size of the tool is also made to specification. Registering devices can be included. **(No. 332)**

A hydraulic vise has been developed which is operated by a foot valve pump and which, it is claimed, attains a holding pressure between the jaws as high as five tons. Stepping on the middle pedal brings the jaw up to grip the work lightly; shifting the foot to the pedal at the right applies holding pressure, and a third pedal releases the jaw. **(No. 333)**

Light duty drilling units to speed up small hole drilling and tapping operations. They are available with two, three and four spindles, each of which is powered by its own motor through belt drive. The drive unit consists of a six-splined pulley mounted on an independent tubular steel spindle supported on the head by large deep-groove ball bearings. The table working surface is precision ground and square with drilling spindles to insure accurate work with jigs and fixtures. **(No. 334)**

A protective metal coating is claimed to prevent tarnish or oxidation of polished or burnished brass or copper. Water-white in color and transparent, the coating is said to produce a finish that resists mild acids, alkalies, steam, hot water and mild heat. Other advantages include durability, toughness, flexibility and freedom from chipping, cracking or peeling. **(No. 335)**

A metal forming brake has been developed on which all types of sheet metal and spring tempered materials can be formed into shapes and complicated forms without the use of dies, it is said. The maximum folding capacity is 16-gage steel plate of 6-inch widths, maximum angular folding range is 110 degrees of radii. **(No. 336)**

This column lists items manufactured or developed by many different sources. Further information on any of them may be obtained by writing Bridgeport Brass Company, which will gladly refer readers to the manufacturer or other source.

the basis of some other adjustment), but only under the terms of an entirely new contract. The payment to the contractor then depends upon the terms of the new contract.

In arriving at the new price, consideration is given to whatever charges may have been incurred because of the prior rejection of the goods. While the new contract may provide for a total consideration without mentioning these charges specifically, it should refer to them in order to obviate any misunderstanding as to whether or not they are included in the consideration for the new agreement. In these cases, all bills covering such charges must be certified by the destination quartermaster to show that payment will be made by the government and that adjustment will be made by the contracting officer in entering in the new contract. The destination quartermaster furnishes the contracting officer with a statement showing the character and amounts of such bills, together with the names of the disbursing officers by whom the bills will be settled. When adjustment has been made, the contracting officer advises the disbursing officers concerned so that they may credit the appropriations from which payments are made.

If goods are rejected at destination through error and are subsequently accepted, they can be accepted under the original contract only, in which case the government becomes liable for all charges incurred.

The Navy has stated that material delivered under a contract and rejected as not conforming to specifications will not be accepted at a reduced price except when: (1) It is actually needed for government purposes; (2) it is entirely fit for government use; (3) the reduction in price on bureau contracts and, in general, on field contracts, in other than minor cases or in an emergency, is approved by the Bureau of Supplies and Accounts before acceptance. Provisions will not be accepted under any conditions if there is the slightest doubt as to their purity or nutritive value.

Porcelain Enamel Plant

(*Continued from Page* 86)

plicant's character, past record and adaptability. The change yields a better class of new employes with a lower percentage of misfits and malcontents.

For peak operation, both an adequate working force and sufficient supervisory staff must be built up. Without them a well planned system of production can fail. As new help is not as efficient as that it replaces, when a great number of inexperienced employes are added to a group, extra manpower should be carried at first for peak production. Otherwise the older help will have to carry the burden, resulting in fatigue and poor workmanship.

One plant has a training system for new employes set up whereby one man trains sprayers, one man trains brushers and one trains sand blast operators. This training is all done on the day shift, and when the teacher feels the trainee is capable of handling the job he is transferred to whichever shift needs him. It is possible for each of these teachers to be training as many as four men at one time.

A clearly written set of specifications for the operation to which he is assigned will be a great help to a new man. Bulletins of helpful instructions posted at the various stations of processing also aid in enlightening new men about their responsibilities.

It is especially important that new employes receive safety training as soon as they begin work, both for their own sake and for that of their fellow employes. The safety program in effect during normal plant operation should not be sidetracked during peak operation as this might result in increased accidents, thus perhaps incapacitating valuable la-

bor. Then, too, good healthy people are needed to maintain a hurried pace.

If a plant is in a competitive labor market, very strict attention must be given to economic conditions every month to avoid too large a labor turnover. Some plants not in competitive districts may not find this such a problem, but they could lose valuable help who decide to change to other jobs. One method of checking need for revision of economic conditions is to check the cost of living index in your local area.

Methods of pay for groups are also important in relation to re-operation and scrap. One plant has found that allowing the groups definite percentages for enamel defects and then making them responsible for processing troubles creates an interest on their part for good work. It is advisable to post a record of their bad work percentage, showing them the value of work lost.

Processing and Control: Control is the very heart of a successful enamel plant. Its aim is to standardize operations as much as possible and to reduce rework with its resultant confusion and special routing of parts. Every shop foreman has his own problems, consequently methods will vary. It has been found advisable to establish specifications and post them where those concerned can refer to and use them. It is also essential that checks be made on the ware at frequent intervals during processing and that re-operation reports be kept from which the trouble can be analyzed preparatory to correction. Minor daily troubles may be discovered to be highly important when studied over a period of time. These reports should be kept in a manner to provide the important facts quickly. Peak production shows up the flaws in processing procedures.

Control figures and facts are invaluable if correct. However, the weakness of the system is faulty facts due to the constant repetition of the job. A control operator should not take anything for granted as the things least expected to change may do so and upset harmonious operation without being discovered. Misinformation on control work is worse than none since it hinders proper investigation when trouble does occur. Then, too, operators become suspicious when materials change unexpectedly. This causes them to get out of swing with their work and place the blame elsewhere for mistakes they may be making themselves.

Chemical Control: A complete and rigid set of standards should be established for the pickling operations. These may be with standard or varying time cycles as may be consistent with rapid production and still maintain satisfactory results. Wherever possible it is recommended that automatic temperature regulators be used and specified time periods be checked by clock rather than estimated. Concentration of solutions should be checked at specified intervals.

It is advisable to carry a double check system whereby the operator is made familiar with and responsible for adherence to specifications and he is cross checked frequently by a control man. It cannot be stressed too strongly that having the steel come uniformly in best possible condition from the pickling operation will reduce confusion in subsequent operations to a minimum, as copper-heads, fishscales, etc., can invariably be traced to faulty pickling. One company pickling large quantities of hot-rolled sheets changes its acid once each week. This has practically eliminated black specks as a cause for rejection.

Physical Control: From the physical control angle it is highly necessary to establish standards on milling, specific gravity, application, drying and firing. Here, too, controls should be set up to take care of prevention of errors which cause rework. Physical control too concerns itself with what is termed

workmanship. Since workmanship is peculiar to each workman or group of workmen, it should be studied continuously to find better methods to increase efficiency and accuracy. Physical control of dipping weights, spray weights and handling of sprayed parts should be standardized.

Rigidity of workmanship standards and general handling of parts tend to slump under production pressure. This should not be allowed to happen as it will increase rework and subsequent confusion and utilization of space which can be employed for new work flowing into the plant. Parts handling should be standardized in such a way that parts receive a minimum of damage in passing from operation to operation.

During peak production not only does the quality of the enamel ware itself have to be watched, but also the quality of the enameling iron being used, the metal fabrication, and the welding. A report showing the type of enameling stock being used in fabrication of the various parts can be made out by the metal shop and turned over to the porcelain shop to aid in controlling inferior stock of enameling iron. Close inspection of fabricated parts from the sheet metal department prior to the pickling operation will avoid excess labor and material loss in later handlings. A daily report showing the reason for and percentage of reoperations due to metal fabricating and welding should be given to the metal shop, and a close understanding of these reports should be had between the metal shop and porcelain department supervision so that immediate steps can be taken to overcome the difficulties.

Watch for "Bugs" in New Parts

Another quality control problem that can be turned over to the enamel control department is responsibility for approving new parts. The correct design, fabrication and processing of new parts should be worked out beforehand so no delays are encountered when put in production. For example, a particular part requiring a great amount of gas welding was noticed to have considerable blistering along the weld when porcelained. The enamel control department, spotting the difficulty, requested more experimental parts and worked with the welding department in trying out various methods. The results were that not only was one method found that eliminated the porcelain shop difficulties, but coincidentally resulted in a method which also reduced the metal fabricating cost.

Milling of enamel should be done in mills of sufficient capacity to take care of daily productions. The larger the mills, the fewer revolutions per minute, resulting in a more uniform grinding and less wear on the mill linings. Large mills should be lined with a 3-inch lining to eliminate frequent repairs and mills should be reversed after each grinding to get a more even wear on the lining. Unloading of mills should be done by air pressure with a compressor of limited capacity as a safety measure. Mills should be unloaded into storage tanks located on an elevated platform so when the enamel is drawn from the storage tanks it will pass through the rotospray and magnetic separator, directly into the pressure tank.

Usually in spite of all precautions, trouble develops and work soon piles up to be reoperated or scrapped. Failure to clean this up immediately causes confusion and disorder. In addition, costs go up and important parts may be delayed. Arrangements should be made to rework this material along with standard production in order to clear the channels. This has the advantage of showing the operators just how much work is defective, making it a constant reminder of their errors. A tendency toward starting anew

must be resisted since "laying aside" defective parts only tends to clutter up the shop.

One job shop has found that a daily correlated meeting of all foremen is valuable in helping to get rework and scrap to a minimum. This takes but half an hour. Since the same problem may not arise the next day, it enables the foreman to do something about it at once.

There are various methods of disposing of parts that require special repair work. Some shops use "hospital departments" to dispose of parts. Others have several competent repair men working in conjunction with the group to keep this material moving. The "hospital" method, however, tends to cause the groups to overload repair departments since they are mainly interested in getting out new parts.

With reference to reclaiming large and rigid shapes, there is a new method of cleaning available now which is known as "vapor blasting". The main difference from the conventional air blasting is that it uses water as the medium for carrying sand, operates at a lower pressure of around 60 pounds, thereby keeping parts cool in blasting and reducing tendency of parts to warp. This method is still quite new but appears to have a place in the picture.

Patching of damaged bisque enamel is now being done successfully, thus saving a lot of ware from being washed off. Use of a stabilized enamel on all recoats, especially panels that have to be matched, is important to prevent any change in color. All enamel rejects should pass through the hands of a final inspector, qualified to determine whether or not the rejects should be spot sprayed, fully sprayed or patched. In all cases of rework, they should be handled by an individual sprayer trained to know just what treatment to give the parts to be reworked. Spot spraying or a thin full coat on surface only is more desirable than a full spray.

Under prevailing steel shortage and need for utilizing equipment and material for every possible bit of production, a scrap prevention committee should be organized in every shop. Such a committee should consist of chief design engineer, chief inspector, general superintendent, works manager mounting foreman and enamel plant superintendent, with the latter acting as chairman.

Issues Standard Letter Symbols for Hydraulics

American Standards Association, 29 West Thirty-ninth street, New York, now has available a revised set of letter symbols for hydraulics, recent publication of which represents 6½ years of endeavor. It provides the shorthand of fluid mechanics wherever oil or water or other liquids are forced through pipes, according to the association.

An earlier set of symbols was adopted and published in 1929. That list was good but too brief to cover the field adequately. The symbols adopted in 1929 have been retained in the 1941 list in so far as it was possible to secure agreements.

The prime objective in adopting a set of standard symbols for any science, according to the ASA, is to save reader brain fag.

In addition to the standard for hydraulics, a new standard, letter symbols for mechanics of solid bodies (Z10.3-1942), was completed recently by a subcommittee of ASA. This new standard is a revision of a former standard Z10a-1932. Copies of the new standards are available from association headquarters. The standard letter symbols for hydraulics (Z10.2-1942) is 35 cents per copy; and the standard letter symbols for mechanics of solid bodies (Z10.3-1942) is 25 cents per copy.

Rust Inhibiting Liquid Protects Exposed Metals

Aquanil, a liquid rust inhibiting product developed by Protective Coatings Inc., 10391 Northlawn, Detroit, when applied on metals is said to provide an ideal protective coating. Applied by dipping, brushing or, in warm weather, spraying, it also is said to make a good base coating for paint.

A 22-day salt spray test recently on cold-rolled metal, treated with one coat of paint over the product, failed to lift the paint along the scratched surface.

The coating is invisible and need not be painted when used, for example, to protect castings and other units that are carried in the stock pile or in transit, according to the company.

Insulating Varnish for High Temperatures

A new insulating varnish, designated as S-110, for application to electrical apparatus that must operate at abnormally high temperatures is reported by Sterling Varnish Co., 172 Ohio River boulevard, Haysville, Pa. According to tests the product will stand operating temperatures at 250 degrees Cent. or higher.

When baked at 175 to 200 degrees Cent., the varnish dries all the way through the deepest winding and does not resoften. The dried film is mechanically strong, exceptionally adhesive and flexible, it is claimed.

Seeks Acceptance of Wire Screen Proposal

Representing producers of aggregate and the manufacturers of screens and screening machinery, the standing committee is proposing a revision of simplified practice recommendation R147-33, "Wire Diameters for Mineral Aggregate Production Screens", according to the Division of Simplified Practice, National Bureau of Standards, Washington.

This recommendation lists wire sizes recommended for the construction of mineral aggregate production screens of various sizes of clear square opening. The original recommendation, drafted in 1932, reduced the variety of wire diameters for openings ranging from ⅛ to 3 inches by approximately 75 per cent of their former number.

Now it is proposed to add to the schedule wire diameters for screens with clear square openings of 3½ and 4 inches, adding only one new wire diameter. Mimeographed copies of the proposed revision may be obtained free from the Division of Simplified Practice.

Copyright Law Covered By Government Expert

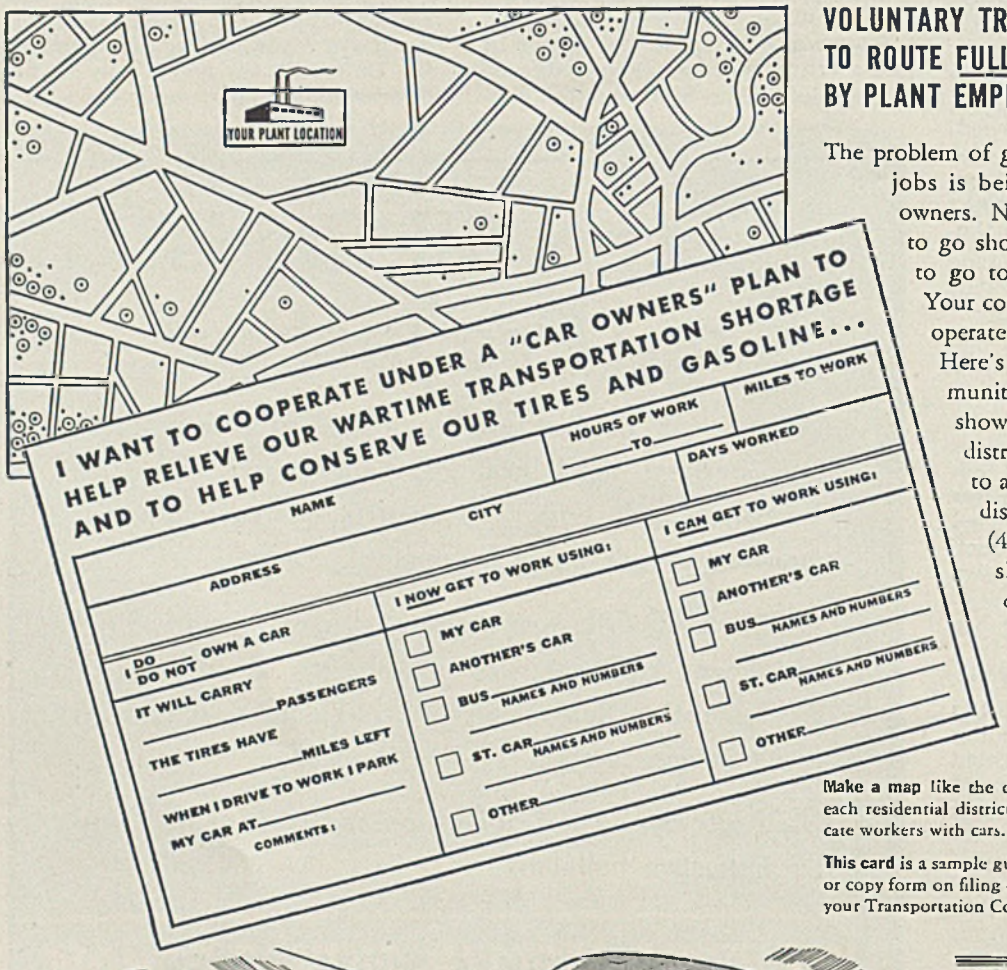
Copyright Law, by Herbert A. Howell; fabrikoid, 280 pages, 6 x 9 inches; published by Bureau of National Affairs Inc., Washington, for $4.50.

The author recently was assistant register of copyrights and brings to his work a thorough knowledge of the subject. The book is based substantially on a thorough revision of a series of lectures originally delivered to graduate law students.

Court decisions cited in the book were carefully chosen, mainly from those rendered since 1909, when the present copyright act went into force. Earlier decisions are not to be ignored but must be closely scrutinized and reappraised as to their applicability under the existing dispensation.

In an introductory chapter the author traces the growth of the copyright ideas in England, then in the United States and finally as an international plan.

MANY LARGE COMPANIES ARE NOW TAKING A CENSUS OF EMPLOYEES' CARS AS PART OF NATION'S PROGRAM TO GET 40,000,000 WORKERS TO THEIR JOBS ON TIME



VOLUNTARY TRANSPORTATION COMMITTEES TO ROUTE FULL CARS TO WORK ARE SET UP BY PLANT EMPLOYEES IN EACH COMMUNITY

The problem of getting 40,000,000 workers to their jobs is being taken over by America's car owners. Neighbors are already doubling up to go shopping, to take children to school, to go to work . . . *but not enough of them!* Your company and your employees can cooperate by taking a census of workers' cars. Here's how you can do it in your community: (1) Fill out cards, like the one shown here, (2) Sort cards by residential districts, (3) Select sectional committees to act as traffic control groups for each district to assure equitable use of cars, (4) Route *full* cars to work on every shift. Details can be worked out quickly by you . . . your workers . . . your community. The important thing is to start today to get every last mile of use from our cars, our gas, our tires!

Make a map like the one above, on which to chart the routes for each residential district. Dots indicate workers' homes; circles indicate workers with cars.

This card is a sample guide. Make changes to suit your needs. Reprint or copy form on filing cards for each worker to fill out and turn in to your Transportation Committee.

Trolleys can't do it ALONE. Even with staggered work hours to level off transportation peaks there aren't enough trolleys to take America's millions to work.

Buses can't do it ALONE. They're already taxed to their full seating capacity. And enough vital steel and rubber can't be spared to build enough new buses.

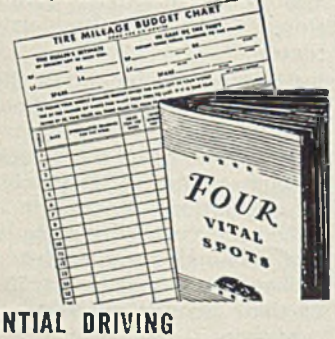
Trains can't do it ALONE. Although every railroad is cooperating 100%, many of America's mighty war production plants can't be serviced by trains or subways.

HOW TO CONSERVE MECHANICAL RUBBER GOODS

This 48-page book is for managers, engineers and plant operating men. It shows how you can conserve rubber through proper handling, installation and care of rubber conveyor, elevator and transmission belts; all types of industrial hose; packings; linings; rolls; mountings; and other mechanical rubber goods; and electrical wires, cables, and tapes. For free copies, write directly to Mechanical Goods Division, United States Rubber Company.

GET FREE MILEAGE BUDGET CHARTS

and copies of this free 32-page book on tire care from your local U. S. Tire Dealer or write direct to the United States Rubber Company. Hundreds of thousands of these charts and books are already in the hands of American car owners — helping to save tires, gas and oil.



IN AMERICA'S FIGHT FOR LIFE, EVERY TIRE-MILE MUST BE SAVED FOR ESSENTIAL DRIVING

UNITED STATES RUBBER COMPANY

1230 Sixth Avenue · Rockefeller Center · New York

Allocations Improve Steel Distribution

Priorities lose value in congested books.
Scrap now sufficient to provide reserves.
Structural steel orders reach high level

MARKET IN TABLOID ★

Demand
High ratings increase.

Prices
No changes in ceilings.

Production
Unchanged at 99 per cent.

IMPROVEMENT in inventory control by War Production Board shows better distribution for essential purposes, reflected by closer balance between requests for steel plates and tonnages being allocated. June allocations show the best relationship yet attained and it is believed that by mid-autumn plate production will meet all rated requirements, although not much capacity expansion is expected by that time.

Allocations and directives are assuming a leading position in controlling delivery of steel, congestion in A-1-a priority being such that this rating has lost much of its meaning and value.

Mills which have been accepting nothing below top rating now in some cases have so much tonnage on directives that they are unable to promise delivery on any rating. Others are able to continue taking business for definite shipment on higher priorities, but the margin is constantly narrowing. A Chicago mill can offer bars at A-1-i and billets at A-1-f. An eastern sheetmaker has some tonnage available at A-1-c. A large producer of diversified products in the East has filled its June schedule from A-1-a ratings, including its bessemer output.

Steel production last week continued at 99 per cent of capacity, the same level as during the corresponding week last year. The feature of the week was a rise of 3 points at Chicago, to 107 per cent, a new all-time record, 1½ points above the previous mark made in the week of May 9. Cincinnati advanced 3½ points to 95 per cent and Cleveland 2½ points to 94. Eastern Pennsylvania lost 5 points to 91 per cent because of flood interruption, Detroit receded 1 point to 92 and New England lost 5 points to 95 per cent. Rates were unchanged at St. Louis, 98; Buffalo, 90½; Birmingham, 95; Pittsburgh, 94; Wheeling, 78; Youngstown, 94.

Various adjustments are being made by Office of Price Administration to meet conditions and serve the industry better. Warehouses are allowed to deliver without rated orders, fence and barbed wire, poultry netting, fence posts, gates, staples, and corrugated roofing and siding, adding to the list which formerly included nails, bale ties and small pipe. Tacoma, Wash., and Sioux Falls, S. Dak., have been announced as distribution centers for iron and steel warehouse products. The scrap industry is aided by amendments allowing scrap five feet long to be sold as No. 2 heavy melting steel and removing restrictions on accumulating large inventory.

War Production Board urges scrap consumers to use every effort to build reserves this summer for winter use, limit on inventory being removed as an aid. This is done to insure against slackening in collections following any hint of lessened demand.

To provide stocks from which orders for alloy steel smaller than full heats may be filled without delay some makers have been authorized to make up heats of national emergency analyses. This class of alloys is being specified increasingly as a measure of conservation of scarce alloying elements.

Tin plate mills find their position reversed, the choke point now being supply of black plate, which is limited by semifinished steel available for that use. Until recently scarcity of tin held back production.

Fabricated structural steel orders booked in April, 327,420 net tons, were largest for any month since 1929. Total orders booked in four months exceeded the similar period last year by 12.4 per cent. As use of steel in other than war construction has been stopped the April figure is an indication of the extent of essential use of structural shapes.

Flow of scrap material is consistently adequate for all current needs and in some cases is reaching consumers in volume that taxes handling facilities. Another effect has been to turn the tide through the hands of brokers, making for a more orderly handling of tonnage than when small dealers were selling directly. Effect of automobile wrecking is seen in better supply of cast scrap, motor blocks furnishing foundries increased tonnage.

STEEL'S composite prices are steady at the level of the past several months, ruled by OPA ceilings. Finished steel composite is $56.73, semifinished steel $36, steelmaking pig iron $23.05 and steelmaking scrap $19.17.

COMPOSITE MARKET AVERAGES

	May 30	May 23	May 16	One Month Ago Apr., 1942	Three Months Ago Feb., 1942	One Year Ago May, 1941	Five Years Ago May, 1937
Finished Steel	$56.73	$56.73	$56.73	$56.73	$56.73	$56.73	$62.18
Semifinished Steel	36.00	36.00	36.00	36.00	36.00	36.00	40.00
Steelmaking Pig Iron	23.05	23.05	23.05	23.05	23.05	23.05	22.84
Steelmaking Scrap	19.17	19.17	19.17	19.17	19.17	19.17	18.50

Finished Steel Composite:—Average of industry-wide prices on sheets, strips, bars, plates, shapes, wire, nails, tin plate, standard and line pipe. Semifinished Steel Composite:—Average of industry-wide prices on billets, slabs, sheet bars, skelp and wire rods. Steelmaking Pig Iron Composite:—Average of basic pig iron prices at Bethlehem, Birmingham, Buffalo, Chicago, Cleveland, Neville Island, Granite City and Youngstown. Steelworks Scrap Composite:—Average of No. 1 heavy melting steel prices at Pittsburgh, Chicago and eastern Pennsylvania.

COMPARISON OF PRICES

Representative Market Figures for Current Week; Average for Last Month, Three Months and One Year Ago

Finished Material

	May 30, 1942	Apr. 1942	Feb. 1942	May 1941
Steel bars, Pittsburgh	2.15c	2.15c	2.15c	2.15c
Steel bars, Chicago	2.15	2.15	2.15	2.15
Steel bars, Philadelphia	2.47	2.49	2.47	2.47
Shapes, Pittsburgh	2.10	2.10	2.10	2.10
Shapes, Philadelphia	2.215	2.22	2.215	2.215
Shapes, Chicago	2.10	2.10	2.10	2.10
Plates, Pittsburgh	2.10	2.10	2.10	2.10
Plates, Philadelphia	2.15	2.15	2.15	2.15
Plates, Chicago	2.10	2.10	2.10	2.10
Sheets, hot-rolled, Pittsburgh	2.10	2.10	2.10	2.10
Sheets, cold-rolled, Pittsburgh	3.05	3.05	3.05	3.05
Sheets, No. 24 galv., Pittsburgh	3.50	3.50	3.50	3.50
Sheets, hot-rolled, Gary	2.10	2.10	2.10	2.10
Sheets, cold-rolled, Gary	3.05	3.05	3.05	3.05
Sheets, No. 24 galv., Gary	3.50	3.50	3.50	3.50
Bright bess., basic wire, Pitts.	2.60	2.60	2.60	2.60
Tin plate, per base box, Pitts.	$5.00	$5.00	$5.00	$5.00
Wire nails, Pittsburgh	2.55	2.55	2.55	2.55

Semifinished Material

Sheet bars, Pittsburgh, Chicago	$34.00	$34.00	$34.00	$34.00
Slabs, Pittsburgh, Chicago	34.00	34.00	34.00	34.00
Rerolling billets, Pittsburgh	34.00	34.00	34.00	34.00
Wire rods No. 5 to 5/32-inch, Pitts.	2.00	2.00	2.00	2.00

Pig Iron

	May 30, 1942	Apr. 1942	Feb. 1942	May 1941
Bessemer, del. Pittsburgh	$25.34	$25.34	$25.34	$25.34
Basic, Valley	23.50	23.50	23.50	23.50
Basic, eastern, del. Philadelphia	25.34	25.39	25.34	25.34
No. 2 fdry., del. Pgh., N.&S. Sides	24.69	24.69	24.69	24.69
No. 2 foundry, Chicago	24.00	24.00	24.00	24.00
Southern No. 2, Birmingham	20.38	20.38	20.38	20.38
Southern No. 2, del. Cincinnati	24.06	24.06	24.06	24.06
No. 2X, del. Phila. (differ. av.)	26.215	26.265	26.215	26.215
Malleable, Valley	24.00	24.00	24.00	24.00
Malleable, Chicago	24.00	24.00	24.00	24.00
Lake Sup., charcoal, del. Chicago	31.54	31.54	31.34	31.09
Gray forge, del. Pittsburgh	24.19	24.19	24.19	24.19
Ferromanganese, del. Pittsburgh	140.65	125.63	125.33	125.33

Scrap

Heavy melting steel, Pitts.	$20.00	$20.00	$20.00	$20.00
Heavy melt. steel, No. 2, E. Pa.	18.75	18.75	18.75	17.75
Heavy melting steel, Chicago	18.75	18.75	18.75	18.75
Rails for rolling, Chicago	22.25	22.25	22.25	22.25
No. 1 cast, Chicago	20.00	20.00	20.00	21.50

Coke

Connellsville, furnace, ovens	$6.25	$6.25	$6.25	$5.70
Connellsville, foundry, ovens	7.25	7.25	7.25	6.30
Chicago, by-product fdry., del.	12.25	12.25	12.25	12.25

STEEL, IRON, RAW MATERIAL, FUEL AND METALS PRICES

Following are maximum prices established by OPA Schedule No. 6 issued April 16, 1941, revised June 20, 1941 and Feb. 4, 1942 The schedule covers all iron or steel ingots, all semifinished iron or steel products, all finished hot-rolled, cold-rolled iron or steel products and any iron or steel product which is further finished by galvanizing, plating, coating, drawing, extruding, etc., although only principal established basing points for selected products are named specifically. All seconds and off-grade products also are covered. Exceptions applying to individual companies are noted in the table.

Semifinished Steel

Gross ton basis except wire rods, skelp.

Carbon Steel Ingots: F.o.b. mill base, rerolling qual., stand. analysis, $31.00.
(Empire Sheet & Tin Plate Co., Mansfield, O., may quote carbon steel ingots at $33 gross ton, f.o.b. mill.)

Alloy Steel Ingots: Pittsburgh base, uncropped, $45.00.

Rerolling Billets, Slabs: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Sparrows Point, Birmingham, Youngstown, $34.00; Detroit, del. $36.25; Duluth (bil.) $36.00.
(Wheeling Steel Corp. allocated 21,000 tons 2" square, base grade rerolling billets under lease-lend during first quarter 1942 at $37, f.o.b. Portsmouth, O.; Andrews Steel Co. may quote carbon steel slabs $41 gross ton at established basing points.)

Forging Quality Billets: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham, Youngstown, $40.00; Detroit, del. $42.25; Duluth, $42.00.
(Andrews Steel Co. may quote carbon forging billets $50 gross ton at established basing points.)

Open Hearth Shell Steel: Pittsburgh, Chicago, base 1000 tons one size and section: 3-12 in., $52.00; 12-18 in., $54.00; 18 in. and over, $56.00.

Alloy Billets, Slabs, Blooms: Pittsburgh, Chicago, Buffalo, Bethlehem, Canton, Massillon, $54.00.

Sheet Bars: Pittsburgh, Chicago, Cleveland, Buffalo, Canton, Sparrows Point, Youngstown, $34.00.
(Empire Sheet & Tin Plate Co., Mansfield, O., may quote carbon steel sheet bars at $39 gross ton, f.o.b. mill.)

Skelp: Pittsburgh, Chicago, Sparrows Pt., Youngstown, Coatesville, lb., $1.90.

Wire Rods: Pittsburgh, Chicago, Cleveland, Birmingham, No. 5—9/32 in., inclusive, per 100 lbs., $2.00.
Do., over 9/32—47/64-in., incl., $2.15. Worcester add $0.10 Galveston, $0.27. Pacific Coast $0.50 on water shipment.

Bars

Hot-Rolled Carbon Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham, base 20 tons one size, 2.15c; Duluth, base 2.25c; Detroit, del. 2.27c; New York del. 2.51c; Phila. del. 2.49c; Gulf Ports, dock 2.52c, all-rail 2.59c Pac. ports, dock 2.50c; all rail 3.25c. (Phoenix Iron Co., Phoenixville, Pa., may quote 2.35c at established basing points.) Joslyn Mfg. Co. may quote 2.35c, Chicago base.)

Rail Steel Bars: Same prices as for hot-rolled carbon bars except base is 5 tons.
(Sweet's Steel Co., Williamsport, Pa., may quote rail steel merchant bars 2.33c f.o.b. mill.

Hot-Rolled Alloy Bars: Pittsburgh, Chicago, Canton, Massillon, Buffalo, Bethlehem, base 20 tons one size, 2.70c Detroit, del. 2.82c.

S.A.E.	Alloy Diff.	S.A.E.	Alloy Diff.
2000	0.35	5100 Spr. flats	0.15
2100	0.75	5100 80-1.10 Cr	0.15
2300	1.70	6100 Bars	1.20
2500	2.55	6100 Spr. flats	0.85
3100	0.70	Carb., Van.	0.85
3200	1.35	9200 Spr. flats	0.15
3300	3.80	9200 Spr. rounds, squares	0.40
3400	3.20	T 1300, Mn, mean 1.51-2.00	0.10
4100 .15-25 Mo. 46.00 .20-.30 Mo. 1.50-2.00; Ni	0.55 1.20	Do., carbon under 0.20 max.	0.35

Cold-Finished Carbon Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, base 20,000-39,999 lbs., 2.65c; Detroit 2.70.

Cold-Finished Alloy Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, base 3.35c; Detroit, del. 3.47c.

Turned, Ground Shafting: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, base (not including turning, grinding, polishing extras) 2.65c; Detroit 2.72c.

Reinforcing Bars (New Billet): Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Sparrows Point, Buffalo, Youngstown, base 2.15c; Detroit del. 2.27c; Gulf ports, dock 2.52c, all-rail 2.61c; Pacific ports, dock 2.80c, all-rail 3.27c.

Reinforcing Bars (Rail Steel): Pittsburgh, Chicago, Gary, Cleveland, Birmingham, base 2.15c; Detroit, del. 2.27c; Gulf ports, dock 2.52c, all-rail 2.61c; Pacific ports, dock 2.80c, all-rail 3.25c.
(Sweet's Steel Co., Williamsport, Pa., may quote rail steel reinforcing bars 2.33c, f.o.b. mill.

Iron Bars: Single refined, Pitts. 4.40c, double refined 5.40c; Pittsburgh, stayholt, 5.75c; Terre Haute, common, 2.15c.

Sheets, Strip

Hot-Rolled Sheets: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Buffalo, Youngstown, Sparrows Pt., Middletown, base 2.10c; Granite City, base 2.20c; Detroit del. 2.22c; Phila. del. 2.28c; New York del., 2.35c Pacific ports 2.65c.
(Andrews Steel Co. may quote hot-rolled sheets for shipment to Detroit and the Detroit area on the Middletown, O. base.)

Cold-Rolled Sheets: Pittsburgh, Chicago, Cleveland, Gary, Buffalo, Youngstown, Middletown, base, 3.05c; Granite City, base 3.15c; Detroit del. 3.17c; New York del. 3.41c; Phila. del. 3.39c; Pacific ports, 3.70c.

Galvanized Sheets, No. 24: Pittsburgh, Chicago, Gary, Birmingham, Buffalo, Youngstown, Sparrows Point, Middletown, base 3.50c; Granite City, base 3.60c; New York del. 3.74c Phila. del. 3.68c; Pacific ports 4.05c.
(Andrews Steel Co. may quote galvanized sheets 3.75c at established basing points.)

Corrugated Galv. Sheets: Pittsburgh, Chicago, Gary, Birmingham, 29 gage, per square 3.31c.

Culvert Sheets: Pittsburgh, Chicago, Gary, Birmingham, 16 gage, not corrugated, copper alloy 3.60c; copper iron 3.90c, pure iron 3.95c; zinc-coated, hot-dipped, heat-treated, No. 24, Pittsburgh 4.25c.

Enameling Sheets: Pittsburgh, Chicago, Gary,

Cleveland, Youngstown, Middletown, 10 gage, base 2.75c; Granite City, base 2.85c; Pacific ports 3.40c.
Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Middletown, 20 gage, base 3.35c; Granite City, base 3.45c; Pacific ports 4.00c.

Electrical Sheets, No. 24:

	Pittsburgh Base	Pacific Ports	Granite City
Field grade	3.20c	3.95c	3.30c
Armature	3.55c	4.30c	3.65c
Electrical	4.05c	4.80c	4.15c
Motor	4.95c	5.70c	5.05c
Dynamo	5.65c	6.40c	5.75c
Transformer			
72	6.15c	6.90c	.....
65	7.15c	7.90c	.....
58	7.65c	8.40c	.....
52	8.45c	9.20c	.....

Hot-Rolled Strip: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Middletown, base, 1 ton and over, 12 inches wide and less 2.10c; Detroit del. 2.22c; Pacific ports 2.75c. (Josiyn Mfg. Co. may quote 2.30c, Chicago base.)

Cold Rolled Strip: Pittsburgh, Cleveland, Youngstown, 0.25 carbon and less 2.80c; Chicago, base 2.90c; Detroit, del. 2.92c; Worcester base 3.00c.

Commodity C. R. Strip: Pittsburgh, Cleveland, Youngstown, base 3 tons and over, 2.95c; Worcester base 3.35c.

Cold-Finished Spring Steel: Pittsburgh, Cleveland bases, add 20c for Worcester; .26-.50 Carb., 2.80c; .51-.75 Carb., 4.30c; .76-1.00 Carb., 6.15c; over 1.00 Carb., 8.35c.

Tin, Terne Plate

Tin Plate: Pittsburgh, Chicago, Gary, 100-lb. base box, $5.00; Granite City $5.10.

Tin Mill Black Plate: Pittsburgh, Chicago, Gary, base 29 gage and lighter, 3.05c; Granite City, 3.15c; Pacific ports, boxed 4.05c.

Long Ternes: Pittsburgh, Chicago, Gary, No. 24 unassorted 3.80c.

Manufacturing Ternes: Pittsburgh, Chicago, Gary, 100-base box $4.30; Granite City $4.40.

Roofing Ternes: Pittsburgh base per package 112 sheets, 20 x 28 in., coating I.C., 8-lb. $12.00; 15-lb. $14.00; 20-lb. $15.00; 25-lb. $16.00; 30-lb. $17.25; 40-lb. $19.50.

Plates

Carbon Steel Plates: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Sparrows Point, Coatesville, Claymont, 2.10c; New York, del., 2.30-2.55c; Phila., del., 2.15c; St. Louis, 2.34c; Boston, del., 2.42-67c; Pacific ports, 2.65c; Gulf Ports, 2.47c.
(Granite City Steel Co. may quote ship plates 2.25c, f.o.b. mill.)

Floor Plates: Pittsburgh, Chicago, 3.35c; Gulf ports, 3.72c; Pacific ports, 4.00c.

Open-Hearth Alloy Plates: Pittsburgh, Chicago, Coatesville, 3.50c.

Wrought Iron Plates: Pittsburgh, 3.80c.

Shapes

Structural Shapes: Pittsburgh, Chicago, Gary, Birmingham, Buffalo, Bethlehem, 2.10c; New York, del., 2.28c Phila., del., 2.22c; Gulf ports, 2.47c; Pacific ports, 2.75c.
(Phoenix Iron Co., Phoenixville, Pa. may quote carbon steel shapes at 2.30c at established basing points.)

Steel Sheet Piling: Pittsburgh, Chicago, Buffalo, 2.40c.

Wire Products, Nails

Wire: Pittsburgh, Chicago, Cleveland, Birmingham (except spring wire) to manufacturers in carloads (add $2 for Worcester):

Bright basic, bessemer wire	2.60c
Galvanized wire	2.60c
Spring wire	2.20c

Wire Products to the Trade:

Standard and cement-coated wire nails, polished and staples, 100-lb. keg	$2.55
Annealed fence wire, 100 lb.	3.05
Galvanized fence wire, 100 lb.	3.40
Woven fence, 12½ gage and lighter, per base column	67
Do., 11 gage and heavier	70
Barbed wire, 80-rod spool, col.	70
Twisted barbless wire, col.	70
Single loop bale ties, col.	59
Fence posts, carloads, col.	69
Cut nails, Pittsburgh, carloads	$3.85

Pipe, Tubes

Welded Pipe: Base price in carloads to consumers about $200 per net ton. Base discounts on steel pipe Pittsburgh and Lorain, O.; Gary, Ind. 2 points less on lap weld, 1 point less on butt weld. Pittsburgh base only on wrought iron pipe.

Butt Weld

Steel In.	Blk.	Galv.	Iron In.	Blk.	Galv.
⅛	56	33	½	24	3½
¼ & ⅜	59	40½	¾	30	10
½	63½	51	1-1¼	34	16
¾	66½	55	1½	38	18½
1-3	68½	57½	2	37½	18

Lap Weld

Steel In.	Blk.	Galv.	Iron In.	Blk.	Galv.
2	61	49½	1¼	23	3½
2½-3	64	52½	1½	28½	10
3½-6	66	54½	2	30½	12
7-8	65	52½	2½, 3½	31½	14½
9-10	64½	52	4	33½	18
11-12	63½	51	4½-8	32½	17
			9-12	28½	12

Boiler Tubes: Net base prices per 100 feet, f.o.b. Pittsburgh in carload lots, minimum wall, cut lengths 4 to 24 feet, inclusive.

O. D. Sizes	B.W.G.	—Seamless— Hot Rolled	Cold Drawn	—Lap Weld— Steel	Charcoal Iron
1"	13	$ 7.82	$ 9.01	.....	.....
1¼"	13	9.26	10.67	.....	.....
1½"	13	10.23	11.72	$ 9.72	$23.71
1¾"	13	11.64	13.42	11.06	22.93
2"	13	13.04	15.03	12.38	19.35
2¼"	13	14.54	16.76	13.79	21.63
2¼"	12	16.01	18.45	15.16	.....
2½"	12	17.54	20.21	16.58	26.57
2¾"	12	18.59	21.42	17.54	29.00
3"	12	19.50	22.48	18.35	31.38
3½"	11	24.63	28.37	23.15	39.81
4"	10	30.54	35.20	28.66	49.90
4½"	10	37.35	43.04	35.22	.....
5"	9	46.87	54.01	44.25	73.93
6"	7	71.96	82.93	68.14	.....

Rails, Supplies

Standard rails, over 60-lb., f.o.b. mill, gross ton, $40.00.
Light rails (billet), Pittsburgh, Chicago, Birmingham, gross ton, $40.00.
*Relaying rails, 35 lbs. and over, f.o.b. railroad and basing points, $28-$30.
Supplies: Angle bars, 2.70c; tie plates, 2.15c; track spikes, 3.00c; track bolts, 4.75c; do. heat treated, 5.00c.

*Fixed by OPA Schedule No. 46, Dec. 15, 1941.

Tool Steels

Tool Steels: Pittsburgh, Bethlehem, Syracuse, base, cents per lb.: Reg. carbon 14.00c; extra carbon 18.00c; special carbon 22.00c; oil-hardening 24.00c; high car.-chr. 43.00c.

High Speed Tool Steels:

Tung.	Chr.	Van.	Moly.	Pitts. base, per lb.
18.00	4	1	..	67.00c
18.00	4	2	1	77.00c
18.00	4	3	1	87.00c
1.5	4	1	8.5	54.00c
..	4	2	8	54.00c
5.50	4	1.50	4	57.50c
5.50	4.50	4	4.50	70.00c

Stainless Steels

Base, Cents per lb.—f.o.b. Pittsburgh

CHROMIUM NICKEL STEEL

Type	Bars	Plates	Sheets	H. R. Strip	C. R. Strip
302	24.00c	27.00c	34.00c	21.50c	28.00c
303	26.00	29.00	36.00	27.00	33.00
304	25.00	29.00	36.00	23.50	30.00
308	29.00	34.00	41.00	28.50	35.00
309	36.00	40.00	47.00	37.00	47.00
310	49.00	52.00	53.00	48.75	56.00
311	49.00	52.00	53.00	48.75	56.00
312	36.00	40.00	49.00	.....	.....
*316	40.00	44.00	48.00	40.00	48.00
*317	50.00	54.00	58.00	50.00	58.00
†321	29.00	34.00	41.00	29.25	38.00
†347	33.00	38.00	45.00	33.00	42.00
431	19.00	22.00	29.00	17.50	22.50

STRAIGHT CHROMIUM STEEL

403	21.50	24.50	29.50	21.25	27.00
**410	18.50	21.50	26.50	17.00	22.00
416	19.00	22.00	27.00	18.25	23.50
††420	24.00	28.50	33.50	23.75	36.50
430	19.00	22.00	29.00	17.50	22.50
‡1430F	19.50	22.50	29.50	18.75	24.50
442	22.50	25.50	32.50	24.00	32.00
446	27.50	30.50	36.50	35.00	52.00
501	8.00	12.00	15.75	12.00	17.00
502	9.00	13.00	16.75	13.00	18.00

STAINLESS CLAD STEEL (20%)

304	.....	§§18.00	19.00	.....	.....

*With 2-3% moly. †With titanium. ‡With columbium. **Plus machining agent. ††High carbon. ‡‡Free machining. §§Includes annealing and pickling.

Basing Point Prices are (1) those announced by U. S. Steel Corp. subsidiaries for first quarter of 1941 or in effect April 16, 1941 at designated basing points or (2) those prices announced or customarily quoted by other producers at the same designated points. Base prices under (2) cannot exceed those under (1) except to the extent prevailing in third quarter of 1940.

Extras mean additions or deductions from base prices in effect April 16, 1941.

Delivered prices applying to Detroit, Eastern Michigan, Gulf and Pacific Coast points are deemed basing points except in the case of the latter two areas when water transportation is not available, in which case nearest basing point price plus all-rail freight may be charged.

Domestic Ceiling prices are the aggregate of (1) governing basing point price, (2) extras and (3) transportation charges to the point of delivery as customarily computed. **Governing basing point** is basing point nearest the consumer providing the lowest delivered price. **Emergency basing point** is the basing point at or near the place of production or origin of shipment.

Dislocated tonnage: Producers shipping material outside their usual marketing areas because of the war emergency may charge the basing point price nearest place of production plus actual cost of transportation to destination.

Seconds or off-grade iron or steel products cannot be sold at delivered prices exceeding those applying to material of prime quality.

Export ceiling prices may be either the aggregate of (1) governing basing point or emergency basing point (2) export extras (3) export transportation charges provided they are the f.a.s. seaboard quotations of the U. S. Steel Export Co. on April 16, 1941. Domestic or export extras may be used in case of Lease-Lend tonnage.

Bolts, Nuts

F.o.b. Pittsburgh, Cleveland, Birmingham, Chicago. Discounts for carloads additional 5%, full containers, add 10%.

Carriage and Machine

½ x 6 and smaller	65½ off
Do., ⅝ and ⅝ x 6-in. and shorter	63½ off
Do., ¾ to 1 x 6-in. and shorter	61 off
1⅛ and larger, all lengths	59 off
All diameters, over 6-in. long	59 off
Tire bolts	50 off
Step bolts	56 off
Plow bolts	65 off

Stove Bolts

In packages with nuts separate 71-10 off; with nuts attached 71 off; bulk 80 off on 15,000 of 3-inch and shorter, or 5000 over 3-in.

Nuts

Semifinished hex.	U.S.S.	S.A.E.
⅞-inch and less	62	64
½-1-inch	59	60
1⅛-1½-inch	57	58
1⅝ and larger	56	..

Hexagon Cap Screws

Upset 1-in., smaller	64 off
Milled 1-in., smaller	60 off

Square Head Set Screws

Upset, 1-in., smaller	71 off
Headless, ¼-in., larger	60 off
No. 10, smaller	70 off

Piling

Pittsburgh, Chicago, Buffalo 2.40c

Rivets, Washers

F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham

Structural	3.75c
⅞-inch and under	65-5 off
Wrought washers, Pittsburgh, Chicago Philadelphia, to jobbers and large nut, bolt manufacturers l.c.l.	$2.75-3.00 off

Metallurgical Coke

Price Per Net Ton

Beehive Ovens

Connellsville, furnace	$6.00
Connellsville, foundry	7.00- 7.50
Connellsville prem. fdry.	7.25- 7.60
New River, foundry	8.00- 8.25
Wise county, foundry	7.50
Wise county, furnace	6.50

By-Product Foundry

Kearny, N. J., ovens	12.15
Chicago, outside delivered	11.50
Chicago, delivered	12.25
Terre Haute, delivered	12.00
Milwaukee, ovens	12.25
New England, delivered	13.75
St. Louis, delivered	12.25
Birmingham, ovens	8.50
Indianapolis, delivered	12.00
Cincinnati, delivered	11.75
Cleveland, delivered	12.30
Buffalo, delivered	12.50
Detroit, delivered	12.25
Philadelphia, delivered	12.38

Coke By-Products

Spot, gal., freight allowed east of Omaha

Pure and 90% benzol	15.00c
Toluol, two degree	28.00c
Solvent naphtha	27.00c
Industrial xylol	27.00c

Per lb. f.o.b. works

Phenol (car lots, returnable drums)	12.50c
Do. less than car lots	13.25c
Do. tank cars	11.50c

Eastern Plants, per lb.

Naphthalene flakes, balls, bbls. to jobbers	8.00c

Per ton, bulk, f.o.b. port

Sulphate of ammonia	$29.00

Pig Iron

Prices (in gross tons) are maximums fixed by OPA Price Schedule No. 10, effective June 10, 1941. Exceptions indicated in footnotes. Allocation regulations from WPB Order M-17, expiring Dec. 31, 1942. Base prices bold face, delivered light face.

	No. 2 Foundry	Basic	Bessemer	Malleable
Bethlehem, Pa., base	$25.00	$24.50	$26.00	$25.50
Newark, N. J., del.	26.62	26.12	27.62	27.12
Brooklyn, N. Y., del.	27.65	.....	.....	28.15
Birdsboro, Pa., del.	25.00	24.50	26.00	25.50
Birmingham, base	†20.38	†19.00	.....	.....
Baltimore, del.	25.67	.....	.....	.....
Boston, del.	25.12	.....	.....	.....
Chicago, del.	‡24.47	.....	.....	.....
Cincinnati, del.	24.30	22.92	.....	.....
Cleveland, del.	24.12	23.24	.....	.....
Newark, N. J., del	26.24	.....	.....	.....
Philadelphia, del.	25.51	25.01	.....	.....
St. Louis, del.	‡24.12	23.24	.....	.....
Buffalo, base	24.00	23.00	25.00	24.50
Boston, del.	25.50	25.00	26.50	26.00
Rochester, del.	25.53	.....	26.53	26.03
Syracuse, del.	26.08	.....	27.08	26.58
Chicago, base	24.00	23.50	24.50	24.00
Milwaukee, del.	25.17	24.67	25.67	25.17
Muskegon, Mich., del.	27.38	.....	.....	27.38
Cleveland, base	24.00	23.50	24.50	24.00
Akron, Canton, O., del.	25.47	24.97	25.97	25.47
Detroit, base	24.00	23.50	24.50	24.00
Saginaw, Mich., del.	26.45	25.95	26.95	26.45
Duluth, base	24.50	.....	25.00	24.50
St. Paul, del.	26.76	.....	27.26	26.76
Erie, Pa., base	24.00	23.50	25.00	24.50
Everett, Mass., base	25.00	24.50	26.00	25.50
Boston	25.50	25.00	26.50	26.00
Granite City, Ill., base	24.00	23.50	24.50	24.00
St. Louis, del.	24.50	24.00	.....	24.50
Hamilton, O., base	24.00	23.50	.....	24.00
Cincinnati, del.	24.68	24.68	.....	25.35
Neville Island, Pa., base	24.00	23.50	24.50	24.00
§Pittsburgh, del., No. & So. sides	24.69	24.19	25.19	24.69
Provo, Utah, base	22.00	.....	.....	.....
Sharpsville, Pa., base	24.00	23.50	24.50	24.00
Sparrows Point, Md., base	25.00	24.50	.....	.....
Baltimore, del.	26.05	.....	.....	.....
Steelton, Pa., base	.....	24.50	.....	25.50
Swedeland, Pa., base	25.00	24.50	26.00	25.50
Philadelphia, del.	25.89	25.39	.....	26.39
Toledo, O., base	24.00	23.50	24.50	24.00
Mansfield, O., del.	26.06	25.56	26.56	26.06
Youngstown, O., base	24.00	23.50	24.50	24.00

*Basic silicon grade (1.75-2.25%), add 50c for each 0.25%. †For phosphorous 0.70 and over deduct 38c. ‡Over 0.70 phos. §For McKees Rocks, Pa., add .55 to Neville Island base; Lawrenceville, Homestead, McKeesport, Ambridge, Monaca, Aliquippa, .84; Monessen, Monongahela City .97 (water); Oakmont, Verona 1.11; Brackenridge 1.24.

High Silicon, Silvery

6.00-6.50 per cent (base)	$29.50		
6.51-7.00	$30.50	9.01- 9.50	$35.50
7.01-7.50	31.50	9.51-10.00	36.50
7.51-8.00	32.50	10.01-10.50	37.50
8.01-8.50	33.50	10.51-11.00	38.50
8.51-9.00	34.50	11.01-11.50	39.50

F.o.b. Jackson county, O., per gross ton. Buffalo base prices are $1.25 higher. Prices subject to additional charge of 50 cents a ton for each 0.50% manganese in excess of 1.00%.

Bessemer Ferrosilicon

Prices same as for high silicon silvery iron, plus $1 per gross ton. (For higher silicon irons a differential over and above the price of base grades is charged as well as for the hard chilling irons, Nos. 5 and 6.)

Charcoal Pig Iron

Northern

Lake Superior Furn. $28.00
Chicago, del. 31.54

Southern

Semi-cold blast, high phos, f.o.b. furnace, Lyles, Tenn. $28.50
Semi-cold blast, low phos., f.o.b furnace, Lyles, Tenn. 33.00

Gray Forge

Neville Island, Pa. $23.50
Valley, base 23.50

Low Phosphorus

Basing points: Birdsboro and Steelton, Pa., and Buffalo, N. Y., $29.50 base; $30.81, delivered, Philadelphia.

Switching Charges: Basing point prices are subject to an additional charge for delivery within the switching limits of the respective districts.

Silicon Differentials: Basing point prices are subject to an additional charge not to exceed 50 cents a ton for each 0.25 silicon in excess of base grade (1.75 to 2.25%).

Phosphorous Differential: Basing point prices are subject to a reduction of 38 cents a ton for phosphorous content of 0.70% and over.

Manganese Differentials: Basing point prices subject to an additional charge not to exceed 50 cents a ton for each 0.50% manganese content in excess of 1.0%.

Ceiling prices are the aggregate of (1) governing basing point (2) differentials (3) transportation charges from governing basing point to point of delivery as customarily computed. Governing basing point is the one resulting in the lowest delivered price for the consumer.

Exceptions to Ceiling Prices: Pittsburgh Coke & Iron Co. (Sharpsville, Pa. furnace only) and Struthers Iron & Steel Co. may charge 50 cents a ton in excess of basing point prices for No. 2 Foundry, Basic, Bessemer and Malleable. Mystic Iron Works, Everett, Mass., may exceed basing point prices by $1 per ton, effective April 20, 1942.

Export Prices: In case of exports only, the governing basing point nearest point of production may be used, plus differentials and export transportation charges.

Refractories

Per 1000 f.o.b. Works, Net Prices

Fire Clay Brick

Super Quality

Pa., Mo., Ky. $64.60

First Quality

Pa., Ill., Md., Mo., Ky.	51.30
Alabama, Georgia	51.30
New Jersey	56.00
Ohio	43.00

Second Quality

Pa., Ill., Ky., Md., Mo.	46.55
Georgia, Alabama	38.00
New Jersey	49.00
Ohio	36.00

Malleable Bung Brick

All bases $59.85

Silica Brick

Pennsylvania	$51.30
Joliet, E. Chicago	58.90
Birmingham, Ala.	51.30

Ladle Brick

(Pa., O., W. Va., Mo.)

Dry press	$31.00
Wire cut	29.00

Magnesite

Domestic dead-burned grains, net ton f.o.b. Chewelah, Wash., net ton, bulk	22.00
net ton, bags	26.00

Basic Brick

Net ton, f.o.b. Baltimore, Plymouth Meeting, Chester, Pa.

Chrome brick	$54.00
Chem. bonded chrome	54.00
Magnesite brick	76.00
Chem. bonded magnesite	65.00

Fluorspar

Washed gravel, f.o.b. Ill., Ky., net ton, carloads, all rail $23.00-25.00
Do., barge 23.00-25.00
No. 2 lump 23.00-25.00
(OPA May 11 established maximum at Jan. 2, 1942, level.)

Ferroalloy Prices

Ferromanganese: 78-82%, carlots, gross ton, duty paid, Atlantic ports, $135; Del. Pittsburgh $140.65; f.o.b. Southern furnaces $135; Add $6 per gross ton for packed carloads $10 for ton, $13.50 for less-ton and $18 for less than 200-lb. lots, packed.

Spiegeleisen: 19-21%, carlots per gross ton, Palmerton, Pa. $36.

Manganese Briquets: Contract basis in carloads per pound, bulk freight allowed 5.50c; packed 5.75c; ton lots 6.00c; less-ton lots 6.25c; less 200-lb. lots 6.50c. Spot prices ¼-cent higher.

Electrolytic manganese: 99.9% plus, less carlots, per lb. 42.00c.

Chromium Metal: Per lb. contained chromium in gross ton lots, contract basis, freight allowed, 98% 80.00c, 88% 79.00c. Spot prices 5 cents per lb. higher.

Ferrocolumbium: 50-60%, per lb. contained columbium in gross ton lots, contract basis, f.o.b. Niagara Falls, N. Y. $2.25; less-ton lots $2.30. Spot prices 10 cents per lb. higher.

Ferrochrome: 66-70%, per lb. contained chromium in carloads, freight allowed, 4-6% carbon 13.00c; ton lots 13.75c; less-ton lots 14.00c; less than 200-lb. lots 14.25c. 66-72%, low carbon grades:

	Car loads	Ton lots	Less ton	Less 200 lbs.
2% C.	19.50c	20.25c	20.75c	21.00c
1% C.	20.50c	21.25c	21.75c	22.00c
0.20% C.	21.50c	22.25c	22.75c	23.00c
0.10% C.	22.50c	23.25c	23.75c	24.00c

Spot is ¼c higher.

Chromium briquets: Contract basis in carloads per lb., freight allowed 8.25c; packed 8.50c; gross ton lots 8.75c; less-ton lots 9.00c; less 200-lb. lots 9.25c. Spot prices ¼-cent higher.

Ferromolybdenum: 55-75%, per lb. contained molybdenum, f.o.b. Langeloth and Washington, Pa., furnace, any quantity 95.00c.

Calcium Molybdate (Molyte): 40-45%, per lb. contained molybdenum, contract basis, f.o.b. Langeloth and Washington, Pa., any quantity, 80.00c.

Molybdic Oxide Briquets: 48-52%, per lb. contained molybdenum, f.o.b. Langeloth, Pa., any quantity 80.00c.

Molybdenum Oxide: 53-63%, per lb. contained molybdenum in 5 and 20 lb. molybdenum contained cans, f.o.b. Langeloth and Washington, Pa., any quantity 80.00c.

Molybdenum Powder: 99% per lb. in 200-lb. kegs, f.o.b. York, Pa. $2.60; 100-200 lb. lots $2.75; under 100-lb. lots $3.00.

Ferrophosphorus: 17-19%, based on 18% phosphorus content, with unitage of $3 for each 1% of phosphorus above or below the base; gross tons per carload f.o.b. sellers' works, with freight equalized with Rockdale, Tenn.; contract price $58.50, spot $62.25.

Ferrophosphorus: 23-26%, based on 24% phosphorus content, with unitage of $3 for each 1% of phosphorus above or below the base; gross tons per carload f.o.b. sellers' works, with freight equalized with Mt. Pleasant, Tenn.; contract price $75, spot $80.

Ferrosilicon: Contract basis in gross tons per carload, bulk, freight allowed; unitage applies to each 1% silicon above or below base.

	Carloads	Ton lots
50%	$ 74.50	$ 87.00
Unitage	1.50	1.75
75%	135.00	151.00
Unitage	1.80	2.00
85%	170.00	188.00
Unitage	2.00	2.20
90-95%	10.25c	11.25c

Spot prices ¼-cent higher.

Silicon Metal: Contract basis per lb., f.o.b. producers' plants, freight allowed; 1% iron; carlots 14.50c, ton lots 15.00c, less-ton lots 15.25c, less 200 lbs. 15.50c.

Silicon Metal: Contract basis per lb.; 2% iron; carlots 13.00c, ton lots 13.50c, less-ton lots 13.75c, less 200 lbs. 14.00c. Spot prices ¼-cent higher.

Silicon Briquets: Contract basis; in carloads, bulk freight allowed, per ton $74.50; packed $80.50; ton lots $84.50; less-ton lots per lb. 4.00c; less 200-lb. lots per lb. 4.25c. Spot ¼-cent per lb. higher on less-ton lots; $5 per ton higher on ton lots and over.

Silicomanganese: Contract basis freight allowed, 1½% carbon; in carloads per gross ton $128; ton lots $140.50. Spot $5 per ton higher.

Ferrotungsten: Carlots, per lb. contained tungsten, $1.90.

Tungsten Metal Powder: 98-99%, per lb. any quantity $2.55-2.65.

Ferrotitanium: 40-45%, f.o.b. Niagara Falls, N. Y., per lb. contained titanium; ton lots $1.23; less-ton lots $1.25. Spot 5 cents per lb. higher.

Ferrotitanium: 20-25%, 0.10 maximum carbon; per lb. contained titanium; ton lots $1.35; less-ton lots $1.40. Spot 5 cents per lb. higher.

High-Carbon Ferrotitanium: 15-20%, Contract basis, per gross ton, f.o.b. Niagara Falls, N. Y., freight allowed to destinations east of Mississippi River and North of Baltimore and St. Louis, 6-8% carbon $142.50; 3-5% carbon $157.50.

Ferrovanadium: 35-40%, contract basis, per lb. contained vanadium, f.o.b. producer's plant with usual freight allowances; open-hearth grade $2.70; special grade $2.80; highly-special grade $2.90.

Vanadium Pentoxide: Technical grade, 88-92 per cent V_2O_5; contracts, any quantity, $1.10 per pound V_2O_5 contained; spot 5 cents per pound higher.

Zirconium Alloys: 12-15%, contract basis, carloads bulk, per gross ton $102.50; packed $107.50; ton lots $108; less-ton lots $112.50. Spot $5 per ton higher.

Zirconium alloy: 35-40%, contract basis, carloads in bulk or package, per lb. of alloy 14.00c; gross ton lots 15.00c; less-ton lots 16.00c. Spot ¼-cent higher.

Alsifer: (Approx. 20% aluminum, 40% silicon, 40% iron) Contract basis, f.o.b. Niagara Falls, N. Y., per lb. 7.50c; ton lots 8.00c. Spot ½-cent higher.

Simanal: (Approx. 20% each silicon, manganese, aluminum) Contract basis, freight allowed, per lb. of alloy; carlots 10.50c; ton lots

WAREHOUSE STEEL PRICES

Base Prices in Cents Per Pound, Delivered Locally, Subject to Prevailing Differentials. As of April 16, 1941

	Soft Bars	Hot-rolled Strip Bands	Hot-rolled Strip Hoops	Plates ¼-in. & Over	Structural Shapes	Floor Plates	Sheets: Hot Rolled	Sheets: Cold Rolled	Sheets: Galv. No. 24	Cold Rolled Strip	Cold Drawn Bars: Carbon	Cold Drawn Bars: S.A.E. 2300	Cold Drawn Bars: S.A.E. 3100
Boston	3.98	4.06	5.06	3.85	3.85	5.66	3.71	4.68	5.11	3.46	4.13	8.88	7.23
New York (Met.)	3.84	3.96	3.96	3.76	3.75	5.56	3.58	4.60	5.00	3.51	4.09	8.84	7.19
Philadelphia	3.85	3.95	4.45	3.55	3.55	5.25	3.55	4.05	4.65	3.31	4.06	8.56	7.16
Baltimore	3.85	4.00	4.35	3.70	3.70	5.25	3.50	....	5.05	....	4.04	....	....
Norfolk, Va.	4.00	4.10	....	4.05	4.05	5.45	3.85	....	5.40	....	4.15	....	....
Buffalo	3.35	3.82	3.82	3.62	3.40	5.25	3.25	4.30	4.75	3.52	3.75	8.40	6.75
Pittsburgh	3.35	3.60	3.60	3.40	3.40	5.00	3.35	....	4.65	....	3.65	8.40	6.75
Cleveland	3.25	3.50	3.50	3.40	3.58	5.18	3.35	4.05	4.62	3.20	3.75	8.40	6.75
Detroit	3.43	3.43	3.68	3.60	3.65	5.27	3.43	4.30	4.84	3.40	3.80	8.70	7.05
Omaha	4.10	4.20	4.20	4.15	4.15	5.75	3.85	5.32	5.50	....	4.42	....	....
Cincinnati	3.60	3.67	3.67	3.65	3.68	5.28	3.42	4.37	4.92	3.45	4.00	8.75	7.10
Chicago	3.50	3.60	3.60	3.55	3.55	5.15	3.25	4.10	4.85	3.50	3.75	8.40	6.75
Twin Cities	3.75	3.85	3.85	3.80	3.80	5.40	3.50	4.35	5.00	3.83	4.34	9.09	7.44
Milwaukee	3.63	3.53	3.53	3.68	3.68	5.28	3.38	4.23	4.98	3.54	3.88	8.38	6.98
St. Louis	3.64	3.74	3.74	3.69	3.69	5.29	3.39	4.24	4.99	3.61	4.02	8.77	7.12
Indianapolis	3.60	3.75	3.75	3.70	3.70	5.30	3.45	....	5.01	....	3.97	....	....
Chattanooga*	3.80	4.00	4.00	3.85	3.85	5.80	3.75	....	4.50	....	4.39	....	....
Memphis	3.90	4.10	4.10	3.95	3.95	5.71	3.85	....	5.25	....	4.31	....	....
Birmingham	3.50	3.70	3.70	3.55	3.55	5.93	3.45	....	4.75	....	4.43	....	....
New Orleans	4.00	4.10	4.10	3.80	3.80	5.75	3.85	....	5.25	5.00	4.60	....	....
Houston, Tex.	3.75	4.30	4.30	4.05	4.05	5.50	4.00	....	5.25	....	6.90	....	....
Seattle	4.20	4.25	5.45	4.75	4.45	6.50	4.65	7.60	5.70	....	5.75	....	....
Los Angeles	4.50	4.95	6.80	4.50	4.50	6.75	4.65	6.50	5.85	....	6.10	10.55	9.55
San Francisco	3.95	4.50	6.25	4.65	4.35	6.35	4.55	6.40	6.10	....	6.80	10.80	9.80

*Not named in OPA price order.

	S.A.E. Hot-rolled Bars (Unannealed): 1035-1050	2300 Series	3100 Series	4100 Series	6100 Series
Boston	4.28	7.75	6.05	5.80	7.90
New York (Met.)	4.04	7.60	5.90	5.65	....
Philadelphia	4.10	7.56	5.86	5.61	8.56
Baltimore	4.45	....	....	....	....
Norfolk, Va.	....	....	....	....	....
Buffalo	3.55	7.35	5.65	5.40	7.50
Pittsburgh	3.40	7.45	5.75	5.50	7.60
Cleveland	3.30	7.55	5.85	5.85	7.70
Detroit	3.48	7.67	5.97	5.72	7.19
Cincinnati	3.65	7.69	5.99	5.74	7.84
Chicago	3.70	7.35	5.65	5.40	7.50
Twin Cities	3.95	7.70	6.00	6.09	8.19
Milwaukee	3.83	7.33	5.88	5.63	7.73
St. Louis	3.84	7.72	6.02	5.77	7.87
Seattle	6.25	....	8.00	7.85	8.65
Los Angeles	4.80	9.55	8.55	8.40	8.80
San Francisco	5.45	9.80	8.80	8.65	9.05

BASE QUANTITIES

Soft Bars, Bands, Hoops, Plates, Shapes, Floor Plates, Hot Rolled Sheets and SAE 1035-1050 Bars: Base, 400-1999 pounds; 300-1999 pounds in Los Angeles; 400-39,999 (hoops, 0-299) in San Francisco; 300-4999 pounds in Portland; 300-9999 Seattle; 400-14,999 pounds in Twin Cities; 400-3999 pounds in B'ham., Memphis.

Cold Rolled Sheets: Base, 400-1499 pounds in Chicago, Cincinnati, Cleveland, Detroit, New York, Omaha, Kansas City, St. Louis; 450-3749 in Boston; 500-1499 in Buffalo; 1000-1999 in Philadelphia, Baltimore: 750-4999 in San Francisco; 300-4999 in Portland, Seattle; any quantity in Twin Cities, New Orleans; 300-1999 Los Angeles.

Galvanized Sheets: Base, 150-1499 pounds, New York; 150-1499 in Cleveland, Pittsburgh, Baltimore, Norfolk; 150-1049 in Los Angeles; 300-10,000 in Portland, Seattle; 450-3749 in Boston; 500-1499 in Birmingham, Buffalo, Chicago, Cincinnati, Detroit, Indianapolis, Milwaukee, Omaha, St. Louis, Tulsa; 3500 and over in Chattanooga; any quantity in Twin Cities; 750-1500 in Kansas City; 150 and over in Memphis; 25 to 49 bundles in Philadelphia: 750-4999 in San Francisco.

Cold Rolled Strip: No base quantity; extras apply on lots of all size.

Cold Finished Bars: Base, 1500 pounds and over on carbon, except 0-299 in San Francisco, 500-999, Los Angeles, 1000 and over in Portland, Seattle; 1000 pounds and over on alloy, except 0-4999 in San Francisco.

SAE Hot Rolled Alloy Bars: Base, 1000 pounds and over, except 0-4999, San Francisco; 0-1999, Portland, Seattle.

EUROPEAN IRON, STEEL PRICES

Dollars at $4.02½ per Pound Sterling

Export Prices f.o.b. Port of Dispatch—

By Cable or Radio

	BRITISH Gross Tons f.o.b. U.K. Ports	L s d
Merchant bars, 3-inch and over	$66.50	16 10 0
Merchant bars, small, under 3-inch, re-rolled	3.60c	20 0 0
Structural shapes	2.95c	15 10 0
Ship plates	2.90c	16 2 6
Boiler plates	3.17c	17 12 6
Sheets, black, 24 gage	4.00c	22 5 0
Sheets, galvanized, corrugated, 24 gage	4.61c	25 12 6
Tin plate, base box, 20 x 14, 108 pounds	$ 6.20	1 10 9

British ferromanganese $120.00 delivered Atlantic seaboard duty-paid.

Domestic Prices Delivered at Works or Furnace—

		L s d
Foundry No. 3 Pig Iron, Silicon 2.50-3.00	$25.79	6 8 0(a)
Basic pig iron	24.28	6 0 6(a)
Furnace coke, f.o.r. ovens	7.56	1 17 6
Billets, basic soft, 100-ton lots and over	49.37	12 5 0
Standard rails, 60 lbs. per yard, 500-ton lots & over	2.61c	14 10 6
Merchant bars, rounds and squares, under 3-inch	3.17c	17 12 0††
Shapes	2.77c	15 8 0††
Ship plates	2.91c	16 3 0††
Boiler plates	3.06c	17 0 6††
Sheets, black, 24 gage, 4-ton lots and over	4.10c	22 15 0
Sheets, galvanized 24 gage, corrugated, 4-ton lots & over	4.70c	26 2 6
Plain wire, mild drawn, catch weight coils, 2-ton lots and over	4.28c	23 15 0
Bands and strips, hot-rolled	3.30c	18 7 0

(a) del. Middlesbrough. 5s rebate to approved customers. ††Rebate 15s on certain conditions.

Ores

Lake Superior Iron Ore

Gross ton, 51½% Lower Lake Ports

Old range bessemer	$4.75
nonbessemer	4.45
High phosphorus	4.35
Mesabi bessemer	4.60
Old range nonbessemer	4.30

Eastern Local Ore

Cents, unit, del. E. Pa.

Foundry and basic 56-63%, contract	12.00

Foreign Ore

Cents per unit, c.i.f. Atlantic ports

Manganiferous ore, 45-55% Fe., 6-10% Mang.	Nom.
N. African low phos.	Nom.
Spanish, No. African basic, 50 to 60%	Nom.
Brazil iron ore, 68-69% f.o.b. Rio de Janeiro	8.00c

Tungsten Ore

Chinese wolframite, per short ton unit, duty paid	$24.00

Chrome Ore

Gross ton c.i.f. Baltimore; dry basis; subject to penalties for guarantees

Indian and African, 2.8:1 lump, 48%	$39.00
South African (excluding war risk)	
No ratio lump, 44%	28.00
Do. 45%	29.00
Do. 48%	34.00
Do. concentrates, 48%	33.00
Do. 50%	34.00
Brazilian (nominal)	
2.5:1 lump, 44%	31.00
2.8:1 lump, 44%	32.50
3:1 lump, 48%	41.00
No ratio lump, 48%	35.00-35.50
Do. concentrate, 48%	33.00-33.50

Manganese Ore

Including war risk but not duty, cents per unit cargo lots

Caucasian, 50-52%	
S. African, 48%	65.00
Indian, 50%	68.00-70.00
Brazilian, 48%	
Chilean, 48%	68.00-69.00
Cuban, 51%, duty free	83.00-85.00

Molybdenum

Sulphide conc., lb., Mo. cont., mines	$0.75

MAXIMUM PRICES FIXED BY OPA ON IRON AND STEEL SCRAP

Other than railroad grades quoted on the basis of basing point prices from which shipping point prices and consumers' delivered prices are to be computed. Scrap originating from railroads quoted delivered to consumers' plants located on the line of the railroad from which the material originated. All prices in gross tons. A basing point includes its switching district.

PRICES FOR OTHER THAN RAILROAD SCRAP

				ELECTRIC FURNACE AND FOUNDRY GRADES										
				Low Phos. Grades										
	OPEN HEARTH GRADES*	Machine Shop Turnings	BLAST FURNACE GRADES*	Billet, Bloom Forge Crops	Bar Crops and smaller; Punchings, Plate	Heavy Structural, Plate 3 ft. and less	Heavy Structural, Plate 2 ft. and less	Heavy Structural, Plate 1 ft. and less	Cut Auto Scrap 3 ft. and less	Cut Auto Scrap 2 ft. and less	Cut Auto Scrap 1 ft. and less	Alloy-Free Low Phos. & Sulphur Turnings	First Cut Heavy Axle & Forge Turnings	Electric Furnace Bundles
Pittsburgh, Brackenridge, Butler, Johnstown, Midland, Monessen, Sharon, Steubenville, Weirton, Canton, Youngstown, Warren	$20.00	$16.00	$16.00	$25.00	$22.50	$21.00	$21.50	$22.00	$20.00	$20.50	$21.00	$18.00	$19.50	$21.00
Claymont, Coatesville, Harrisburg, Conshohocken, Phoenixville	18.75	14.75	14.75	23.75	21.25	19.75	20.25	20.75	18.75	19.25	19.75	16.75	18.25	19.75
Bethlehem	18.25	14.25	14.25	23.25	20.75	19.25	19.75	20.25	18.25	18.75	19.25	16.25	17.75	19.25
Buffalo	19.25	15.25	15.25	24.25	21.75	20.25	20.75	21.25	19.25	19.75	20.25	17.25	18.75	20.25
Cleveland, Middletown, Cincinnati, Portsmouth, Ashland	19.50	15.50	15.50	24.50	22.00	20.50	21.00	21.50	19.50	20.00	20.50	17.50	19.00	20.50
Detroit	17.85	13.85	13.85	22.85	20.35	18.85	19.35	19.85	17.85	18.35	18.85	15.85	17.35	18.85
Toledo	....	13.85	13.85	....	....	....	....	....	....	....	....	....	....	....
Chicago	18.75	14.75	14.75	23.75	21.25	19.75	20.25	20.75	18.75	19.25	19.75	16.75	18.25	19.75
Kokomo	18.25	14.25	14.25	23.25	20.75	19.25	19.75	20.25	18.25	18.75	19.25	16.25	17.75	19.25
Duluth	18.00	14.00	14.00	23.00	20.50	19.00	19.50	20.00	18.00	18.50	19.00	16.00	17.50	19.00
St. Louis	17.50	13.50	13.50	22.50	20.00	18.50	19.00	19.50	17.50	18.00	18.50	15.50	17.00	18.50
Birmingham, Atlanta, Alabama City, Los Angeles, San Francisco, Pittsburg, Calif.	17.00	13.00	13.00	22.00	19.50	18.00	18.50	19.00	17.00	17.50	18.00	15.00	16.50	18.00
Minnequa, Colo.	16.50	12.50	12.50	21.50	19.00	17.50	18.00	18.50	16.50	17.00	17.50	14.50	16.00	17.50
Seattle	14.50	10.50	10.50	19.50	17.00	15.50	16.00	16.50	14.50	15.00	15.50	12.50	14.00	15.50
Portland, Oreg.	....	....	....	....	15.50	14.00	14.50	15.00	13.00	13.50	14.00	11.00	12.50	14.00

RAILROAD SCRAP

	Heavy Melting Steel	Scrap Rails	Rails for Rolling	Scrap Rails 3 ft. and under	Scrap Rails 2 ft. and under	Scrap Rails 18 in. and under
Pittsburgh, Wheeling, Steubenville, Sharon, Youngstown, Canton	21.00	22.00	23.50	24.00	24.25	24.50
Philadelphia, Wilmington, Sparrows Point	19.75	20.75	22.25	22.75	23.00	23.25
Cleveland, Cincinnati, Middletown, Ashland, Portsmouth	20.50	21.50	23.00	23.50	23.75	24.00
Chicago	19.75	20.75	22.25	22.75	23.00	23.25
Buffalo	20.25	21.25	22.75	23.25	23.50	23.75
Detroit	18.85	19.85	21.35	21.85	22.10	22.35
Kokomo	19.25	20.25	21.75	22.25	22.50	22.75
Duluth	19.00	20.00	21.50	22.00	22.25	22.50
Kansas City, Mo.	17.00	18.00	19.50	20.00	20.25	20.50
St. Louis	18.50	19.50	21.00	21.50	21.75	22.00
Birmingham	18.00	19.00	20.50	21.00	21.25	21.50
Los Angeles, San Francisco	18.00	19.00	20.50	21.00	21.25	21.50
Seattle	15.50	16.50	18.00	18.50	18.75	19.00

CAST IRON SCRAP OTHER THAN RAILROAD

(Shipping point prices in gross tons)

	Group A	Group B	Group C
No. 1 Cupola Cast	$18.00	$19.00	$20.00
No. 1 Machinery Cast, Drop Broken, 150 lbs. & Under	18.00	19.00	20.00
Clean Auto Cast	18.00	19.00	20.00
Stove Plate	17.00	18.00	19.00
Unstripped Motor Blocks	17.50	18.50	19.50
Heavy Breakable Cast	15.50	16.50	17.50
Charging Box Size Cast	17.00	18.00	19.00
Miscellaneous Malleable	20.00	21.00	22.00

Group A includes the states of Montana, Idaho, Wyoming, Nevada, Utah, Arizona and New Mexico.

Group B includes the states of North Dakota, South Dakota, Nebraska, Colorado, Kansas, Oklahoma, Texas and Florida.

Group C includes states not named in groups A and B, plus Kansas City, Kans.-Mo.

*Open Hearth Grades refer to No. 1 heavy melting steel, No. 1 hydraulic compressed black sheet scrap, No. 2 heavy melting steel, dealers' No. 1 bundles, dealers' No. 2 bundles and No. 1 busheling. Blast Furnace Grades refer to mixed borings and turnings, shoveling turnings, No. 2 busheling and cast iron borings. Add $5 per ton for chemical borings containing not over 0.5 per cent oil content.

A basing point includes the switching district of the city named. The Pittsburgh basing point includes the switching districts of Bessemer, Homestead, Duquesne, Munhall and McKeesport, Pa. Cincinnati basing point includes the switching district of Newport, Ky. St. Louis basing point includes the switching districts of Granite City, East St. Louis and Madison, Ill. San Francisco basing point includes the switching districts of South San Francisco, Niles and Oakland, Calif.

Inferior Grades: Maximum prices of inferior grades shall continue to bear the same differential below the corresponding listed grades as existed from Sept. 1, 1940, to Jan. 31, 1941. No premium allowed on grades considered superior, unless approved by OPA. Addition of special preparation charges prohibited. Purchase of electric furnace or foundry grades for open hearth or blast furnace use permitted only at no more than price for corresponding open hearth grade. Exceptions: Low phos. billet, bloom and forge crops and electric furnace bundles may exceed open hearth price, and electric furnace bundles may exceed blast furnace price, if material is delivered to the consumer direct from the original industrial producer.

Commissions: No commission is payable except by a consumer to a broker for services rendered the commission not to exceed 50 cents per gross ton. No commission is payable unless: The broker guarantees the quality and delivery of an agreed tonnage the scrap is purchased at a price no higher than the maximum allowed; the broker sells the scrap to the consumer at the same price at which he purchased it; the broker does not split the commission with the seller of the scrap, with another broker or sub-broker, or with the consumer. Commissions must be shown as separate item on invoice.

Maximum Shipping Point Price: Where shipment to consumer is by rail, vessel or combination of both, scrap is at its shipping point when it has been placed f.o.b. railroad car or f.a.s. vessel. In such cases, maximum shipping point prices are: (1) For shipping points located within a basing point, the price listed in the above table for scrap at the basing point in which the shipping point is located, minus the lowest established switching charge for scrap within the basing point; and (2) for shipping points located outside a basing point, the price in the above table for scrap at the most favorable basing point, minus the lowest transportation charge by rail, water or combination thereof. When vessel movement is involved, dock charges shall be 50 cents at Memphis, $1 at Great Lakes ports, $1.25 at New England ports, 75 cents elsewhere. New England shipping point prices computed on most favorable basing point prices; maximum transportation charge on scrap from New England, $6.65 per ton.

Scrap shipped by motor vehicle is at its shipping point when loaded. For shipping points within basing points, maximum is price listed in table minus lowest switching charge. When outside basing point, maximum is price at most favorable basing point minus lowest established charge when hauled by common carrier. When hauled by seller charges are based on carload rate for rail shipment, minimum $1.00 per ton.

Maximum Delivered Prices: Determined by adding established transportation charges to shipping point price, not to exceed by more than $1 (plus freight rate increase March 18, 1942) the prices listed in the table for the nearest basing point. Certain exceptions specified in Revised Price Schedule No. 4 (Amendment 1) apply to St. Louis district consumers, to WPB allocations, to water shipments from Duluth or Superior, Wis., to shipments of billets, blooms and forge crops from Pittsburgh and to shipments of electric and foundry grades from Michigan; to shipments of turnings to ferroalloy producers and of borings to chemical users. Delivered prices of scrap shipped under WPB allocations may exceed prices at nearest basing point by more than $1, provided most economical transportation is used.

Unprepared Scrap: Above prices are for prepared scrap. Maximum prices for unprepared scrap are $2.50 less (railroad grades $3.50 less) than for the corresponding grades of prepared scrap, except for heavy breakable cast. In no case shall electric furnace and foundry grades be used as the "corresponding grade or grades of prepared scrap." Graveyard autos not considered unprepared scrap.

Remote Scrap: Consists of all grades, except railroad scrap, located in Florida, Montana, Idaho, Wyoming, Nevada, Arizona, New Mexico, Texas, Oklahoma, Oregon, Washington and Utah. Delivered price may exceed by not more than $5 the price at the basing point nearest consumer's plant, provided sworn details furnished OPA. Permission required to exceed by more than $5 the nearest basing point price. Colorado scrap is remote scrap for Colorado consumers only.

Sheets, Strip

Sheet & Strip Prices, Page 114

Sheet mill schedules currently are engaged fully on ratings usually not lower than A-1-e and even on higher priorities frequent demands are made for expedited shipments. Demand tends toward heavier gages and higher ratings.

Manufacturers of steel drums and other sheet fabricators are being delayed in receiving material by the fact that continuous sheet mills are devoting most capacity to production of plates.

In the South, sheet production is at about 80 per cent of capacity, due to heavy plate demand, which absorbs much semifinished steel.

Heavily booked on top-rated high carbon and alloy strip, rerollers of narrow cold-finished in numerous instances are unable to accept additional tonnages of these finishes even on relatively high priorities with any assurance of meeting delivery requirements. Alloy demand for aircraft is heavier. Low carbon is less tight, but as with high carbon and alloys, supplies of hot material are geared to high priorities, hot strip replacements below A-1-b being difficult.

Many new consumers of cold strip are getting into production on war products and are taking large shipments, annealing capacity limiting delivery schedules.

Plates

Plate Prices, Page 115

Better balance between requests for steel plates and the tonnage allocated by WPB is being attained and distribution for June shows the closest relationship of any month since allocations were started. Inventory control is partially responsible for this condition. Some trade leaders believe that in another three months sufficient plates will be available for all rated needs, notwithstanding the fact that not much expansion in plate capacity is expected by that time.

In spite of high backlogs of plate orders some mills are operating below capacity because part of their orders are not at highest priorities and as a result semifinished steel allocations are insufficient for full production. This results from priorities being carried back to the ingot.

Consumers who can use strip and universal plates instead of sheared plates occasionally find it possible to obtain a delivery as low as A-1-k. Tank fabricators cannot obtain sufficient tank work at high ratings to engage their shops fully and are seeking other types of plate assembly that carry better rating.

Bars

Bar Prices, Page 114

With some mills carbon and alloy steel bars are as tight as plates. Some alloy analyses are more difficult to obtain than plates. The larger portion of specifications are against contracts covered originally by high and even top priorities, some being revised to assure and maintain deliveries on monthly shipments.

Only by re-extended A-1-a ratings are distributors able to obtain partial replacements on hot-rolled material, and cold-rolled sections are broken and depleted.

In New England conversion to war work has had more effect on bars than any other product, from small rod sizes for screw machines to larger diameters for forgings, shells and guns. Forged die-lock chain and shipbuilding requirements are heavy and large orders are frequent from yard supply shops. A recent order of this sort required 725 tons of slow-cooled hot-rolled bars, 1 3/8-inch to 3 7/16-inch for Boston, awarded to Bethlehem Steel Co., Bethlehem, Pa., at $50,932, delivered.

War requirements for wrought iron bars for chainmaking are reviving that industry, which has been operating at a low level in recent years. Wrought iron output is much below capacity as demand has not been sufficient for this material to obtain supplies of pig iron, but this condition is changing.

Some important producers of alloy steels have been authorized to make up heats of national emergency steels to make billets available to fill orders for less than full

heats. Among types included in this authorization are 8120, 8620, 8442 and 8744.

Cold drawers are still receiving allocations of shell steel, particularly for 20 and 37 millimeter armor piercing shot. Most of this tonnage is now coming through in relatively small amounts, following placements made earlier in the year.

Hot carbon bar deliveries against A-1-a ratings have shown little variation recently, ranging around 8 to 10 weeks in most instances. Shipments against A-1-b priorities average about a week longer. Below A-1-b delivery promises are highly indefinite as a rule, some mills refusing to make definite promises under A-1-a, although they are still the exception. Chief stringency lies in small rod sizes up to and including 9/16-inch and sizes ranging from 1½ inches and higher. An exception may be noted in the 13/16-inch rounds required for 20 millimeter shot. Occasionally some surprisingly good deliveries can be made. For instance, one consumer this week got delivery on A-1-i tonnage in five weeks.

Wire

Wire Prices, Page 115

Bookings of specialties with most wire mills were slightly lower in May, averaging close to 5 per cent under shipments. Volume of forward orders, however, is heavy and releases each month against this tonnage tend to increase with limited rod supplies and annealing bottlenecks in production schedules. High carbon rounds lead in demand, with indications requirements for alloys destined for aircraft production will mount during the balance of the year. Bookings tend to range in the higher A-1 brackets and accumulation of top priorities presents a problem as to what orders to process first after lend-lease.

Rails, Cars

Track Material Prices, Page 115

Control of freight car production by WPB has eased pressure on builders and their suppliers and has increased volume of war work produced in their plants. Car shops now are producing gun carriages, gun forgings, tank parts, armor plate and other heavy material.

Possibility exists that considerable railroad business may be released later this year, with priorities sufficiently high to insure delivery, which will tax shops when added to other business now on books.

Structural Shapes

Structural Shape Prices, Page 115

Structural mills in most instances will be allocated more semifinished for June production. War Production Board asked producers for June rolling schedules with a breakdown covering tonnage for shipyards and for other uses and also asked how much tonnage could be rolled if steel were available. Adjustments have been made by which more steel will be provided to care for increased volume for shipbuilding.

This course is taken rather than to curtail supplies to fabricating shops heavily engaged on highly-rated war plant construction, mainly in A-1 classification. Restrictions in the latter are not expected to be felt for some weeks. A backlog of about 780,000 tons is available for fabrication during the next four months. Curtailment will be noted first in inquiry and projects will be sifted closely, with some held up. In the latter class is a heating plant at Washington for which steel had been ordered and foundations started.

By heavier allocations for shipbuilding, structural shops may get some relief on certain sections. Fabricators often are handicapped by partial deliveries for a project, with delayed shipment on the remainder. Involved in the latter frequently are sizes being diverted to shipyards from 24 and 28-inch mills, light beams, angles and channels. With more steel provided for mills, fabricators will get better deliveries on these sections. Many structural shops are seeking subcontracts, especially for shipbuilding fabrications.

Orders for fabricated structural material booked during April, 327,420 net tons, were the largest for

any month since 1929, according to the American Institute of Steel Construction. This compares with 248,319 tons in March and 218,018 in April, 1941. Bookings for four months totaled 987,814 tons, 12.4 per cent increase over the same period in 1941. Shipments for four months were 700,508 tons, compared with 685,856 tons last year.

Reinforcing Bars

Reinforcing Bar Prices, Page 115

Concrete reinforcing bars of new billet steel one inch square and larger now require A-1-a priorities to gain a place on mill rolling schedules. Orders with lower ratings previously placed on producers' books have been held up, and no new tonnages below that are being considered.

Smaller sizes are still being taken on ratings as low as A-1-f by some mills, although this represents the minimum and not all mills are able to accept these ratings. Requirements on rerolled rail bars are lower, recent tonnages as low as A-3 having been accepted. These are dependent to a large measure on the availability of rails, however, and production has been erratic because of the tight rail market.

Pig Iron

Pig Iron Prices, Page 116

Distribution of pig iron under allocations continues satisfactory and most consumers find their needs well covered. Various changes in blast furnace units are being made, with the general trend toward heavier production. A new stack was blown in last week at Republic Steel Corp. plant at Gadsden, Ala., and Mystic furnace, Everett, Mass., was relighted after relining. Indications now are that an eastern Pennsylvania stack scheduled to go out for relining May 1 will be continued until July 1. Production was interrupted last week at furnaces of Bethlehem Steel Co., Bethlehem, Pa., when floods cut off power, but by the middle of the week conditions were restored to normal.

Following return of the Massachusetts stack to production allocations to New England pig iron consumers in June will be revised considerably as to suppliers, due in part to lowering of reserves during the idle period. This is especially true of basic and some special analyses.

Gray iron foundry operators were reported holding up billings on some orders, pending announcement from OPA of new price ceiling regulations. OPA originally issued a letter requesting foundries to hold prices at levels of October, 1941, pending establishment of a definite price ceiling. Subsequent discussions indicated that some other date for the establishment of the ceiling might be chosen, but no definite action was taken.

It was later affirmed that gray iron castings came under the general maximum price regulations, and last week-end a formula was issued by OPA for pricing of castings under sections 2 and 3 of that regulation, which froze prices at levels of March, 1942.

Scrap

Scrap Prices, Page 118

Scrap deliveries have improved to the point where strict observance of grading is prevalent and more rejections are met. Shipments in some cases have been sufficient to allow accumulation for inventory. Instances have occured where the inflow has been too large for handling facilities and shipments have been ordered held back.

War Production Board through the director of industry operations has urged scrap consumers to accumulate as much scrap as possible during the summer to assure capacity steel production next winter. To assist in this endeavor an amendment has been issued to order M-24, removing restrictions imposed by priorities regulation No. 1, as it related to iron and steel scrap. Iron and steel branch warns that any tendency to limit purchases will adversely affect collections, which should be maintained at the highest possible level to insure supplies for winter.

One effect of the better supply is to enable large consumers to buy through brokers instead of seek-

ing shipments from small dealers in the effort to obtain sufficient for current needs. Some inadvertent violations of regulations have resulted from inability to inspect these small lots closely, a factor eliminated through buying from brokers in large lots.

Foundries are receiving a more nearly adequate supply, motor blocks from automobile wrecking operations supplying a large tonnage of cast scrap.

A heavy volume of scrap is moving from the eastern field by barge to Buffalo, but most is being shipped to eastern Pennsylvania.

Borings are being produced in large volume but considerable of this goes to briquetters. Light alloy steels are being segregated better than in the immediate past. Low phosphorus scrap is still scarce. Railroad offerings are below normal and most of this is being allocated.

A city-sponsored WPA project at St. Louis will reclaim 53,750 feet of abandoned street railway rails. It is estimated the city will profit $4 to $6 per ton after meeting expense of street repair.

Regulation providing that trucks carrying scrap 15 miles or more to a delivery point must carry a full load and also provide a 75 per cent load on the back haul, continues to be protested, due to difficulty of obtaining a full load from rural districts and to obtaining the return load. The protest is based on the assumption this would hamper prompt deliveries.

An amendment has been announced by OPA to allow pieces of iron and steel scrap 15 inches wide and 5 feet long to be sold as No.2 heavy melting steel, with thickness specifications unchanged. This amendment to schedule No. 4 follows the practice of the majority of open-hearth consumers, accepting 5-foot material as such, and does not alter the maximum on automotive cut steel for foundry use. Car sides and all light plates still are required to be sheared to 15 x 15 inches or under and all tires and light rods 12 inches or less in length.

Seven of the 14 states in the Chicago War Production Board area have reported on industrial plant salvage for the week ended May 9. Industrial plants in Illinois disclose that 14,900 tons was collected in this period; Minnesota plants salvaged 9250 tons; Missouri. 4260 tons; Upper Michigan and Wisconsin, 21,165 tons; Tennessee, 5850 tons; and Alabama, 8850 tons.

Industrial salvage committee of the Illinois Manufacturers' Association reports that Illinois manufacturers from April 1 to May 9 gathered enough scrap iron and steel to supply the needs of 11 battleships. The total was 100,500 tons.

Warehouse

Warehouse Prices, Page 117

Steel warehouses find their new rating of A-1-k came too late to be of service, as under present conditions mills can not entertain business rated that low. Only by extended A-1-a ratings are distributors able to obtain partial replacements and stocks are being depleted by constant calls, with little opportunity to obtain material to build up their stocks.

Office of Price Administration has added Tacoma, Wash., and Sioux Falls, S. Dak., to listed cities recognized as distribution centers for iron and steel sold from warehouses whose prices can serve as base lists for city delivery. OPA also allows sale on unrated orders for fence wire, barbed wire, fence posts, gates, staples, poultry netting, siding and corrugated roofing, by an amendment to the iron and steel order. Optional change in quota basis on wire and wire products delivered to warehouses is provided in the same amendment.

Pacific Coast

Seattle—Rolling mills, fabricators, shipyards and contractors are working at top speed, many plants having backlogs to the end of the year and refusing all new business, except what federal agencies place with the highest priorities. The tire restriction is presenting a new problem in transportation of war workers.

Alcoa's new reduction plant at Spokane has started operations, the

second unit scheduled for completion next month. T. B. Parsons, construction superintendent for Alcoa, announces the Defense Plant Corp.'s aluminum ingot mill at Troutdale, Oreg., is now in production, capacity 30,000,000 pounds of aluminum pig per year. Second and third units will be ready for operation June 15 and Aug. 15 respectively, it is stated.

Puget Sound Bridge & Dredging Co., Seattle, has the contract to build a 10,000 ton wooden drydock costing $1,500,000 for the Navy on the Columbia river. Whitehouse & Price, Spokane, will have charge of architectural and engineering work on the $10,000,000 naval supply depot in eastern Washington, general contract to Clifton & Appleral and Henry Georg, Spokane, tonnages unstated.

Washington state has called bids June 9 for the sale of $50,000 worth of surplus machine tools and equipment at state institutions, including lathes, milling machines and other items.

Cast iron pipe sales are confined to government requirements. A housing project at Vancouver, Wash., will require a large tonnage. Federal funds have been provided for water systems at Port Orchard and Poulsbo, Wash., and a treatment plant at Renton, Wash. Bids for a treatment plant at Poulsbo will be called shortly.

Steel in Europe

Foreign Steel Prices, Page 117

London—(*By Cable*)—Rising demand for special and alloy steel is being experienced in Great Britain as war needs increase. Further expansion is under way in the plate market, including requirements for shipbuilding, tanks, locomotives and railroad wagon work. Rerolled products are in steady demand. Distribution of steel to commercial users is further restricted. The structural market is quiet.

Tin Plate

Tin Plate Prices, Page 115

Tin plate production is expected to drop considerably during second half, as a result of tin allocations Production has been at about 70 per cent of 1941 volume, second quarter output being less than first quarter. Most plate for domestic use is normally produced in first half. Stocks are heavy in mill warehouses and in hands of canmakers and users. Output from now on will be principally for late packs and export, the latter expected to lead in fourth quarter.

Canada

Toronto, Ont.—Instructions issued to Canadian primary steel makers which prohibit sales and deliveries of steel except by approval of F. B. Kilbourn, steel controller, are expected to result in early suspension of practically all civilian manufacture. While recent orders did not place further restrictions on civilian production of articles in which use of iron and steel are involved, they do shut off supply of steel and other metals to these consumers and when present stocks of raw materials have been used there is little chance of replenishing. Local representatives of Canadian steel producers and United States mill representatives, state a continuous flood of new orders is pouring in, but only those with top ratings are being given consideration. Warehouse operators also report difficulty in obtaining fresh supplies of steel. Mills are booked solid on all products and are decidedly indefinite regarding shipments against fresh contracts.

Structural steel lettings were about 11,000 tons last week but are far below those reported at this time a year ago. All awards are for war plants or additions and new construction to be started soon will require some 40,000 tons.

Merchant bar orders directly associated with war industry are heavy but mills promise no definite delivery date.

Brisk action is the feature of the scrap market. Fresh supplies are pouring in from all sections of the country and have enabled many consumers to build substantial yard stocks in the past two or three weeks. Tin cans are being used more extensively. Deliveries of scrap from rural districts and autowreckers are gaining and dealers have difficulty handling the incoming materials.

Nonferrous Metal Prices

May	Copper: Electro, del. Conn.	Copper: Lake, del. Midwest	Copper: Casting, refinery	Straits Tin, New York: Spot	Straits Tin, New York: Futures	Lead N. Y.	Lead East St. L.	Zinc St. L.	Aluminum 99%	Antimony Amer. Spot, N.Y.	Nickel Cathodes
1-28	12.00	12.12½	11.75	52.00	52.00	6.50	6.35	8.25	15.00	14.50	35.00

F.o.b. mill base, cents per lb. except as specified. Copper brass products based on 12.00c Conn. copper

Sheets

Yellow brass (high)	19.48
Copper, hot rolled	20.87
Lead, cut to jobbers	9.75
Zinc, 100 lb. base	13.15

Tubes

High yellow brass	22.23
Seamless copper	21.37

Rods

High yellow brass	15.01
Copper, hot rolled	17.37

Anodes

Copper, untrimmed	18.12

Wire

Yellow brass (high)	19.73

OLD METALS

Dealers' Buying Prices
(In cents per pound, carlots)

Copper

No. 1 heavy	9.25-10.00
Light	7.25- 8.00

Brass

No. 1 composition	8.75- 9.50
Heavy yellow	6.25- 6.75
Auto radiators	7.00- 7.75
Red Brass, borings & turnings	8.25- 9.00

Zinc

Old	5.25- 5.75
New clippings	6.75- 7.25

Aluminum

Clippings	10.00-11.00
Cast	9.00- 9.50
Pistons	9.00-10.50
Sheet	9.00- 9.25

Lead

Heavy	5.65- 5.85
Mixed babbitt	4.50- 6.00
Electrotype shells	5.75- 6.25
Stereotype, Linotype	6.25- 6.50

Tin and Alloys

Block tin pipe	44.00-46.00
No. 1 pewter	32.00-34.00
Solder joints	7.60- 8.10

SECONDARY METALS

Brass ingot, 85-5-5-5, l.c.l.	13.25
Standard No. 12 aluminum	14.50

Nonferrous Metals

New York—Expansion of copper production facilities may have to be suspended, according to Leon Henderson, OPA administrator. Steel, copper and other materials may have to be used this year instead of getting ready to produce war goods at a faster pace next year. The limitations already in force and those contemplated have had no effect, however, on expansion of aluminum and magnesium production facilities. T. D. Jolly, Aluminum Co. of America, reports that his company is now building for Defense Plant Corp. a total of 15 plants and that the company has 20 other major projects of its own under way. By the end of 1943, the United States production of aluminum will be approximately 2,100,000,000 pounds, or 6½ times its 1939 production "Aside from our operating expenditures," Mr. Jolly said, "we will have spent for construction from Jan. 1, 1940, to the middle of 1943, just about 600 million dollars."

Henry Prentiss & Co. To Retire from Business

Henry Prentiss & Co. Inc., New York, sales representatives and distributors for a number of nationally-known machine tool manufacturers, recently announced that no orders will be accepted by the firm after May 31 due to voluntary retirement of all principals interested in the business.

The firm served as sales agents for the following concerns: Abrasive Machine Tool Co., East Providence, R. I.; Acme Machine Tool Co., Avey Drilling Machine Co., both of Cincinnati, O.; Blanchard Machine Co., Cambridge, Mass.; Bryant Chucking Grinder Co., Springfield, Vt.; Cincinnati Bickford Tool Co., Cincinnati Milling Machine Co., Cincinnati Grinders Inc., and Cincinnati Planer Co., all of Cincinnati, O.; Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.; Gould &

Eberhardt, Irvington, N. J.; Hanchett Mfg. Co., Big Rapids, Mich.; Lodge & Shipley Machine Tool Co., Cincinnati, O.; Moline Tool Co., Moline, Ill.; National Automatic Tool Co., Richmond, Ind.; Racine Tool & Machine Co., Racine, Wis.; The V. & O. Press Co., Hudson, N. Y., and O. S. Walker Co., Worcester, Mass.

Cincinnati Milling Machine Co., and Cincinnati Grinders Inc., announced establishment of their own sales subsidiary for New York and New England, (STEEL, *May* 25, *p.* 62).

Aluminum Output To Top Two Billion Pounds

(*Concluded from Page* 35)

plying castings and all of the other suppliers were able to produce more because of the duplication.

"We had 72 buildings from the same shop drawings and many other duplications, but the most interesting one is in one of the powerhouses. At this plant, we were being supplied with natural gas at a very low price. No amount of standardization will obtain quick delivery of 35,000-kilowatt steam-driven turbo-generators. We were to be supplied with temporary power until we could get a steam power station in operation, but because of the long delivery on steam power equipment and the need for a quick source of power, other arrangements had to be made.

"We are installing 60 gas engines each driving a 750-kilowatt generator, and 18 equipped with 2250-kilowatt generators. These are direct current generators and the power is transmitted directly to the production line. The conventional procedure is to convert A.C. to D.C. by means of mercury arc rectifiers. The elimination of this equipment makes the price of the gas-engine power compare favorably with that from other sources, and with low priced gas we believe it will be a very economical installation.

Mr. Jolly said that aside from operating expenditures, Alcoa will have spent for construction from Jan. 1, 1940, to the middle of 1943, just about 600 million dollars.

"We have not yet been seriously behind schedule and have been ahead in some cases. No organization the size of ours could have handled this work without the co-operation of everyone connected with it. Engineering, purchasing, construction, operating, and priority divisions all feel that it is their job. Everyone from the blueprint boy up is anxious to see the schedules kept and takes personal pride in beating them. We have always had a purchasing policy of fair treatment to suppliers, and it is paying big dividends under today's rather difficult conditions."

R. C. Haberkern Elected To Head Purchasing Agents

Roy C. Haberkern was elected president of the National Association of Purchasing Agents at the annual convention at the Waldorf-Astoria, New York. He is connected with the R. J. Reynolds Tobacco Co., Winston-Salem, N. C., and succeeds F. Albert Hayes, of the American Hide and Leather Co., Boston.

Nine district vice presidents were elected as follows: District No. 1, Seibert W. Mote, University of Utah, Salt Lake City, Utah; District No. 2, C. S. Worley, Consolidated Gas Utilities Corp., Oklahoma City, Okla.; District No. 3, Leslie F. Robbins, University of Colorado, Boulder Dam, Colo.; District No. 4, Earl L. Cleman, city of Dearborn, Mich.; District No. 5, Harold I. Nelson, North Shore Paper Co., Montreal, Canada; District No. 6, E. A. Jensen, Wittenberg college, Springfield, O.; District No. 7, A. Grant Clark, McWilliams Dredging Co., New Orleans; District No. 8, Joseph I. Kitchin, Lanston Monotype Machine Co., Philadelphia; District No. 9, Stephen J. Kennedy, Springfield Gas Light Co., Springfield, Mass.

NEW BUSINESS

Plant Expansion, Construction and Enterprise, Government Inquiries, Sub-Contract Opportunities, Contracts Placed and Pending

SUB-CONTRACT OPPORTUNITIES . . .

Data on subcontract work are issued by local offices of the Contract Distribution Branch, WPB. Contact either the office issuing the data or your nearest district office. Data on prime contracts also are issued by Contract Distribution offices, which usually have drawings and specifications, but bids should be submitted directly to contracting officers as indicated.

Chicago office, Contract Distribution Branch of WPB, 20 North Wacker Drive, is seeking contractors for the following:

GHC-D1: Central Iowa concern seeks single or multiple automatic screw machine capacity 1½-inch size, for fabrication of steel bolts approximately 6 inches long and 1½ inches O.D. Also hex nuts. Both bolts and nuts to be Parkerized and nuts only to be heat treated. Bolt quantity 20,200, nut quantity 39,000. Delivery to start July 1 or sooner. Tolerances .002 and .005. Steel 3135 and 3140, which prime contractor can furnish if required. Price is wanted both with subcontractor furnishing or not furnishing the material. Prints available at Des Moines, Iowa, office, 708 Crocker building.

34-N-515: Cylindrical grinding facilities are immediately needed on steel shafts. Two shafts 13 inches in diameter and 8 feet 3½ inches long; two shafts 10¾ inches in diameter and 7 feet 6 inches long. Tolerances .0005 to .001. Additional operations consist of deep hole drilling 48 inches deep. It may be feasible to use roll grinder such as used for printers' rollers if tolerances can be held. A-1-a priority.

39-N-516: Facilities wanted for manufacturing 12 cross manifolds, 600 pounds air pressure, and auxiliary parts. Overall length 23¾ inches, depth 5⅝ inches. Tools required are small boring mill, milling machine, drill press, lathes and other auxiliary tools. Materials to be furnished by prime contractor, delivery to start as soon as possible. Drawings at Chicago office.

New York office, Contract Distribution Branch of WPB, 122 East Forty-Second street, New York, reports the following subcontract opportunities:

D-22: A Philadelphia radio manufacturer now working on ordnance is seeking six or four-spindle automatic screw machine facilities for production of 25,000 to 50,000 parts per week. Material, cold-rolled steel WDX 1314, 2 1/16 inches in diameter. Tolerance, plus .005. Machines needed, 2⅝-inch six-spindle automatic screw machines, four-spindle will also be considered. Tapping and threading must be done as one operation to insure internal and external threads are concentric. Necessary perishable tools will be furnished for first run. Drawings, specifications and sample at New York office.

S-132: New Jersey manufacturer of hydraulic machinery has about 20,000 hours of work to subcontract. Machines needed, horizontal boring mills of 7, 6 and 5-inch diameters, floor or table type; planers, 72-inch, open side or double housing type, 14 to 16-foot bed; vertical boring mills, 120 and 96-inch, preferably with 96 inches under rail, but not necessarily; engine lathes, 36 or 48-inch swing, 12 to 18-inch minimum between centers; radial drills with 6 or 8-foot arms; slotters with stroke of at least 24 inches, 48 or 60-inch tables; 54-inch vertical turret lathe of Bullard or King type, with side head and thread-cutting attachment. Materials to be furnished by prime contractor. Blueprints at Newark office, 20 Washington place.

S-133: New Jersey aircraft manufacturer is seeking subcontractors to produce parts to close tolerances, of chrome-moly steel, 800 to 2500 of each part. Machines needed, small and medium sized machine tools, including lathes, milling machines, drill presses and heat treating facilities. Blueprints at Newark office, 20 Washington place.

Boston office, Contract Distribution Branch of WPB, 17 Court street, is seeking contractors for the following:

SC-46: Large manufacturer urgently requires services of subcontractors on jigs, tools, gages and fixtures. Tool department must have surface grinders, drills, milling, jig boring, hardening equipment, lathes, planer, surface plates and general toolroom equipment.

SC-47: Manufacturer is in need of subcontracting sources having No. 3 and 5 Warner & Swasey universal turret lathes or their equivalent.

Detroit office, Contract Distribution Branch, Production Division, WPB, Boulevard building, is seeking contractors for the following:

Rm No. 775: Steel screw machine part, 1⅝-inch diameter, ¼-inch long, SAE 1010 steel, 14,000 required. Drilling and countersinking are second operations. Material is furnished. Needed at once.

Rm No. 774: SAE 1020 steel lever, made of ½ x 1⅛-inch bar stock, which is furnished. Turning, milling and drilling operations. Quantity, 14,000 pieces.

Rm No. 773: SAE 2350 steel flange, made of 2-inch bar stock, which is furnished by prime contractor. Second operations consist of drilling, reaming and chamfering. Quantity, 14,000 pieces. Delivery to start at once.

Rm No. 776: SAE 2330 steel collar, made of 1⅜-inch bar stock, which is furnished. Quantity, 14,000 pieces. Delivery to start at once.

Rm No. 778: SAE 2330 steel spindle, 6⅜-inch long and ¼-inch diameter; several diameters are centerless ground. Both ends have ⅜-20 British thread. Material and thread chasers furnished by prime contractor. Quantity, 14,000 pieces. Required as soon as possible on A-1-a priority.

Rm No. 471 and 472: Local prime contractor desires machine facilities for large steel castings. Material furnished. Machines required, heavy-duty drills, etc. Quantity, 100 rights and 100 lefts in May, 200 each in June, 400 each in July and by September approximating 1000 each. A-1-a priority. Prints on display.

Cleveland office Division of Contract Distribution, WPB, Union Commerce building, is seeking contractors for the following:

1-S-131: Subcontractor to machine airplane strut parts, consisting of steel tubing and forging (SAE steel X4130). Machine tools indicated are No. 4 Warner & Swasey universal or equal; No. 4H Libby or equal; medium-size milling machine; heavy-duty internal and external grinding machines; horizontal broaching machines; medium sized drill presses; heat treating, welding, sandblasting, chrome and cadmium plating facilities. Deliveries 5 to 150 per month of ten items. Tolerances close. Material to be furnished by subcontractor. Blueprints at Cleveland office.

8-S-3: Subcontractor to perform all milling and planing operations cylinder block and bases, requiring heavy-duty No. 4 milling machine and approximately 160-inch planers. Delivery, four sets of base and block in May, continuing at rate of 8 to 10 sets per month thereafter. Samples can be seen at prime contractor's plant. Material to be furnished and prints can be seen at Cleveland and Pittsburgh offices.

1-S-133: Manufacturer with heat treating centerless and precision grinding facilities to finish screw machine parts. Quantities: 5,000 to 10,000 pieces of twelve items.

1-S-134: Steel casting and machining facilities needed. Five castings weighing 9000, 21,600, 3260, 3500 and 1750 pounds, respectively. Machine tools required are 80" planer; 5" or 6" boring bar and horizontal mill (either Giddings and Lewis, Lucas, or similar machine). Tolerances plus or minus .001. Quantity: One complete set per week for duration of war. Information as to physical properties on file at C. D. B. offices.

1-S-137: Subcontractor with equipment to fabricate 50,000 of each of four items. Delivery to start September 15, 1942. Material to be furnished by subcontractor, which is steel forgings, but alternate of bar stock and tubing provided. Machining equipment governed by type of material furnished. Blueprints on file.

1-S-138: Subcontractor to machine and thread large quantity of four items to be made from seamless steel tubing WD 1015, ranging in finished diameter from approximately 2.775" to 6.00". Screw machines and chucking machines indicated. Blueprints on file in this office.

1-S-139: Subcontractor to fabricate any part or all of six items. Materials made from bar stock ranging in di-

ameter from ¾" to 1.65" approx. Stainless Grade No. 6, WD-X-1112 and WD-X-1314—one item seamless steel tubing 1½". Equipment indicated is automatic screw machines, drills, mills, etc. Quantities large. Delivery May, 1942. Blueprints on file in this office.

1-S-143: Ohio contractor requires subcontracting facilities to machine complete 500 of each of six items made from aluminum casting, which is to be furnished by the prime contractor. Equipment indicated—horizontal boring mills, up to 2¾"; No. 2 and No. 3 milling machines; small planers; drill press, and small drills. Blueprints on file in Cleveland office.

1-S-145: Subcontractor to machine complete brackets made of steel castings at scheduled rate of 700 pieces per month each of two items. Equipment indicated 2" horizontal boring mills, No. 3 milling machines, medium and small drills, tapping and threading machines. Material to be furnished by prime contractor. Blueprints on file in Cleveland office.

1-S-146: Subcontractor with facilities to machine complete 200,000 primer bodies, at the rate of 30,000 pieces per month. Equipment indicated turret lathes, single spindle automatics (1 5/16" bar) and plating facilities. Material —1 5/16" bar WD X-1315 in lengths of 10' to 12'. Material to be furnished by prime contractor. Blueprints on file in Cleveland office.

1-S-147: Subcontractor to fabricate any part or all of 100 items consisting of studs, bolts, sleeve nuts, castelated nuts. Equipment indicated is multiple spindle automatics, ranging from No. 000 B & S 1¾" bar, turret lathes, small drills, threading, etc. Material—bronze, also steel AMS-6310-5010-5034. Thirty representative items on display at the Cleveland office, also blueprints covering details of all items involved.

1-S-148: Group 1: Subcontractors to fabricate thirty (30) items—major operations of which require hand or automatic screw machine equipment from ½" diameter to 2½" diameter. Secondary operations using medium-sized lathe mills and drills. Material steel castings, forging, bar stock and tubing. Quantities: 500 to 72,000 pieces on initial order for delivery July 1, 1942. Continuous monthly requirements thereafter.

Group 2: Also source to machine small items with steel aluminum and brass parts weighing from ¼ to 11 pounds each. Equipment indicated, medium sized lathe or hand screw machines; milling, drilling, tapping, boring, slotting, broaching and threading; with some parts requiring grinding and cadmium plating. Latter items ideal for Tool Shop desiring important small production runs. Tolerance close on material furnished by prime contractor.

1-S-149: Subcontractor with facilities to fabricate quantity of six items, requiring the following equipment: 18" engine or turret lathe, single spindle drill press, hand screw machine. Material SAE 1045 steel, also brass, furnished by prime contractor. Quantities 230 each of four items and 1840 each of two items. Prints on file in Cleveland office.

1-S-150: Subcontractor to machine complete 20 each of six jig boring attachments. Equipment indicated No. 3 milling machine, planer 6' bed, medium size engine lathe, single spindle drill press. Material SAE 1020 hot rolled steel, furnished by prime contractor. Tolerances close. Blueprints on file in Cleveland office.

Philadelphia Office, Contract Distribution Branch, Production Division, WPB, Broad Street Station Building, reports the following subcontract opportunities:

2-22-1: A Maryland concern wishes to find subcontracting facilities on race bearings. Material required: Oil quench, strain drain at 400 Fahr., 48-56 Rockwell C scale; steel, spec. 57-107D, heat treated to 1550 Fahr. Minimum tolerance of only .002 is required for this work. Quantity, 20 units per month, building up to 300 units by Oct. 1, which will be going rate thereafter. Tools required: Precision 52-inch vertical boring mill or 52-inch swing lathe; also drop forge facilities to provide race bearing circular forgings 52 inches O.D., 42 inches I.D. by 4 inches thick. Prints and specifications at Philadelphia office.

2-22-2: Illinois manufacturer requires subcontracting facilities on the following: (a) alum-ferrule-conduit, size ½ to ¾-inch inc.; (b) coupling-nut, internally threaded, outside diameter ⅝-inch to 1 3/16-inch by 7/16-inch thick for all these diameters; (c) brass threaded straight coupling with hex spaces between threads, length of couplings 1⅛ to 1¼ inches; (d) brass 45-degree couplings with hex space between external threads. Also large quantities of tin copper braided shielding conduit, Avioflores braided covered hose and cellulined hose Cellu R-1. Material necessary, brass and aluminum. Tolerances, plus or minus .005. Quantity, 25,000, 50,000, 100,000, 150,000. Priority rating A-1-a. Tools required are small automatic production lathes or 4-spindle automatic screw machines. Samples on display at Philadelphia exhibit.

11-20-1: A Pennsylvania concern seeks facilities for manufacturing 22 groups of miscellaneous sizes of pins and latches. Material, Duronze III, S.A.E. 3250, C.R.S. Quantity, 5000 to 50,000 pieces of each item. Production to start as soon as possible. Priority rating A-1-a. Tools required, automatic screw machines ⅜ or ⅝-inch bar stock capacity, precision grinding and heat treating equipment. Prints and specifications at Philadelphia office.

16-23-1: An eastern Pennsylvania concern seeks subcontracting facilities for heavy gray iron castings, 10,000 to 12,000 pounds each, for low, high and

SHAPE AWARDS COMPARED

	Tons
Week ended May 30	5,000
Week epded May 23	4,982
Week ended May 16	28,560
This week, 1941	11,725
Weekly average, 1942	29,635
Weekly average, 1941	27,373
Weekly average, April, 1942	64,510
Total to date, 1941	674,935
Total to date, 1942	622,342

Includes awards of 100 tons or more.

intermediate cylinders, pistons and beds for triple-expansion engines. Tool requirements are heavy engine lathes, large planers and vertical boring mills. Prints and specifications at Philadelphia office.

STRUCTURAL SHAPES .

SHAPE CONTRACTS PLACED

4000 tons, factory, Curtiss-Wright Corp., to International Steel Co., Evansville, Ind.; bids May 26.

1000 tons, hose building No. 27, U. S. Rubber Co., Passaic, N. J., to Bethlehem Fabricators Inc., Bethlehem, Pa., through Thompson-Starrett Co., New York.

SHAPE CONTRACTS PENDING

5000 tons, Kitrect viaduct, Washington.

Unstated, $10,000,000 naval supply depot near Spokane, Wash.; Clifton & Applegate and Henry Georg, Spokane, contractors.

Unstated, hangars at Pacific Northwest air bases; Hawkins & Armstrong, Seattle, low to United States engineer, Portland, Oreg., for Units A. and B.; C. W. Watkins, Boise, Idaho, low Unit C. and L. L. Quigley, Portland, low for Unit D.

REINFORCING BARS . .

REINFORCING STEEL AWARDS

550 tons, jail, Philadelphia yard, to American Steel Engineering Co., Philadelphia.

300 tons, addition, Henry Disston & Sons, Philadelphia, to Taylor-Davis Inc., Philadelphia, through Barclay White & Co., Philadelphia.

REINFORCING STEEL PENDING

500 tons or more, addition to Port of Seattle grain elevator; bids soon.

260 tons, depot warehouse, for war department; James I. Barnes Construction Co., Culver, Ind., contractor; bids May 23.

100 tons or more, Columbia substation

CONCRETE BARS COMPARED

	Tons
Week ended May 30	850
Week ended May 23	5,950
Week ended May 16	12,260
This week, 1941	11,343
Weekly average, 1942	9,995
Weekly average, 1941	13,609
Weekly average, April, 1942	22,105
Total to date, 1941	253,266
Total to date, 1942	209,894

Includes awards of 100 tons or more.

for Seattle light department; Lidral Construction Co., Seattle, awarded at $17,371.

Unstated, diversion tunnel and powerhouse extension, Nisqually power project, Tacoma; West Construction Co., Seattle, low for former at $1,604,218; J. F. Shea Co., San Francisco, and General Construction Co., Seattle, joint low at $298,071 for latter.

RAILS, CARS . . .

LOCOMOTIVES PLACED

Boston & Maine, six 1000-horsepower diesel-electric, to Electro Motive Corp., La Grange, Ill.

Chicago & Eastern Illinois, one 600-horsepower diesel-electric, to Baldwin Locomotive Works, Philadelphia.

Minneapolis, Northfield & Southern, one 660-horsepower diesel-electric, to Baldwin Locomotive Works, Philadelphia.

Newburgh & South Shore, two 660-horsepower diesel-electric, to American Locomotive Co., New York.

Peoria & Pekin Union, one 1000-horsepower diesel-electric, to American Locomotive Co., New York.

St. Louis-San Francisco, five 1000-horsepower diesel-electric, to Baldwin Locomotive Works, Philadelphia.

Western Maryland, three 660-horsepower diesel-electric, to Baldwin Locomotive Works, Philadelphia.

PIPE . . .

CAST PIPE PLACED

380 tons, 12, 8 and 6-inch, Renton, Wash., housing project, to H. G. Purcell, Seattle, for U. S. Pipe & Foundry Co., Burlington, N. J.

CAST PIPE PENDING

500 tons, King county, Washington, District No. 61; Valley Construction Co., Seattle, low at $104,853.

PLATES . . .

PLATE CONTRACTS PENDING

Unstated tonnage, 57 515-gallon fuel tanks, various deliveries, Civil Aeronautics Administration, Washington, Niles Steel Tank Co., Niles, Mich., low, bids April 15, inv. 1404.

CONSTRUCTION and ENTERPRISE

Connecticut

NEW BRITAIN, CONN.—Caval & Brunette, 15 Hartford avenue, plans one-story 50 x 100-foot tool manufacturing plant.

NEW HAVEN, CONN.—M. & B. Co., 1060 State street, has let contract for plant addition to Kelley-Wood Co., estimated to cost $45,000. L. F. Caponi, 1221 Chapel street, New Haven, engineer. (Noted May 25).

STONINGTON, CONN.—Atwood Ma-

chine Co. has awarded contract for one-story 80 x 160-foot factory to New England General Contracting Co., 341 State street, New Haven. Estimated cost $57,000. (Noted May 4).

WATERBURY, CONN.—Waterbury Tool Division, Vickers Inc., 188 East Aurora street, has let contract to Oscar Stroberg & Sons, 1003 Watertown avenue, for one-story 150 x 350-foot steel foundry. Estimated cost $165,000. (Noted April 27).

Massachusetts

WORCESTER, MASS.—Johnson Steel & Wire Co., 53 Wiser avenue, has awarded contracts for two one-story plant units estimated to cost $40,000. (Noted May 25).

Rhode Island

PROVIDENCE, R. I.—H & H Screw Products Mfg. Co.,. 1883 Mineral Springs avenue, has completed plans by F. N. Brown Jr., 28 Alexander street, for factory costing $40,000.

New York

DEPEW, N. Y.—Symington-Gould Corp., 20 Symington place, Rochester, N. Y., plans steel foundry. Estimated cost $75,000.

NEW YORK—Gibbs & Hill, 450 Seventh avenue, New York, architects and engineers, are preparing preliminary plans for additional plant facilities in Pennsylvania to cost in excess of $5,000,000.

New Jersey

BOONTON, N. J.—Norda Essential Oil & Chemical Co., 601 West Twenty-sixth street, New York, plans to alter its factory here. Estimated cost $40,000.

CHATHAM, N. J.—H. K. Lorentzen Inc., 391 West Broadway, New York, has let contract for one-story factory to Simonsen & Emerson Corp., 101 Park avenue, New York. Estimated cost $40,000. G. Kinsley, 101 Park avenue, New York, engineer and architect.

IRVINGTON, N. J.—Irvington Varnish & Insulation Co., 6 Argyle place is having plans prepared by Epple & Kahrs, architects, 17 Washington street, Newark, for one-story, 100 x 100-foot plant.

NEWARK, N. J.—New Jersey Galvanizing & Tinning Works will soon award contract for one-story 165 x 177-foot plant. V. Strombach, 1243 Springfield avenue, Irvington, N. J., architect.

PHILLIPSBURG, N. J.—Canister Co. has let contract for factory addition to be built here to E. C. Machin Co., Allentown, Pa. Paul Beidler, Bethlehem, Pa., is architect.

Ohio

CANTON, O.—Union Metal Mfg. Co. is building an $18,000 power control house at its plant, 1432 Maple avenue Northeast.

CLEVELAND—National Metal Abrasives Co., Harvey Marette, secretary-treasurer, 3560 Norton road, plans addition to foundry.

CLEVELAND — Lewis Machine Co., Marvin W. Lewis, president, plans $12,000 addition to machine shop at 3441 East Seventh-sixth street.

CLEVELAND—Allyne-Ryan Foundry Co., M. J. Sweeney, vice president and treasurer, Aetna road and East Ninety-first street, will soon start work on interior and exterior alterations to factory.

DELAWARE, O.—W. G. Caldwell, 838 Engineers building, Cleveland, is preparing plans for an industrial plant here.

HAMILTON, O.—City will make improvements to municipal power plant, including installation of new boiler and considerable machinery. Estimated cost $750,000.

MASURY, O.—General American Transportation Corp., Masury, will erect an addition to its plant.

TROY, O.—Hobart Bros. Co. plans to erect addition to motor generator

division building containing 30,000 square feet of space. Estimated cost $43,000.

Michigan

DETROIT — Arthur O. Misch Co., Detroit, has contract for factory and office building on Grinnell avenue for V. L. Graf Co.

DETROIT—Reisdorf-Brewe Co., Detroit, was low on general contract for factory and office building on Schaefer highway for Vinco Corp.

DETROIT—Haberkorn-Barry Co., Detroit, has general contract for factory for Gear Grinding Machine Co., H. E. Beyster Corp., Detroit, architect.

DETROIT—Square Surface Plate & Tool Co. has been organized with $25,000 capital by Robert S. Gans, 704 Boulevard building, to deal in tools and dies.

DETROIT — All State Engineering Co., 6841 Michigan avenue, has been organized to deal in tools and machines by Ernst M. Schmelz, 16602 Couzens Highway.

DETROIT—U. S. Broach Co., 6463 East Seven Mile road, has been incorporated with $25,000 capital to deal in broaches and tools, by John K. Penny, 488 Lakeland road.

HILLSDALE, MICH.—H. R. Graf, Jackson, Mich., architect, is preparing plans for manufacturing building here.

JACKSON, MICH.—Ampco Twist Drill Co. will erect an addition to its plant. Russell Allen, Jackson, architect.

LANSING, MICH.—Reniger Construction Co., Lansing, has been awarded general contract for plant in Howell, Mich., for Bruce Products Corp.

LANSING MICH.—Federal Mfg. Co., 731-35 East Kalamazoo street, has been incorporated to deal in metals and plastics by Maurice O. Green Jr., 611 East Kalamazoo street.

PONTIAC, MICH.—American Foundry & Pattern Co. is taking figures for $15,000 foundry building. W. C. Zimmerman, Pontiac, architect.

ROYAL OAK, MICH. — Bone-Bell Machine Co. Inc., 1222 East First street, has been incorporated with $25,000 capital to deal in machinery, by Leslie E. Bone, 610 Altadena avenue.

Pennsylvania

ELLWOOD CITY, PA.—City, E. E. Moyer, clerk, has passed bond issue for sewage disposal plant to cost approximately $149,000. Lowell W. Monroe, Ellwood City, borough engineer.

ERIE, PA.—Erie Forge Co., Erie, will erect an addition to its factory at Fifteenth and Cascade streets.

ERIE, PA.—Hammermill Paper Co., E. E. Behrend, president, will soon award contract for one-story 40 x 50-foot addition to boiler house. Estimated cost $80,000. O. C. Schoenwerk, 3240 North Lake Shore drive, Chicago, consulting engineer.

GETTYSBURG, PA.—Central Chemical Corp. of Pennsylvania, S. G. Spangler, manager, will rebuild its two and three-story, 55 x 250-foot plant recently destroyed by fire.

HARRISBURG, PA.—Harrisburg Steel Corp. has awarded John Stapf, Harrisburg, contract for plant at 1341 North Cameron street.

JEANETTE, PA.—Elliott Co., W. A. Elliott, vice president in charge of purchases, has given general contract for one and two-story building to Westmoreland Construction Co., Greensburg, Pa.

LATROBE, PA.—Stupakoff Ceramic &

Mfg. Co. will soon receive bids for factory estimated to cost over $500,000.

NORTH CHARLEROI, PA.—Federal Foundry & Supply Co., R. Ditty, president, 4600 East Seventy-first street, Cleveland, plans two-story factory here to cost approximately $60,000. (Noted May 25).

PHILADELPHIA—F. C. Castelli Co., 4055 Ridge avenue, has plans by Davis & Dunlap, 1717 Sansom street, for one and two-story 236 x 490-foot plant addition. Estimated cost $150,000.

PITTSBURGH—Koppers United Co., Koppers building, is having preliminary plans prepared for a manufacturing plant in Pennsylvania to cost over $5,000,000.

PITTSBURGH — Pittsburgh Equitable Meter Co. has awarded contract to O. H. Martin, 513 North Homewood avenue, for an addition to factory at 400 Lexington avenue. Franklin & Brown, Fulton building, architects.

Illinois

CHICAGO—Mechanical Equipment Co., Minneapolis, is building a branch manufacturing unit here.

CHICAGO—Galvin Mfg. Corp., 4545 West August street, is constructing an engineering research building.

CHICAGO — Hyman-Michaels Co., 122 South Michigan avenue, is building a warehouse and freight car repair shop.

CHICAGO—Stewart Die Casting Division, Stewart-Warner Corp., 4535 West Fullerton avenue, is expanding its manufacturing space.

CHICAGO — Pyott Foundry & Machine Co., 328 North Sangamon avenue, is making a machine shop addition to its gray iron foundry.

CHICAGO—Midland Machine Corp., 515 West Thirty-fifth street, is erecting a one and two-story addition, to be financed by Defense Plant Corp.

CHICAGO — Crowe Name Plate & Mfg. Co., 3701 North Ravenswood avenue, is making an addition to its main plant. It is also constructing a building nearby.

CHICAGO—General Engineering Works, 4701 West Division street, is making a major expansion of its present plant for production of screw machine products.

CHICAGO — Fisher Furnace Co. Inc., 1740 North Kilmar avenue, has purchased the industrial building of Vermont Marble Co., 5535 North Wolcott avenue, for manufacturing purposes.

CHICAGO—Chicago Metallic Mfg. Co., 3724 South Rockwell avenue, is building an addition to its plant. A. Epstein, 2001 West Pershing road, engineer, and Carl E. Erickson & Co. Inc., 4753 North Broadway, general contractor.

Alabama

GORGAS, ALA. — Wilborn Construction Co., Birmingham, Ala., was low bidder for steam plant for Alabama Power Co., Birmingham. (Noted May 18).

North Carolina

CHARLOTTE, N. C.—Sanderson & Porter, 1903 Liberty Life building, Charlotte, and New York, are engineers for proposed shell loading plant near here to be operated by United States Rubber Co. Estimated cost $10,000,000.

Louisiana

LAKE CHARLES, LA.—City, J. H. Handley, mayor, votes June 30 on $200,000 bonds for sewage plant extension.

Virginia

RICHMOND, VA.—Virginia Electric & Power Co., J. G. Holtzclaw, president, plans $6,800,000 steam plant. Stone & Webster Engineering Corp., New York, has contract.

Missouri

ST. LOUIS—John Ramming Machine Co., R. J. Ramming, president, 4591 McRee avenue, is building one-story addition to machine shop costing $15,000.

Wisconsin

MILWAUKEE—Kair Mfg. Co. has asked bids for one-story 120 x 150-foot factory. R. A. Sutherland, 259 East Wells street, architect.

MILWAUKEE—Perfex Corp., 500 West

Oklahoma avenue, has plans by Eschweiler & Eschweiler, 720 East Mason street, for factory addition.

Minnesota

MINNEAPOLIS — Minneapolis-Honeywell Regulator Co., 2753 Fourth avenue, will soon take bids for remodeling building. Haxby & Bissel, 111 Nicolett street, architects.

Utah

SALT LAKE CITY—An appropriation of $350,000 by Defense Plant Corp. has been authorized for construction of a tungsten mill here to be built and operated by Vanadium Corp. of America.

California

GLENDALE, CALIF.—Western Aeronautical Supply Mfg. Co. will erect an addition, 50 x 100 feet, to its plant at 1729 Standard avenue.

LOS ANGELES—Pacific Steel Treating Co., 1155 East Pico boulevard, has been organized by William McCullough and Bert Wells.

LOS ANGELES—Evri Tool Mfg. Co., 1420 West Slauson avenue, has been organized by Edward G. Clark and Stuart D. Anderson.

LOS ANGELES—Sharon Machine Works is the firm name under which David G. Challacombe Jr., David Challacombe III, and Leonard Challacombe have obtained certificate to conduct business at 423 Lanzit street.

LOS ANGELES — Aetna Aircraft Corp. has been organized with 1000 shares of no par value stock by J. P. Fitzpatrick, William Berk and Harold Larson. The new corporation is represented by James P. Fitzpatrick, 510 West Sixth street, Los Angeles.

LYNWOOD, CALIF.—Grayson Heat Control Co. will erect two factory buildings at 3000 Imperial way to cost about $30,000.

Washington

SEATTLE—Ederer Engineering Co., 2939 Utah street, will build addition to steel fabricating plant.

SEATTLE—Olsen Boiler & Welding Co., 1761 Airport way, has let contract for factory addition, 45 x 85 feet.

SEATTLE—Seattle Box Co., 401 Spokane street, will erect a dry kiln and storage warehouse, 112 x 130 feet to cost $20,000.

Canada

NORTH VANCOUVER, B. C.—Burrard Rivet & Forgings Ltd., 509 Richards street, is considering plans for plant addition to cost about $25,000.

HAMILTON, ONT.—United Gas & Fuel Co. of Hamilton Ltd., 82 King street East, in co-operation with Department of Munitions and Supply, Ottawa, H. H. Turnbull, secretary, plans installation of coke oven assembly at Depew street plant to cost $2,000,000. T. P. Pinckard is general manager.

HAMILTON, ONT.—B. Greening Wire Co. Ltd., 55 Queen street North, is having plans prepared by Prack & Prack, architects, Pigott building, for further addition to plant to cost $25,000 with equipment.

NEW TORONTO, ONT.—Aluminum Co. of Canada Ltd., Sun Life building, Montreal, has plans by J. C. Meadowcraft, architect, 1154 Beaver Hall Hill, Montreal, and has called bids for plant buildings here including foundry, to cost about $500,000.

SUDBURY, ONT. — International Nickel Co. of Canada Ltd., 25 King street West, Toronto, will erect three structures at the Levack mine near here to cost about $30,000. Other plant additions also are planned.

TORONTO, ONT.—D. R. Clarke Engine Co. Ltd., 558 Front street West, has had plans prepared and will call bids immediately for plant at Dufferin and Roselawn avenue, to cost about $65,000.

WINDSOR, ONT.—Ford Motor Co. of Canada Ltd., Sandwich street East, has given general contract to Hein Construction Co. Ltd., 172 Aylmer avenue, for addition to constant temperature room and machine shop to cost about $35,000. (Noted May 25).

WINDSOR, ONT.—S.K.D. Tool Co. Ltd., 1673 May avenue, has extended contract with Wilfrid Loaring Construction Co., 1662 Ouellette avenue, for further addition to plant to cost about $35,000 with equipment.

LASARRE, QUE.—LaSarre Power Co. Ltd., 103 Cote de la Montagne, Quebec City, has plans and will let contract soon for power plant addition here to cost about $20,000.

SHERBROOKE, QUE.—Manganese Steel Castings Ltd., Abenaquis street, has plans for foundry addition to cost about $12,000. H. R. Neville, 2 Howard street, is manager.

WHERE-TO-BUY

A classified list of advertisers according to products. ¶Index to advertisements gives page number of any advertiser.

ABRASIVE WHEELS
Abrasive Co., Tacony & Fraley Sts., Philadelphia, Pa.
Atkins, E. C., & Co., 427 So. Illinois St., Indianapolis, Ind.
Bay State Abrasive Products Co., Westboro, Mass.
Blanchard Machine Co., The, 64 State St., Cambridge, Mass.
Carborundum Co., The, Niagara Falls, N. Y.
DeSanno, A. P., & Sons, Inc., 436 Wheatland St., Phoenixville, Pa.
Macklin Co., Jackson, Mich.
Norton Co., Worcester, Mass.
Sterling Grinding Wheel Div., Cleveland Quarries Co., Tiffin, O.

ABRASIVES (Blast Cleaning)
American Foundry Equipment Co., The, 509 So. Byrkit St., Mishawaka, Ind.
Pangborn Corp., Hagerstown, Md.
Pittsburgh Crushed Steel Co., 4839 Harrison St., Pittsburgh, Pa.
Vapor Blast Mfg. Co., 333 S. 16th St., Milwaukee, Wis.

ABRASIVES (Polishing)
Abrasive Co., Tacony & Fraley Sts., Philadelphia, Pa.
Carborundum Co., The, Niagara Falls, N. Y.
General Abrasive Co., College Ave., & Hyde Park Blvd., Niagara Falls, N. Y.
Norton Co., Worcester, Mass.

ACCUMULATORS
Elmes, Chas. F., Engineering Wks., 245 N. Morgan St., Chicago, Ill.
Farquhar, A. B., Co., Ltd., 195 Duke St., York, Pa.
Hydropress, Inc., 570 Lexington Ave., New York City.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Morgan Engineering Co., The, Alliance, O.
Schloemann Engineering Corp., Empire Bldg., Pittsburgh, Pa.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

ACETYLENE
Air Reduction, 60 E. 42nd St., New York City.
Linde Air Products Co., The, 30 E. 42nd St., New York City.
National Cylinder Gas Co., 205 W. Wacker Dr., Chicago, Ill.

ACID-PROOF LININGS
Cellcote Co., 750 Rockefeller Bldg., Cleveland, O.
Pennsylvania Salt Mfg. Co., Dept. S, Pennsalt Cleaner Div., Philadelphia, Pa.
Quigley Co., 56 W. 45th St., New York City.

ACIDS (Pickling)
American Chemical Paint Co., Dept. 310, Ambler, Pa.
Ampco Metal, Inc., Dept. S-6, 3830 W. Burnham St., Milwaukee, Wis.
Pennsylvania Salt Mfg. Co., Dept. S, Pennsalt Cleaner Div., Philadelphia, Pa.

AEROCASING
Lakeside Steel Improvement Co., The, 5418 Lakeside Ave., Cleveland, O.

AIR COMPRESSORS—See COMPRESSORS (Air)

AIR CONDITIONING EQUIPMENT
American Air Filter Co., 443 Central Ave., Louisville, Ky.
Peabody Engineering Corp., 580 Fifth Ave., New York City.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.
Worthington Pump & Machinery Corp., Harrison, N. J.

AIRCRAFT ACCESSORIES, PARTS, SUPPLIES
Spriesch Tool & Mfg. Co., 10 Howard St., Buffalo, N. Y.

AIRLESS BLAST CLEANING EQUIPMENT
American Foundry Equipment Co., The, 509 So. Byrkit St., Mishawaka, Ind.
Pangborn Corp., Hagerstown, Md.
Vapor Blast Mfg. Co., 333 S. 16th St., Milwaukee, Wis.

ALKALI CLEANING COMPOUNDS
Cowles Detergent Co., The, 7016 Euclid Ave., Cleveland, O.
Pennsylvania Salt Mfg. Co., Dept. S, Pennsalt Cleaner Div., Philadelphia, Pa.

ALLOYS (Corrosion & Abrasive Resistant)
Wall-Colmonoy Corp., 637 Buhl Bldg., Detroit, Mich.

ALLOYS—See FERROALLOYS

ALLOYS (Magnesium)
Dow Chemical Co., Midland, Mich.

ANGLES, CHANNELS—See BEAMS, CHANNELS, ANGLES

ANNEALING BOXES—See BOXES (Annealing)

ANNEALING COVERS
General American Transportation Corp., 135 So. LaSalle St., Chicago, Ill.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.

ANNEALING (Tempering)
Lakeside Steel Improvement Co., The, 5418 Lakeside Ave., Cleveland, O.

ANODES (All Types)
Udylite Corp., The, 1651 E. Grand Blvd., Detroit, Mich.

ANODES (Nickel)
Seymour Manufacturing Co., The, Seymour, Conn.

AXLES
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Republic Steel Corp., Dept. ST, Cleveland, O.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

BABBITT METAL
Cadman, A. W., Mfg. Co., 2816 Smallman St., Pittsburgh, Pa.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.

BALANCING MACHINES
Gisholt Machine Co., 1217 E. Washington Ave., Madison, Wis.

BALING PRESSES
Galland-Henning Manufacturing Co., 2753 So. 31st St., Milwaukee, Wis.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.

BALL TRANSFERS
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

BALLS (Brass or Bronze)
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Strom Steel Ball Co., 1850 S. 54th Ave., Cicero, Ill.

BALLS (Special Alloy Metals)
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.

BALLS (Steel)
***Also Stainless**
*Strom Steel Ball Co., 1850 S. 54th Ave., Cicero, Ill.

BAND FILES (Metal)
Continental Machines, Inc., 1324 So. Washington Ave., Minneapolis, Minn.

BAND SAWS (Metal Cutting)
Continental Machines, Inc., 1324 So. Washington Ave., Minneapolis, Minn.
Disston, Henry, & Sons, Inc., 626 Tacony, Philadelphia, Pa.
Walker-Turner Co., Inc., 5062 Berckman St., Plainfield, N. J.

BANDS—See HOOPS AND BANDS

BANDS (Iron and Steel)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

BAR BENDERS
Kardong Bros. Inc., 346 Buchanan St., Minneapolis, Minn.

BARGE MOVERS
Silent Hoist Winch & Crane Co., 849 63rd St., Brooklyn, N. Y.

BARGES (Steel)
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Dravo Corp. (Engin'r'g Works Div.) Neville Island, Pittsburgh, Pa.
Federal Shipbuilding & Dry Dock Co., Kearney, N. J.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Maryland Dry Dock Co., Baltimore, Md.

BARREL DUMPERS
Economy Engineering Co., 2657 W. Van Buren St., Chicago, Ill.

BARRELS (Plating)
Udylite Corp., The, 1651 E. Grand Blvd., Detroit, Mich.

BARRELS (Steel)
Continental Steel Corp., Kokomo, Ind.
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.

BARS (Alloy)
Ampco Metal, Inc., Dept. S-6, 3830 W. Burnham St., Milwaukee, Wis.
Bethlehem Steel Co., Bethlehem, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Copperweld Steel Co., Warren, O.
Firth-Sterling Steel Co., McKeesport, Pa.
International Nickel Co. Inc., The, 67 Wall Street, New York City.
LaSalle Steel Co., Chicago, Ill.
Midvale Co., The, Nicetown, Philadelphia, Pa.
Monarch Steel Co., 545 W. McCarty St., Indianapolis, Ind.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Roller Bearing Co., The, Steel & Tube Div., Canton, O.

BARS (Brass, Bronze or Copper)
American Brass Co., The, Waterbury, Conn.
Copperweld Steel Co., Warren, O.
Johnson Bronze Co., 550 So. Mill St., New Castle, Pa.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.

BARS (Concrete Reinforcing)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Northwest Steel Rolling Mills, 4315 Ninth Ave., Seattle, Wash.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

BARS (Iron)—See IRON (Bar)

BARS (Steel)
(*Also Stainless)
*Allegheny Ludlum Steel Corp., Dept. S-229, Oliver Bldg., Pittsburgh, Pa.
*Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
*Copperweld Steel Co., Warren, O.
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
*Midvale Co., The, Nicetown, Philadelphia, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
*Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Scully Steel Products Co., 1316 Wabansia Ave., Chicago, Ill.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Sutton Engineering Co., Park Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Roller Bearing Co., The, Canton, O.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

BATHS (Heat Treating-High Speed)
A. F. Holden Co., The, 200 Winchester Ave., New Haven, Conn.

BATTERIES (Storage)
Edison Storage Battery Div. of Edison, Thomas A., Inc., West Orange, N. J.
Electric Storage Battery Co., The, 19th St. and Allegheny Ave., Philadelphia, Pa.
Graybar Electric Co., 420 Lexington Ave., New York City.

WHERE-TO-BUY

BATTERY CHARGING APPARATUS

Cutler-Hammer, Inc., 1267 St. Paul Ave., Milwaukee, Wis.
Mallory, P. R., & Co., 3029 E. Washington Ave., Indianapolis, Ind.

BEAMS, CHANNELS, ANGLES, ETC.

(*Also Stainless)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Dow Chemical Co., Midland, Mich.
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Levinson Steel Co., 33 Pride St., Pittsburgh, Pa.
*Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

BEARINGS (Ball)

Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
New Departure Div., General Motors Corp., Bristol, Conn.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Torrington Co., The, Torrington, Conn.

BEARINGS (Babbitt)

Johnson Bronze Co., 550 So. Mill St., New Castle, Pa.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.

BEARINGS (Brass, Bronze)

Ampco Metal, Inc., Dept. S-6, 3830 W. Burnham St., Milwaukee, Wis.
Cadman, A. W., Mfg. Co., 2816 Smallman St., Pittsburgh, Pa.
Johnson Bronze Co., 550 So. Mill St., New Castle, Pa.
Moraine Products Division, General Motors Corporation, Dayton, Ohio.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Shenango-Penn Mold Co., 404 W. Third St., Dover, O.

BEARINGS (Graphite)

United States Graphite Co., The, Saginaw, Mich.
Ampco Metal, Inc., Dept. S-142.

BEARINGS (Journal)

Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Division, General Motors Corp., Harrison, N. J.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Rollway Bearing Co., Inc., 541 Seymour Ave., Syracuse, N. Y.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS (Needle)

Torrington Co., The, Torrington, Conn.

BEARINGS (Non-Metallic)

Moraine Products Division, General Motors Corporation, Dayton, Ohio.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.

BEARINGS (Oilless)

Moraine Products Division, General Motors Corporation, Dayton, Ohio.
Rhoades, R. W., Metaline Co., 43 Third St., Long Island City, N. Y.

BEARINGS (Quill)

Bantam Bearings Corp., South Bend, Ind.

BEARINGS (Radial)

Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
American Roller Bearing Co., 416 Melwood St., Pittsburgh, Pa.
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Div., General Motors Corp., Harrison, N. J.
Link-Belt Co., 519 No. Holmes Ave. Indianapolis, Ind.
New Departure Div., General Motors Corp., Bristol, Conn.
Rollway Bearing Co., Inc., 541 Seymour Ave., Syracuse, N. Y.
SKF Industries, Inc., Front St., and Erie Ave., Philadelphia, Pa.
Timken Roller Bearing Co., The Canton, O.

BEARINGS (Roll Neck)

Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn. Harrison, N. J.
Hyatt Bearings Div., General Motors Corp., Harrison, N. J.
Morgan Construction Co., Worcester, Mass.
National Bearing Metals Corp., 928 Shore Ave. Pittsburgh, Pa.
Rollway Bearing Co., Inc., 541 Seymour Ave., Syracuse, N. Y.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS (Roller)

Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
American Roller Bearing Co., 416 Melwood St., Pittsburgh, Pa.
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Div., General Motors Corp., Harrison, N. J.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis, Ind.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
Rollway Bearing Co., Inc., 541 Seymour Ave., Syracuse, N. Y.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS (Roller Tapered)

Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
Rollway Bearing Co., Inc., 541 Seymour Ave., Syracuse, N. Y.

BEARINGS (Rolling Mill)

American Roller Bearing Co., 416 Melwood St., Pittsburgh, Pa.
Bantam Bearings Corp., South Bend, Ind.
Hyatt Bearings Div., General Motors Corp., Harrison, N. J.
Morgan Construction Co., Worcester, Mass.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS (Shaft Hangers)

Rollway Bearing Co., Inc., 541 Seymour Ave., Syracuse, N. Y.

BEARINGS (Thrust)

Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Link-Belt Co., 519 No. Holmes Ave., Indianapolis, Ind.
Norma-Hoffmann Bearings Corp., Stamford, Conn.

BEARINGS (Thrust)—Con.
Rollway Bearing Co., Inc., 541 Seymour Ave., Syracuse, N. Y.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Timken Roller Bearing Co., The, Canton, O.

BELTING (Chain and Link)
Jeffrey Mfg. Co., 956 N. Fourth St., Columbus, O.
Link-Belt Co., 220 So. Belmont Ave., Indianapolis, Ind.

BELTING (Metal, Conveyor, High and Low Temperature)
Cyclone Fence Co., Waukegan, Ill.

BELTING (Rubber)
United States Rubber Co., 1230 Sixth Ave., New York City.

BENCHES
Lyon Metal Products, Inc., 7211 Madison Ave., Aurora, Ill.

BENDING AND STRAIGHTENING MACHINES
Alliance Machine Co., The, Alliance, O.
Cleveland Crane & Engineering Co., Steelweld Machinery Div., The, 1125 E. 283rd St., Wickliffe, O.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Elmes, Chas. F., Engineering Works, 245 N. Morgan St., Chicago, Ill.
Farquhar, A. B., Co., Ltd., 195 Duke St., York, Pa.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Kardong Bros., Inc., 346 Buchanan St., Minneapolis, Minn.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Morgan Engineering Co., The, Alliance, O.
O'Neil-Irwin Mfg. Co., 304 8th Ave. So., Minneapolis, Minn.
Thomas Machine Mfg. Co., Etna Branch P. O., Pittsburgh, Pa.
Webb City & Carterville Foundry & Machine Works, Webb City, Mo.

BENZOL AND TOLUOL RECOVERY PLANTS
Koppers Co., Engineering and Construction Div., 300 Koppers Bldg., Pittsburgh, Pa.
Koppers Co., Tar & Chemical Div., 901 Koppers Bldg., Pittsburgh, Pa.
Western Gas Div., Koppers Co., Fort Wayne, Ind.
Youngstown Sheet & Tube Co., The, Youngstown, O.

BILLETS (Alloys and Carbon Steel)
Alan Wood Steel Co., Conshohocken, Pa.
Andrews Steel Co., The, Newport, Ky.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Firth-Sterling Steel Co., McKeesport, Pa.
Harrisburg Steel Corp., Harrisburg, Pa.
Northwest Steel Rolling Mills, 4315 Ninth Ave., Seattle, Wash.
Republic Steel Corp., Dept. ST, Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Roller Bearing Co., The, Steel & Tube Div., Canton, O.
Washburn Wire Co., Phillipsdale, R. I.

BILLETS (Forging)
Alan Wood Steel Co., Conshohocken, Pa.
Andrews Steel Co., The, Newport, Ky.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Copperweld Steel Co., Warren, O.
Harrisburg Steel Corp., Harrisburg, Pa.
Heppenstall Co., Box S-7, 4620 Hatfield St., Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Midvale Co., The, Nicetown, Philadelphia, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Roller Bearing Co., The, Steel & Tube Div., Canton, O.

BILLETS AND BLOOMS (*Also Stainless)
*Alan Wood Steel Co., Conshohocken, Pa.
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Steel Corp., Kokomo, Ind.
*Copperweld Steel Co., Warren, O.
*Firth-Sterling Steel Co., McKeesport, Pa.
Harrisburg Steel Corp., Harrisburg, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
*Republic Steel Corp., Dept. ST, Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Roller Bearing Co., The, Steel & Tube Div., Canton, O.
Youngstown Sheet & Tube Co., The, Youngstown, O.

BINS (Storage)
Lyon Metal Products, Inc., 7211 Madison Ave., Aurora, Ill.

BLACKING (Graphite)
United States Graphite Co., The, Saginaw, Mich.

BLAST CLEANING EQUIPMENT (Sand)
American Foundry Equipment Co., The, 509 So. Byrkit St., Mishawaka, Ind.
Pangborn Corp., Hagerstown, Md.
Vapor Blast Mfg. Co., 333 S. 16th St., Milwaukee, Wis.

BLAST FURNACE CLEANING (Gas)
McKee, Arthur G., & Co., 2300 Chester Ave., Cleveland, O.
Peabody Engineering Corp., 580 Fifth Ave., New York City.

BLAST FURNACE HOT BLAST STOVES
McKee, Arthur G., & Co., 2300 Chester Ave., Cleveland, O.

BLAST FURNACE SPECIALTIES
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Co., Sharpsburg Branch, Pittsburgh, Pa.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.
McKee, Arthur G., & Co., 2300 Chester Ave., Cleveland, O.
Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.

BLAST FURNACE STOCK HOUSES
McKee, Arthur G., & Co., 2300 Chester Ave., Cleveland, O.

BLAST FURNACES—See FURNACES (Blast)

BLOCKS (Chain)
Reading Chain & Block Co., Dept. D-5, Reading, Pa.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

BLOWERS
General Electric Co., Schenectady, N. Y.
Mahr Mfg. Co., Div. of Diamond Iron Works, Inc., Minneapolis, Minn.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.

BLOWPIPES (Oxy-Acetylene)
Linde Air Products Co., The, 30 E. 42nd St., New York City.

BLUE PRINTING MACHINES
Wickes Brothers, Saginaw, Mich.

BOILER HEADS
Bethlehem Steel Co., Bethlehem, Pa.

BOILER TUBES—See TUBES (Boiler)

BOILERS
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.
Oil Well Supply Co., Dallas, Texas

BOLT AND NUT MACHINERY
Landis Machine Co., Waynesboro, Pa.
National Machinery Co., The, Tiffin, O.
Oster Mfg. Co., The, 2037 E. 61st St., Cleveland, O.

BOLTS (*Also Stainless)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Cleveland Cap Screw Co., 2917 E. 79th St., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Oliver Iron & Steel Corp., So. 10th & Muriel Sts., Pittsburgh, Pa.
*Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
*Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Triplex Screw Co., The, 5317 Grant Ave., Cleveland, O.

BOLTS (Carriage and Machine)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2917 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Triplex Screw Co., The, 5317 Grant Ave., Cleveland, O.

BOLTS (Non-Ferrous and Stainless)
Harper, H. M., Co., The, 2646 Fletcher St., Chicago, Ill.

BOLTS (Special)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2917 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

BOLTS (Stove)
Central Screw Co., 3517 Shields Ave., Chicago, Ill.
Cleveland Cap Screw Co., 2917 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.

BOLTS (Stove, Recessed Head)
American Screw Co., Providence, R. I.
Bristol Co., Waterbury, Conn.
Chandler Products Co., Euclid, O.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., New Britain, Conn.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
National Screw & Mfg. Co., 2440 E. 75th St., Cleveland, O.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Mfg. Co., Waterbury, Conn.

BOLTS (Track)—See TRACK BOLTS

BORING MACHINES (Precision)
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
Heald Machine Co., Worcester, Mass.
National Automatic Tool Co., The, Richmond, Ind.
Ohio Machine Tool Co., The, Kenton, O.
William Sellers & Co., Inc., 16th & Callowhill St., Philadelphia, Pa.

BORING MILLS (Automatic Controls for)
Detroit Universal Duplicator Co., 218 St. Aubin, Detroit, Mich.

BORING TOOLS (Carbide Tipped)
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

BOXES (Annealing)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
General American Transportation Corp., 135 So. LaSalle St., Chicago, Ill.
National-Erie Corp., Erie, Pa.
Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.
Union Steel Casting Div. of Blaw-Knox Co., 62nd & Butler Sts., Pittsburgh, Pa.
United Engineering & Foundry Co., First National Bank Bldg., Pittsburgh, Pa.
Wilson, Lee, Engineering Co., 1368 Blount St., Cleveland, O.

BOXES (Open Hearth Charging)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Morgan Engineering Co., The, Alliance, O.
Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.

BRAKE LININGS
Johns-Manville Corp., 22 E. 40th St., New York City.

BRAKES (Electric)
Cutler-Hammer, Inc., 1267 St. Paul Ave., Milwaukee, Wis.
Electric Controller & Mfg. Co., The, 2700 E. 79th St., Cleveland, O.

BRAKES (Hand)
O'Neil-Irwin Mfg. Co., 304 8th Ave. So., Minneapolis, Minn.

BRAKES (Press)
Bliss, E. W., Co., 53rd St. & 2nd Ave., Brooklyn, N. Y.
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Cleveland Crane & Engineering Co., The, Steelweld Machinery Div., 1125 E. 283rd St., Wickliffe, O.
Elmes, Chas. F., Engineering Works, 245 N. Morgan St., Chicago, Ill.

BRICK (Acid Resisting)
Keagler Brick Co., 1443 W. Market St., Steubenville, O.
Nukem Products Corp., 70 Niagara St., Buffalo, N. Y.
Quigley Co., 56 W. 45th St., New York City.

BRICK (Chrome)
Harbison-Walker Refractories Co., 1800 Farmers Bank Bldg., Pittsburgh, Pa.

BRICK—(Insulating)—See INSULATING BRICK

BRICK (Ladle)
Globe Brick Co., The, East Liverpool, O.

BRICK (Refractory)—See REFRACTORIES, CEMENT, ETC.

BRICK (Silica)
Harbison-Walker Refractories Co., 1800 Farmers Bank Bldg., Pittsburgh, Pa.

BRICK (Silicon Carbide)
Bay State Abrasive Products Co., Westboro, Mass.
Carborundum Co., The, Perth Amboy, N. J.
Norton Co., Worcester, Mass.

BRIDGE CRANES (Ore and Coal Handling)—See CRANES (Bridge)

BRIDGES, BUILDINGS, VIADUCTS, STACKS, ETC.
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.
Belmont Iron Works, 22nd St. and Washington Ave., Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Blaw-Knox Co., Blawnox, Pa.
Columbia Steel Co., San Francisco, Calif.
General American Transportation Corp., 135 So. LaSalle St., Chicago, Ill.
Levinson Steel Co., 33 Pride St., Pittsburgh, Pa.
Robertson, H. H., Co., Farmers Bank Bldg., Pittsburgh, Pa.
Uhl Construction Co., 6001 Butler St., Pittsburgh, Pa.

WHERE-TO-BUY

BROACHING CUTTERS
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.

BROACHING MACHINES
American Broach & Machine Co., Ann Arbor, Mich.
Bullard Co., The, Bridgeport, Conn.
Cincinnati Milling Machine & Cincinnati Grinders, Inc., Oakley Sta., Cincinnati, O.
Colonial Broach Co., 147 Jos. Campau, Detroit, Mich.

BRUSHES
Fuller Brush Co., The, Hartford, Conn.

BRUSHES (Carbon)
United States Graphite Co., The, Saginaw, Mich.

BRUSHES (Industrial)
Fuller Brush Co., The, Hartford, Conn.

BRUSHES (Steelgrip)
Fuller Brush Co., The, Hartford, Conn.

BUCKETS (Clam Shell, Dragline Grab, Single Line)
Atlas Car & Mfg. Co., The,
Blaw-Knox Co., Blawnox, Pa.
Cullen-Friestedt Co., 1308 So. Kilbourn St., Chicago, Ill.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Wellman Engineering Co., The, 7016 Central Ave., Cleveland, O.

BUCKETS (Single Hook, Automatic Dump, Automatic Single Line)
Brosius, Edgar E., Co., Sharpsburg Branch, Pittsburgh, Pa.
Wellman Engineering Co., The, 7016 Central Ave., Cleveland, O.

BUILDINGS (Industrial)
Austin Co., The, 16112 Euclid Ave., Cleveland, O.

BUILDINGS (Steel)—See BRIDGES, BUILDINGS, ETC.

BULLDOZERS
Beatty Machine & Mfg. Co., Hammond, Ind.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.

BURNERS (Acetylene)—See TORCHES AND BURNERS

BURNERS (Automatic)
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Bloom Engineering Co., 916 Behan St., Pittsburgh, Pa.
Peabody Engineering Corp., 580 Fifth Ave., New York City.
Surface Combustion Div., 2375 Dorr St., Toledo, O.
Wean Engineering Co., Warren, O.
Wilson, Lee, Engineering Co., 1368 Blount St., Cleveland, O.

BURNERS (Fuel, Oil, Gas, Combination)
American Gas Furnace Co., Elizabeth, N. J.
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.
Bloom Engineering Co., 916 Behan St., Pittsburgh, Pa.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Maehler, Paul, Co., The, 2208 W. Lake St., Chicago, Ill.
Mahr Mfg. Co., Div. of Diamond Iron Works, Inc., Minneapolis, Minn.
Peabody Engineering Corp., 580 Fifth Ave., New York City.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Surface Combustion Div., 2375 Dorr St., Toledo, O.
Wean Engineering Co., Warren, O.
Wilson, Lee, Engineering Co., 1368 Blount St., Cleveland, O.

BUSHINGS (Bronze)
Ampco Metal, Inc., Dept. S-6 3830 W. Burnham St., Milwaukee, Wis.
Cadman, A. W., Mfg. Co., 2816 Smallman St., Pittsburgh, Pa.
Johnson Bronze Co., 550 So. Mill St., New Castle, Pa.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Shenango-Penn Mold Co., 404 W. Third St., Dover, O.

BUSHINGS (Jig)
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.

BUSHINGS (Oilless)
Rhoades, R. W., Metaline Co., 43 Third St., Long Island City, N. Y.

BY-PRODUCT PLANTS
Koppers Co., Engineering and Construction Div., 901 Koppers Bldg., Pittsburgh, Pa.

CABINETS (Steel)
Dahlstrom Metallic Door Co., Jamestown, N. Y.

CADMIUM
Udylite Corp., The, 1651 E. Grand Blvd., Detroit, Mich.

CADMIUM PLATING PROCESS
Udylite Corp., The, 1651 E. Grand Blvd., Detroit, Mich.

CALCIUM METAL AND ALLOYS
Electro Metallurgical Co., 30 E. 42nd St., New York City.

CAP SCREWS—See SCREWS (Cap, Set, Safety-Set)

CAISSONS (Pneumatic)
Dravo Corp., (Contracting Div.), Neville Island, Pittsburgh, Pa.

CAPSTANS (Electric, Gasoline, Diesel)
Silent Hoist Winch & Crane Co., 849 63rd St., Brooklyn, N. Y.

CAR DUMPERS
Alliance Machine Co., The, Alliance, Ohio.
Industrial Brownhoist Corp., Bay City, Mich.

CAR PULLERS and SPOTTERS
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
Cullen-Friestedt Co., 1308 So. Kilbourn St., Chicago, Ill.
Link-Belt Co., 2410 W. 18th St., Chicago, Ill.
Silent Hoist Winch & Crane Co., 849 63rd St., Brooklyn, N. Y.

CARBIDE
Linde Air Products Co., The, 30 E. 42nd St., New York City
National Carbide Corp., 60 E. 42nd St., New York City.
National Cylinder Gas Co., 205 W. Wacker Dr., Chicago, Ill.

CARBIDE (Special Parts)
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

CARBIDE TOOLS (Steel Cutting)
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

CARBON SPECIALTIES
United States Graphite Co., The, Saginaw, Mich.

CARBURIZING COMPOUNDS
Park Chemical Co., 8076 Military Ave., Detroit, Mich

CARBURIZING (Pack or Gas)
Lakeside Steel Improvement Co., The, 5418 Lakeside Ave., Cleveland, O.

CARS (Charging)
Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Morgan Engineering Co., The, Alliance, O.
Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.

CARS (Dump)
Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.
Easton Car & Construction Co., Easton, Pa.

CARS (Industrial and Mining)
Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Easton Car & Construction Co., Easton, Pa.
Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.

CARS (Scale)
Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.

CASTING WASHER EQUIPMENT
Pangborn Corp., Hagerstown, Md.

CASTINGS (Acid Resisting)
Ampco Metal, Inc., Dept. S-6 3830 W. Burnham St., Milwaukee, Wis.
Cadman, A. W., Mfg. Co., 2816 Smallman St., Pittsburgh, Pa.
International Nickel Co., Inc., The, 67 Wall St., New York City.
Lebanon Steel Foundry, Lebanon, Pa.
National Alloy Steel Div. of Blaw-Knox Co., Blawnox, Pa.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Shenango-Penn Mold Co., 404 W. Third St., Dover, O.

CASTINGS (Alloy Iron)
Erie Forge Co., W. 15th & Cascade Sts., Erie, Pa.
National Alloy Steel Div. of Blaw-Knox Co., Blawnox, Pa.

CASTINGS (Alloy Steel)
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Electro Alloys Co., The, Elyria, O.
Erie Forge Co., W. 15th & Cascade Sts., Erie, Pa.
Lebanon Steel Foundry, Lebanon, Pa.
Michiana Products Co., Michigan City, Ind.
National Alloy Steel Div. of Blaw-Knox Co., Blawnox, Pa.
National-Erie Corp., Erie, Pa.
Ohio Steel Foundry Co., Lima, O.-Springfield, O.

CASTINGS (Brass, Bronze, Copper, Aluminum)
Ampco Metal, Inc., Dept. S-6, 3830 W. Burnham St., Milwaukee, Wis.
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Cadman, A. W., Mfg. Co., 2816 Smallman St., Pittsburgh, Pa.
Homestead Valve Mfg. Co., P. O. Box 20, Coraopolis, Pa.
Morgan Engineering Co., The, Alliance, O.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Shenango-Penn Mold Co., 404 W. Third St., Dover, O.

CASTINGS (Corrosion Resisting)
Lebanon Steel Foundry, Lebanon, Pa.
National Alloy Steel Div. of Blaw-Knox Co., Blawnox, Pa.
Wall-Colmonoy Corp., 637 Buhl Bldg., Detroit, Mich.

CASTINGS (Die)—See DIE CASTINGS

CASTINGS (Electric Steel)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Erie Forge Co., W. 15th & Cascade Sts., Erie, Pa.
Lebanon Steel Foundry, Lebanon, Pa.
National-Erie Corp., Erie, Pa.
Reading Steel Casting Div. of American Chain & Cable Co. Inc., Reading, Pa.
West Steel Casting Co., 805 E. 70th St., Cleveland, O.
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

CASTINGS (Gray Iron, Alloy, or Semi-Steel)
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Brown & Brown, Inc., 456 So. Main St., Lima, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Erie Foundry Co., Erie, Pa.
Etna Machine Co., The, 3400 Maplewood Ave., Toledo, O.
Ferracute Machine Co., Bridgeton, N. J.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Roll & Foundry Co., The, Avonmore, Pa.
Oil Well Supply Co., Dallas, Texas.
Shenango-Penn Mold Co., 404 W. Third St., Dover, O.
Western Gas Div., Koppers Co., Fort Wayne, Ind.

CASTINGS (Heat Resisting)
Electro Alloys Co., The, Elyria, O.
International Nickel Co. Inc., The, 67 Wall Street, New York City.
Lebanon Steel Foundry, Lebanon, Pa.
Michiana Products Co., Michigan City, Ind.
National Alloy Steel Div. of Blaw-Knox Co., Blawnox, Pa.
Shenango-Penn Mold Co., 404 W. Third St., Dover, O.

CASTINGS (Malleable)
American Chain & Cable Co. Inc., Bridgeport, Conn.
Lake City Malleable Co., 5026 Lakeside Ave., Cleveland, O.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

CASTINGS (Manganese Steel)
Damascus Steel Casting Co., New Brighton, Pa.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Ferracute Machine Co., Bridgeton, N. J.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National-Erie Corp., Erie, Pa.
National Roll & Foundry Co., The, Avonmore, Pa.
Ohio Steel Fdry. Co., Lima, O.-Springfield, O.
Oil Well Supply Co., Dallas, Texas.
Pittsburgh Rolls Div. of Blaw-Knox Co., Pittsburgh, Pa.
Standard Steel Works Div. of Baldwin Locomotive Works, The Paschall P. O., Philadelphia, Pa.
Steel Founders' Society of America, 920 Midland Bldg., Cleveland, O.
Strong Steel Fdry. Co., Hertel & Norris Ave., Buffalo, N. Y.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Union Steel Casting Div. of Blaw-Knox Co., 62nd and Butler Sts., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Western Gas Div., Koppers Co., Fort Wayne, Ind.
West Steel Casting Co., 805 E. 70th St., Cleveland, O.
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

CASTINGS (Steel) (*Also Stainless)
*Allegheny Ludlum Steel Corp., Dept. S-229. Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehm, Pa.
Birdsboro Stel Fdry. & Mach. Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Erie Forge Co., W. 15th & Cascade Sts., Erie, Pa.
*Lebanon Steel Foundry, Lebanon, Pa.
*Michiana Products Co., Michigan City, Ind.
Pittsburgh Rolls, Div. of Blaw-Knox Co., Pittsburgh, Pa.
Union Steel Casting Div. of Blaw-Knox Co., 62nd and Butler Sts., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

CASTINGS (Wear Resisting)
Hagan, George J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Lebanon Steel Foundry, Lebanon, Pa.
Shenango-Penn Mold Co., 404 W. Third St., Dover, O.
Wall-Colmonoy Corp., 637 Buhl Bldg., Detroit, Mich.

CASTINGS (Worm and Gear Bronze)
Ampco Metal, Inc., Dept. S-2, 3830 W. Burnham St., Milwaukee, Wis.
Cadman, A. W., Mfg. Co., 2816 Smallman St., Pittsburgh, Pa.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.

CEMENT (Acid Proof)
Nukem Products Corp., 70 Niagara St., Buffalo, N. Y.
Pennsylvania Salt Mfg. Co., Dept. S, Pennsalt Cleaner Div., Philadelphia, Pa.
Quigley Co., 56 W. 45th St., New York City.

CEMENT (High Temperature)
Bay State Abrasive Products Co., Westboro, Mass.
Carborundum Co., The, Perth Amboy, N. J.
Eagle-Picher Lead Co., The, Cincinnati, O.
Harbison-Walker Refractories Co., 1800 Farmers Bank Bldg., Pittsburgh, Pa.
Johns-Manville Corp., 22 E. 40th St., New York City.
Norton Company, Worcester, Mass.
Quigley Co., 56 W. 45th St., New York City.

CEMENT (High Temperature Hydraulic)
Atlas Lumnite Cement Co., Dept. S, Chrysler Bldg., New York City.

CENTRAL STATION EQUIPMENT
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.

CHAIN (Conveyor and Elevator)
Jeffrey Mfg. Co., 956 N. Fourth St., Columbus, O.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

CHAIN (Draw Bench)
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

CHAIN (Malleable)
Lake City Malleable Co., 5026 Lakeside Ave., Cleveland, O.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

CHAIN (Power Transmission)
Jeffrey Mfg. Co., 956 N. Fourth St., Columbus, O.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

CHAIN (Roller)
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

CHAIN (Sling)
American Chain & Cable Co. Inc., Bridgeport, Conn.

CHAIN (Sprocket)
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

CHAIN (Steel-Finished Roller)
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

CHAIN (Welded or Weldless)
American Chain & Cable Co. Inc., Bridgeport, Conn.

CHARGING MACHINES (Cupola)
Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.
Morgan Engineering Co., The, Alliance, O.

CHARGING MACHINES (Open Hearth)
Morgan Engineering Co., The, Alliance, O.
Wellman Engineering Co., The, 7016 Central Ave., Cleveland, O.

CHARGING MACHINES AND MANIPULATORS (Autofloor Type)
Brosius, Edgar E., Co., Sharpsburg Branch, Pittsburgh, Pa.

CHECKER BRICK
Loftus Engineering Corp., 747 Oliver Bldg., Pittsburgh, Pa.

CHECKS (Metal)
Cunningham, M. E., Co., 172 E. Carson St., Pittsburgh, Pa.
Matthews, James H., & Co., 3978 Forbes St., Pittsburgh, Pa.

CHEMICALS (Industrial)
Metal & Thermit Corp., 120 Broadway, New York City.
Park Chemical Co., 8076 Military Ave., Detroit, Mich.
Titanium Alloy Mfg. Co., The, Niagara Falls, N. Y.
Turco Products, Inc., 6135 S. Central Ave., Los Angeles, Calif.

CHROME ORE
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

CHROMIUM METAL AND ALLOYS
Electro Metallurgical Co., 30 E. 42nd St., New York City.
Metal & Thermit Corp., 120 Broadway, New York City.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

CHROMIUM PLATING PROCESS
United Chromium, Inc., 51 E. 42nd St., New York City.

CHUCKING MACHINES (Multiple Spindle)
National Acme Co., The, 170 E. 131st St., Cleveland, O.
Oster Mfg. Co., The, 2057 E. 61st St., Cleveland, O.

CHUCKS (Automatic Closing)
Tomkins-Johnson Co., The, Dept. S, 611 N. Mechanic St., Jackson, Mich.

CLAMPS (Drop Forged)
Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

CLEANERS (Steam)
Homestead Valve Mfg. Co., P. O. Box 20, Coraopolis, Pa.

CLEANING SPECIALTIES
American Chemical Paint Co., Dept. 310, Ambler, Pa.
Cowles Detergent Co., The, 7016 Euclid Ave., Cleveland, O.
MacDermid, Inc., Waterbury, Conn.
Pennsylvania Salt Mfg. Co., Dept. S, Pennsalt Cleaner Div., Philadelphia, Pa.
Quigley Co., 56 W. 45th St., New York City.
Turco Products, Inc., 6135 S. Central Ave., Los Angeles, Calif.

CLUTCHES (Friction)
Jones, W. A. Fdry. & Mach. Co., 4437 Roosevelt Rd., Chicago, Ill.

CLUTCHES (Magnetic)
Cutler-Hammer, Inc., 1267 St. Paul Ave., Milwaukee, Wis.

COAL OR COKE
Alan Wood Steel Co., Conshohocken, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Hanna Furnace Corp., The, Ecorse, Detroit, Mich.
Koppers Co., Gas & Coke Div., 300 Koppers Bldg., Pittsburgh, Pa.
Koppers Coal Co., 300 Koppers Bldg., Pittsburgh, Pa.
New England Coal & Coke Co., Boston, Mass.
Pickands Mather & Co., Union Commerce Bldg., Cleveland, O.
Shenango Furnace Co., Oliver Bldg., Pittsburgh, Pa.
Snyder, W. P., & Co., Oliver Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

COAL, COKE, ORE AND ASH HANDLING MACHINERY
Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.
Easton Car & Construction Co., Easton, Pa.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Industrial Brownhoist Corp., Bay City, Mich.
Koppers Co., Engineering & Construction Div., 901 Koppers Bldg., Pittsburgh, Pa.
Koppers-Rheolaveur Co., 300 Koppers Bldg., Pittsburgh, Pa.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

COKE—See COAL OR COKE

COKE OVEN MACHINERY
Alliance Machine Co., The, Alliance, Ohio.
Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.
Morgan Engineering Co., The, Alliance, O.

COKE OVENS (By-Product)
Koppers Co., Engineering and Construction Div., 100 Koppers Bldg., Pittsburgh, Pa.

COLUMBIUM
Electro Metallurgical Co., 30 E. 42nd St., New York City.

COMBUSTION BULBS
Norton Company, Worcester, Mass.

COMBUSTION CONTROLS
Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.
Morgan Construction Co., Worcester, Mass.
Norton Company, Worcester, Mass.

COMPARATORS (Optical)
Jones & Lamson Machine Co., Springfield, Vt.

COMPENSATORS (Automatic)
Electric Controller & Mfg. Co., The, 2700 E. 79th St., Cleveland, O.

COMPOUNDS (Case Hardening, Heat Treating, Polishing)
Park Chemical Co., 8076 Military Ave., Detroit, Mich.

COMPRESSORS (Air)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Cooper-Bessemer Corp., The, Mt. Vernon, O.
Curtis Pneumatic Machinery Div. of Curtis Mfg. Co., 1996 Kienlen Ave., St. Louis, Mo.
General Electric Co., Schenectady, N. Y.
Worthington Pump & Machinery Corp., Harrison, N. J.

CONCRETE (Heat Resistant)
Atlas Lumnite Cement Co., Dept. S, Chrysler Bldg., New York City.

CONCRETE REINFORCING BARS —See BARS (Concrete Reinforcing)

CONDENSERS (Surface, Barometric, Multi-Jet)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Western Gas Div., Koppers Co., Fort Wayne, Ind.
Worthington Pump & Machinery Corp., Harrison, N. J.

CONDUITS (Electric)
Youngstown Sheet & Tube Co., The, Youngstown, O.

CONDUITS (Pressure-Treated Wood)
Wood Preserving Corp., The, 300 Koppers Bldg., Pittsburgh, Pa.

CONNECTING RODS
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Heppenstall Co., Box S-7, 4620 Hatfield St., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.

CONSTRUCTION (Industrial Building)
Austin Company, The, 16112 Euclid Ave., Cleveland, O.

CONTACTS & CONTACTORS (Electrical)
Mallory, P. R., & Co., 3029 E. Washington Ave., Indianapolis, Ind.

CONTRACT WORK
Commercial Metals Treating, Inc., Toledo, O.
Kirk & Blum Mfg. Co., 2822 Spring Grove Ave., Cincinnati, O.
A. H. Nilson Machine Co., Inc., Bridgeport, Conn.
North Wales Machine Co., Inc., North Wales, Pa.
Orr & Sembower, Inc., Reading, Pa.

CONTRACTORS—See ENGINEERS AND CONTRACTORS

CONTROL SYSTEMS (Automatic)
Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.
Brown Instrument Div. of Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.

CONTROLLERS (Electric)
Allen-Bradley Co., 1320 So Second St., Milwaukee, Wis.
Cutler-Hammer, Inc., 1267 St. Paul Ave., Milwaukee, Wis.
Electric Controller & Mfg. Co., The, 2700 E. 79th St., Cleveland, O.
General Electric Co., Schenectady, N. Y.

CONTROLS (Combustion)—See COMBUSTION CONTROLS

CONTROLS (Temperature)
Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.
Brown Instrument Div. of Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.

CONVEYING SYSTEMS (Steam Jet)
Hagan, George J., Co., 2400 E. Carson St., Pittsburgh, Pa.

CONVEYOR BELTS (Wire)
Cyclone Fence Co., Waukegan, Ill.

CONVEYORS (Apron)
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

CONVEYORS (Chain)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

CONVEYORS (Elevating)
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

CONVEYORS (Overhead Trolley)
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.
Reading Chain & Block Corp., Dept. D-5, Reading, Pa.

CONVEYORS (Roller—Power and Gravity)
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

COPPER (Phosphorized)
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.

COPPERING COMPOUND
American Chemical Paint Co., Dept. 310, Ambler, Pa.

CORE WASH
United States Graphite Co., The, Saginaw, Mich.

COTTER PINS
American Chain & Cable Co., Inc., York, Pa.
Hindley Mfg. Co., Valley Falls, R. I.
Hubbard, M. D., Spring Co., 444 Central Ave., Pontiac, Mich.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.

COUNTERBORES
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.

COUNTING DEVICES
Veeder-Root, Inc., Hartford, Conn.

COUPLINGS (Flexible)
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Electric Controller & Mfg. Co., The, 2700 E. 79th St., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
James, D. O., Mfg. Co., 1120 W. Monroe St., Chicago, Ill.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.
Lovejoy Flexible Coupling Co., 4973 W. Lake St., Chicago, Ill.
Philadelphia Gear Works, Erie Ave. & G St., Philadelphia, Pa.
Poole Fdy. & Mach. Co., Woodberry St., Baltimore, Md.
Waldron, John, Corp., New Brunswick, N. J.

COUPLINGS (Pipe)
Bethlehem Steel Co., Bethlehem, Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa
Oil Well Supply Co., Dallas, Texas.
Republic Steel Corp., Dept. ST, Cleveland, O.
Youngstown Sheet & Tube Co., The, Youngstown, O.

CRANES, BRIDGE (Ore and Coal Handling)
Alliance Machine Co., The, Alliance, Ohio.
Dravo Corp. (Engineering Works Div.), Neville Island, Pittsburgh, Pa.
Industrial Brownhoist Corp., Bay City, Mich.

CRANES (Charging)
Alliance Machine Co., The, Alliance, Ohio.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Morgan Engineering Co., The, Alliance, O.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.

CRANES (Crawler, Erection)
Bucyrus-Erie Corp., S. Milwaukee, Wis.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Northwest Engineering Co., 28 E. Jackson Blvd., Chicago, Ill.
Ohio Locomotive Crane Co., Bucyrus, O.

CRANES (Electric)
Alliance Machine Co., The, Alliance, Ohio.
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Euclid Crane & Hoist Co., The, Chardon Rd., Euclid, Ohio.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Morgan Engineering Co., The, Alliance, O.
Reading Chain & Block Corp., Dept. D-5, Reading, Pa.
Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 406 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

CRANES (Gantry)
Alliance Machine Co., The, Alliance, Ohio.
Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Cullen-Friestedt Co., 1308 So. Kilbourn Ave., Chicago, Ill.
Euclid Crane & Hoist Co., The, Chardon Rd., Euclid, Ohio.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.
Northwest Engineering Co., 28 E. Jackson Blvd., Chicago, Ill.
Ohio Locomotive Crane Co., Bucyrus, O.
Reading Chain & Block Corp., Dept. D-5, Reading, Pa.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.

CRANES (Gasoline and Diesel)
Cullen-Friestedt Co., 1308 So. Kilbourn Ave., Chicago, Ill.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Northwest Engineering Co., 28 E. Jackson Blvd., Chicago, Ill.
Ohio Locomotive Crane Co., Bucyrus, O.
Silent Hoist Winch & Crane Co., 849 63rd St., Brooklyn, N. Y.

CRANES (Hand)
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Curtis Pneumatic Machinery Div. of Curtis Mfg. Co., 1996 Kienlen Ave., St. Louis, Mo.
Euclid Crane & Hoist Co., The, Chardon Rd., Euclid, Ohio.
Industrial Brownhoist Corp., Bay City, Mich.
Reading Chain & Block Corp., Dept. D-5, Reading, Pa.
Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 406 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.
Wright Mfg. Div. of American Chain & Cable Co., Inc., York, Pa.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

CRANES (Jib)
Alliance Machine Co., The, Alliance, Ohio.
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Euclid Crane & Hoist Co., The, Chardon Rd., Euclid, Ohio.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.
Reading Chain & Block Corp., Dept. D-5, Reading, Pa.
Wright Mfg. Div. of American Chain & Cable Co. Inc., York, Pa.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

CRANES (Locomotive)
Cullen-Friestedt Co., 1308 So. Kilbourn Ave., Chicago, Ill.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Northwest Engineering Co., 28 E. Jackson Blvd., Chicago, Ill.
Ohio Locomotive Crane Co., Bucyrus, O.
Silent Hoist Winch & Crane Co., 849 63rd St., Brooklyn, N. Y.

CRANES (Monorail)
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Tramrail Div., of The Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Euclid Crane & Hoist Co., The, Chardon Rd., Euclid, Ohio.
Reading Chain & Block Corp., Dept. D-5, Reading, Pa.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.

CRANES (Traveling)
Euclid Crane & Hoist Co., The, Chardon Rd., Euclid, Ohio.
Reading Chain & Block Corp., Dept. D-5, Reading, Pa.
Wright Mfg. Div. of American Chain & Cable Co., Inc., York, Pa.

CRANK SHAFTS
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Erie Forge Co., W. 15th & Cascade Sts., Erie, Pa.
Union Drawn Steel Div. Republic Steel Corp., Massillon, O.
Metal & Thermit Corp., 120 Broadway, New York City.

CRUSHERS
American Pulverizer Co., 1539 Macklind Ave., St. Louis, Mo.
Gruendler Crusher & Pulverizer Co., 2920-28 N. Market St., St. Louis, Mo.

CUSHIONS (Pneumatic)
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.

CUT-OFF MACHINES (Abrasive)
DeSanno, A. P., & Son Inc., 436 Wheatland St., Phoenixville, Pa.

CUTTERS (Die Sinking & End Milling)
Brown & Sharpe Mfg. Co., Providence, R. I.
Tomkins-Johnson Co., The, 611 N. Mechanic St., Dept. S, Jackson, Mich.

CUTTING AND WELDING—See WELDING

CUTTING OILS—See OILS (Cutting)

CUTTING-OFF MACHINES (Rotary)
Motch & Merryweather Machinery Co., Penton Bldg., Cleveland, O.
Taylor-Wilson Mfg. Co., 1200 Thomson Ave., McKees Rocks, Pa.

CYANIDING
Lakeside Steel Improvement Co., The, 5418 Lakeside Ave., Cleveland, O.

CYLINDERS (Air or Hydraulic)
Curtis Pneumatic Machinery Div. of Curtis Mfg. Co., 1996 Kienlen Ave., St. Louis, Mo.
Galland-Henning Mfg. Co., 2747 So. 31st St., Milwaukee, Wis.
Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Scaife Co., Ames St., Oakmont, Pa.
Tomkins-Johnson Co., The, Dept. S, 611 N. Mechanic St., Jackson, Mich.

CYLINDERS (Hydraulic)
American Hollow Boring Co., 1054 W. 20th St., Buffalo, N. Y.
Scaife Co., Ames St., Oakmont, Pa.

CYLINDERS (Pressure)
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.
Scaife Co., Ames St., Oakmont, Pa.

DEGREASERS
Magnus Chemical Co., Inc., 206 South Ave., Garwood, N. J.
Pennsylvania Salt Mfg. Co., Dept. S, Pennsalt Cleaner Div., Philadelphia, Pa.

DEOXIDIZERS
Vanadium Corp. of America, 420 Lexington Ave., New York City.

DESCALING PROCESSES
The Bullard Co., Bridgeport, Conn.
Turco Products, Inc., 6135 S. Central Ave., Los Angeles, Calif.

DIAMONDS (Wheel Dressing)
Diamond Tool Co., 933 E. 41st St., Chicago, Ill.

DIE BLOCKS
American Shear Knife Co., 3rd & Ann Sts., Homestead, Pa.
Ampco Metal, Inc., Dept. S-6, 3830 W. Burnham St., Milwaukee, Wis.
Bissett Steel Co., The, 943 E. 67th St., Cleveland, O.
Heppenstall Co., Box S-7 4620 Hatfield St., Pittsburgh, Pa.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.

DIE CENTERS
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

DIE CUSHIONS
Dayton Rogers Co., Minneapolis, Minn.

DIE HANDLING EQUIPMENT (Lifters)
Economy Engineering Co., 2657 W. Van Buren St., Chicago, Ill.

DIE HEADS
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Waynesboro, Pa.
National Acme Co., The, 170 E. 131st St., Cleveland, O.
Oster Mfg. Co., The, 2037 E. 61st St., Cleveland, O.

DIE-SINKING MACHINES
Cincinnati Milling Machine and Cincinnati Grinders, Inc., Oakley Sta., Cincinnati, O.
Elmes, Chas. F., Engineering Works, 245 N. Morgan St., Chicago, Ill.

DIES (Punching, Stamping, Blanking)
Columbus Die, Tool & Mach. Co. 955 Cleveland Ave., Columbus, O.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.
Spriesch Tool & Mfg. Co., 10 Howard St., Buffalo, N. Y.
Zeh & Hahnemann Co., 56 Avenue A, Newark, N. J.

DIES (Steel, Embossing)
Cunningham, M. E., Co., 172 E. Carson St., Pittsburgh, Pa.

DOLOMITE—FLUX AND REFRACTORIES
Basic Refractories, Inc., Hanna Bldg., Cleveland, O.

DOORS & SHUTTERS (Steel, Fire, and Rolling)
Kinnear Mfg. Co., 1780-1800 Fields Ave., Columbus, O.

DOORS & TRIM (Metal)
Dahlstrom Metallic Door Co., Jamestown, N. Y.

DRAFT GAGES (Indicating, Recording)
Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.
Peabody Engineering Corp., 580 Fifth Ave., New York City.

DRAGLINES (Crawler)
Northwest Engineering Co., 28 E. Jackson Blvd., Chicago, Ill.

DRAW BENCHES
Vaughn Machinery Co., Cuyahoga Falls, O.

DRESSERS (Grinding Wheel)
Diamond Tool Co., 933 E. 41st St., Chicago, Ill.

DRILL HEADS (Multiple)
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.

DRILL RODS—see RODS (DRILL)

DRILLING MACHINERY
Walker-Turner Co., Inc., 5062 Berckman St., Plainfield, N. J.

DRILLING MACHINES (Multiple Spindle)
National Automatic Tool Co., The, Richmond, Ind.

DRILLING MACHINES (Radial)
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Walker-Turner Co., Inc., 5062 Berckman St., Plainfield, N. J.

DRILLING MACHINES (Vertical)
Bryant Machinery & Engineering Co., 400 W. Madison St., Chicago, Ill.
Cleereman Machine Tool Co., Green Bay, Wis.
Walker-Turner Co., Inc., 5062 Berckman St., Plainfield, N. J.

DRILLS (Twist)—See TWIST DRILLS

DRIVES (Chain)
Link-Belt Co., 220 S. Belmont Ave. Indianapolis, Ind.
Simonds Gear & Mfg. Co., The, 25th St., Pittsburgh, Pa.

DRIVES (Cut Herringbone Gear)
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Philadelphia Gear Works, Erie Ave. & G St., Philadelphia, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

DRIVES (Machine Tool)
Berkeley Equipment Co., First Avenue, Corry, Pa.

DRIVES (Motor)
Berkeley Equipment Co., First Avenue, Corry, Pa.

DRIVES (Multi-V-Belt)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

DRUMS (Steel)
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.

DRYERS (Compressed Air)
Ruemelin Mfg. Co., 3882 N. Palmer St., Milwaukee, Wis.

DRYERS (Paint, Varnish, Enamel, Chemical)
Machler, Paul, Co., The, 2208 W. Lake St., Chicago, Ill.

DRYERS (Rotary)
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

DUCTS (Acid Fume, Rubber Lined)
American Hard Rubber Co., 11 Mercer St., New York City.

DUST ARRESTING EQUIPMENT
American Air Filter Co., 443 Central Ave., Louisville, Ky.
American Foundry Equipment Co., The, Mishawaka, Ind.
Pangborn Corp., Hagerstown, Md.
Peabody Engineering Corp., 580 Fifth Ave., New York City.
Ruemelin Mfg. Co., 3882 N. Palmer St., Milwaukee, Wis.
Torit Mfg. Co., 285 Walnut St., St. Paul, Minn.
Vapor Blast Mfg. Co., 333 S. 16th St., Milwaukee, Wis.

ECONOMIC SERVICE
Brookmire Corp., 551 Fifth Ave., New York City.

ECONOMIZERS
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.

ELECTRIC WELDING—See WELDING

ELECTRIC WIRING—See WIRE AND CABLE

ELECTRICAL EQUIPMENT
Allen-Bradley Co., 1320 So. Second St., Milwaukee, Wis.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Electric Controller & Mfg. Co., The, 2700 E. 79th St., Cleveland, O.
Fairbanks, Morse & Co., Dept. E75, 600 S. Michigan Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Graybar Electric Co., 420 Lexington Ave., New York City.

ELECTRODES (Carbon and Graphite)
National Carbon Co., W. 117th St. at Madison Ave., Cleveland, O.

ELECTRODES (Hard Surfacing Welding)
Metal & Thermit Corp., 120 Broadway, New York City.

ELECTRODES (Resistance Welding)
Mallory, P. R., & Co., 3029 E. Washington Ave., Indianapolis, Ind.

ELEVATING AND CONVEYING MACHINERY—See CONVEYORS

ENGINEERS AND CONTRACTORS
Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.
Austin Co., The, 16112 Euclid Ave., Cleveland, O.
McKee, Arthur G., & Co., 2300 Chester Ave., Cleveland, O.
Morgan Engineering Co., The, Alliance, O.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.
Uhl Construction Co., 6001 Butler St., Pittsburgh, Pa.
Wean Engineering Co., Warren, O.

ENGINEERS (Consulting)
Austin Co., The, 16112 Euclid Ave., Cleveland, O.
Easton Car & Construction Co., Easton, Pa.
Garrett, George K., Co., D & Tioga Sts., Philadelphia, Pa.
Koppers Co., Engineering and Construction Div., 901 Koppers Bldg., Pittsburgh, Pa.
Loftus Engineering Corp. 747 Oliver Bldg., Pittsburgh, Pa.
McKee, Arthur G., & Co., 2300 Chester Ave., Cleveland, O.
Wean Engineering Co., Warren, O.

ENGINES (Diesel)
Cooper-Bessemer Corp., The, Mt. Vernon, O.
Fairbanks, Morse & Co., Dept. E75, 600 So. Michigan Ave., Chicago, Ill.

ENGINES (Gas, Oil)
Cooper-Bessemer Corp., The, Mt. Vernon, Ohio.
Fairbanks, Morse & Co., Dept. E75, 600 So. Michigan Ave., Chicago, Ill.
Worthington Pump & Machinery Corp., Harrison, N. J.

ENGINES (Kerosene)
Fairbanks, Morse & Co., Dept. E75, 600 S. Michigan Ave., Chicago, Ill.

ENGINES (Steam)
Oil Well Supply Co., Dallas, Texas.

EXCAVATORS
Northwest Engineering Co., 28 E. Jackson Blvd., Chicago, Ill.

FACTORY & INDUSTRIAL BUILDINGS—See BUILDINGS (Industrial)

FANS (Crane Cab)
Graybar Electric Co., 420 Lexington Ave., New York City.
Perkins, B. F. & Son, Inc., Holyoke, Mass.

FANS (Exhaust Ventilating)
Graybar Electric Co., 420 Lexington Ave., New York City.
Sturtevant, B. F., Co., 1316 Wabansia Ave., Chicago, Ill.

FANS (Portable)
Graybar Electric Co., 420 Lexington Ave., New York City.
Perkins, B. F., & Son, Inc., Holyoke, Mass.

FANS (Wall)
Graybar Electric Co., 420 Lexington Ave., New York City.
Perkins, B. F. & Son, Inc., Holyoke, Mass.

FENCE (Chain Link)
Continental Steel Corp., Kokomo, Ind.
Cyclone Fence Co., Waukegan, Ill.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.

FENCING (Wire)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

FERROALLOY (Briquets)
Electro Metallurgical Co., 30 E. 42nd St., New York City.

FERROALLOYS
Cleveland-Cliffs Iron Co., The, Union Commerce Bldg., Cleveland, O.
Electro Metallurgical Co., 30 E. 42nd St., New York City.
International Nickel Co., Inc., The, 67 Wall St., New York City.
Metal & Thermit Corp., 120 Broadway, New York City.
Titanium Alloy Mfg. Co., The, Niagara Falls, N. Y.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROCHROME
Electro Metallurgical Co., 30 E. 42nd St., New York City.
Samuel, Frank & Co., Inc., Harrison Bldg., Philadelphia, Pa.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROMANGANESE
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Electro Metallurgical Co., 30 E. 42nd St., New York City.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

FERROPHOSPHORUS
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

FERROSILICON
Electro Metallurgical Co., 30 E. 42nd St., New York City.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.
Southern Ferro Alloys Co., 2108 Chestnut St., Chattanooga, Tenn.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROSILICON ALUMINUM
Vanadium Corp. of America,

FERROTITANIUM
Metal & Thermit Corp., 120 Broadway, New York City.
Titanium Alloy Mfg. Co., The, Niagara Falls, N. Y.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROVANADIUM
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Vanadium Corp. of America, 420 Lexington Ave.,

FILES AND RASPS
Atkins, E. C., & Co., 427 So. Illinois St., Indianapolis, Ind.
Disston, Henry, & Sons, Inc., 626 Tacony, Philadelphia, Pa.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.

WHERE-TO-BUY

FILTER CLOTH (Asbestos)
Johns-Manville Corp., 22 E. 40th St., New York City.

FIRE CLAY—See REFRACTORIES

FIRE DOORS & SHUTTERS—See DOORS & SHUTTERS

FIRE EXTINGUISHERS
C-O-Two Fire Equipment Co., 10 Empire St., Newark, N. J.
Kidde, Walter, & Co., Inc., 532 West St., Bloomfield, N. J.

FIRE EXTINGUISHING SYSTEMS
C-O-Two Fire Equipment Co., 10 Empire St., Newark, N. J.

FIRE PROTECTION EQUIPMENT
C-O-Two Fire Equipment Co., 10 Empire St., Newark, N. J.
Walter Kidde & Co., Inc., 532 West St., New York, N. Y.

FITTINGS (Electric Steel)
Reading-Pratt & Cady Div. of American Chain & Cable Co., Inc., Bridgeport, Conn.

FITTINGS (Rubber Lined)
American Hard Rubber Co., 11 Mercer St., New York City.

FLAME HARDENING
Air Reduction, 60 E. 42nd St., New York City.
Linde Air Products Co., 30 E. 42nd St., New York City.
National-Erie Corp., Erie, Pa.

FLANGES (Welded Steel)
King Fifth Wheel Co., 2915 No. Second St., Philadelphia, Pa.

FLOORING (Monolithic)
Carey, Philip, Mfg. Co., The, Lockland, Cincinnati, O.
Johns-Manville Corp., 22 E. 40th St., New York City.

FLOORING (Steel)
Alan Wood Steel Co., Conshohocken, Pa.
Blaw-Knox Co., Blawnox, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Dravo Corp. (Machinery Div.), 300 Penn Ave., Pittsburgh, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Robertson, H. H. Co., Farmers Bank Bldg., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Scully Steel Products Co., 1316 Wabansia Ave., Chicago, Ill.
Tri-Lok Co., 5515 Butler St., Pittsburgh, Pa.

FLUE DUST CONDITIONERS
Broslus, Edgar E., Co., Sharpsburg, Branch, Pittsburgh, Pa.

FLUE GAS ANALYZERS
Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.

FLUORSPAR
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

FLUXES (Soldering, Welding & Tinning)
American Chemical Paint Co., Dept. 310, Ambler, Pa.
Kester Solder Co., 4222 Wrightwood Ave., Chicago, Ill.
Wayne Chemical Products Co., 9502 Copeland St., Detroit, Mich.

FORGING BILLETS—See BILLETS

FORGING MACHINERY
Alliance Machine Co., The, Alliance, Ohio.
Erie Foundry Co., Erie, Pa.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.
National Machinery Co., The, Tiffin, O.

FORGINGS (Aluminum, Brass, Bronze, Copper)
American Brass Co., The, Waterbury, Conn.
Ampco Metal, Inc., Dept. S-6, 3830 W. Burnham St., Milwaukee, Wis.
Bridgeport Brass Co., Bridgeport, Conn.
Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

FORGINGS (Drop) (*Also Stainless)
*Atlas Drop Forge Co., Lansing, Mich.
*Bethlehem Steel Co., Bethlehem, Pa.
Oil Well Supply Co., Dallas, Texas.
Oliver Iron & Steel Corp., So. 10th & Muriel Sts., Pittsburgh, Pa.

FORGINGS (Hollow Bored)
American Hollow Boring Co., 1054 W. 20th St., Erie, Pa.
Atlas Drop Forge Co., Lansing, Mich.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Erie Forge Co., W. 15th & Cascade Sts., Erie, Pa.

FORGINGS (Iron and Steel) (*Also Stainless)
*Atlas Drop Forge Co., Lansing, Mich.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Erie Forge Co., W. 15th & Cascade Sts., Erie, Pa.
Heppenstall Co., Box S-7, 4620 Hatfield St., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
*Midvale Co., The, Nicetown, Philadelphia, Pa.
Oil Well Supply Co., Dallas, Texas.
Standard Steel Works Div. of The Baldwin Locomotive Works, Paschall P. O., Philadelphia, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

FORGINGS (Small)
Oliver Iron & Steel Corp., So. 10th & Muriel Sts., Pittsburgh, Pa.

FORGINGS (Upset)
Atlas Drop Forge Co., Lansing, Mich.
Bethlehem Steel Co., Bethlehem, Pa.
Oliver Iron & Steel Corp., So. 10th & Muriel Sts., Pittsburgh, Pa.

FOUNDRY EQUIPMENT
American Foundry Equipment Co., The, Mishawaka, Ind.
Vapor Blast Mfg. Co., 333 S. 16th St., Milwaukee, Wis.

FROGS AND SWITCHES
Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.

FURNACE INSULATION—See INSULATION

FURNACES (Blast)
McKee, Arthur G., & Co., 2300 Chester Ave., Cleveland, O.
Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.

FURNACES (Brazing)
Bellis Heat Treating Co., Branford, Conn.
Hevi Duty Electric Co., 4100 W. Highland Blvd., Milwaukee, Wis.

FURNACES (Electric Heating)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Bellis Heat Treating Co., Branford, Conn.
Electric Furnace Co., The, Salem, O.
General Electric Co., Schenectady, N. Y.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Hevi Duty Electric Co., 4100 W. Highland Blvd., Milwaukee, Wis.
Mahr Mfg. Co., Div. of Diamond Iron Works, Inc., Minneapolis, Minn.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1257, Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Swindell-Dressler Corp., P. O. Box 1888, Pittsburgh, Pa.
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.

» » » WHERE-TO-BUY « « «

FURNACES (Electric Melting)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Detroit Electric Furnace Div., Kuhlman Electric Co., Bay City, Mich.
General Electric Co., Schenectady, N. Y.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1257, Pittsburgh, Pa.

FURNACES (Enameling)
Hagan, George J., Co., 2400 E. Carson St., Pittsburgh, Pa.

FURNACES (Forging)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Amsler-Morton Co., The, Fulton Bldg., Pittsburgh, Pa.
Bellis Heat Treating Co., Branford, Conn.
Electric Furnace Co., The, Salem, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Surface Combustion Div., 2375 Dorr St., Toledo, O.
Swindell-Dressler Corp., P. O. Box 1888, Pittsburgh, Pa.

FURNACES (Galvanizing)
Salem Engineering Co., 714 So. Broadway, Salem, O.

FURNACES (Gas or Oil)
Electric Furnace Co., The, Salem, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Surface Combustion Div., 2375 Dorr St., Toledo, O.
Swindell-Dressler Corp., P. O. Box 1888, Pittsburgh, Pa.

FURNACES (Heat Treating, Annealing, Carburizing, Hardening, Tempering)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
American Gas Furnace Co., Elizabeth, N. J.
Amsler-Morton Co., The, Fulton Bldg., Pittsburgh, Pa.
Bellis Heat Treating Co., Branford, Conn.
Carborundum Co., The, Perth Amboy, N. J.
Electric Furnace Co., The, Salem, O.
General Electric Co., Schenectady, N. Y.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Hevi Duty Electric Co., 4100 W. Highland Blvd., Milwaukee, Wis.
A. F. Holden Co., The, 200 Winchester Ave., New Haven, Conn.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.
Mahr Mfg. Co., Div. of Diamond Iron Works, Inc., Minneapolis, Minn.
Ohio Crankshaft Co., The, 6600 Clement Ave., Cleveland, O.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Surface Combustion Div., 2375 Dorr St., Toledo, O.
Swindell-Dressler Corp., P. O. Box 1888, Pittsburgh, Pa.
Wean Engineering Co., Warren, O.
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.

FURNACES (Laboratory)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Dietert, Harry W., Co., 9330J Roselawn Ave., Detroit, Mich.
Hevi Duty Electric Co., 4100 W. Highland Blvd., Milwaukee, Wis.

FURNACES (Non-Ferrous Melting)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Detroit Electric Furnace Div., Kuhlman Electric Co., Bay City, Mich.

FURNACES (Open Hearth)
Amsler-Morton Co., The, Fulton Bldg., Pittsburgh, Pa.
McKee, Arthur G., & Co., 2300 Chester Ave., Cleveland, O.
Swindell-Dressler Corp., P. O. Box 1888, Pittsburgh, Pa.

FURNACES (Portable)
Hagan, George J., Co., 2400 E. Carson St., Pittsburgh, Pa.

FURNACES (Recuperative)
Electric Furnace Co., The, Salem, O.
Hagan, Geo. J. Co., 2400 E. Carson St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Surface Combustion Div., 2375 Dorr St., Toledo, O.
Swindell-Dressler Corp., P. O. Box 1888, Pittsburgh, Pa.

FURNACES (Rivet Heating)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Surface Combustion Div., 2375 Dorr St., Toledo, O.

FURNACES (Sheet and Tin Mill)
Electric Furnace Co., The, Salem, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Surface Combustion Div., 2375 Dorr St., Toledo, O.
Swindell-Dressler Corp., P. O. Box 1888, Pittsburgh, Pa.
Wean Engineering Co., Warren, O.
Wilson, Lee, Engineering Co., 1368 Blount St., Cleveland, O.

FURNACES (Steel Mill)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Electric Furnace Co., The, Salem, O.
General Electric Co., Schenectady, N. Y.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Surface Combustion Div., 2375 Dorr St., Toledo, O.
Swindell-Dressler Corp., P. O. Box 1888, Pittsburgh, Pa.
Wellman Engineering Co., The, 7016 Central Ave., Cleveland, O.
Wilson, Lee, Engineering Co., 1368 Blount St., Cleveland, O.

FURNACES (Welding)
Hagan, George J., Co., 2400 E. Carson St., Pittsburgh, Pa.

GAGE BLOCKS
Dearborn Gage Co., 22036 Beech St., Dearborn, Mich.

GAGES
Brown & Sharpe Mfg. Co., Providence, R. I.
Federal Products Corp., 1144 Eddy St., Providence, R. I.
Greenfield Tap & Die Corp., Greenfield, Mass.
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.
Sheffield Corp., The, Gage Div., Dayton, O.

GAGES (Automatic Control & Recording)
Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.

GAGES (Indicating and Recording)
Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.
General Electric Co., Schenectady, N. Y.
Sheffield Corp., The, Gage Div., Dayton, O.

GAGES (Pressure & Vacuum Recording)
Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.

GALVANIZING (Hot Dip)
Acme Galvanizing, Inc., Milwaukee, Wis.
Acme Steel & Malleable Iron Works, Buffalo, N. Y.
American Hot Dip Galvanizers Assoc., Inc., 903 American Bank Bldg., Pittsburgh, Pa.
American Tinning & Galvanizing Co., Erie, Pa.
Atlantic Steel Co., Atlanta, Ga.
Buffalo Galvanizing & Tinning Works, Inc., Buffalo, N. Y.
Cattie, Jos. P., & Bros., Gaul and Liberty Sts., Philadelphia, Pa.
Diamond Expansion Bolt Co., Inc., Garwood, N. J.
Enterprise Galvanizing Co., 2525 E. Cumberland St.,
Equipment Steel Products Div., of Union Asbestos & Rubber Co., Blue Island, Ill.
Galvanizers Incorporated, Portland, Ore.
Fanner Mfg. Co., The, Cleveland, O.
Finn, John, Metal Works, San Francisco, Calif.
Gregory, Thomas, Galvanizing Works, Maspeth, N. Y.
Hanlon-Gregory Galvanizing Co., 5515 Butler St., Pittsburgh, Pa.
Hill, James, Mfg. Co., Providence, R. I.
Hubbard & Co., Oakland, Calif.
Independent Galvanizing Co., Newark, N. J.
International-Stacey Corp., Columbus, O.
Isaacson Iron Works, Seattle, Wash
Joslyn Co. of California, Los Angeles, Calif.
Joslyn Mfg. & Supply Co., Chicago, Ill.
Koven, L. O., & Bro., Inc., Jersey City, N. J.
Lehigh Structural Steel Co., Allentown, Pa.
Lewis Bolt & Nut Co., Minneapolis, Minn.
Missouri Rolling Mill Corp., St. Louis, Mo.
National Telephone Supply Co., The, Cleveland, O.
Penn Galvanizing Co., Philadelphia, Pa.
Riverside Foundry & Galvanizing Co., Kalamazoo, Mich.
San Francisco Galvanizing Works, San Francisco, Calif.
Sanitary Tinning Co., The, Cleveland, O.
Scaife Co., Ames St., Oakmont, Pa.
Standard Galvanizing Co., Chicago, Ill.
Wilcox, Crittenden & Co., Inc., Middletown, Conn.
Witt Cornice Co., The, Cincinnati, O.

GALVANIZING PLANTS FOR SHEETS
Erie Foundry Co., Erie, Pa.
Wean Engineering Co., Warren, O

GALVANIZING PRODUCTS
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.

GAS HOLDERS
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Western Gas Div., Koppers Co., Fort Wayne, Ind.

GAS PRODUCER PLANTS
Koppers Co., Engineering and Construction Div., 901 Koppers Bldg., Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

GAS RECOVERY COKE OVEN AND GAS PLANTS
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Koppers Co., Engineering and Construction Div., 901 Koppers Bldg., Pittsburgh, Pa.

GAS SCRUBBERS
Bartlett-Hayward Div., Koppers Co., Baltimore, Md
Peabody Engineering Corp., 580 Fifth Ave., New York City.
Western Gas Div., Koppers Co., Fort Wayne, Ind.

GASKETS (Asbestos, Metal or Rubber)
Johns-Manville Corp., 22 E. 40th St., New York City.

GEAR BLANKS
Ampco Metal, Inc., Dept. S-6, 3830 W. Burnham St., Milwaukee, Wis.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
King Fifth Wheel Co., 2915 No. Second St., Philadelphia, Pa.
National-Erie Corp., Erie, Pa.
Philadelphia Gear Works, Erie Ave. & G St., Philadelphia, Pa.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.
Waldron, John, Corp., New Brunswick, N. J.

GEAR MACHINERY (Generating)
National Broach & Machine Co., 5600 St. Jean, Detroit, Mich.

GEAR MACHINERY (Lapping, Finishing, Checking)
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.

GEARS (Non-Metallic)
Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.
Pittsburgh Gear & Machine Co., 2680-2700 Smallman St., Pittsburgh, Pa.
Simonds Gear & Mfg. Co., The, 25th St., Pittsburgh, Pa.

GEARS (Steel Laminated)
Simonds Gear & Mfg. Co., The, 25th St., Pittsburgh, Pa.
Waldron, John, Corp., New Brunswick, N. J.

GEARS (Worm)
Cleveland Worm & Gear Co., 3270 E. 80th St., Cleveland, O.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.
Philadelphia Gear Works, Erie Ave. & G St., Philadelphia, Pa.
Pittsburgh Gear & Machine Co., 2680-2700 Smallman St., Pittsburgh, Pa.
Simonds Gear & Mfg. Co., The, 25th St., Pittsburgh, Pa.

GEARS AND GEAR CUTTING
General Electric Co., Schenectady, N. Y.
Grant Gear Works, 2nd & B Sts., Boston, Mass.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
James, D. O., Mfg. Co., 1120 W. Monroe St., Chicago, Ill.
Jones, W. A., Fdry. & Mach. Co., 4437 Roosevelt Rd., Chicago, Ill.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1467 Pittsburgh, Pa.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.
National-Erie Corp., Erie, Pa.
Philadelphia Gear Works, Erie Ave. & G St., Philadelphia, Pa.
Pittsburgh Gear & Machine Co., 2680-2700 Smallman St., Pittsburgh, Pa.
Simonds Gear & Mfg. Co., 25th St., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

GENERATING SETS
Century Electric Co., 1806 Pine St., St. Louis, Mo.
Cooper-Bessemer Corp., The, Mt. Vernon, Ohio.
Fairbanks, Morse & Co., Dept. E75, 600 So. Michigan Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Reliance Electric & Eng. Co., 1088 Ivanhoe Rd., Cleveland, O.
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.

GENERATORS (Acetylene—Portable and Stationary)
Linde Air Products Co., The, 30 E. 42nd St., New York City.

GENERATORS (Electric)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Century Electric Co., 1806 Pine St., St. Louis, Mo.
Fairbanks, Morse & Co., Dept. E75, 600 S. Michigan Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.

WHERE-TO-BUY

GENERATORS (Electric)—Con.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O.
Reliance Electric & Eng. Co., 1088 Ivanhoe Rd., Cleveland, O.
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.

GENERATORS (Plating)
Udylite Corp., The, 1651 E. Grand Blvd., Detroit, Mich.

GRABS—FOR SHEETS, COILS, INGOTS
J-B Engineering Sales Co., 3100 East St., New Haven, Conn.

GRAPHITE
United States Graphite Co., The, Saginaw, Mich.

GRATING
Blaw-Knox Co., Blawnox, Pa.
Dravo Corp., (Machinery Div.), 300 Penn Ave., Pittsburgh, Pa.
Tri-Lok Co., 5515 Butler St., Pittsburgh, Pa.

GREASE (Lubricating)—See LUBRICANTS (Industrial)

GREASE RETAINERS AND SEALS
Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.

GRINDER CENTERS
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

GRINDER HEADS
Fitchburg Grinding Machine Corp., Fitchburg, Mass.

GRINDERS (Circular Saw)
Motch & Merryweather Machinery Co., Penton Bldg., Cleveland, O.

GRINDERS (Foundry Core)
Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee, Wis.

GRINDERS (Precision Thread)
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
Jones & Lamson Machine Co., Springfield, Vt.

GRINDERS (Single Slide Internal)
Bryant Chucking Grinder Co., Springfield, Vt.

GRINDERS (Surface)
Brown & Sharpe Mfg. Co., Providence, R. I.
Heald Machine Co., Worcester, Mass.
Norton Company, Worcester, Mass.

GRINDING (Shear Knife)
American Shear Knife Co., 3rd & Ann Sts., Homestead, Pa.

GRINDING COMPOUNDS
Stuart, D. A., Oil Co., Ltd., 2733 S. Troy St., Chicago, Ill.
Sun Oil Co., Dept. 1, 1608 Walnut St., Philadelphia, Pa.
Wayne Chemical Products Co., 9502 Copeland St., Detroit, Mich.

GRINDING MACHINE ATTACHMENTS
Fitchburg Grinding Machine Corp., Fitchburg, Mass.

GRINDING MACHINES (Automotive Reconditioning)
Heald Machine Co., Worcester, Mass.

GRINDING MACHINES (Bench & Floor Type)
Walker-Turner Co., Inc., 5012 Berckman St., Plainfield, N. J.

GRINDING MACHINES (Centerless, Internal and External)
Cincinnati Milling Machine and Cincinnati Grinders, Inc., Oakley Sta., Cincinnati, O.
Heald Machine Co., Worcester, Mass.

GRINDING MACHINES (Chucking)
Cincinnati Milling Machine and Cincinnati Grinders, Inc., Oakley Sta., Cincinnati, O.
Fitchburg Grinding Machine Corp., Fitchburg, Mass.
Heald Machine Co., Worcester, Mass.

GRINDING MACHINES (Crank Pin, Cam, Piston & Valve Face)
Cincinnati Milling Machine and Cincinnati Grinders, Inc., Oakley Sta., Cincinnati, O.
Norton Company, Worcester, Mass.

GRINDING MACHINES (Die)
Fitchburg Grinding Machine Corp., Fitchburg, Mass.

GRINDING MACHINES (Gear)
Fitchburg Grinding Machine Corp., Fitchburg, Mass.

GRINDING MACHINES (Oscillating)
Cincinnati Milling Machine and Cincinnati Grinders, Inc., Oakley Sta., Cincinnati, O.

GRINDING MACHINES (Plain and Universal)
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine and Cincinnati Grinders, Inc. Oakley Sta., Cincinnati, O.
Fitchburg Grinding Machine Corp., Fitchburg, Mass.
Norton Co., Worcester, Mass.

GRINDING MACHINES (Roll)
Cincinnati Milling Machine and Cincinnati Grinders, Inc., Oakley Sta., Cincinnati, O.
Mesta Machine Co., P. O. Box 1466 Pittsburgh, Pa.
Norton Co., Worcester, Mass.

GRINDING MACHINES (Rotary Surface)
Blanchard Machine Co., The, 64 State St., Cambridge, Mass.
Heald Machine Co., Worcester, Mass.

GRINDING MACHINES (Segmental)
Norton Company, Worcester, Mass.

GRINDING MACHINES (Spline)
Fitchburg Grinding Machine Corp., Fitchburg, Mass.

GRINDING MACHINES (Tool and Cutter)
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine and Cincinnati Grinders, Inc., Oakley Sta., Cincinnati, O.
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
Fitchburg Grinding Machine Corp., Fitchburg, Mass.
Kearney & Trecker Corp., 5926 National Ave., Milwaukee, Wis.
Norton Co., Worcester, Mass.
Oster Mfg. Co., The, 2037 E. 61st St., Cleveland, O.
Walker-Turner Co., Inc., 5062 Berckman St., Plainfield, N. J.
William Sellers & Co., Inc., 16th & Callowhill St., Philadelphia, Pa.

GRINDING WHEELS
Abrasive Co., Tacony & Fraley Sts., Philadelphia, Pa.
Atkins, E. C., & Co., 427 So. Illinois St., Indianapolis, Ind.
Bay State Abrasive Products Co., Westboro, Mass.
Blanchard Machine Co., The, 64 State St., Cambridge, Mass.
Carborundum Co., The, Niagara Falls, N. Y.
DeSanno, A. P., & Son Inc., 436 Wheatland St., Phoenixville, Pa.
Macklin Co., Jackson, Mich.
Norton Co., Worcester, Mass.
Sterling Grinding Wheel Div. Cleveland Quarries Co., Tiffin, O.

GRINDING WHEELS (Segmental)
Abrasive Co., Tacony & Fraley Sts., Philadelphia, Pa.
Blanchard Machine Co., The, 64 State St., Cambridge, Mass.
Carborundum Co., The, Niagara Falls, N. Y.
Macklin Co., Jackson, Mich.
Norton Company, Worcester, Mass.
Sterling Grinding Wheel Div. Cleveland Quarries Co., Tiffin, O.

GUIDE SHOES
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

GUIDES (Mill)
Ampco Metal, Inc., Dept. S-6, 3830 W. Burnham St., Milwaukee, Wis.
National-Erie Corp., Erie, Pa.
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

GUNS (Blast Furnace Mud)
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Co., Sharpsburg Branch, Pittsburgh, Pa.

» » » WHERE-TO-BUY « « «

GUNS (Steam, Hydraulic, Electric)
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Co., Sharpsburg Branch, Pittsburgh, Pa.

HAMMERS (Drop)
Alliance Machine Co., The, Alliance, Ohio.
Chambersburg Engineering Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.

HAMMERS (Power)
Yoder Co., The, W. 55th St. & Walworth Ave., Cleveland, O.

HAMMERS (Steam)
Alliance Machine Co., The, Alliance, Ohio.
Chambersburg Engineering Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.

HANGERS
Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
Grinnell Co., Inc., Providence, R. I.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.

HANGERS (Shaft)
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Division, General Motors Corp., Harrison, N. J.
New Departure Div., General Motors Corp., Bristol, Conn.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.

HEADING MACHINERY
National Machinery Co., Tiffin, O.

HEAT TREATING
Lakeside Steel Improvement Co., The, 5418 Lakeside Ave., Cleveland, O.
Van Dorn Iron Works, 2685 E. 79th St., Cleveland, O.

HEAT TREATING MATERIALS
Houghton, E. F., & Co., Third, American & Somerset Sts., Philadelphia, Pa.
Park Chemical Co., 8076 Military Ave., Detroit, Mich.

HEATERS (Air)
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.

HEATERS (Electric Space)
Cutler-Hammer, Inc., 1267 St. Paul Ave., Milwaukee, Wis.

HEATERS (Unit)
Dravo Corp. (Machinery Div.), 300 Penn Ave., Pittsburgh, Pa.
Grinnell Co., Inc., Providence, R. I.

HELMETS (Blast Cleaning)
Pangborn Corp., Hagerstown, Md.

HITCHINGS (Mine Car)
American Chain & Cable Co., Inc., Bridgeport, Conn.

HOBS
Brown & Sharpe Mfg. Co., Providence, R. I.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.

HOISTS (Chain)
Cleveland Tramrail Div., of Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Ford Chain Block Div. of American Chain & Cable Co., Inc., 2nd & Diamond Sts., Philadelphia, Pa.
Reading Chain & Block Co., Dept. D-5, Reading, Pa.
Wright Mfg. Div. of American Chain & Cable Co., Inc., York, Pa.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

HOISTS (Electric)
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Economy Engineering Co., 2657 W. Van Buren St., Chicago, Ill.
Euclid Crane & Hoist Co., The, Chardon Rd., Euclid, Ohio.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Reading Chain & Block Corp., Dept. D-5, Reading, Pa.
Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 406 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.
Silent Hoist Winch & Crane Co., 849 63rd St., Brooklyn, N. Y.
Wright Mfg. Div. of American Chain & Cable Co. Inc., York, Pa.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

HOISTS (Hand)
Economy Engineering Co., 2657 W. Van Buren St., Chicago, Ill.

HOISTS (Monorail)
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Euclid Crane & Hoist Co., The, Chardon Rd., Euclid, Ohio.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Reading Chain & Block Corp., Dept. D-5, Reading, Pa.
Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 406 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

HOISTS (Pneumatic)
Curtis Pneumatic Machinery Div. of Curtis Mfg. Co., 1996 Kienlen Ave., St. Louis, Mo.
Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill.

HONING MACHINES
Micromatic Hone Corp., 1345 E. Milwaukee Ave., Detroit, Mich.

HOOKS (Chain)
American Chain & Cable Co., Inc., Bridgeport, Conn.

HOOPS AND BANDS
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

HOSE REINFORCEMENT MACHINES
Fidelity Machine Co., 3908-18 Frankford Ave., Philadelphia, Pa.

HOSE (Flexible Metal)
American Metal Hose Branch of The American Brass Co., Waterbury, Conn.
Chicago Metal Hose Corp., 1315 S. Third St., Maywood, Ill.

HOSE (Rubber)
United States Rubber Co., 1230 Sixth Ave., New York City.

HUMIDIFIERS (Industrial)
Grinnell Co., Inc., Providence, R. I.

HYDRAULIC MACHINERY
Alliance Machine Co., The, Alliance, Ohio.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Baldwin Southwark Div., Baldwin Locomotive Works, Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Chambersburg Engineering Co., Chambersburg, Pa.
Elmes, Chas. F., Engineering Works, 245 N. Morgan St., Chicago, Ill.
Farquhar, A. B., Co., Ltd., 195 Duke St., York, Pa.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Hydropress, Inc., 570 Lexington Ave., New York City.
Morgan Engineering Co., The, Alliance, O.
National-Erie Corp., Erie, Pa.
Schloemann Engineering Corp., Empire Bldg., Pittsburgh, Pa.
Weinman Pump & Supply Co., The, 210 Boulevard of the Allies, Pittsburgh, Pa.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

HYDRAULIC PRESSES—See PRESSES (Hydraulic)

HYDRAULIC UNITS
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
Racine Tool & Machine Co., Racine, Wis.
Weinman Pump & Supply Co., The, 210 Boulevard of the Allies, Pittsburgh, Pa.

INDICATORS (Blast Furnace Stock Line)
Brosius, Edgar E., Co., Sharpsburg Branch, Pittsburgh, Pa.

INDICATORS (Temperature)
Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.
Brown Instrument Div. of Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.

INGOT MOLD WASH (Graphite)
United States Graphite Co., The, Saginaw, Mich.

INGOT MOLDS
Bethlehem Steel Co., Bethlehem, Pa.
Shenango-Penn Mold Co., Oliver Bldg., Pittsburgh, Pa.
Valley Mould & Iron Corp., Hubbard, O.

INHIBITORS
American Chemical Paint Co., Dept. 310, Ambler, Pa.
Parkin, Wm. M., Co., The, 1005 Highland Bldg., Pittsburgh, Pa.

INSTRUMENTS (Electric-Indicating and Recording)
Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.
Brown Instrument Div. of Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
General Electric Co., Schenectady, N. Y.
Graybar Electric Co., 420 Lexington Ave., New York City.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.

INSULATING BLOCK
Illinois Clay Products Co., 214 Barber Bldg., Joliet, Ill.
Johns-Manville Corp., 22 E. 40th St., New York City.
Ramtite Co., The, Div. of the S. Obermayer Co., 2557 W. 18th St., Chicago, Ill.

INSULATING BRICK
Illinois Clay Products Co., 214 Barber Bldg., Joliet, Ill.
Johns-Manville Corp., 22 E. 40th St., New York City.
Quigley Co., 56 W. 45th St., New York City.
Ramtite Co., The, Div. of the S. Obermayer Co., 2557 W. 18th St., Chicago, Ill.

INSULATING CONCRETE
Atlas Lumnite Cement Co., Dept. S, Chrysler Bldg. New York City.
Illinois Clay Products Co., 214 Barber Bldg., Joliet, Ill.
Johns-Manville Corp., 22 E. 40th St., New York City.
Quigley Co., 56 W. 45th St., New York City.

INSULATING POWDER AND CEMENT
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.
Illinois Clay Products Co., 214 Barber Bldg., Joliet, Ill.
Johns-Manville Corp., 22 E. 40th St., New York City.
Ramtite Co., The, Div. of the S. Obermayer Co., 2557 W. 18th St., Chicago, Ill.

INSULATION (Building)
Carey, Philip, Mfg. Co., The, Lockland, Cincinnati, O.
Johns-Manville Corp., 22 E. 40th St., New York City.

INSULATION (Furnace, Boiler Settings, Ovens, Steam Pipe, Etc.)
Illinois Clay Products Co., 214 Barber Bldg., Joliet, Ill.
Johns-Manville Corp., 22 E. 40th St., New York City.
Quigley Co., 56 W. 45th St., New York City.

IRON (Bar)
Ryerson, Jos. T., & Son Co., 16th & Rockwell Sts., Chicago, Ill.

IRON ORE
Alan Wood Steel Co., Conshohocken, Pa.
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
Hanna Furnace Corp., The, Ecorse, Detroit, Mich.
Pickands Mather & Co., Union Commerce Bldg., Cleveland, O.
Shenango Furnace Co., Oliver Bldg., Pittsburgh, Pa.
Snyder, W. P., & Co., Oliver Bldg., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., The, Youngstown, O.

JIG BORERS
Bryant Machinery & Engineering Co., 400 W. Madison St., Chicago, Ill.
Cleereman Machine Tool Co., Green Bay, Wis.

JIGS AND FIXTURES
Columbus Die, Tool & Mach. Co., 955 Cleveland Ave., Columbus, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.

KETTLES (Galvanizing)
Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.

KEYS (Machine or Woodruff)
Moltrup Steel Products Co., Beaver Falls, Pa.

KNIVES
American Shear Knife Co., 3rd and Ann Sts., Homestead, Pa.
Atkins, E. C., & Co., 427 So. Illinois St., Indianapolis, Ind.
Cowles Tool Co., 2086 W. 110th St., Cleveland, O.
Disston, Henry, & Sons, Inc., 626 Tacony, Philadelphia, Pa.
Ohio Knife Co., Dreman Ave. & B. & O. R.R., Cincinnati, O.

LABORATORY EQUIPMENT
Dietert, Harry W., Co., 9330J Roselawn Ave., Detroit, Mich.

LABORATORY WARE
Bay State Abrasive Products Co., Westboro, Mass.
Norton Company, Worcester, Mass.

LADLES
Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.

LAPPING MACHINES
Cincinnati Milling Machine and Cincinnati Grinders, Inc., Oakley Sta., Cincinnati, O.
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
National Broach & Machine Co., 5600 St. Jean, Detroit, Mich.
Norton Company, Worcester, Mass.

LARRIES (Coal)
Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.

LATHE CENTERS
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

LATHE DOGS (Drop Forged)
Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

LATHES
Jones & Lamson Machine Co., Springfield, Vt.
LeBlond, R. K., Machine Tool Co., Dept. J-2, Cincinnati, O.
Monarch Machine Tool Co., Sidney, O.
Morey Machinery Co., Inc., 410 Broome St., New York City.
South Bend Lathe Works, 863 E. Madison St., South Bend, Ind.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland, O.

LATHES (Automatic)
Brown & Sharpe Mfg. Co., Providence, R. I.
Gisholt Machine Co., 1217 E. Washington Ave., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vt.
Monarch Machine Tool Co., Sidney, O.

LATHES (Automatic Controls for)
Detroit Universal Duplicator Co., 218 St. Aubin, Detroit, Mich.

LATHES (Crankshaft)
Wickes Brothers, Saginaw, Mich.

LATHES (Buffing & Polishing)
Walker-Turner Co., Inc., 5062 Berckman St., Plainfield, N. J.

LATHES (Chucking)
Gisholt Machine Co., 1217 E. Washington Ave., Madison, Wis.
Oster Mfg. Co., The, 2037 E. 61st St., Cleveland, O.

WHERE-TO-BUY

LATHES (Engine)
Monarch Machine Tool Co., Sidney, O.
South Bend Lathe Works, 863 E. Madison St., South Bend, Ind.
Wickes Brothers, Saginaw, Mich.

LATHES (Railroad Car & Driving Wheel)
William Sellers & Co., Inc., 16th & Callowhill St., Philadelphia, Pa.

LATHES (Roll Turning)
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland, O.

LATHES (Turret)
Brown & Sharpe Mfg. Co., Providence, R. I.
Bullard Company, The, Bridgeport, Conn.
Gisholt Machine Co., 1217 E. Washington Ave., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vt.
Osier Mfg. Co., The, 2037 E. 61st St., Cleveland, O.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland, O.

LEAD (Tellurium)
National Lead Co., 111 Broadway, New York City.

LENSES (Illuminated)
Pike, E. W., & Co., 492 North Ave., Elizabeth, N. J.

LEVELING MACHINES
Erie Foundry Co., Erie, Pa.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
Hydropress, Inc., 570 Lexington Ave., New York City.
McKay Machine Co., Youngstown, O.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Sutton Engineering Co., Park Bldg., Pittsburgh, Pa.
Wean Engineering Co., Warren, O.

LIFTERS (Hand & Electric)
Economy Engineering Co., 2657 W. Van Buren St., Chicago, Ill.

LIFTERS (Machine Shop)
Economy Engineering Co., 2657 W. Van Buren St., Chicago, Ill.

LIFT TRUCKS—See TRUCKS (Lift)

LIFTING MAGNETS—See MAGNETS (Lifting)

LIGHTING (Industrial)
Graybar Electric Co., 420 Lexington Ave., New York City.

LINERS (Pump and Cylinder)
Shenango-Penn Mold Co., 404 W. Third St., Dover, O.

LOCOMOTIVE CRANES—See CRANES (Locomotive)

LOCOMOTIVES (Diesel-Electric)
Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.
Cooper-Bessemer Corp., The, Mt. Vernon, O.
Plymouth Locomotive Works, Div., Fate-Root-Heath Co., Plymouth, O.
Porter, H. K., Co., Inc., 49th & Harrison Sts., Pittsburgh, Pa.
Whitcomb Locomotive Co., Rochelle, Ill.

LOCOMOTIVES (Diesel Mechanical)
Plymouth Locomotive Works, Div., Fate-Root-Heath Co., Plymouth, O.
Porter, H. K., Co., Inc., 49th & Harrison Sts., Pittsburgh, Pa.
Whitcomb Locomotive Co., Rochelle, Ill.

LOCOMOTIVES (Electric)
Porter, H. K., Co. Inc., 49th & Harrison Sts., Pittsburgh, Pa.

LOCOMOTIVES (Electric Trolley)
Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Whitcomb Locomotive Co., Rochelle, Ill.

LOCOMOTIVES (Fireless)
Porter, H. K., Co. Inc., 49th & Harrison Sts., Pittsburgh, Pa.

LOCOMOTIVES (Gasoline-Electric)
Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Whitcomb Locomotive Co., Rochelle, Ill.

LOCOMOTIVES (Gasoline Mechanical)
Whitcomb Locomotive Co., Rochelle, Ill.

LOCOMOTIVES (Oil-Electric)
Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.

LOCOMOTIVES (Steam)
Porter, H. K., Co., Inc., 49th & Harrison Sts., Pittsburgh, Pa.

LOCOMOTIVES (Storage Battery)
Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Whitcomb Locomotive Co., Rochelle, Ill.

LOCOMOTIVES (Switching and Transfer)
Cooper-Bessemer Corp., The, Mt. Vernon, O.

LUBRICANTS (Graphite)
Acheson Colloids Corp., Port Huron, Mich.
United States Graphite Co., The, Saginaw, Mich.

LUBRICANTS (Industrial
Acheson Colloids Corp., Port Huron, Mich.
American Lanolin Corp., Railroad St., Lawrence, Mass.
Houghton, E. F., & Co., Third, American & Somerset Sts., Philadelphia, Pa.
Lubriplate Div., Fiske Bros. Refining Co., 129 Lockwood St., Newark, N. J.
New York & New Jersey Lubricant Co., 292 Madison Ave., New York City.
Shell Oil Co., Inc., 50 W. 50th St., New York City.
Socony-Vacuum Oil Co., Inc., 26 Broadway, New York City.
Stuart, D. A., Oil Co., Ltd., 2733 So. Troy St., Chicago, Ill.
Sun Oil Co., Dept. 1, 1608 Walnut St., Philadelphia, Pa.
Tide Water Associated Oil Co., 17 Battery Place, New York City.
Wayne Chemical Products Co., 9502 Copeland St., Detroit, Mich.

LUBRICATING SYSTEMS
Farval Corp., The, 3270 E. 80th St., Cleveland, O.

MACHINE WORK
American Metal Products Co., 5959 Linsdale Ave., Detroit, Mich.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Federal Shipbuilding & Dry Dock Co., Kearney, N. J.
Fidelity Machine Co., 3908-18 Frankford Ave., Philadelphia, Pa.
Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.
Scaife Co., Ames St., Oakmont, Pa.

MACHINERY (Flexible Shaft)
Walker-Turner Co., Inc., 5062 Berckman St., Plainfield, N. J.

MACHINERY (Special)
Alliance Machine Co., The, Alliance, Ohio.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.
Baldwin Southwark Div., Baldwin Locomotive Works, Philadelphia, Pa.
Bayard, M. L., & Co., 20th & Indiana Ave., Philadelphia, Pa.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Bliss, E. W., Co., 53rd St. & 2nd Ave., Brooklyn, N. Y.
Brosius, Edgar E., Co., Sharpsburg Branch, Pittsburgh, Pa
Cleveland Automatic Machine Co., 2269 Ashland Ave., Cleveland, O.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Columbus Die, Tool & Mach. Co., 955 Cleveland Ave., Columbus, O.
Continental Roll & Steel Fdry. Co. E. Chicago, Ind.
Elmes, Chas. F., Engineering Works, 245 N. Morgan St., Chicago, Ill.
Etna Machine Co., The, 3400 Maplewood Ave., Toledo, O.

MACHINERY (Special)—Con.
Farquhar, A. B., Co., Ltd., 195 Duke St., York, Pa.
Fidelity Machine Co., 3908-18 Frankford Ave., Philadelphia, Pa.
Greenlee Bros. & Co., Rockford, Ill.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
National Broach & Machine Co., 5600 St. Jean, Detroit, Mich.
National-Erie Corp., Erie, Pa.
National Roll & Fdry. Co., The, Avonmore, Pa.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.
Oil Well Supply Co., Dallas, Texas.
Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.
Shuster, F. B., Co., The, New Haven, Conn.
Thomas Machine Mfg. Co., Etna Branch P. O., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
William Sellers & Co., Inc., 16th & Callowhill St., Philadelphia, Pa.

MACHINERY (Used & Rebuilt)
Albert, L., & Son, Whitehead Rd., Trenton, N. J.
Crawbuck, John D., Co., Empire Bldg., Pittsburgh, Pa.
Galbreath Machinery Co., Empire Bldg., Pittsburgh, Pa.
General Blower Co., 404 No. Peoria St., Chicago, Ill.
Iron & Steel Products, Inc., Hegewisch Sta., Chicago, Ill.
Lang Machinery Co., 28th & A.V.R.R., Pittsburgh, Pa.
Motor Repair & Mfg. Co., 1558 Hamilton Ave., Cleveland, O.
West Penn Machinery Co., 1208 House Bldg., Pittsburgh, Pa.

MAGNESIA (Electrically Fused)
Norton Co., Worcester, Mass.

MAGNESIUM
Dow Chemical Co., Midland, Mich.

MAGNETIC SEPARATORS—See SEPARATORS (Magnetic)

MAGNETS (Lifting)
Cutler-Hammer, Inc., 1267 St. Paul Ave., Milwaukee, Wis.
Electric Controller & Mfg. Co., 2700 E. 79th St., Cleveland, O.
Ohio Electric Mfg. Co., The, 5906 Maurice Ave., Cleveland, O.

MAGNETS (Separating)
Ohio Electric Mfg. Co., The, 5906 Maurice Ave., Cleveland, O.

MANGANESE METAL AND ALLOYS
Electro Metallurgical Co., 30 E. 42nd St., New York City.

MANGANESE ORE
Cuban-American Manganese Corp., 122 E. 42nd St., New York, N. Y.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

MANIPULATORS
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Morgan Engineering Co., The, Alliance, O.

MANIPULATORS (Forging)
Alliance Machine Co., The, Alliance, Ohio.

MARKING DEVICES
Cunningham, M. E., Co., 172 E. Carson St., Pittsburgh, Pa.
Matthews, James H., & Co., 3978 Forbes St., Pittsburgh, Pa.

METAL (Perforated)—See PERFORATED METAL

METAL BLAST ABRASIVES (Shot and Grit)
American Foundry Equipment Co., The, 509 So. Byrkit St., Mishawaka, Ind.
Pangborn Corp., Hagerstown, Md.
Pittsburgh Crushed Steel Co., 4839 Harrison St., Pittsburgh, Pa.
Vapor Blast Mfg. Co., 333 S. 16th St., Milwaukee, Wis.

METAL CLEANERS
American Chemical Paint Co., Dept. 310, Ambler, Pa.
Cowles Detergent Co., The, 7016 Euclid Ave., Cleveland, O.
Houghton, E. F., & Co., Third, American & Somerset Sts., Philadelphia, Pa.
Pennsylvania Salt Mfg. Co., Dept. S, Pennsalt Cleaner Div., Philadelphia, Pa.
Udylite Corp., The, 1651 E. Grand Blvd., Detroit, Mich.
Turco Products, Inc., 6135 S. Central Ave., Los Angeles, Calif.

METAL CLEANING MACHINES
Ransohoff, N., Inc., Elmwood Place, Cincinnati, O.

METAL DUPLICATION (Without Dies)
O'Neil-Irwin Mfg. Co., 304 8th Ave. So., Minneapolis, Minn.

METAL FINISHES
American Nickeloid Co., 1310 N. Second St., Peru, Ill.

METAL FORMING MACHINERY
O'Neil-Irwin Mfg. Co., 304 8th Ave. So., Minneapolis, Minn.

METAL SPECIALTIES AND PARTS—See STAMPINGS

METAL STAMPINGS—See STAMPINGS

METALS (Nonferrous)
American Brass Co., The, Waterbury, Conn.
International Nickel Co., Inc., The, 67 Wall St., New York City.

MICROMETERS
Brown & Sharpe Mfg. Co., Providence, R. I.

MILL BUILDINGS
Uhl Construction Co., 6001 Butler St., Pittsburgh, Pa.

MILLING CUTTERS
Atkins, E. C., & Co., 427 So. Illinois St., Indianapolis, Ind.
Brown & Sharpe Mfg. Co., Providence, R. I.
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

MILLING MACHINES
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine and Cincinnati Grinders, Inc., Oakley Sta., Cincinnati, O.
Kearney & Trecker Corp., 5926 National Ave., Milwaukee, Wis.
National Broach & Machine Co., 5600 St. Jean, Detroit, Mich.
Ohio Machine Tool Co., The, Kenton, O.
William Sellers & Co., Inc., 16th & Callowhill St., Philadelphia, Pa.

MILLING MACHINES (Automatic Controls for)
Detroit Universal Duplicator Co., 218 St. Aubin, Detroit, Mich.

MILLING MACHINES (Milling and Centering Combined)
Jones & Lamson Machine Co., Springfield, Vt.

MILLS (Blooming, Universal, Plate, Sheet, Tin, Bar, Strip, Etc.)—See ROLLING MILL EQUIPMENT

MOLDING MACHINERY (Foundry)
Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee, Wis.

MOLDINGS (Metal)
Dahlstrom Metallic Door Co., Jamestown, N. Y.

MOLDS (Ingot)—See INGOT MOLDS

MOLYBDENUM
Climax Molybdenum Co., 500 Fifth Ave., New York City.
Molybdenum Corp. of America, Grant Bldg., Pittsburgh, Pa.

MONEL METAL (All Commercial Forms)
International Nickel Co., Inc., The, 67 Wall St., New York City.

MONORAIL SYSTEMS
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Reading Chain & Block Corp., Dept. D-5, Reading, Pa.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.

MOTOR-ROLLERS
Schloemann Engineering Corp., Empire Bldg., Pittsburgh, Pa.

MOTORS (Electric)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Century Electric Co., 1806 Pine St., St. Louis, Mo.
Fairbanks, Morse & Co., Dept. E-75, 600 So. Michigan Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Graybar Electric Co., 420 Lexington Ave., New York City.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O.
Reliance Electric & Eng. Co., 1088 Ivanhoe Rd., Cleveland, O.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.
Walker-Turner Co., Inc., 5062 Berckman St., Plainfield, N. J.
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.

MUCK BAR
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

NAILS (*Also Stainless)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Hassall, John, Inc., 402 Oakland St., Brooklyn, N. Y.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Youngstown Sheet & Tube Co., The, Youngstown, O.

NAILS (Coated and Galvanized)
Wickwire Brothers, 189 Main St., Cortland, N. Y.

NICKEL (All Commercial Forms)
International Nickel Co., Inc., The, 67 Wall St., New York City.

NICKEL (Shot)
International Nickel Co., Inc., The, 67 Wall St., New York City

NICKEL STEEL (Cold Drawn)
Bethlehem Steel Co., Bethlehem, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Republic Steel Co., Dept. ST, Cleveland, O.
Union Drawn Steel Div. Republic Steel Corp., Massillon, O.

NOZZLES (Blasting)
American Foundry Equipment Co., The, Mishawaka, Ind.
Pangborn Corporation, Hagerstown, Md.
Vapor Blast Mfg. Co., 333 S. 16th St., Milwaukee, Wis.

NUTS (*Also Stainless)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2917 E. 79th St., Cleveland, O.
Elastic Stop Nut Corp., 2367 Vauxhall Rd., Union, N. J.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Oliver Iron & Steel Corp., So. 10th & Muriel Sts., Pittsburgh, Pa.
*Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Tinnerman Products, Inc., 2039 Fulton Rd., Cleveland, O.
Triplex Screw Co., The, 5317 Grant Ave., Cleveland, O.

NUTS (Castellated)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2917 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
National Acme Co., The, 170 E. 131st St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd. Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co. Port Chester, N. Y.

NUTS (Machine Screw)
Central Screw Company, 3517 Shields Ave., Chicago, Ill.

NUTS (Non-Ferrous and Stainless)
Harper, H. M., Co., The, 2646 Fletcher St., Chicago, Ill.

NUTS (Self Locking)
Elastic Stop Nut Corp., 2367 Vauxhall Rd., Union, N. J.

NUTS (Semi-Finished)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2917 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS (Wing)
Central Screw Company 3517 Shields Ave., Chicago, Ill.
Parker-Kalon Corp., 194-200 Varick St., New York City.

OIL RETAINERS AND SEALS
Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.

OILS (Cutting)
Fiske Bros. Refining Co., 129 Lockwood St., Newark, N. J.
Oster Mfg. Co., The, 2037 E. 61st St., Cleveland, O.
Shell Oil Co., Inc., 50 W. 50th St., New York City.
Socony-Vacuum Oil Co., Inc., 26 Broadway, New York City.
Stuart, D. A., Oil Co. Ltd., 2733 So. Troy St., Chicago, Ill.
Sun Oil Co., Dept. 1, 1608 Walnut St., Philadelphia, Pa.
Tide Water Associated Oil Co., 17 Battery Place, New York City.
Wayne Chemical Products Co., 9502 Copeland St., Detroit, Mich.

OILS (Lubricating)—See LUBRICANTS (Industrial)

OILS (Quenching)
Park Chemical Co., 8076 Military Ave., Detroit, Mich.

OILS (Rust Preventive)
American Chemical Paint Co., Dept. 310, Ambler, Pa.
Wayne Chemical Products Co., 9502 Copeland St., Detroit, Mich.

OPEN-HEARTH FURNACES—See FURNACES (Open-Hearth)

OVENS (Annealing, Japanning, Tempering)
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Maehler, Paul, Co., The, 2208 W. Lake St., Chicago, Ill.

OVENS (Coke, By-Product Recovery)
Koppers Co., Engineering and Construction Div., 901 Koppers Bldg., Pittsburgh, Pa.

OVENS (Core and Mold)
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.

OVENS (Gas or Oil Heat)
Maehler, Paul, Co., The, 2208 W. Lake St., Chicago, Ill.

OXY-ACETYLENE WELDING AND CUTTING—See WELDING

OXYGEN IN CYLINDERS
Air Reduction, 60 E. 42nd St., New York City.
Linde Air Products Co., The, 30 E. 42nd St., New York City
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago, Ill.

PACKING (Asbestos or Rubber)
Carey, Philip, Mfg. Co., The, Lockland, Cincinnati, O.
Johns-Manville Corp., 22 E. 40th St., New York City.
United States Rubber Co., 1230 Sixth Ave., New York City.

PACKINGS—MECHANICAL LEATHER (Cup, U-Cup, Flange and Vees)
Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.

PAINT (Alkali Resisting)
Pennsylvania Salt Mfg. Co., Dept. S, Pennsalt Cleaner Div., Philadelphia, Pa.

PAINT (Aluminum)
Koppers Co., Tar & Chemical Div., 300 Koppers Bldg., Pittsburgh, Pa.

PAINT (Heat Resisting)
American Chemical Paint Co., Dept. 310, Ambler, Pa.
Quigley Co., 56 W. 45th St., New York City.

PAINT (Industrial)
Carey, Philip, Mfg. Co., The, Lockland, Cincinnati, O.

PAINT (Marking)
Koppers Co., Tar & Chemical Div., 300 Koppers Bldg., Pittsburgh, Pa.

PAINT (Rust Preventive)
American Chemical Paint Co., Dept. 310, Ambler, Pa.
Koppers Co., Tar & Chemical Div., 300 Koppers Bldg., Pittsburgh, Pa.

PARTS (Precision)
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.

PATTERNS (Wood or Metal)
Wellman Bronze & Aluminum Co., The, 6011 Superior Ave., Cleveland, O.

PERFORATED METAL
Chicago Perforating Co., 2443 W. 24th Pl., Chicago, Ill.
Erdle Perforating Co., 171 York St., Rochester, N. Y.
Harrington & King Perforating Co., 5634 Fillmore St., Chicago, Ill.

PHENOL RECOVERY PLANTS
Koppers Co., Engineering and Construction Div., 901 Koppers Bldg., Pittsburgh, Pa.

PICKLING COMPOUNDS
American Chemical Paint Co., Dept. 310, Ambler, Pa.
American Hard Rubber Co., 11 Mercer St., New York City.
Houghton, E. F., & Co., Third, American & Somerset Sts., Philadelphia, Pa.
Parkin, Wm. M., Co., The, 1005 Highland Bldg., Pittsburgh, Pa.

PICKLING COMPOUNDS—Con.
Pennsylvania Salt Mfg. Co., Dept. S. Pennsalt Cleaner Div., Philadelphia, Pa.

PICKLING EQUIPMENT
International Nickel Co., The, 67 Wall St., New York City.

PICKLING MACHINERY
Erie Foundry Co., Erie, Pa.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Wean Engineering Co., Warren, O.

PICKLING TANK LININGS
Celicote Co., 750 Rockefeller Bldg., Cleveland, O.
Keagler Brick Co., 1443 W. Market St., Steubenville, O.
Pennsylvania Salt Mfg. Co., Dept. S. Pennsalt Cleaner Div., Philadelphia, Pa.

PICKLING TANKS—See TANKS (Pickling)

PIERCER POINTS
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

PIG IRON
Alan Wood Steel Co., Conshohocken, Pa.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Brooke, E. & G., Iron Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
Hanna Furnace Corp., The, Ecorse, Detroit, Mich.
Jackson Iron & Steel Co., Jackson, O.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Pickands Mather & Co., Union Commerce Bldg., Cleveland, O.
Republic Steel Corp., Dept. ST, Cleveland, O.
Samuel, Frank & Co., Inc., Harrison Bldg., Philadelphia, Pa.
Shenango Furnace Co., Oliver Bldg., Pittsburgh, Pa.
Snyder, W. P., & Co., Oliver Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

PIG IRON (Charcoal)
Tennessee Products Corp., Nashville, Tenn.

PILING (Iron and Steel)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 South Dearborn St., Chicago, Ill.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.

PILING (Pressure-Treated Wood)
Wood Preserving Corp., The, 300 Koppers Bldg., Pittsburgh, Pa.

PILLOW BLOCKS (Ball)
Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.

PILLOW BLOCKS (Roller Bearing)
Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis, Ind.

PILLOW BOXES
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.

PINIONS (Mill)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
National-Erie Corp., Erie, Pa.
Simonds Gear & Mfg. Co., The, 25th St., Pittsburgh, Pa.
United Engineering & Foundry Co., First National Bank Bldg., Pittsburgh, Pa.

PINS (Taper)
Moltrup Steel Products Co., Beaver Falls, Pa.

PIPE (Brass, Bronze, Copper)
American Brass Co., The, Waterbury, Conn.
Bridgeport Brass Co., Bridgeport, Conn.
Lewin-Mathes Co., E. St. Louis, Ill.
Shenango-Penn Mold Co., 404 W. Third St., Dover, O.

PIPE (Rubber Lined)
American Hard Rubber Co., 11 Mercer St., New York City.

PIPE (Square and Rectangular)
Tubular Service Corp., 120 44th St., Brooklyn, N. Y.
Youngstown Sheet & Tube Co., The, Youngstown, O.

PIPE (Steel)
Allegheny Ludlum Steel Corp., Dept. S-229. Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, 1511 Curtis St., Middletown, O.
Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Crane Co., 836 So. Michigan Ave., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tubular Service Corp., 120 44th St., Brooklyn, N. Y.
Western Gas Div., Koppers Co., Fort Wayne, Ind.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

PIPE BALLS
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

PIPE BENDING
Crane Co., 836 So. Michigan Ave., Chicago, Ill.
Tubular Service Corp., 120 44th St., Brooklyn, N. Y.

PIPE CUTTING AND THREADING MACHINERY
Landis Machine Co., Waynesboro, Pa.
Oster Mfg. Co., The, 2037 E. 61st St., Cleveland, O.

PIPE FITTINGS
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.
Crane Co., 836 So. Michigan Ave., Chicago, Ill.
Grinnell Co., Inc., Providence, R. I.
Oil Well Supply Co., Dallas, Texas.
Worthington Pump & Machinery Corp., Harrison, N. J.

PIPE LINES (Riveted and Welded)
Bethlehem Steel Co., Bethlehem, Pa.

PIPE MILL MACHINERY
Taylor-Wilson Mfg. Co., 1200 Thomson Ave., McKees Rocks, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Yoder Co., The, W. 55th St. & Walworth Ave., Cleveland, O.

PIPE STRAIGHTENING MACHINERY
Elmes, Chas. F., Engineering Works, 245 N. Morgan St., Chicago, Ill.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Sutton Engineering Co., Park Bldg., Pittsburgh, Pa.
Taylor-Wilson Mfg. Co., 1200 Thomson Ave., McKees Rocks, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

PIPE TOOLS
Greenfield Tap & Die Corp., Greenfield, Mass.
Oster Mfg. Co., The, 2037 E. 61st St., Cleveland, O.

PIPING CONTRACTORS
Grinnell Co., Inc., Providence, R. I.
Power Piping Co., Beaver and Western Ave., Pittsburgh, Pa.

PISTON RINGS
American Hammered Piston Ring Div., Koppers Co., Baltimore, Md.

PISTON RODS
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Heppenstall Co., Box S-7, 4620 Hatfield St., Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.
Union Drawn Steel Div., Republic Steel Corp., Massillon, O.

PLANERS (Automatic Controls for)
Detroit Universal Duplicator Co., 218 St. Aubin, Detroit, Mich.

PLANERS AND SHAPERS
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Ohio Machine Tool Co., The, Kenton, O.
William Sellers & Co., Inc., 16th & Callowhill St., Philadelphia, Pa.

PLANT DISMANTLERS
Hetz Construction Co., Warren, O.

PLATE CASTORS
Hyatt Bearings Div., General Motors Corp., Harrison, N. J.

PLATE LIFTING GRIPS
Downs Crane & Hoist Co., 540 West Vernon Ave., Los Angeles, Cal.

PLATES (Sheared or Universal) (*Also Stainless)
*Alan Wood Steel Co., Conshohocken, Pa.
*Allegheny Ludlum Steel Corp., Dept. S-229. Oliver Bldg., Pittsburgh, Pa.
*American Rolling Mill Co., The, 1511 Curtis St., Middletown, O.
*Bethlehem Steel Co., Bethlehem, Pa.
*Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
Granite City Steel Co., Granite City, Ill.
Ingersoll Steel & Disc Div., Borg-Warner Corp., 310 S. Michigan Ave., Chicago, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Levinson Steel Co., 33 Pride St., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
*Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Scully Steel Products Co., 1316 Wabansia Ave., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Worth Steel Co., Claymont, Del.
Youngstown Sheet & Tube Co., The, Youngstown, O.

PLATES (Stainless Clad)
Granite City Steel Co., Granite City, Ill.
Ingersoll Steel & Disc Div., Borg-Warner Corp., 310 S. Michigan Ave., Chicago, Ill.

PLATES (Steel—Floor)—See FLOORING (Steel)

PLATES (Terne and Tin)—See TIN PLATE

PLATING EQUIPMENT
Udylite Corp., The, 1651 E. Grand Blvd., Detroit, Mich.

PLUGS (Expansion)
Hubbard, M. D., Spring Co., 444 Central Ave., Pontiac, Mich.

PLUGS (Rolling Mill)
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

POLE LINE MATERIAL
Oliver Iron & Steel Corp., So. 10th & Muriel Sts., Pittsburgh, Pa.

POLES (Tubular Steel)
National Tube Co., Frick Bldg., Pittsburgh, Pa.

POTENTIOMETERS
Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.

POTS (Case Hardening)
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.

POTS (Lead)
Pollock, Wm. B. Co., The, 101 Andrews Ave., Youngstown, O.

POTS (Melting)
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.

POWER UNITS (Gasoline, Electric for Industrial Trucks)
Ready-Power Co., The, 3842 Grand River Ave., Detroit, Mich.

PREHEATERS
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.

PRESSED METAL PARTS
Dahlstrom Metallic Door Co., Jamestown, N. Y.
Stanley Works, The, Pressed Metal Div., New Britain, Conn.

PRESSES
Bliss, E. W., Co., 53rd St. & 2nd Ave., Brooklyn, N. Y.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Elmes, Chas. F., Engineering Works, 245 N. Morgan St., Chicago, Ill.
Erie Foundry Co., Erie, Pa.
Farquhar, A. B., Co., Ltd., 195 Duke St., York, Pa.
Galland-Henning Manufacturing Co., 2753 So. 31st St., Milwaukee, Wis.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.
Streine Tool & Mfg. Co., New Bremen, O.
Tomkins-Johnson Co., The, (Dept. S) 611 N. Mechanic St., Jackson, Mich.
Watson-Stillman Co., Roselle, N. J.

PRESSES (Bending)
Cleveland Crane & Engineering Co., Steelweld Machinery Div., The, 1125 E. 283rd St., Wickliffe, O.
Watson-Stillman Co., Roselle, N. J.
Zeh & Hahnemann Co., 56 Avenue A, Newark, N. J.

PRESSES, BRIQUETTING (Turnings & Borings)
Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee, Wis.

PRESSES (Extrusion)
Elmes, Chas. F., Engineering Works, 245 N. Morgan St., Chicago, Ill.
Schloemann Engineering Corp., Empire Bldg., Pittsburgh, Pa.
Watson-Stillman Co., Roselle, N. J.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

PRESSES (Forging)
Erie Foundry Co., Erie, Pa.
Farquhar, A. B., Co., Ltd., 195 Duke St., York, Pa.
Hydropress, Inc., 570 Lexington Ave., New York City.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
National Machinery Co., The, Tiffin, O.
Schloemann Engineering Corp., Empire Bldg., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Watson-Stillman Co., Roselle, N. J.

PRESSES (Forming and Braking)
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Cleveland Crane & Engineering Co., The, Steelweld Machinery Div., 1125 E. 283rd St., Wickliffe, O.
Farquhar, A. B., Co., Ltd., 195 Duke St., York, Pa.
Watson-Stillman Co., Roselle, N. J.
Zeh & Hahnemann Co., 56 Avenue A, Newark, N. J.

PRESSES (Hydraulic)
Baldwin Southwark Div., Baldwin Locomotive Works, Philadelphia, Pa.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Bliss, E. W., Co., 53rd St. & 2nd Ave., Brooklyn, N. Y.
Chambersburg Engineering Co., Chambersburg, Pa.
Denison Engineering Co., The, 1160 Dublin Rd., Columbus, O.
Elmes, Chas. F., Engineering Works, 245 N. Morgan St., Chicago, Ill.
Erie Foundry Co., Erie, Pa.
Farquhar, A. B., Co., Ltd., 195 Duke St., York, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Galland-Henning Manufacturing Co., 2753 So. 31st St., Milwaukee, Wis.
Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
National-Erie Corp., Erie, Pa.
Schloemann Engineering Corp., Empire Bldg., Pittsburgh, Pa.
Watson-Stillman Co., Roselle, N. J.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

PRESSES (Pneumatic)
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

PRESSES (Punching, Drawing, Coining, Blanking, etc.)
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Farquhar, A. B., Co., Ltd., 195 Duke St., York, Pa.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.

PRESSES (Punching, Drawing, Coining, Blanking, etc.)
Zeh & Hahnemann Co., 56 Avenue A, Newark, N. J.
PRESSES (Riveting)
Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
PRESSES (Scrap Bundling and Baling)
Galland-Henning Manufacturing Co., 2753 So. 31st St., Milwaukee, Wis.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
PRESSES (Stamping)
Zeh & Hahnemann Co., 56 Avenue A, Newark, N. J.
PRESSES (Welding)—See WELDERS
PRESSURE VESSELS
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.
Scaife Co., Ames St., Oakmont, Pa.
PRODUCER GAS SYSTEMS—See GAS PRODUCER PLANTS
PROJECTILE BANDS
Lewin-Mathes Co., E. St. Louis, Ill.
PUG MILLS (For Blast Furnaces and Sintering Plants)
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
PULLEYS (Magnetic)
Cutler-Hammer, Inc., 1267 St. Paul Ave., Milwaukee, Wis.
PULVERIZERS
American Pulverizer Co., 1539 Macklind Ave., St. Louis, Mo.
Gruendler Crusher & Pulverizer Co., 2920-28 N. Market St., St. Louis, Mo.
PUMP HOUSES
Dravo Corp. (Contracting Div.), Neville Island, Pittsburgh, Pa.
PUMPS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Fairbanks, Morse & Co., Dept. E75, 600 S. Michigan Ave., Chicago, Ill.
Hydropress, Inc., 570 Lexington Ave., New York City.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Oil Well Supply Co., Dallas, Texas.
Roper, The Geo. D., Corp., Rockford, Ill.
Weinman Pump & Suply Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.
PUMPS (Boiler Feed)
Fairbanks, Morse & Co., Dept. E75, 600 S. Michigan Ave., Chicago, Ill.
Weinman Pump & Supply Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.
Worthington Pump & Machinery Corp., Harrison, N. J.
PUMPS (Centrifugal)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Brown & Sharpe Mfg. Co., Providence, R. I.
Fairbanks, Morse & Co., Dept. E75, 600 So. Michigan Ave., Chicago, Ill.
Tomkins-Johnson Co., The, 611 N. Mechanic St., Dept. S, Jackson, Mich.
Weinman Pump & Supply Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.
Worthington Pump & Machinery Corp., Harrison, N. J.
PUMPS (Fuel Injection)
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
PUMPS (Hydraulic)
Brown & Sharpe Mfg. Co., Providence, R. I.
Elmes, Chas. F., Engineering Works, 245 N. Morgan St., Chicago, Ill.
Galland-Henning Manufacturing Co., 2753 So. 31st St., Milwaukee, Wis.
Hydropress, Inc., 570 Lexington Ave., New York City.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
National-Erie Corp., Erie, Pa.
Racine Tool & Machine Co., Racine, Wis.
Roper, The Geo. D., Corp., Rockford, Ill.
Schloemann Engineering Corp., Empire Bldg., Pittsburgh, Pa.
Weinman Pump & Supply Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.
Worthington Pump & Machinery Corp., Harrison, N. J.
PUMPS (Reciprocating)
Fairbanks, Morse & Co., Dept. E75, 600 S. Michigan Ave., Chicago, Ill.
Weinman Pump & Supply Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.

PUMPS (Rotary)
Brown & Sharpe Mfg. Co., Providence, R. I.
Fairbanks, Morse & Co., Dept. E75, 600 S. Michigan Ave., Chicago, Ill.
Roper, The Geo. D., Corp., Rockford, Ill.
Fairbanks, Morse & Co., Dept. D75,
Weinman Pump & Supply Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.
PUMPS (Vacuum)
Fairbanks, Morse & Co., Dept. E75, 600 S. Michigan Ave., Chicago, Ill.
Worthington Pump & Machinery Corp., Harrison, N. J.
PUMPS (Vertical Turbine)
Layne & Bowler, Inc., Memphis, Tenn.
PUNCHES (Multiple)
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
PUNCHING AND SHEARING MACHINERY
Beatty Machine & Mfg. Co., Hammond, Ind.
Chambersburg Engineering Co., Chambersburg, Pa.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.
Thomas Machine Mfg. Co., Etna Branch P. O., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
PYROMETER TUBES
Norton Company, Worcester, Mass.
PYROMETERS
Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.
Brown Instrument Div. of Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.
RACKS (Portable)
Union Steel Products Co., 437 Pine St., Albion, Mich.
RACKS (Steel, for Drums & Barrels)
Economy Engineering Co., 2657 W. Van Buren St., Chicago, Ill.
RAIL BREAKERS
National Roll & Foundry Co., The, Avonmore, Pa.
United Engineering & Fdry Co., First National Bank Bldg., Pittsburgh, Pa.
RAILS (New and Relaying)
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.
RAILS (Steel)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Ryerson, Jos. T. & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
REAMERS
Blanchard Machine Co., The, 64 State St., Cambridge, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Twist Drill Co., The, 1242 E. 49th St., Cleveland, O.
Gisholt Machine Co., 1217 E. Washington Ave., Madison, Wis.
Greenfield Tap & Die Corp., Greenfield, Mass.
REBUILT EQUIPMENT
Albert, L., & Son, Whitehead Rd., Trenton, N. J.
Crawbuck, John D., Co., Empire Bldg., Pittsburgh, Pa.
Galbreath Machinery Co., Empire Bldg., Pittsburgh, Pa.
General Blower Co., 404 N. Peoria St., Chicago, Ill.

Iron & Steel Products, Inc., Hegewisch Sta., Chicago, Ill.
Lang Machinery Co., 28th & A.V.R.R., Pittsburgh, Pa.
Motor Repair & Mfg. Co., 1558 Hamilton Ave., Cleveland, O.
West Penn Machinery Co., 1208 House Bldg., Pittsburgh, Pa.
RECEIVERS
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.
Scaife Co., Ames St., Oakmont, Pa.
RECORDERS (Combustion)
Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.
RECORDERS (Pressure, Speed, Temperature, Time)
Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.
Brown Instrument Div. of Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.
RECTIFIERS (Dry Disc)
Mallory, P. R., & Co., 3029 E. Washington Ave., Indianapolis, Ind.
REDUCERS (Speed)—See SPEED REDUCERS
REDUCTION GEARS
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
National-Erie Corp., Erie, Pa.
Philadelphia Gear Works, Erie Ave. & G St., Philadelphia, Pa.
Sturtevant, B. F., Co. Hyde Park, Boston, Mass.
REFRACTORIES (Dolomite)
Basic Refractories, Inc., Hanna Bldg., Cleveland, O.
REFRACTORIES (Fire Clay)
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.
Eureka Fire Brick Works, 1100 B. F. Jones Law Bldg., Pittsburgh, Pa.
Globe Brick Co., The, East Liverpool, O.
Harbison-Walker Refractories Co., 1800 Farmers Bank Bldg., Pittsburgh, Pa.
Illinois Clay Products Co., 214 Barber Bldg., Joliet, Ill.
Keaglér Brick Co., 1443 W. Market St., Steubenville, O.
Ramtite Co., The, Div. of the S. Obermayer Co., 2557 W. 18th St., Chicago, Ill.
REFRACTORIES (For High Frequency Furnaces)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Carborundum Co., The, Perth Amboy, N. J.
Norton Co., Worcester, Mass.
Titanium Alloy Mfg. Co., The, Niagara Falls, N. Y.
REFRACTORIES (Silicon Carbide)
Bay State Abrasive Products Co., Westboro, Mass.
Carborundum Co., The, Perth Amboy, N. J.
Norton Co., Worcester, Mass.
REFRACTORY CONCRETE
Atlas Lumnite Cement Co., Dept. S, Chrysler Bldg., New York City.
Johns-Manville Corp., 22 E. 40th St., New York City.
Quigley Co., 56 W. 45th St., New York City.
REGULATORS (Pressure)
Electric Controller & Mfg. Co., The, 2700 E. 79th St., Cleveland, O.
REGULATORS (Temperature)
Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.
Brown Instrument Div. of Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.
REINFORCEMENT FABRIC (Electric Welded)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
RESISTORS (Graphite Disc)
Allen-Bradley Co., 1320 So. 2nd St., Milwaukee, Wis.
RHEOSTATS (Plating)
Electric Controller & Mfg. Co., The, 2700 E. 79th St., Cleveland, O.
Udylite Corp., The, 1651 E. Grand Blvd., Detroit, Mich.
RINGS (Steel)
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Heppenstall Co., Box S-6, 4620 Hatfield St., Pittsburgh, Pa.

King Fifth Wheel Co., 2915 No. Second St., Philadelphia, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.
RINGS (Weldless) (*Also Stainless)
*Midvale Co., The, Nicetown, Philadelphia, Pa.
RIVET SETS
Pittsburgh Saw & Tool Co., 78-80 Sycamore St., Etna P. O., Pittsburgh, Pa.
RIVETERS (Hydraulic—Portable and Stationary)
Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
RIVETERS (Pneumatic)
Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
RIVETING MACHINERY
Chambersburg Engineering Co., Chambersburg, Pa.
Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill.
Shuster, F. B., Co., The, New Haven, Conn.
Tomkins-Johnson Co., (Dept. S), 611 N. Mechanic St., Jackson, Mich.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.
RIVETS (*Also Stainless)
Bethlehem Steel Co., Bethlehem, Pa.
Hassall, John, Inc., 402 Oakland St., Brooklyn, N. Y.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Oliver Iron & Steel Corp., So. 10th & Muriel Sts., Pittsburgh, Pa.
*Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
*Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Triplex Screw Co., The, 5317 Grant Ave., Cleveland, O.
RIVETS (Non-Ferrous and Stainless)
Harper, H. M., Co., The 2646 Fletcher St., Chicago, Ill.
RODS (Alloy)
Ampco Metal, Inc., Dept. S-6, 3830 W. Burnham St., Milwaukee, Wis.
Bethlehem Steel Co., Bethlehem, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Copperweld Steel Co., Warren, O.
Midvale Co., The, Nicetown, Philadelphia, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
RODS (Brass, Bronze, Copper, Nickel Silver, Silicon-Bronze)
American Brass Co., The, Waterbury, Conn.
Bridgeport Brass Co., Bridgeport, Conn.
Roebling's, John A., Sons Co., Trenton, N. J.
Seymour Manufacturing Co., The, Seymour, Conn.
RODS (Drill)
Allegheny Ludlum Steel Corp., Dept. S-229, Oliver Bldg., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Frasse, Peter A., & Co., Inc. 17 Grand St., New York City
Monarch Steel Co., 545 W. McCarty St., Indianapolis, Ind.
Pittsburgh Tool Steel Wire Co., Monaca, Pa.
RODS (Phosphor Bronze)
Seymour Manufacturing Co., The, Seymour, Conn.
RODS (Rounds, Flats and Shapes) (*Also Stainless)
*Allegheny Ludlum Steel Corp., Dept. S-229, Oliver Bldg., Pittsburgh, Pa.
*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
*Copperweld Steel Co., Warren, O.
*Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.

WHERE-TO-BUY

RODS (Rounds, Flats & Shapes)—Con.
*Republic Steel Corp., Dept. ST, Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Roller Bearing Co., The, Steel & Tube Div., Canton, O.
Washburn Wire Co., Phillipsdale, R. I.
Youngstown Sheet & Tube Co., The, Youngstown, O.

RODS (Steel and Iron)
Firth-Sterling Steel Co., McKeesport, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.

RODS (Welding)—See WELDING RODS

RODS (Wire)—See WIRE PRODUCTS

ROLL FORMING MACHINES
Etna Machine Co., The, 3400 Maplewood Ave., Toledo, O.

ROLLING DOORS & SHUTTERS—See DOORS AND SHUTTERS

ROLLING MILL BEARINGS—See BEARINGS (Rolling Mill)

ROLLING MILL EQUIPMENT
Alliance Machine Co., The Alliance, Ohio
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Cold Metal Products Co., The, 2131 Wilson Ave., Youngstown, O.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
Hydropress, Inc., 570 Lexington Ave., New York City.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Monessen Foundry & Machine Co., Monessen, Pa.
Morgan Construction Co., Worcester, Mass.
Morgan Engineering Co., The, Alliance, O.
National Roll & Foundry Co., The, Avonmore, Pa.
Streine Tool & Mfg. Co., New Bremen, O.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Wean Engineering Co., Warren, O.
Yoder Co., The, 55 Walworth Ave., Cleveland, O.

ROLLING MILLS (Consulting, Contracting Engineers)
Hydropress, Inc., 570 Lexington Ave., New York City.
Schloemann Engineering Corp., Empire Bldg., Pittsburgh, Pa.

ROLLING MILL MACHINERY (Used)
Frank B. Foster, Oliver Bldg., Pittsburgh, Pa.

ROLLING MILL TABLES
Hydropress, Inc., 570 Lexington Ave., New York City.
Schloemann Engineering Corp., Empire Bldg., Pittsburgh, Pa.

ROLLS (Bending and Straightening)
Baldwin Southwark Div., Baldwin Locomotive Works, Philadelphia, Pa.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Webb City & Carterville Foundry & Machine Works, Webb City, Mo.

ROLLS (Sand and Chilled)
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
National Roll & Foundry Co., The, Avonmore, Pa.
Ohio Steel Fdry. Co., Lima, O. Springfield, O.
Pittsburgh Rolls Div. of Blaw-Knox Co., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

ROLLS (Steel and Iron)
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mach. Co. Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Hyde Park Fdry. and Machine Co., Hyde Park, Pa.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Roll & Fdry. Co., The, Avonmore, Pa.
Ohio Steel Fdry. Co., Lima, O.-Springfield, O.
United Engineering & Fdry Co., First National Bank Bldg., Pittsburgh, Pa.

ROLLS (Tinning Machine)
American Shear Knife Co., 3rd & Ann Sts., Homestead, Pa.

ROOFING AND SIDING
Johns-Manville Corp., 22 E. 40th St., New York City.

ROOFING AND SIDING (Corrugated and Plain)
American Rolling Mill Co., The, 1511 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carey, Philip, Mfg. Co., The, Lockland, Cincinnati, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 S. Dearborn St. Chicago, Ill.
New Jersey Zinc Co., 160 Front St., New York City.
Republic Steel Corp., Dept. ST, Cleveland, O.
Robertson, H. H., Co., Farmers Bank Bldg., Pittsburgh, Pa.
Ryerson, Jos. T., & Sons, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va
Youngstown Sheet & Tube Co., The, Youngstown, O.

ROOFING (Plastic and Liquid)
Carey, Philip, Mfg. Co., The, Lockland, Cincinnati, O.
Koppers Co., Tar & Chemical Div., 300 Koppers Bldg., Pittsburgh, Pa.

RUBBER GOODS (Mechanical)
United States Rubber Co., 1230 Sixth Ave., New York City.

RUBBER LINING (Hard and Soft)
American Hard Rubber Co., 11 Mercer St., New York City.

RUST PREVENTIVES
Airose Chemical Co., 80 Clifford St., Providence, R. I.
American Lanolin Corp., Railroad St., Lawrence, Mass.
Koppers Co., Tar & Chemical Div., 300 Koppers Bldg., Pittsburgh, Pa.
Smith Oil & Refining Co., Rockford, Ill.
Wayne Chemical Products Co., 9502 Copeland St., Detroit, Mich.

RUST PROOFING PROCESS
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
Koppers Co., Tar & Chemical Div., 300 Koppers Bldg., Pittsburgh, Pa.
Udylite Corp., The, 1651 E. Grand Blvd., Detroit, Mich.

SAFE ENDS (Boiler Tube)
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Tubular Service Corp., 120 44th St., Brooklyn, N. Y.

SAFETY DEVICES (Electric)
Electric Controller & Mfg. Co., The, 2700 E. 79th St., Cleveland, O.

SALT TABLETS
Morton Salt Co., 310 So. Michigan Ave., Chicago, Ill.

SAND CONDITIONING AND PREPARING MACHINERY
American Foundry Equipment Co., The, Mishawaka, Ind.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Vapor Blast Mfg. Co., 333 S. 16th St., Milwaukee, Wis.

SAWING MACHINES (Hack)
Racine Tool & Machine Co., Racine, Wis.

SAWING MACHINES (Hot and Cold)
Armstrong-Blum Mfg. Co., 5700 Bloomingdale Ave., Chicago, Ill.

SAWING MACHINES (Hot, Cold)—Con.
Morgan Engineering Co., The, Alliance, O.
Motch & Merryweather Machinery Co., Penton Bldg., Cleveland, O.
Pittsburgh Saw & Tool Co., 78-80 Sycamore St., Etna P. O., Pittsburgh, Pa.
Racine Tool & Machine Co., Racine, Wis.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

SAWING MACHINES (Contour)
Continental Machines, Inc., 1324 So. Washington Ave., Minneapolis, Minn.

SAWS (Band—Metal Cutting)
Atkins, E. C., & Co., 427 So. Illinois St., Indianapolis, Ind.
Disston, Henry, & Sons, Inc., 626 Tacony, Philadelphia, Pa.
Huther Bros. Saw & Mfg. Co., 1290 University Ave., Rochester, N. Y.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.

SAWS (Gang)
Wickes Brothers, Saginaw, Mich.

SAWS (Hack)
Armstrong-Blum Mfg. Co., 5700 Bloomingdale Ave., Chicago, Ill.
Atkins, E. C., & Co., 402 So. Illinois St., Indianapolis, Ind.
Disston, Henry & Sons, Inc., 626 Tacony, Philadelphia, Pa.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.

SAWS (Hot and Cold)
Huther Bros. Saw & Mfg. Co., 1290 University Ave., Rochester, N. Y.
Motch & Merryweather Machinery Co., Penton Bldg., Cleveland, O.

SAWS (Inserted Tooth, Cold)
Disston, Henry, & Sons, Inc., 626 Tacony, Philadelphia, Pa.
Huther Bros. Saw & Mfg. Co., 1290 University Ave., Rochester, N. Y.
Pittsburgh Saw & Tool Co., 78-80 Sycamore St., Etna P. O., Pittsburgh, Pa.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.

SAWS (Metal Cutting)
Atkins, E. C., & Co., 402 So. Illinois St., Indianapolis, Ind.
Brown & Sharpe Mfg. Co., Providence, R. I.
Disston, Henry, & Sons, Inc., 626 Tacony, Philadelphia, Pa.
Motch & Merryweather Machinery Co., Penton Bldg., Cleveland, O.
Pittsburgh Saw & Tool Co., 78-80 Sycamore St., Etna P. O., Pittsburgh, Pa.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SAWS (Segmental)
Atkins, E. C., & Co., 427 So. Illinois St., Indianapolis, Ind.
Disston, Henry, & Sons, Inc., 626 Tacony, Philadelphia, Pa.
Motch & Merryweather Machinery Co., Penton Bldg., Cleveland, O.
Pittsburgh Saw & Tool Co., 78-80 Sycamore St., Etna P. O., Pittsburgh, Pa.

SCAFFOLDING (Tubular)
Dravo Corp. (Machinery Div.) 300 Penn Ave., Pittsburgh, Pa.

SCALES
Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.
Fairbanks, Morse & Co., Dept. E75, 600 So. Michigan Ave., Chicago, Ill.
Kron Co., The, Bridgeport, Conn.

SCALES (Dial & Recording)
Fairbanks, Morse & Co., Dept. E75, 600 S. Michigan Ave., Chicago, Ill.

SCALES (Laboratory)
Fairbanks, Morse & Co., Dept. E75, 600 South Michigan Ave., Chicago, Ill.

SCALES (Monorail)
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Fairbanks, Morse & Co., Dept. E75, 600 So. Michigan Ave., Chicago, Ill.
Kron Co., The, Bridgeport, Conn.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.

SCRAP BALING PRESSES—See BALING PRESSES

SCRAP (Iron & Steel)
Hyman-Michaels Co., 122 S. Michigan Ave., Chicago, Ill.

SCREENS AND SIEVES
Chicago Perforating Co., 2443 W. 24th Pl., Chicago, Ill.
Erdle Perforating Co., 171 York St., Rochester, N. Y.
Harrington & King Perforating Co., 5634 Fillmore St., Chicago, Ill.
Koppers Co., Engineering & Construction Div., 901 Koppers Bldg., Pittsburgh, Pa.

SCREW EXTRACTORS
Greenfield Tap & Die Corp., Greenfield, Mass.

SCREW MACHINE PRODUCTS
Barnes, Wallace, Co., The, Div. Associated Spring Corp., 97 Main St., Bristol, Conn.
Hindley Mfg. Co., Valley Falls, R. I.
National Acme Co., The, 170 E. 131st St., Cleveland, O.
Oliver Iron & Steel Corp. So. 10th & Muriel Sts., Pittsburgh, Pa.

SCREW MACHINES (Automatic, Single and Multiple Spindle)
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Automatic Machine Co., 2269 Ashland Ave., Cleveland, O.
Cone Automatic Machine Co., Inc., Windsor, Vt.
Greenlee Bros. & Co., Rockford, Ill.
National Acme Co., The, 170 E. 131st St., Cleveland, O.
Oster Mfg. Co., The, 2037 E. 61st St., Cleveland, O.

SCREW PLATES
Greenfield Tap & Die Corp., Greenfield, Mass.

SCREW STOCK—See STEEL (Screw Stock)

SCREWS
Cleveland Cap Screw Co., 2917 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Parker-Kalon Corp., 194-200 Varick St., New York City.

SCREWS (Cap, Set, Safety-Set)
Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.
Cleveland Cap Screw Co., 2917 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
National Acme Co., The, 170 E. 131st St., Cleveland, O.
Parker-Kalon Corp., 194-200 Varick St., New York City
Triplex Screw Co., The, 5317 Grant St., Cleveland, O.

SCREWS (Cold Headed)
Central Screw Company, 3517 Shields Ave., Chicago, Ill.
Cleveland Cap Screw Co., 2917 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.

SCREWS (Conveyor)
Lee Spring Co. Inc., 30 Main St., Brooklyn, N. Y.

SCREWS (Drive)
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Parker-Kalon Corp., 194-200 Varick St., New York City.

SCREWS (Hardened Self-Tapping)
Central Screw Company, 3517 Shields Ave., Chicago, Ill.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Parker-Kalon Corp., 194-200 Varick St., New York City.

SCREWS (Machine)
Central Screw Company, 3517 Shields Ave., Chicago, Ill.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Triplex Screw Co., The, 5317 Grant Ave., Cleveland, O.

SCREWS (Machine, Recessed Head)
American Screw Co., Providence, R. I.
Bristol Co., Waterbury, Conn.
Central Screw Co., Chicago, Ill.
Chandler Products Co., Euclid, O.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., New Britain, Conn.
International Screw Co., Detroit, Mich.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
National Screw & Mfg. Co., 2440 E. 75th St., Cleveland, O.
New England Screw Co., Keene, N. H.
Parker-Kalon Corp., 194-200 Varick St., New York City.
Pawtucket Screw Co., Pawtucket, R. I.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Mfg. Co., Waterbury, Conn.

SCREWS (Non-Ferrous and Stainless)
Harper, H. M., Co., The 2646 Fletcher St., Chicago, Ill.

SCREWS (Sheet Metal, Recessed Head)
American Screw Co., Providence, R. I.
Bristol Co., Waterbury, Conn.
Central Screw Co., Chicago, Ill.
Chandler Products Co., Euclid, O.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., New Britain, Conn.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
National Screw & Mfg. Co., 2440 E. 75th St., Cleveland, O.
Parker-Kalon Corp., 194-200 Varick St., New York City.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Shakeproof Lock Washer Co., Chicago, Ill.

SCREWS (Socket, Cold Forged)
Parker-Kalon Corp., 194-200 Varick St., New York City.

SCREWS (Thread-Cutting)
Parker-Kalon Corp., 194-200 Varick St., New York City

SCREWS (Thumb)
Central Screw Company, 3517 Shields Ave., Chicago, Ill.
Parker-Kalon Corp., 194-200 Varick St., New York City.

SCREWS (Wood, Recessed Head)
American Screw Co., Providence, R. I.
Bristol Co., Waterbury, Conn.
Chandler Products Co., Euclid, O.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., New Britain, Conn.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
National Screw & Mfg. Co., 2440 E. 75th St., Cleveland, O.
Parker, Charles, Co., The, Meriden, Conn.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Southington Hdwe. Mfg. Co., Pawtucket, R. I.
Whitney Screw Co., Nashua, N. H.

SEAMLESS STEEL TUBING—See TUBES

SEPARATORS (Magnetic)
Cutler-Hammer, Inc., 1267 St. Paul Ave., Milwaukee, Wis.
Electric Controller & Mfg. Co., The, 2700 E. 79th St., Cleveland, O.
Frantz, S. G., Co., Inc., 221-5 Centre St., New York City.
Ohio Electric Mfg. Co., The, 5906 Maurice Ave., Cleveland, O.

SHAFT HANGERS—See HANGERS (Shaft)

SHAFTING
Bliss & Laughlin, Inc., Harvey, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
LaSalle Steel Co., Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
Monarch Steel Co., 545 W. McCarty St., Indianapolis, Ind.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Scully Steel Products Co., 1316 Wabansia Ave., Chicago, Ill.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.
Union Drawn Steel Div. Republic Steel Corp., Massillon, O.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

SHAFTING (Flexible)
Walker-Turner Co., Inc., 5062 Berckman St., Plainfield, N. J.

SHAPERS
Cincinnati Shaper Co., Garrard and Elam Sts., Cincinnati, O.
Ohio Machine Tool Co., The, Kenton, O.

SHAPERS (Automatic Controls for)
Detroit Universal Duplicator Co., 218 St. Aubin, Detroit, Mich.

SHAPES (Brass, Bronze, Nickel, Silver)
Dahlstrom Metallic Door Co., Jamestown, N. Y.

SHAPES (Steel)—See STEEL (Structural)

SHAPES, SPECIAL (Steel)
Bliss & Laughlin, Inc., Harvey, Ill.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Dahlstrom Metallic Door Co., Jamestown, N. Y.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Monarch Steel Co., 545 W. McCarty St., Indianapolis, Ind.
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.
Roebling's, John A., Sons Co., Trenton, N. J.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Union Drawn Steel Div. Republic Steel Corp., Massillon, O.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

SHEAR BLADES
American Shear Knife Co., 3rd and Ann Sts., Homestead, Pa.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Disston, Henry, & Sons, Inc., 626 Tacony, Philadelphia, Pa.
Heppenstall Co., Box S-7, 4620 Hatfield St., Pittsburgh, Pa.
Ohio Knife Co., Dreman Ave. & B. & O. R.R., Cincinnati, O.

SHEARS
Beatty Machine & Mfg. Co., Hammond, Ind.
Bliss, E. W., Co., 53rd St. & 2nd Ave., Brooklyn, N. Y.
Cincinnati Shaper Co., Garrard and Elam Sts., Cincinnati, O.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Hallden Machine Co., The, Thomaston, Conn.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
Lewis Fdry. & Mach. Div. of Blaw-Knox Co., Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.
O'Neil-Irwin Mfg. Co., 316 8th Ave. So., Minneapolis, Minn.
Streine Tool & Mfg. Co., New Bremen, O.
Thomas Machine Mfg. Co., Etna Branch P. O., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

SHEARS, ROTARY (Slitting, Beveling, Circling, Flanging)
Hydropress, Inc., 570 Lexington Ave., New York City.
Yoder Co., 55 Walworth Ave., Cleveland, O.

SHELL BANDS (Rotating)
Lewin-Mathes Co., E. St. Louis, Ill.

SHEET BARS
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHEET LIFTERS AND CARRIERS
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cullen-Friestadt Co., 1308 S. Kilbourn Ave., Chicago, Ill.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
J-B Engineering Sales Co., 3100 East St., New Haven, Conn.

SHEET METAL PRODUCTS—See STAMPINGS

WHERE-TO-BUY

SHEET METAL WORKERS MACHINES

Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.
Streine Tool & Mfg. Co., New Bremen, O.
Yoder Co., The, 55 Walworth Ave., Cleveland, O.

SHEET STEEL PILING (New and Used)

Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.

SHEETS (Acid Resisting)

International Nickel Co., Inc., The, 67 Wall St., New York City.

SHEETS (Black)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Andrews Steel Co., The, Newport, Ky.
Continental Steel Corp., Kokomo, Ind.
Granite City Steel Co., Granite City, Ill.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Superior Sheet Steel Div., Continental Steel Corp., Canton, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

SHEETS (Brass, Bronze, Copper, Nickel Silver, Silicon-Bronze)

American Brass Co., The, Waterbury, Conn.
Ampco Metal, Inc., Dept. S-6, 3830 W. Burnham St., Milwaukee, Wis.
Bridgeport Brass Co., Bridgeport, Conn.

SHEETS (Corrugated)

American Rolling Mill Co., The, 1511 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., 2243-2244 Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Superior Sheet Steel Div., Continental Steel Corp., Canton, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHEETS (Deep Drawing and Stamping)

Alan Wood Steel Co., Conshohocken, Pa.
American Rolling Mill Co., The, 1511 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., 2243-2244 Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Granite City Steel Co., Granite City, Ill.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHEETS (Electrical)

Allegheny Ludlum Steel Corp., Dept. S-229, Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, 1511 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Granite City Steel Co., Granite City, Ill.
Ingersoll Steel & Disc. Div., Borg-Warner Corp., 310 S. Michigan Ave., Chicago, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHEETS (Galvanized)

American Rolling Mill Co., The, 1511 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., 2243-2244 Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Scully Steel Products Co., 1316 Wabansia Ave., Chicago, Ill.
Superior Sheet Steel Div., Continental Steel Corp., Canton, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wheeling Steel Corp., Wheeling, W. Va.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHEETS (Hot Rolled and Hot Rolled Annealed)

Alan Wood Steel Co., Conshohocken, Pa.
American Rolling Mill Co., The, 1511 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., 2243-2244 Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Disston, Henry, & Sons, Inc., 626 Tacony, Philadelphia, Pa.
Granite City Steel Co., Granite City, Ill.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Levinson Steel Co., 33 Pride St., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Scully Steel Products Co., 1316 Wabansia Ave., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wheeling Steel Corp., Wheeling, W. Va.
Weirton Steel Co., Weirton, W. Va.
Worth Steel Co., Claymont, Del.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHEETS (Lead Coated)

Continental Steel Corp., Kokomo, Ind.
Superior Sheet Steel Div., Continental Steel Corp., Canton, O.

SHEETS (Long Terne)
Andrews Steel Co., The, Newport, Ky.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Steel Corp., Kokomo, Ind.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Superior Sheet Steel Div., Continental Steel Corp..
Weirton Steel Co., Weirton, W. Va.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHEETS (Nickel Silver)
Seymour Manufacturing Co., The, Seymour, Conn.

SHEETS (Perforated)
Harrington & King Perforating Co., 5634 Fillmore St., Chicago, Ill.

SHEETS (Phosphor Bronze)
Seymour Manufacturing Co., The, Seymour, Conn.

SHEETS (Reinforced)
Erdle Perforating Co., 171 York St., Rochester, N. Y.

SHEETS (Roofing)—See ROOFING AND SIDING

SHEETS (Stainless)
Allegheny Ludlum Steel Corp., Dept. S-229, Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, 1511 Curtis St., Middletown, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Republic Steel Corp., Massillon, O.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.

SHEETS (Stainless Clad)
Granite City Steel Co., Granite City, Ill.
Ingersoll Steel & Disc Div., Borg-Warner Corp., 310 S. Michigan Ave., Chicago, Ill.

SHEETS (Tin)—See TIN PLATE

SHEETS (Tin Mill Black)
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.

SHEETS—HIGH FINISH (Automobile, Metal Furniture, Enameling)
American Rolling Mill Co., The, 1511 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., 2243-2244 Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wheeling Steel Corp., Wheeling, W. Va.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHELL BANDS (Rotating)
Lewin-Mathes Co., East St. Louis, Mo.

SHELLS (Seamless Drawn)
Crosby Co., The, 183 Pratt St., Buffalo, N. Y.

SHOVELS (Power)
Northwest Engineering Co., 28 E. Jackson Blvd., Chicago, Ill.

SIEVES—See SCREENS AND SIEVES

SIGNALING & INTER-COMMUNICATION EQUIPMENT
Graybar Electric Co., 420 Lexington Ave., New York City.

SIGNS (Metal)
Webb City & Carterville Foundry & Machine Works, Webb City, Mo.

SILICO-MANGANESE
Electro Metallurgical Co., 30 E. 42nd St., New York City.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

SILICON METAL AND ALLOYS
Electro Metallurgical Co., 30 E. 42nd St., New York City.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

SKELP (Steel)
Alan Wood Steel Co., Conshohocken, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

SLAG GRANULATING MACHINES (Blast Furnace and Open Hearth)
Brosius, Edgar E., Co., Sharpsburg Branch, Pittsburgh, Pa.

SLITTERS
Cowles Tool Co., 2086 W. 110th St., Cleveland, O.
Ohio Knife Co., Dreman Ave. & B. & O. R.R., Cincinnati, O.

SMALL TOOLS
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Twist Drill Co., The, 1242 E. 49th St., Cleveland, O.

SOAKING PITS
Amsler-Morton Co., The, Fulton Bldg., Pittsburgh, Pa.
Salem Engineering Co., 714 S. Broadway, Salem, O.
Surface Combustion Div., 2375 Dorr St., Toledo, O.

SOLDER
Kester Solder Co., 4222 Wrightwood Ave., Chicago, Ill.
Wayne Chemical Products Co., 9502 Copeland St., Detroit, Mich.

SOLENOIDS (Electric)
Cutler-Hammer, Inc., 1267 St. Paul Ave., Milwaukee, Wis.

SOLVENT (Degreasing)
Pennsylvania Salt Mfg. Co., Dept. S, Pennsalt Cleaner Div., Philadelphia, Pa.

SPACING TABLES
Thomas Machine Mfg. Co., Etna Branch P. O., Pittsburgh, Pa.

SPECIAL MACHINERY—See MACHINERY (Special)

SPEED REDUCERS
Cleveland Worm & Gear Co., 3270 E. 80th St., Cleveland, O.
Grant Gear Works, 2nd & B. Sts., Boston, Mass.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
James, D. O., Mfg. Co., 1120 W. Monroe St., Chicago, Ill.
Jones, W. A., Fdry. & Mach. Co., 4437 Roosevelt Rd., Chicago, Ill.
Link-Belt Co., 2045 W. Hunting Park Ave., Philadelphia, Pa.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.
New Departure Div., General Motors Corp., Bristol, Conn.
Philadelphia Gear Works, Erie Ave. & G St., Philadelphia, Pa.

SPIEGELEISEN
Electro Metallurgical Co., 30 E. 42nd St., New York City.
New Jersey Zinc Co., 160 Front St., New York City.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

SPIKES (Screw)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SPINDLE SHAPERS (For Non-Ferrous Metal, Plastics & Wood)
Walker-Turner Co., Inc., 5062 Berckman St., Plainfield, N. J.

SPINDLES (Grinding)
Bryant Chucking Grinder Co., Springfield, Vt.
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
Heald Machine Co., Worcester, Mass.

SPINDLES (Lathe)
American Hollow Boring Co., 1054 W. 20th St., Erie, Pa.

SPLICE BARS (Rail)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

SPRINGS (*Also Stainless)
*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
*Barnes, Wallace, Co., The, Div. Associated Spring Corp., 97 Main St., Bristol, Conn.
Hubbard, M. D., Spring Co., 444 Central Ave., Pontiac, Mich.
Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y.
*Raymond Mfg. Co., Div. Associated Spring Corp., 280 So. Centre St., Corry, Pa.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.
Washburn Wire Co., 118th St. & Harlem River, New York City.

SPRINGS (Alloy)
Barnes, Wallace, Co., The, Div. Associated Spring Corp., 97 Main St., Bristol, Conn.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 So. Centre St., Corry, Pa.

SPRINGS (Coil & Elliptic)
Barnes, Wallace, Co., The, Div. Associated Spring Corp., 97 Main St., Bristol, Conn.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 So. Centre St., Corry, Pa.

SPRINGS (Compression)
Barnes, Wallace, Co., The, Div. Associated Spring Corp., 97 Main St., Bristol, Conn.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 So. Centre St., Corry, Pa.

SPRINGS (Oil Tempered—Flat)
Barnes, Wallace, Co., The, Div. Associated Spring Corp., 97 Main St., Bristol, Conn.
Davis Brake Beam Co., Laurel Ave., & P. R. R., Johnstown, Pa.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 So. Centre St., Corry, Pa.

SPRINGS (Torsion)
Barnes, Wallace, Co., The, Div. Associated Spring Corp., 97 Main St., Bristol, Conn.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 So. Centre St., Corry, Pa.

SPRINGS (Valve)
Barnes, Wallace, Co., The, Div. Associated Spring Corp., 97 Main St., Bristol, Conn.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 So. Centre St., Corry, Pa.

SPRINKLERS (Automatic)
Grinnell Co., Inc., Providence, R. I.

SPRUE CUTTERS
Shuster, F. B., Co., The, New Haven, Conn.

STACKS (Steel)—See BRIDGES, ETC.

STAINLESS STEEL—See BARS, SHEETS, STRIP, PLATES, ETC.

STACKING MACHINES (Hand & Electric)
Economy Engineering Co., 2657 W. Van Buren St., Chicago, Ill.

STAMPINGS
American Tube & Stamping Plant, (Stanley Wks.), Bridgeport, Conn.
Barnes, Wallace, Co., The, Div. Associated Spring Corp., 97 Main St., Bristol, Conn.
Crosby Co., The, 183 Pratt St., Buffalo, N. Y.
Dahlstrom Metallic Door Co., Jamestown, N. Y.
Davis Brake Beam Co., Laurel Ave., & P. R. R., Johnstown, Pa.
Dayton Rogers Co., Minneapolis, Minn.
Erdle Perforating Co., 171 York St., Rochester, N. Y.
Homestead Valve Mfg. Co., P. O. Box 20, Coraopolis, Pa.
Hubbard, M. D., Spring Co., 444 Central Ave., Pontiac, Mich.
Lyon Metal Products, Inc., 7205 Madison Ave., Aurora, Ill.
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 So. Centre St., Corry, Pa.
Scaife Co., Ames St., Oakmont, Pa.
Spriesch Tool & Mfg. Co., 10 Howard St., Buffalo, N. Y.
Stanley Works, The, Bridgeport, Conn. New Britain, Conn.
Toledo Stamping & Mfg. Co., 90 Fearing Blvd., Toledo, O.
Whitehead Stamping Co., 1667 W. Lafayette Blvd., Detroit, Mich.

STAMPS (Steel)
Cunningham, M. E., Co., 172 E. Carson St., Pittsburgh, Pa.
Matthews, James H., & Co., 3978 Forbes St., Pittsburgh, Pa.

STAPLES (Wire)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Youngstown Sheet & Tube Co., The, Youngstown, O.

STARTERS (Electric Motor)
Electric Controller & Mfg. Co., The, 2700 E. 79th St., Cleveland, O.

STEEL (Alloy)
Alan Wood Steel Co., Conshohocken, Pa.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Carpenter Steel Co., Dept. 51, Reading, Pa.
Columbia Steel Co., San Francisco, Calif.
Copperweld Steel Co., Warren, O.
Disston, Henry, & Sons, Inc., 626 Tacony, Philadelphia, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Frasse, Peter A., & Co., Inc., 17 Grand St., New York City
Harrisburg Steel Corp., Harrisburg, Pa.
Heppenstall Co., Box S-6, 4620 Hatfield St., Pittsburgh, Pa.
Jessop Steel Co., 584 Green St., Washington, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Scully Steel Products Co., 1316 Wabansia Ave., Chicago, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Roller Bearing Co., The, Steel & Tube Div., Canton, O.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Washburn Wire Co., Phillipsdale, R. I.

STEEL (Alloy, Cold Finished)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bliss & Laughlin, Inc., Harvey, Ill.
Copperweld Steel Co., Warren, O.
Firth-Sterling Steel Co., McKeesport, Pa.
LaSalle Steel Co., Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
Monarch Steel Co., 545 W. McCarty St., Indianapolis, Ind.

STEEL (Alloy, Cold Finished) —Con.
Pittsburgh Tool Steel Wire Co., Monaca, Pa.
Union Drawn Steel Div. of Republic Steel Corp., Massillon, O.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

STEEL (Clad—Corrosion Resisting) (*Also Stainless)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Carpenter Steel Co., Dept. 51, Reading, Pa.
*Copperweld Steel Co., Warren, O. Room 117—405 Lexington Ave., New York City.
*Granite City Steel Co., Granite City, Ill.
Ingersoll Steel & Disc Div., Borg-Warner Corp., 310 S. Michigan Ave., Chicago, Ill.
Jessop Steel Co., 584 Green St., Washington, Pa.
Sharon Steel Corp., Sharon, Pa.
Superior Steel Corp., Carnegie, Pa.

STEEL (Cold Drawn)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bliss & Laughlin, Inc., Harvey, Ill.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.
Monarch Steel Co., 545 W. McCarty St., Indianapolis, Ind.
Pittsburgh Tool Steel Wire Co., Monaca, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.
Sutton Engineering Co., Park Bldg., Pittsburgh, Pa.
Union Drawn Steel Div. of Republic Steel Corp., Massillon, O.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

STEEL (Cold Finished)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
LaSalle Steel Co., Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
Monarch Steel Co., 545 W. McCarty St., Indianapolis, Ind.
Pittsburgh Tool Steel Wire Co., Monaca, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Scully Steel Products Co., 1316 Wabansia Ave., Chicago, Ill.
Union Drawn Steel Div. of Republic Steel Corp., Massillon, O.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

STEEL (Corrosion Resisting)
Allegheny Ludlum Steel Corp., Dept. S-229, Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, 1511 Curtis St., Middletown, O.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Bissett Steel Co., The, 943 E. 67th St., Cleveland, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Carpenter Steel Co., Dept. 51, Reading, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Frasse, Peter A., & Co., Inc. 17 Grand St., New York City
Granite City Steel Co., Granite City, Ill.
Ingersoll Steel & Disc Div., Borg-Warner Corp., 310 S. Michigan Ave., Chicago, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jessop, Wm., & Sons, Inc., 627-629 Sixth Ave., New York City.
Jessop Steel Co., 584 Green St., Washington, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Superior Steel Corp., Carnegie, Pa.
Timken Roller Bearing Co., The, Steel & Tube Div., Canton, O.

STEEL (Die)
Disston, Henry, & Sons, Inc., 626 Tacony, Philadelphia, Pa.
Jessop, Wm., & Sons, Inc., 627-629 Sixth Ave., New York City.
Jessop Steel Co., 584 Green St., Washington, Pa.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL (Electric)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Copperweld Steel Co., Warren, O.
Disston, Henry, & Sons, Inc., 626 Tacony, Philadelphia, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jessop, Wm., & Sons, Inc., 627-629 Sixth Ave., New York City.
Jessop Steel Co., 584 Green St., Washington, Pa.
Latrobe Electric Steel Co., Latrobe, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Timken Roller Bearing Co., The, Steel & Tube Div., Canton, O.

STEEL (High Speed)
Allegheny Ludlum Steel Corp., Dept. S-229, Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Dept. 51, Reading, Pa.
Disston, Henry, & Sons, Inc., 626 Tacony, Philadelphia, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Ingersoll Steel & Disc Div., Borg-Warner Corp., 310 S. Michigan Ave., Chicago, Ill.
Jessop, Wm., & Sons Co., 627-629 Sixth Ave., New York City.
Jessop Steel Co., 584 Green St., Washington, Pa.
Latrobe Electric Steel Co., Latrobe, Pa.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL (High Tensile, Low Alloy)
Alan Wood Steel Co., Conshohocken, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Cold Metal Products Co., The, 2131 Wilson Ave., Youngstown, O.
Columbia Steel Co., San Francisco, Calif.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

STEEL (Nitriding)
Allegheny Ludlum Steel Corp., Dept. S-229, Oliver Bldg., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.

STEEL (Rustless)—See STEEL (Corrosion Resisting)

STEEL (Screw Stock)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.

STEEL (Screw Stock)—Con.
LaSalle Steel Co., Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
Monarch Steel Co., 545 W. McCarty St., Indianapolis, Ind.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Union Drawn Steel Div. of Republic Steel Corp., Massillon, O.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., The, Youngstown, O.

STEEL (Spring)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Barnes, Wallace, Co., The, Div. Associated Spring Corp., 97 Main St., Bristol, Conn.
Cold Metal Products Co., The, Wilson Ave., Youngstown, O.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.
Washburn Wire Co., 118th St. & Harlem River, New York City. Phillipsdale, R. I.

STEEL (Stainless)—See STEEL (Corrosion Resisting)

STEEL (Strapping)
Atkins, E. C., & Co., 427 So. Illinois St., Indianapolis, Ind.

STEEL (Strip, Copper Coated)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Thomas Steel Co., The, Warren, O. Rockefeller Bldg., Cleveland, O.

STEEL (Strip, Hot and Cold Rolled) (*Also Stainless)
*Allegheny Ludlum Steel Corp., Dept. S-229, Oliver Bldg., Pittsburgh, Pa.
*American Rolling Mill Co., The, 1511 Curtis St., Middletown, O.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
American Tube & Stamping Plant, (Stanley Wks.), Bridgeport, Conn.
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Cold Metal Products Co., The, 2131 Wilson Ave., Youngstown, O.
Columbia Steel Co., San Francisco, Calif.
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
*Firth-Sterling Steel Co., McKeesport, Pa.
Frasse, Peter A., & Co., Inc. 17 Grand St., New York City
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Ingersoll Steel & Disc Div., Borg-Warner Corp., 310 S. Michigan Ave., Chicago, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jessop, Wm., & Sons, Inc., 627-629 Sixth Ave., New York City.
Jessop Steel Co., 584 Green St., Washington, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
*Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Scully Steel Products Co., 1316 Wabansia Ave., Chicago, Ill.
*Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Superior Steel Corp., Carnegie, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Thomas Steel Co., The, Warren, O.
Washburn Wire Co., 118th St. & Harlem River, New York City. Phillipsdale, R. I.
Weirton Steel Co., Weirton, W. Va.

STEEL (Strip, Tin Coated)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
Thomas Steel Co., The, Warren, O.
Washburn Wire Co., 118th St. & Harlem River, New York City.

STEEL (Strip, Zinc Coated)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
Thomas Steel Co., The, Warren, O.
Washburn Wire Co., 118th St. & Harlem River, New York City.

STEEL (Structural) (*Also Stainless)
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Belmont Iron Works, 22nd St. and Washington Ave., Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Clinton Bridge Works, Clinton, Ia.
Columbia Steel Co. San Francisco, Calif.
Duffin Iron Co., 37 W. Van Buren St., Chicago, Ill.
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
Gage Structural Steel Co., Chicago, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Levinson Steel Co., 33 Pride St., Pittsburgh, Pa.
Midland Structural Steel Co., Cicero, Ill.
*Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Scully Steel Products Co., 1316 Wabansia Ave., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Uhl Construction Co., 6001 Butler St., Pittsburgh, Pa.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

STEEL (Tool)
Allegheny Ludlum Steel Corp., Dept. S-229, Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Bissett Steel Co., The, 900 E. 67th St., Cleveland, O.
Carpenter Steel Co., Dept. 51, Reading, Pa.
Copperweld Steel Co., Warren, O.
Darwin & Milner, Inc., 1260 W. 4th St., Cleveland, O.
Disston, Henry, & Sons, Inc., 626 Tacony, Philadelphia, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Frasse, Peter A., & Co., Inc. 17 Grand St., New York City
Ingersoll Steel & Disc Div., Borg-Warner Corp., 310 S. Michigan Ave., Chicago, Ill.
Jessop, Wm., & Sons Co., 627-629 Sixth Ave., New York City.
Jessop Steel Co., 584 Green St., Washington, Pa.
Latrobe Electric Steel Co., Latrobe, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Broach & Mach. Co., 5600 St. Jean, Detroit, Mich.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Vanadium Alloys Steel Co., Latrobe, Pa.

STEEL BUILDINGS—See BRIDGES, BUILDINGS, ETC.

STEEL DOORS & SHUTTERS—See DOORS & SHUTTERS

STEEL FABRICATORS—See BRIDGES, BUILDINGS, ETC.

STEEL FLOATING AND TERMINAL EQUIPMENT
Dravo Corp. (Engin'r'g Works Div.), Neville Island, Pittsburgh, Pa.

STEEL PLATE CONSTRUCTION
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Belmont Iron Works, 22nd St., and Washington Ave., Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.

STEEL PLATE CONSTRUCTION—Con.
Federal Shipbuilding & Dry Dock Co., Kearney, N. J.
General American Transportation Corp., 135 So. LaSalle St., Chicago, Ill.
Graver Tank & Mfg. Co., Inc., 4409-40 Tod Ave., E. Chicago, Ind.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.
Western Gas Div., Koppers Co., Fort Wayne, Ind.

STELLITE
Haynes Stellite Co., Harrison and Lindsay Sts., Kokomo, Ind.

STENCILS (Spray and Sand Blast)
Matthews, James H., & Co., 3978 Forbes St., Pittsburgh, Pa.

STOKERS
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.

STONES (Honing)
Bay State Abrasive Products Co., Westboro, Mass.

STOPPERS (Cinder Notch)
Bailey, Wm. M. Co., 702 Magee Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Co., Sharpsburg Branch, Pittsburgh, Pa.

STOPPERS (Rubber)
Rhoades, R. W., Metaline Co., 43 Third St., Long Island City, N. Y.

STORAGE EQUIPMENT
Graver Tank & Mfg. Co., Inc., 4409-40 Tod Ave., E. Chicago, Ind.
Lyon Metal Products, Inc., 7205 Madison Ave., Aurora, Ill.

STORAGE BATTERIES—See BATTERIES (Storage)

STRAIGHTENING MACHINERY
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Elmes, Chas. F., Engineering Works, 245 N. Morgan St., Chicago, Ill.
Farquhar, A. B., Co., Ltd., 195 Duke St., York, Pa.
Hydropress, Inc., 570 Lexington Ave., New York City.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
Lewis Machine Co., 3450 E. 76th St., Cleveland, O.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Shuster, F. B., Co., The, New Haven, Conn.
Sutton Engineering Co., Park Bldg., Pittsburgh, Pa.

SULPHURIC ACID
Cleveland-Cliffs Iron Co., The, Union Commerce Bldg., Cleveland, O.
New Jersey Zinc Co., 160 Front St., New York City.
Pennsylvania Salt Mfg. Co., Dept. S. Pennsalt Cleaner Div., Philadelphia, Pa.

SURFACE WELDING
Wall-Colmonoy Corp., 637 Buhl Bldg., Detroit, Mich.

SWAGING MACHINES
Etna Machine Co., The, 3400 Maplewood Ave., Toledo, O.

SWITCHES (Electric)
Cutler-Hammer, Inc., 1267 St. Paul Ave., Milwaukee, Wis.
Electric Controller & Mfg. Co., The, 2700 E. 79th St., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.

TACHOMETERS
Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.
Brown Instrument Div. of Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.

TANK LININGS
Ceilcote Co., 750 Rockefeller Bldg., Cleveland, O.
National Carbon Co., W. 117th St. and Madison Ave., Cleveland, O.
Nukem Products Corp., 70 Niagara St., Buffalo, N. Y.

TANKS (Gas Auxiliary)
Webb City & Carterville Foundry & Machine Works, Webb City, Mo.

TANKS (Pickling)
National Carbon Co., W. 117th St. and Madison Ave., Cleveland, O.
Nukem Products Corp., 70 Niagara St., Buffalo, N. Y.
United States Rubber Co., 1230 Sixth Ave., New York City.

TANKS (Storage, Pressure, Riveted, Welded)
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
General American Transportation Corp., 135 So. LaSalle St., Chicago, Ill.
Graver Tank & Mfg. Co., Inc., 4409-40 Tod Ave., E. Chicago, Ind.
Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.
Scaife Co., Ames St., Oakmont, Pa.
Western Gas Div., Koppers Co., Fort Wayne, Ind.

TANKS (Wood or Steel, Rubber or Lead Lined)
American Hard Rubber Co., 11 Mercer St., New York City.
United States Rubber Co., 1230 Sixth Ave., New York City.

TAPPING MACHINES
National Automatic Tool Co., The, Richmond, Ind.

TAPS AND DIES
Greenfield Tap & Die Corp., Greenfield, Mass.
Landis Machine Co., Waynesboro, Pa.
National Acme Co., The, 170 E. 131st St., Cleveland, O.
Oster Mfg. Co., The, 2037 E. 61st St., Cleveland, O.

TERMINALS (Locking)
Thompson-Bremer & Co., 1644 W. Hubbard St., Chicago, Ill.

TERNE PLATE—See TIN PLATE

TESTING MACHINERY (Materials)
Baldwin Southwark Div., Baldwin Locomotive Works, Philadelphia, Pa.
National Broach & Machine Co., 5600 St. Jean, Detroit, Mich.

THERMIT WELDING
Metal & Thermit Corp., 120 Broadway, New York City.

THERMOMETERS
Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.
Brown Instrument Div. of Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4957 Stanton Ave., Philadelphia, Pa.

THREAD CUTTING TOOLS
Landis Machine Co., Waynesboro, Pa.
Oster Mfg. Co., The, 2037 E. 61st St., Cleveland, O.

TIE PLATES
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.

TIN PLATE
Bethlehem Steel Co. Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Weirton Steel Co., Weirton, W. Va.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TIN PLATE MACHINERY
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Wean Engineering Co., Warren, O.

TITANIUM
Titanium Alloy Mfg. Co., The, Niagara Falls, N. Y.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

TONGS (Chain Pipe)
Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

TONGS (Rail Handling)
Cullen-Friestedt Co., 1308 S. Kilbourn Ave., Chicago, Ill.

TOOL BITS (High Speed)
Allegheny Ludlum Steel Corp., Dept. S-229, Oliver Bldg., Pittsburgh, Pa.
Disston, Henry, & Sons, Inc., 626 Tacony, Philadelphia, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Haynes Stellite Co., Harrison and Lindsay Sts., Kokomo, Ind.
Jessop Steel Co., 584 Green St., Washington, Pa.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.

TOOL HOLDERS
Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

TOOLS (Pneumatic)
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.

TOOLS (Precision, Lathe, Metal Cutting, etc.)
Brown & Sharpe Mfg. Co., Providence, R. I.
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
Gisholt Machine Co., 1217 E. Washington Ave., Madison, Wis.
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

TOOLS (Steel-Cutting)
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

TOOLS (Tipped, Carbide)
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

TOOLS (Turning, Boring and Facing)
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

TORCHES & BURNERS (Acetylene, Blow, Oxy-Acetylene)
Air Reduction, 60 E. 42nd St., New York City.
Linde Air Products Co., The, 30 E. 42nd St., New York City.
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago, Ill.

TOWBOATS
Dravo Corp. (Engin'r'g Works Div.) Neville Island, Pittsburgh, Pa.

TOWERS (Transmission)
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.

TOWERS (Tubular Hoisting)
Dravo Corp., (Machinery Div.), 300 Penn Ave., Pittsburgh, Pa.

TRACK ACCESSORIES
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Oliver Iron & Steel Corp., So. 10th & Muriel Sts., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

TRACK BOLTS
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TRAILERS
Easton Car & Construction Co., Easton, Pa.
Mercury Manufacturing Co., 4140 S. Halsted St., Chicago, Ill.
Ohio Galvanizing & Mfg. Co., Penn St., Niles, O.

TRAILERS (Arch-Girder)
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

TRAMRAILS
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

TRANSMISSIONS—VARIABLE SPEED
Link-Belt Co., 2045 W. Hunting Park Ave., Philadelphia, Pa.

TREADS (Safety)
Alan Wood Steel Co., Conshohocken, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Dravo Corp. (Machinery Div.), 300 Penn Ave., Pittsburgh, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tri-Lok Co., 5515 Butler St., Pittsburgh, Pa.

TROLLEYS
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Ford Chain Block Div., American Chain & Cable Co. Inc., 2nd & Diamond Sts., Philadelphia, Pa.
Reading Chain & Block Co., Dept. D-5, Reading, Pa.
Wright Mfg. Div. of American Chain & Cable Co., Inc., York, Pa.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

TRUCK CRANES
Northwest Engineering Co., 28 E. Jackson Blvd., Chicago, Ill.
Silent Hoist Winch & Crane Co., 849 63rd St., Brooklyn, N. Y.

TRUCKS AND TRACTORS (Electric Industrial)
Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.
Baker-Raulang Co., The, 2167 W. 25th St., Cleveland, O.
Easton Car & Construction Co., Easton, Pa.
Elwell-Parker Electric Co., The, 4501 St. Clair Ave., Cleveland, O.
Mercury Manufacturing Co., 4140 S. Halsted St., Chicago, Ill.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

TRUCKS AND TRACTORS (Gasoline Diesel)
Silent Hoist Winch & Crane Co. 849 63rd St., Brooklyn, N. Y.

TRUCKS AND TRACTORS (Gasoline Industrial)
Baker-Raulang Co., The, 2167 W. 25th St., Cleveland, O.
Clark Tructractor Div., Clark Equipment Co., Battle Creek, Mich.
Elwell-Parker Electric Co., The, 4501 St. Clair Ave., Cleveland, O.
Mercury Manufacturing Co., 4140 S. Halsted St., Chicago, Ill.

TRUCKS (Dump-Industrial)
Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.
Easton Car & Construction Co., Easton, Pa.

TRUCKS (Hydraulic Lift)
Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.

TRUCKS (Industrial)
Easton Car & Construction Co., Easton, Pa.
Mercury Manufacturing Co., 4044-4140 S. Halsted St., Chicago, Ill.
Ohio Galvanizing & Mfg. Co., Penn St., Niles, O.

TRUCKS (Lift)
Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.
Baker-Raulang Co., The, 2167 W. 25th St., Cleveland, O.

WHERE-TO-BUY

TRUCKS (Lift)—Con.
Clark Tructractor Div., Clark Equipment Co., Battle Creek, Mich.
Easton Car & Construction Co., Easton, Pa.
Elwell-Parker Electric Co., The, 4501 St. Clair Ave., Cleveland, O.
Mercury Manufacturing Co., 4140 S. Halsted St., Chicago, Ill.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

TUBE MILL EQUIPMENT
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Taylor-Wilson Mfg. Co., 1200 Thomson Ave., McKees Rocks, Pa.

TUBE WELDING MACHINES
Etna Machine Co., The, 3400 Maplewood Ave., Toledo, O.

TUBES (Boiler)
Allegheny Ludlum Steel Corp., Dept. S-229, Oliver Bldg., Pittsburgh, Pa.
Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Bissett Steel Co., The, 943 E. 67th St., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Ohio Seamless Tube Co., Shelby, O.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Steel and Tubes Division, Republic Steel Corp., 226 E. 131st St., Cleveland, O.
Timken Roller Bearing Co., The, Steel & Tube Div., Canton, O.
Tubular Service Corp., 120 44th St., Brooklyn, N. Y.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TUBES (Brass, Bronze, Copper, Nickel Silver)
American Brass Co., The, Waterbury, Conn.
Bridgeport Brass Co., Bridgeport, Conn.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.

TUBES (High Carbon)
Ohio Seamless Tube Co., Shelby, O.
Steel and Tubes Division, Republic Steel Corp., 226 E. 131st St., Cleveland, O.
Tubular Service Corp., 120 44th St., Brooklyn, N. Y.

TUBING (Alloy Steel) (*Also Stainless)
*Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Bissett Steel Co., The, 943 E. 67th St., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
*National Tube Co., Frick Bldg., Pittsburgh, Pa.
Ohio Seamless Tube Co., Shelby, O.
Steel and Tubes Division, Republic Steel Corp., 226 E. 131st St., Cleveland, O.
Timken Roller Bearing Co., The, Steel & Tube Div., Canton, O.
Tubular Service Corp., 120 44th St., Brooklyn, N. Y.

TUBING (Copper, Brass, Aluminum)
American Brass Co., The, Waterbury, Conn.
Lewin-Mathes Co., E. St. Louis, Ill.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.
Shenango-Penn Mold Co., 404 W. Third St., Dover, O.

TUBING (Flexible Metal)
Chicago Metal Hose Corp., 1315 S. Third St., Maywood, Ill.

TUBING (Monel)
Bundy Tubing Co., 10951 Hern Ave., Detroit, Mich.

TUBING (Seamless Flexible Metal)
American Metal Hose Branch of The American Brass Co., Waterbury, Conn.

TUBING (Seamless Steel)
Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Columbia Steel Co., San Francisco, Calif.
Frasse, Peter A., & Co., Inc., 17 Grand St., New York City
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Ohio Seamless Tube Co., Shelby, O.
Pipe & Tube Products, Inc., 445 Communipaw Ave., Jersey City, N. J.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Steel and Tubes Division, Republic Steel Corp., 226 E. 131st St., Cleveland, O.
Timken Roller Bearing Co., The, Steel & Tube Div., Canton, O.
Tubular Service Corp., 120 44th St., Brooklyn, N. Y.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TUBING (Square, Rectangular)
Ohio Seamless Tube Co., Shelby, O.
Steel & Tubes Division, Republic Steel Corp., 226 E. 131st St., Cleveland, O.
Tubular Service Corp., 120 44th St., Brooklyn, N. Y.

TUBING (Welded Steel)
Bundy Tubing Co., 10951 Hern Ave., Detroit, Mich.
Frasse, Peter A., & Co. Inc., 17 Grand St., New York City
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Ohio Seamless Tube Co., Shelby, O.
Republic Steel Corp., Dept. ST, Cleveland, O.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.
Steel and Tubes Division, Republic Steel Corp., 226 E. 131st St., Cleveland, O.
Tubular Service Corp., 120 44th St., Brooklyn, N. Y.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TUBULAR PRODUCTS
Bundy Tubing Co., 10951 Hern Ave., Detroit, Mich.
Ohio Seamless Tube Co., Shelby, O.
Steel and Tubes Division, Republic Steel Corp., 226 E. 131st St., Cleveland, O.
Tubular Service Corp., 120 44th St., Brooklyn, N. Y.

TUMBLING BARRELS (Coke Testing)
Brosius, Edgar E., Co., Sharpsburg Branch, Pittsburgh, Pa.

TUNGSTEN CARBIDE
Bissett Steel Co., The, 943 E. 67th St., Cleveland, O.
Haynes Stellite Co., Harrison and Lindsay Sts., Kokomo, Ind.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.

TUNGSTEN CARBIDE (Tools and Dies)
Firth-Sterling Steel Co., McKeesport, Pa.
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

TUNGSTEN METAL AND ALLOYS
Electro Metallurgical Co., 30 E. 42nd St., New York City.

TURBINES (Steam)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.

TURBO BLOWERS—See BLOWERS

TURNTABLES
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.

TURRET LATHES—See LATHES (Turret)

TURRET LATHE CUTTERS (Carbide Tipped)
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

TWIST DRILLS
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, O.
Greenfield Tap & Die Corp., Greenfield, Mass.

UNIT HEATERS
Dravo Corp. (Machinery Div.) 300 Penn Ave., Pittsburgh, Pa.

VACUUM CLEANERS
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.

VALVE CONTROL (Motor Operated Units)
Cutler-Hammer, Inc., 1267 St. Paul Ave., Milwaukee, Wis.

VALVE CONTROLS
Philadelphia Gear Works, Erie Ave. & G St., Philadelphia, Pa.

VALVES (Blast Furnace)
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Co., Sharpsburg Branch, Pittsburgh, Pa.

VALVES (Blow-off)
Homestead Valve Mfg. Co., P. O. Box 20, Coraopolis, Pa.

VALVES (Brass, Iron and Steel)
Crane Co., 836 S. Michigan Ave., Chicago, Ill.
Galland-Henning Mfg. Co., 2747 So. 31st St., Milwaukee, Wis.
Reading-Pratt & Cady Div. of American Chain & Cable Co., Inc., Bridgeport, Conn.

VALVES (Check)
Crane Co., 836 S. Michigan Ave., Chicago, Ill.
Reading-Pratt & Cady Div. of American Chain & Cable Co., Inc., Bridgeport, Conn.

VALVES (Control—Air and Hydraulic)
Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Galland-Henning Mfg. Co., 2753 So. 31st St., Milwaukee, Wis.
Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Homestead Valve Mfg. Co., P. O. Box 22, Coraopolis, Pa.
Racine Tool & Machine Co., Racine, Wis.

VALVES (Electrically Operated)
Atkins, E. C., & Co., 427 So. Illinois St., Indianapolis, Ind.
Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.

VALVES (Gas and Air Reversing)
Blaw-Knox Co., Blawnox, Pa.

VALVES (Gate)
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Crane Co., The, 836 So. Michigan Ave., Chicago, Ill.
Reading-Pratt & Cady Div. of American Chain & Cable Co., Inc., Bridgeport, Conn.
Western Gas Div. Koppers Co., Fort Wayne, Ind.

VALVES (Globe)
Crane Co., 836 S. Michigan Ave., Chicago, Ill.
Reading-Pratt & Cady Div. of American Chain & Cable Co., Inc., Bridgeport, Conn.

VALVES (Hydraulic)
Bayard, M. L., & Co., 20th & Indiana Ave., Philadelphia, Pa.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Elmes, Chas. F., Engineering Works, 245 N. Morgan St., Chicago, Ill.
Homestead Valve Mfg. Co., P. O. Box 20, Coraopolis, Pa.
Racine Tool & Machine Co., Racine, Wis.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

VALVES (Iron & Steel)
Galland-Henning Mfg. Co., 2753 So. 31st St., Milwaukee, Wis.

VALVES (Needle)
Crane Co., 836 S. Michigan Ave., Chicago, Ill.
Reading-Pratt & Cady Div. of American Chain & Cable Co., Inc., Bridgeport, Conn.

VALVES (Plug)
Homestead Valve Mfg. Co., P. O. Box 20, Coraopolis, Pa.

VALVES (Steam and Water)
Reading-Pratt & Cady Div. of American Chain & Cable Co., Inc., Bridgeport, Conn.

VALVES AND FITTINGS—See PIPE FITTINGS

VANADIUM
Electro Metallurgical Co., 30 E. 42nd St., New York City.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

VIADUCTS (Steel)—See BRIDGES, ETC.

WALKWAYS—See FLOORING—(Steel)

WASHERS (Iron and Steel)
Hubbard, M. D., Spring Co., 444 Central Ave., Pontiac, Mich.
Oliver Iron & Steel Corp., So. 10th & Muriel Sts., Pittsburgh, Pa.
Thompson-Bremer & Co., 1644 W. Hubbard St., Chicago, Ill.

WASHERS (Lock)
Garrett, George K., Co., D & Tioga Sts., Philadelphia, Pa.
Thompson-Bremer & Co., 1644 W. Hubbard St., Chicago, Ill.

WASHERS (Non-ferrous and Stainless)
Garrett, George K., Co., D & Tioga Sts., Philadelphia, Pa.
Harper, H. M., Co., The, 2646 Fletcher St., Chicago, Ill.

WASHERS (Spring)
Barnes, Wallace, Co., The, Div. Associated Spring Corp., 97 Main St., Bristol, Conn.
Garrett, George K., Co., D & Tioga Sts., Philadelphia, Pa.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 So. Centre St., Corry, Pa.
Thompson-Bremer & Co., 1644 W. Hubbard St., Chicago, Ill.

WASHROOM EQUIPMENT
Sugar Beet Products Co., Saginaw, Mich.

WATER FILTRATION & SOFTENING
Graver Tank & Mfg. Co., Inc., 4409-40 Tod Ave., E. Chicago, Ind.

WELDED STEEL CONSTRUCTION
Pollock, Wm. B., Co., The 101 Andrews Ave., Youngstown, O.

WELDERS (Electric—Arc)
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Hobart Bros., Box ST—62, Troy, O.
Lincoln Electric Co., The, Cleveland, O.
Welding Equipment & Supply Co., 220 Leib St., Detroit, Mich.

WELDING
Bartlett-Hayward Div. Koppers Co., Baltimore, Md.
Bayard, M. L., & Co., 20th & Indiana Ave., Philadelphia, Pa.
Lincoln Electric Co., The, Cleveland, O.
Metal & Thermit Corp., 120 Broadway, New York City.
Scaife Co., Ames St., Oakmont, Pa.
Van Dorn Iron Works, 2685 E. 79th St., Cleveland, O.
Western Gas Div., Koppers Co., Ft. Wayne, Ind.

WELDING (Thermit)
Metal & Thermit Corp., 120 Broadway, New York City.

WELDING (Welded Machine Steel Bases)
Van Dorn Iron Works, 2685 E. 79th St., Cleveland, O.

WELDING DIES (Flash)
Mallory, P. R., & Co., 3029 E. Washington Ave., Indianapolis, Ind.

WELDING RODS (Alloys)
Alloy Rods Co., York, Pa.
American Agile Corp., 5806 Hough Ave., Cleveland, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
International Nickel Co. Inc., The, 67 Wall Street, New York City.
Lincoln Electric Co., The, Cleveland, O.
McKay Co., The, York, Pa.
Maurath, Inc., 7311 Union Ave., Cleveland, O.
Metal & Thermit Corp., 120 Broadway, New York City
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Welding Equipment & Supply Co., 220 Leib St., Detroit, Mich.

WELDING RODS (Bronze)
American Brass Co., The, Waterbury, Conn.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.
Welding Equipment & Supply Co., 220 Leib St., Detroit, Mich.

WELDING RODS (Hard Surfacing)
Lincoln Electric Co., The, Cleveland, O., Dept. Y-25.
Wall-Colmonoy Corp., 637 Buhl Bldg., Detroit, Mich. Dept. AC, Peoria, Ill.

WELDING RODS (Stainless)
Alloy Rods Co., York, Pa.
Lincoln Electric Co., The, Cleveland, O., Dept. Y-25.
McKay Co., The, York, Pa.

WELDING RODS OR WIRE
Air Reduction, 60 E. 42nd St., New York City.
American Agile Corp., 5806 Hough Ave., Cleveland, O.
American Brass Co., The, Waterbury, Conn.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bridgeport Brass Co., Bridgeport, Conn.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Hobart Bros., Box ST—62, Troy, O.
Lincoln Electric Co., The, Cleveland, O.
Linde Air Products Co., The, 30 E. 42nd St., New York City.
McKay Co., The, York, Pa.
Maurath, Inc., 7311 Union Ave., Cleveland, O.
Metal & Thermit Corp., 120 Broadway, New York City
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago, Ill.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Washburn Wire Co., Phillipsdale, R. I.
Welding Equipment & Supply Co., 220 Leib St., Detroit, Mich.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wilson Welder & Metals Co., 60 East 42nd St., New York City.
Youngstown Sheet & Tube Co., The, Youngstown, O.

WELDING TIPS (Spot)
Mallory, P. R., & Co., 3029 E. Washington Ave., Indianapolis, Ind.

WELDING WHEELS (Seam)
Mallory, P. R., & Co., 3029 E. Washington Ave., Indianapolis, Ind.

WELDING AND CUTTING APPARATUS AND SUPPLIES (Electric)
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Hobart Bros., Box ST—62, Troy, O.
Lincoln Electric Co., The, Cleveland, O.
McKay Co., The, York, Pa.
Mallory & Co., P. R., 3029 E. Washington Ave., Indianapolis, Ind.
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago, Ill.
Welding Equipment & Supply Co., 220 Leib St., Detroit, Mich.
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.
Wilson Welder & Metals Co., 60 E. 42nd St., New York City.

WELDING AND CUTTING APPARATUS AND SUPPLIES (Oxy-Acetylene)
Air Reduction, 60 E. 42nd St., New York City.
Linde Air Products Co., The, 30 E. 42nd St., New York City.
Mallory, P. R., & Co., 3029 E. Washington Ave., Indianapolis, Ind.
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago, Ill.
Welding Equipment & Supply Co., 220 Leib St., Detroit, Mich.

WELL WATER SUPPLY SYSTEMS
Layne & Bowler, Inc., Memphis, Tenn.

WHEELS (Car and Locomotive)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Midvale Co., The, Nicetown, Philadelphia, Pa.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.

WHEELS (Track)
National-Erie Corp., Erie, Pa.

WHEELS (Trolley)
Crosby Co., The, 183 Pratt St., Buffalo, N. Y.

WINCHES (Electric)
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.

WINCHES (Electric, Gasoline, Diesel)
Silent Hoist Winch & Crane Co. 849 63rd St., Brooklyn, N. Y.

WIRE (Alloy Steel) (*Also Stainless)
*American Steel & Wire Co. Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Firth-Sterling Steel Co., McKeesport, Pa.
*Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
*Republic Steel Corp., Dept. ST Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.

WIRE (Annealed, Bright, Galvanized)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Johnson Steel & Wire Co., Worcester, Mass.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Republic Steel Corp., Dept. ST. Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wheeling Steel Corp., Wheeling, W. Va.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
Youngstown Sheet & Tube Co., The, Youngstown, O.

WIRE (Barb)
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

WIRE (Cold Drawn)
Johnson Steel & Wire Co., Worcester, Mass.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.
Washburn Wire Co., 118th St. & Harlem River, New York City.

WIRE (High Carbon)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Republic Steel Corp., Dept. ST. Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
Washburn Wire Co., 118th St. and Harlem River, New York City.

WIRE (Music)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Frasse, Peter A., & Co., Inc. 17 Grand St., New York City
Johnson Steel & Wire Co., Worcester, Mass.
Roebling's, John A., Sons Co., Trenton, N. J.
Washburn Wire Co., 118th St. and Harlem River, New York City.

WIRE (Nickel Silver)
Seymour Manufacturing Co., The, Seymour, Conn.

WIRE (Phosphor Bronze)
Seymour Manufacturing Co., The, Seymour, Conn.

WHERE-TO-BUY

WIRE (Round, Flat, Square, Special Shapes)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., Los Angeles, Calif.
Continental Steel Corp., Kokomo, Ind.
Johnson Steel & Wire Co., Worcester, Mass.
Page Steel & Wire Div., of American Chain & Cable Co., Inc., Monessen, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Washburn Wire Co., 118th St. and Harlem River, New York City.
Youngstown Sheet & Tube Co., The, Youngstown, O.

WIRE (Spring)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Washburn Wire Co., 118th St. & Harlem River, New York City.

WIRE (Stapling)
Continental Steel Corp., Kokomo, Ind.

WIRE (Stainless)
Allegheny Ludlum Steel Corp., Dept. S-229, Oliver Bldg., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.

WIRE (Welding)—See WELDING RODS OR WIRE

WIRE AND CABLE (Electric)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
General Electric Co., Sec. G-2903, Appliance & Merchandise Dept., Bridgeport, Conn.
Graybar Electric Co., 420 Lexington Ave., New York City.
Roebling's, John A., Sons Co., Trenton, N. J.

WIRE CLOTH
Cyclone Fence Co., Waukegan, Ill.
Roebling's, John A., Sons Co., Trenton, N. J.
Wickwire Brothers, 189 Main St., Cortland, N. Y.

WIRE COILING TOOLS (Cemented Carbide)
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

WIRE COVERING MACHINES
Fidelity Machine Co., 3908-18 Frankford Ave., Philadelphia, Pa.

WIRE DRAWING COMPOUNDS
Cowles Detergent Co., The, 7016 Euclid Ave., Cleveland, O.

WIRE FORMS, SHAPES AND SPECIALTIES
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Barnes, Wallace, Co., The, Div. Associated Spring Corp., 97 Main St., Bristol, Conn.
Columbia Steel Co., San Francisco, Calif.
Firth-Sterling Steel Co., McKeesport, Pa.
Hubbard, M. D., Spring Co., 444 Central Ave., Pontiac, Mich.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 So. Centre St., Corry, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.

WIRE FORMING MACHINERY
Nilson, A. H., Machine Co., The, Bridgeport, Conn.

WIRE MILL EQUIPMENT
Fidelity Machine Co., 3908-18 Frankford Ave., Philadelphia, Pa.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
Lewis Machine Co., 3450 E. 76th St., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
Shuster, F. B., Co., The, New Haven, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

WIRE NAILS—See NAILS

WIRE PRODUCTS (*Also Stainless)
*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Continental Steel Corp., Kokomo, Ind.
Hubbard, M. D., Spring Co., 444 Central Ave., Pontiac, Mich.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Leschen, A., & Sons Rope Co., 5909 Kennerly Ave., St. Louis, Mo.
Republic Steel Corp., Dept. ST, Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Washburn Wire Co., 118th St. and Harlem River, New York City.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Youngstown Sheet & Tube Co., The, Youngstown, O.

WIRE ROPE AND FITTINGS (*Also Stainless)
American Cable Div. of American Chain & Cable Co., Inc., Wilkes-Barre, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Hazard Wire Rope Div. of American Chain & Cable Co., Inc., Wilkes-Barre, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Leschen, A., & Sons Rope Co., 5909 Kennerly Ave., St. Louis, Mo.
Macwhyte Co., 2912 14th Ave., Kenosha, Wis.
Roebling's, John A., Sons Co., Trenton, N. J.

WIRE ROPE SLINGS
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Leschen, A., & Sons Rope Co., 5909 Kennerly Ave., St. Louis, Mo.
Macwhyte Co., 2912 14th Ave., Kenosha, Wis.
Roebling's, John A., Sons Co., Trenton, N. J.

WIRE SPOOLING MACHINES
Fidelity Machine Co., 3908-18 Frankford Ave., Philadelphia, Pa.

WIRE STRAIGHTENING AND CUTTING MACHINERY
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
Lewis Machine Co., 3450 E. 76th St., Cleveland, O.
Shuster, F. B., Co., The, New Haven, Conn.

WIRE WINDING MACHINES
Fidelity Machine Co., 3908-18 Frankford Ave., Philadelphia, Pa.

WRENCHES (Drop Forged)
Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

ZINC
New Jersey Zinc Co., 160 Front St., New York City.

ZINC ALLOYS
New Jersey Zinc Co., 160 Front St., New York City.

ZINC (Rolled Sheets, Strips, Coils)
New Jersey Zinc Co., 160 Front St., New York City.

ZIRCONIUM METAL AND ALLOYS
Electro Metallurgical Co., 30 E. 42nd St., New York City

USED and REBUILT EQUIPMENT
MATERIALS

WANTED

The following used equipment, specifications approximately as shown:

1—BRIDGE CRANE:

25-Ton Main Hoist
10-Ton Auxiliary Hoist
75 ft. to 78 ft. Span—30 ft. lift
Size of Bridge Rail—Approx. 100 lb.
12 ft. Clearance, Bridge Rail to Roof Truss
230 Volt, D.C. Motors

1—BRIDGE CRANE:

60-Ton Main Hoist, 32 ft. lift
15-Ton Auxiliary Hoist, 40 ft. lift
85 ft. 3½ in. Span
12 ft. Clearance, Bridge Rail to Roof Truss
Size of Bridge Rail—Approx. 100 lb.
230 Volt, D.C. Motors

1—YARD BRIDGE CRANE:

10 to 15-Ton Main Hoist, 35 ft. lift
About 90 ft. Span
230 Volt D.C. or 220 Volt, 3 phase, 60 cycle motors
Yard runway as follows may be included:
35 ft. base of column to top of bridge rail
Approximate length required—200 ft.

1—BRIDGE CRANE:

15-Ton Main Hoist—30 ft. lift
95'6" Span
Clearance above bridge rail—12 ft.
Size of Bridge Rail—approximately 100 lb.
230 Volt, D.C. Motors

1—PLATE SLITTING SHEAR:

To cut 1 in. thick plate
Knives to be 154" or longer
230 Volt D.C. or 220 Volt, 3 phase, 60 cycle Motors

Write to Box 705,
STEEL, Penton Bldg., Cleveland.

WANTED

2—12' Power Breaks—1/4" or heavier
1— 9' Bending Roll—3/8" or heavier
1—Hot saw—United or similar
2—Squaring shears, 10'-12'—1/4-1/2" cap.
1—Forge Hammer 4-10,000 lb.
6—Pouring Ladles, 4-8 tons

HETZ CONSTRUCTION CO. — PHONE: 4474 — WARREN, OHIO

RAILS
AND ACCESSORIES

RELAYING RAILS — Super-quality machine-reconditioned—not ordinary Relayers.
NEW RAILS, Angle and Splice Bars, Bolts, Nuts, Frogs, Switches, Tie Plates, and all other Track Accessories.

Although our tonnages are not as large as heretofore, most sizes are usually available from warehouse stocks.
Every effort made to take care of emergency requirements. *Phone, Write or Wire . . .*

L. B. FOSTER COMPANY, Inc.
PITTSBURGH NEW YORK CHICAGO

MAHR NEW and USED EQUIPMENT BARGAINS
For Immediate Delivery

QUENCH BELT

One (1) Audubon flexible metalwove conveyor belt (quench tank belt) 24" wide x 46' lg. chainweave type, 3 mesh, No. 14 W. & M. ga. (.080) dia. Audubon plain steel. Chain: one strand No. 660 chain mounted each side of belt. Chain provided with special boss attachments for insertion of 3/16" dia. Cross rod support through belt.....Used

RIVET FORGES

Four (4) No. 38 rivet forges. Sold with or without Immersion oil heater .....New
Three (3) No. 12 D forge stands..New

MAHR MANUFACTURING COMPANY
DIV. OF DIAMOND IRON WORKS, INC.
Minneapolis Minnesota

FOR SALE

BAR BENDERS

4 Benders—Operate on compressed air. Capacity 1¼" bars.
1 Electric Bar Bender—Complete with motor. Capacity 1¼" bars.

COMPRESSORS

1 Ingersoll Rand Compressor 880 Cu. feet complete with 440 V. 152 H.P. AC Motor and Starter. Air Receiver. Endless 50' Leather Belt.
1 Ingersoll Rand Compressor 1240 Cu. feet. Requires 200 H.P. Motor.

DERRICKS

3 All steel Derricks, 50 Ton capacity. 95' boom. Complete with guys, sheaves, and either Electric or Steam Hoist.

NIBBLER

New W. J. Savage Nibbler. ⅜" capacity. Complete with 220 V. Motor.

PLANER

48" x 48" x 14' 4 swivel heads. Excellent condition. Used for planing metal and also equipped with an extra arrangement to use as a Carborundum machine.

STEAM HAMMER

2000 lbs. Bement Niles No. 2654 complete with top and bottom dies.

SAW

Circular Metal Cutting Saw—handles 9 x 9 material.

WHEEL PRESSES

1—200 Ton Pittsburgh.

GLAZER IRON & METAL CO.
520-610 Chamberlain St. Knoxville, Tenn.

WANTED

STEEL BUILDINGS
With or Without Crane
RUNWAYS AND CRANES
STEEL TANKS
Of All Kinds
PIPE AND TUBES

Can Make Immediate Inspection

JOS. GREENSPON'S SON PIPE CORP.
National Stock Yards
(St. Clair Co.) Illinois

FOR SALE

1—20" Farrell-Birmingham Rolling Mill 3 High Stands Including Pinions.
1—12" Rolling Mill 3 High Pinion and 4 Stands.
1—400 H.P. Synchronous Motor 450 RPM.
500 H.P. Full Reduction Gear 3.7 to 1.

SCHNITZER STEEL PRODUCTS CO.
3300 N. W. Yeon Ave., Portland, Ore.

More for Your Dollar!

IRON & STEEL PRODUCTS, INC.
37 Years' Experience
13462 S. Brainard Ave., Chicago, Illinois
"Anything containing IRON or STEEL"
SELLERS — BUYERS — TRADERS

—REBUILT—
BLOWERS - FANS - EXHAUSTERS

Connersville-Roots positive blowers.
Centrifugals for gas and oil burning.
Sand blast, grinder and dust exhausters.
Ventilating fans and roof ventilators.

GENERAL BLOWER CO.
404 North Peoria St. Chicago, Ill.

Generator, Plating 6V 3500 Amps.
Grinder, Roll 30" x 76" Farrel, M.D.
Grinder, Knife 13' Bridgeport, M.D.
Lathe, Roll 42" x 20' United, M.D.
Lathe, 32" x 20' S-B, Grd. Hd., M.D.
Lathe, 42" x 20' N-H, Grd. Hd., M.D.
Pipe Machs. 2-4-6-8-12-18" Williams, M.D.
Saw, Friction Ryerson, 46" blades.
Straightener, 48" x 4" dia. McKay. 17 roll.
Shear, Niagara 10' x 14 gauge. B.D.

WEST PENN MACHINERY CO.
1208 House Bldg. Pittsburgh, Pa.

We Pay BEST PRICES for

Iron and Steel material and equipment; Industrial plants; Mills, railroads; trackage, etc. For highest offers, write

SONKEN-GALAMBA CORP.
108 N. 2d St. Kansas City, Kans.
We buy and sell. Get our quotations.

GEAR CUTTERS, Spur, 30", 40", M.D.
GEAR PLANERS, Bevel, 36" & 54" Gleason, M.D.
LATHES, 48" x 22-1/2' Johnson, triple geared, B.D.
LATHES, Grd. head, 27" x 11', 20" x 27', M.D.
PUNCH, Multiple "E" L & A, cap. 340 tons
SHEARS, Plate 72" x 1-1/4" United, M.D.
SHEAR, Plate No. 32 Wms. & White, 100" x 1"
SHEAR, Squaring 122" x 1/4" Wheeling, M.D.
SHEARS, Squaring 84" and 48" x 3/16", M.D.

LANG MACHINERY COMPANY
28th St. & A. V. R. R. Pittsburgh, Pa.

SKINNER ENGINE

Heavy Duty Side Crank Automatic—24" x 24" x 450 IHP Good Condition—may be inspected at Erie, Pennsylvania. Replaced by larger unit. For Further Details Write Box 703, STEEL, Penton Bldg., Cleveland.

USED and REBUILT EQUIPMENT MATERIALS

THE MORECO BARGAIN CORNER

230 Volt D.C. Adjustable Speed Motors

100 HP. Gen. Elec. LC, 365/525 RPM
25 HP. Gen. Elec. LC, 525/1050 RPM
25 HP. Gen. Elec. RC-13 775/1550 RPM
16½ HP. Gen. Elec. LC, 176/352 RPM
16 HP. Gen. Elec. RC-13 550/1650 RPM
15 HP. Reliance F-953, 725/1025 RPM
10 HP. Westinghouse SK, 400/1600 RPM

THE MOTOR REPAIR & MFG. CO.
1558 Hamilton Ave. Cleveland, Ohio

FOR SALE

1—Heyl-Patterson Coal Bridge or Gantry 2½ Ton with bucket. 5 ton without. 200' span—57' height—230 V. DC
3—133 HP Sterling Boilers
5—250 HP Sterling Boilers
1—300 K.W. Turbo Generator Set. 230 V. DC

HETZ CONSTRUCTION CO. — PHONE: 4474 — WARREN, OHIO

WHEN THERE IS SOMETHING . . .

you want to buy or sell, use the classified pages to tell other readers. Write STEEL, Penton Bldg., Cleveland.

FOR SALE

Hydraulic Riveting Machines, 48" throat, 1½" daylight.
400 lb. Air or Steam-Operated Drop hammer.
No. 3 Williams, White Bulldozer.
Canton Portable Alligator Shears.
2", 4" & 8" Bolt & Pipe Threading Machines.
Metal Cleaning Machines.

Address Box 490
STEEL, Penton Bldg., Cleveland

CLASSIFIED

Help Wanted

WANTED METALLURGIST

Modern manufacturing plant located in South has opening for Metallurgist experienced in cast steel and iron foundry practice. Please give age, education, experience and salary desired. Address Box 704, STEEL, Penton Bldg., Cleveland.

WANTED: GENERAL SUPERINTENDENT for Sheet and Steel Plate Fabricating Shop. Good Salary and future for person that can produce. Plant located in Texas. Address Box 693, STEEL, Penton Bldg., Cleveland.

Help Wanted

WANTED: MAN WITH GENERAL OFFICE or field sales experience by large reputable manufacturer of seamless and electric welded tubing, alloy and carbon steels. Please apply giving full information, experience, etc. to Box 708, STEEL, Penton Bldg., Cleveland.

NIGHT TURN SUPERINTENDENT AND General Molding Foreman wanted by a prominent Electric Steel Foundry. Address Box 699, STEEL, Penton Bldg., Cleveland.

Help Wanted

WANTED: IN JOBBING FOUNDRY LOcated in Eastern Pennsylvania, producing steel castings, acid electric process, ranging from 1 lb. to 3 tons, a man who is thoroughly familiar with heading and gating and has a good knowledge of molding and core making and is capable of handling men; acting in the capacity of assistant to foundry superintendent. In reply, please state age, experience and salary desired. Address Box 685, STEEL, Penton Bldg., Cleveland.

Employment Service

EXECUTIVE POSITIONS

$3600—$25,000

If you have earned $3000 and up, are a man of high integrity and ability who has reached a ceiling in salary or promotion within your own company, you will be interested in this Licensed and Bonded Executive Placement Service. Completely confidential, it permits you to register on our executive list without any initial cost whatever for the purpose of being available for calls to higher positions in the salary brackets from $3600 to $25,000—depending on your ability. Only cost for service is after actual placement has been made. Send detailed experience in first letter; application will be sent if selected.

PERSONNEL ADVANCEMENT BUREAU
Grant Bldg., Pittsburgh, Pa.

CONTRACT WORK

KIRK & BLUM

WELDED MACHINE BASES, PEDESTALS and FRAMES
LATHE PANS
GEAR and BELT GUARDS
Pressed Steel Louver Panels and Cover Plates

THE KIRK & BLUM MFG. CO.
2822 Spring Grove Ave., Cincinnati, Ohio

Send your inquiries for
SPECIAL ENGINEERING WORK
to the
A. H. NILSON MACHINE COMPANY, BRIDGEPORT, CONN.
designers and builders of wire and ribbon stock forming machines.
We also solicit your bids for cam milling

Castings

NORTH WALES MACHINE CO., INC., North Wales, Pa. Grey Iron, Nickel, Chrome, Molybdenum Alloys, Semi-steel. Superior quality machine and hand molded sand blast and tumbled.

SALARIED POSITIONS—$2,500 to $25,000. This advertising service of 32 years' recognized standing negotiates for positions of calibre indicated. Procedure individualized to your personal requirements. Retaining fee protected by refund provision. Identity covered. If salary has been $2,500 or more send for details. R. W. Bixby, Inc., 110 Delward Bldg., Buffalo, N. Y.

ADVERTISING INDEX

Where-to-Buy Products Index carried in first issue of month.

ADVERTISING INDEX

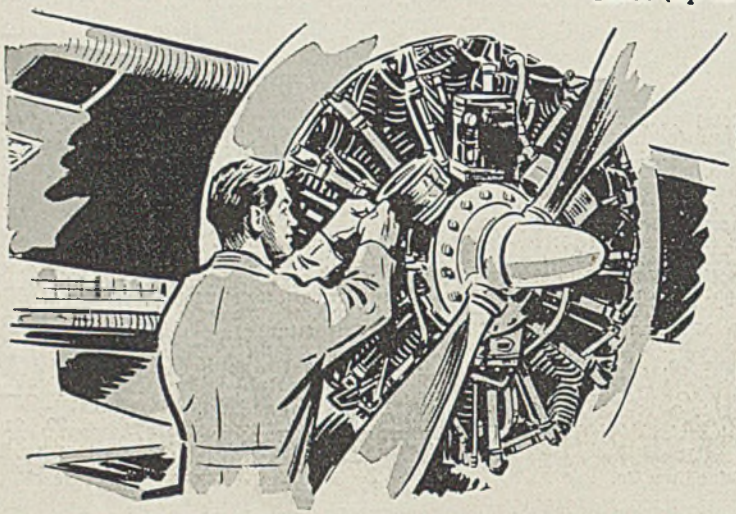
Where-to-Buy Products Index carried in first issue of month.

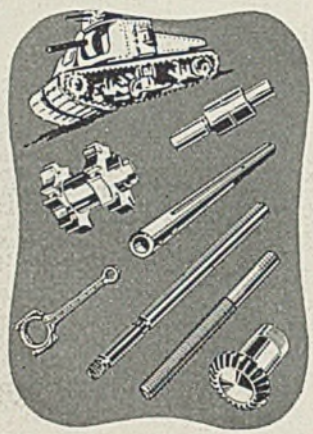
Save steel
Make machinery last longer!

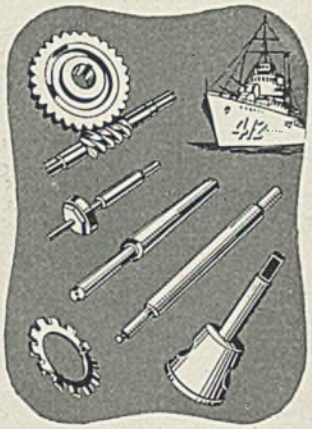
To save steel and make machine parts more durable without increase of weight use

NITRALLOY

Nitrided Nitralloy produces the hardest steel surface known (up to 1200 Vickers), allows control of core properties, retains its physical characteristics even at sustained high temperatures (up to 1100° F).

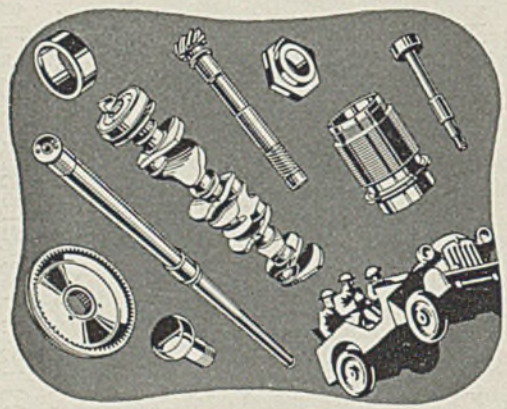






Nitralloy is daily demonstrating its life-extending resistance to wear and fatigue in high-speed aircraft engine cylinders; in bushings, gudgeons, spacers and plates of tanks; in motor trucks, marine equipment and industrial machinery of many types.

Conserve steel, labor, power, transportation, and plant capacity by prolonging the life of war material and machine tools by using Nitrided Nitralloy.



NITRIDING is the process of case hardening certain alloy steels by means of a nitrogenous medium, such as ammonia gas. The alloy steels that are most suitable for Nitriding are known as **NITRALLOY**

This new, enlarged edition of the Technical Nitralloy Data Booklet is yours on request to us or to any of the licensees listed below. Please write on your business stationery.

THE NITRALLOY CORPORATION
230 PARK AVENUE NEW YORK, N. Y.

Companies Licensed by The Nitralloy Corp.

ALLEGHENY LUDLUM STEEL CORP. WATERVLIET, N. Y.
BETHLEHEM STEEL CO. BETHLEHEM, PA.
COPPERWELD STEEL CO. WARREN, O.
CRUCIBLE STEEL CO. OF AMERICA NEW YORK, N. Y.
FIRTH-STERLING STEEL CO. McKEESPORT, PA.
REPUBLIC STEEL CORPORATION, CLEVELAND, O.
THE TIMKEN ROLLER BEARING CO., CANTON, O.
VANADIUM-ALLOYS STEEL CO. PITTSBURGH, PA.
ATLAS STEEL LIMITED. WELLAND, ONTARIO

Operating and Accredited Nitriding Agents

CAMDEN FORGE CO. CAMDEN, N. J.
COMMERCIAL STEEL TREATING CORP. DETROIT, MICH.
THE LAKESIDE STEEL IMPROVEMENT CO. CLEVELAND, O.
LINDBERG STEEL TREATING CO., CHICAGO, ILL.
LINK-BELT CO. PHILADELPHIA, PA.
MET-LAB, INC. PHILADELPHIA, PA.
NEW ENGLAND METALLURGICAL CORP. BOSTON, MASS.
PITTSBURGH COMMERCIAL HEAT TREATING CO. PITTSBURGH, PA.
QUEEN CITY STEEL TREATING CO. CINCINNATI, O.
WESLEY STEEL TREATING CO. MILWAUKEE, WIS.
ONTARIO RESEARCH FOUNDATION TORONTO, ONTARIO, CANADA

Manufacturers of Nitralloy Steel Castings

LEBANON STEEL FOUNDRY. LEBANON, PA.
EMPIRE STEEL CASTINGS CO. READING, PA.
THE MASSILLON STEEL CASTING CO. MASSILLON, O.
MILWAUKEE STEEL FOUNDRY CO. MILWAUKEE, WIS.
WARMAN STEEL CASTING CO. LOS ANGELES, CAL.

2221