STEEL

ESTABLISHED 1882

Contents

Volume 109—No. 22 **December 1, 1941**

PRODUCTION • PROCESSING • DISTRIBUTION • USE

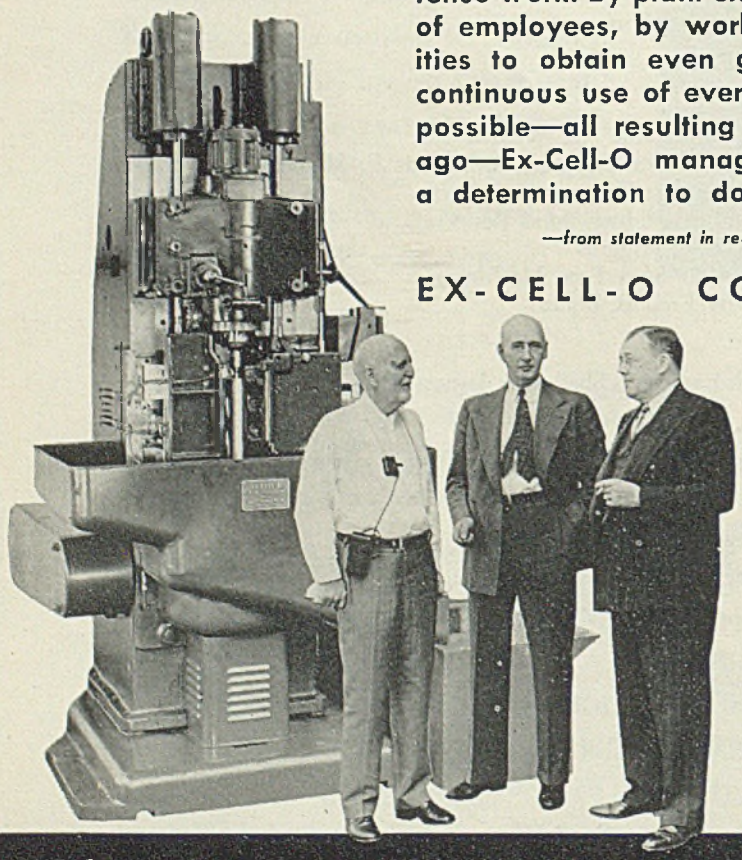
by Ex-Cell-O, has been a major factor in stepping up the standard accuracy and production for modern industry. Below is section of of Ex-Cell-O's assembly lines for the production of Precision Thr Grinders (Ex-Cell-O makes eight different styles of Precision Thr Grinders, enabling manufacturers to select machines exactly suited their requirements). The assembly line shown is located in one several additions recently made to Ex-Cell-O's three plants in Det

"EX-CELL-O started early in the day . . .

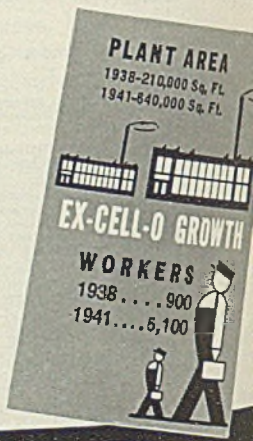
. . . to do its part in supplying precision machine tools urgently needed for d fense work. By plant expansion on a large scale, by more than doubling the numb of employees, by working three shifts a day, by rearrangement of factory faci ities to obtain even greater efficiency, by installation of new equipment an continuous use of every machine, and by subcontracting to other shops wherev possible—all resulting in an output many times what it was only a year or s ago—Ex-Cell-O management and men have translated into worthwhile actio a determination to do their full share in building up this country's defense.

—from statement in recent issue of Ex-Cell-O TOOL TIPS by Phil Huber, President of Ex-Cell-O Corporation

EX-CELL-O CORPORATION • DETROIT, MICHIGA



Early in 1935 Ex-Cell-O was already working closely with national authorities in the development of precision machines that are now operating day and night in Government arsenals and plants of private industry—in volume production of materials required to safeguard America. Recognized then, as now, as a pioneer in the designing and building of machine tools that operate to the most practical degree of accuracy and efficiency, Ex-Cell-O was asked to bring its engineering and manufacturing skill to the task of developing a shell-turning lathe—and later a horizontal-type rifling machine—that would incorporate advanced features required by the Ordnance Department. . . . Here is shown a picture of shell-turning lathe, designed and built by Ex-Cell-O in association with Alex Dow, Chief of the Detroit Ordnance District, to left in group, with Phil Huber, President and General Manager of Ex-Cell-O, to right, and Thor M. Olson, Ex-Cell-O's Vice-President, in center.



Precision THREAD GRINDING, BORING AND LAPPING MACHINES, TOOL GRINDERS, HYDRAULIC POWER UNITS, GRINDING SPINDLES, BROACHES, CUTTING TOOLS, DRILL JIG BUSHINGS, PARTS

XLO

HIGHLIGHTING THIS ISSUE OF STEEL

■ THE NEXT few months will see a gradual easing of shortage problems, because **(p. 37)** recent experiences have taught the national administration a better appreciation of industry's normal distribution systems, predicts E. L. Shaner, STEEL's editor-in-chief. The new Production Requirements Plan, which replaces the former Defense Supplies Rating Plan, is expected to have such an effect. Under it **(p. 29)** the amount of paper work in filling defense orders will be reduced substantially. To obtain assistance manufacturers must fill in PD-25A and the sooner they take such action the sooner they will receive such assistance. The new plan was described to thousands of manufacturers at priorities clinics held last week **(p. 59)** in Pittsburgh, Cleveland and Detroit.

♦ ♦ ♦

OPM Given New Powers

OPM now has power **(p. 45)** to requisition materials and property; lead and tin foil no longer may be used to wrap tobacco, candy; builders of heat treating furnaces have an A-1-c rating. . . . OPM defines meanings of the terms "minor improvements" and "minor capital additions" **(p. 41)** used in Preference Rating Order P-46; hardships under Limitation Order L-4 will be relieved. . . . Titanium dioxide **(p. 44)** is under allocations; preference orders covering pig iron, steel, steel warehouses, special steels have been extended to Dec. 31, 1942. . . . General Allocations Order No. 1, covering all plate mill products, goes into effect **(p. 115)** Dec. 1; a new PD-1 form will permit extensions to suppliers; Preference Rating Order P-31 has been extended to May 30, 1942.

♦ ♦ ♦

Chromium Use Curtailed

All manufacturers **(p. 59)** should read carefully Priorities Regulation No. 1; steel cartridge cases now are beyond development and have reached the limited production stage. . . . Allocation of export steel not included in lease-lend and aid to Canada **(p. 58)** is expected soon. . . . Arthur G. McKee **(p. 58)** recommends establishment of a central board to schedule iron and steel products to the mills qualified to roll them. . . . Use of chromium and chromium steels **(p. 33)** is sharply curbed. . . . Vacuum cleaner production **(p. 40)** is to be cut 10 per cent; price ceilings have been set over second hand drums and small electrical appliances; Preference Rating Order P-22 does not cover packaging material. . . . The Columbia Steel and Copperweld Steel expansion programs **(p. 34)** have been approved.

♦ ♦ ♦

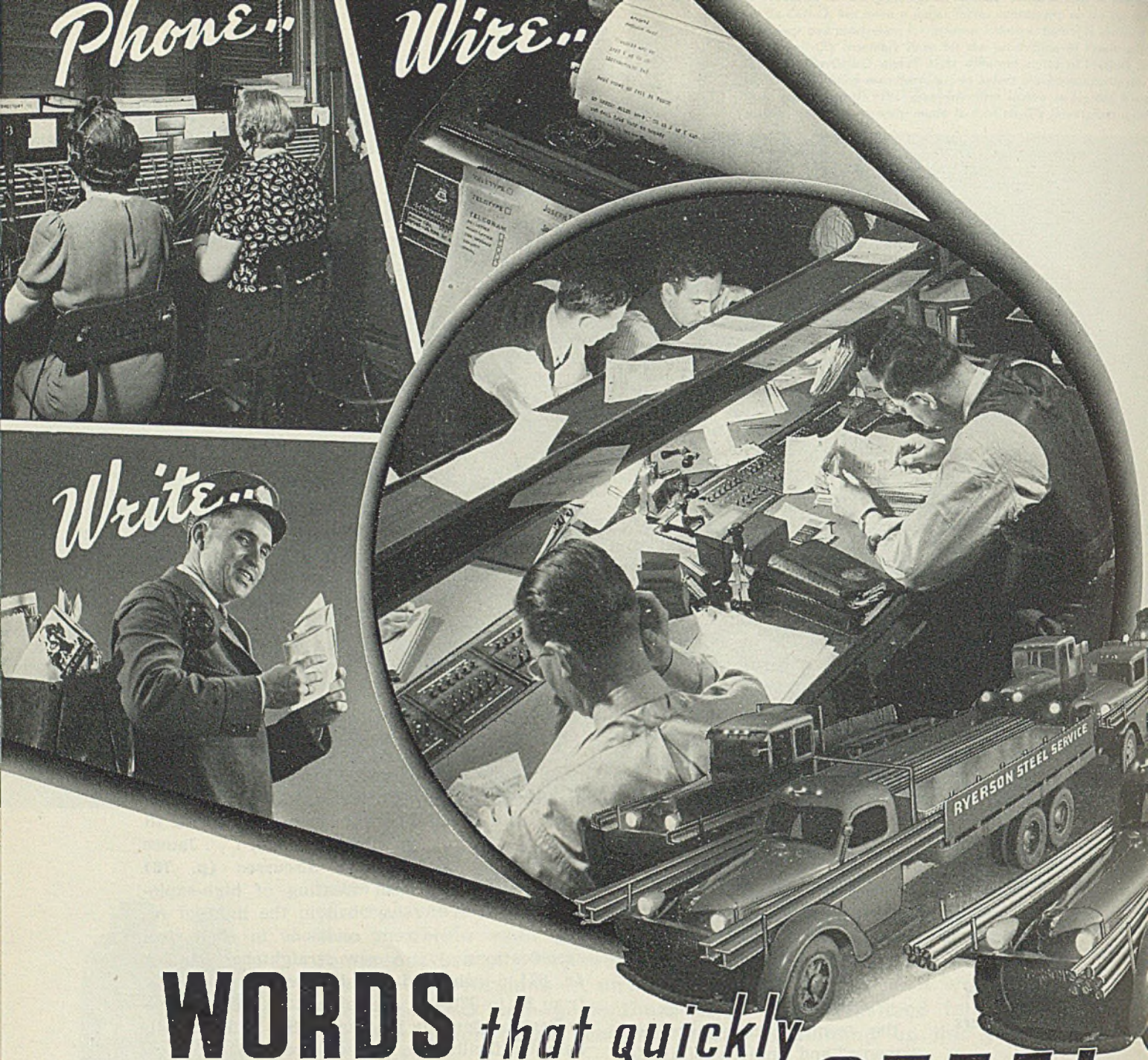
Small Arms Ammunition

Ammunition for modern small arms is analyzed **(p. 65)** by Professor Macconochie who gives data on 40 different types from 6.5 to 13 millimeter in size. . . . James McElgin discusses **(p. 70)** heat treating of high-explosive shell in the light of recent revisions in shell steel specifications. . . . A new straightener handles **(p. 82)** 6-inch solid rounds, operates at speeds from 80 to 320 feet per minute. . . . One of the largest bonderizing layouts **(p. 85)** is fitted with handling facilities to reduce processing time. . . . A new book covering rebuilding of used machine tools **(p. 86)** is quite timely.

♦ ♦ ♦

Stopper Rod Drying Oven

H. T. Klein describes **(p. 93)** an inexpensive oven for drying stopper rods that employs slag for the heating medium. Entire setup costs only a small amount. . . . Fred R. Bonte follows his article of Nov. 24 on graphitic steels with a discussion **(p. 96)** of some of their more important applications. . . . Graphic records can be used as a valuable and accurate quality control in welding, according to Harold Lawrence who explains **(p. 76)** their method of application. . . . B. J. Higgins gives some details **(p. 88)** on manufacture of tinned tubing. . . . An explanation is given **(p. 90)** to show how addition of bismuth makes stainless steel free machining.



WORDS *that quickly turn to* STEEL

SUBMIT your steel requirements to this experienced, highly-specialized source. Telephone, wire, or write—however you communicate, you'll get action and effective co-operation.

If you phone, experienced operators connect you, *without waiting*, with a Ryerson steel man, a man who talks *your language*. Wires are received by teletype, direct from central telegraph offices. Mail is picked up hourly at the post office, a *faster service* than special delivery.

In almost a matter of minutes, your words have become steel — steel that is on its way back to serve you.

Rapid handling of incoming orders is typical of Ryerson service in *every department*. It matches large and varied Ryerson stocks and Ryerson Certified Quality — an unequalled service to American Industry. Because many sizes are low or even missing, "Open orders" are advisable during the emergency. Stock list sent promptly on request.

Joseph T. Ryerson & Son, Inc., Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.

RYERSON CERTIFIED STEELS

RYERSON *Certified* STEELS

Production Requirements Plan Offers Blanket Ratings to More Manufacturers

✦

New procedure replaces Defense Supplies Rating Plan, but covers wider field . . . Number of applications required will be reduced . . . May cover all or part of materials needs

✦

WASHINGTON

■ "PRODUCTION Requirements Plan," a streamlined procedure for extending priority assistance to manufacturers engaged in essential production, was announced last week by the OPM Division of Priorities.

Replacing the Defense Supplies Rating Plan under which priority ratings were given to certain producers who found it necessary to schedule production in advance of receiving orders, the new plan will have a much wider application. A larger number of producers will be eligible for limited blanket ratings, provided they can show that a substantial proportion of their production in recent months has been essential to the defense program.

The new plan will help manufacturers of products needed for defense or essential civilian use to obtain priority ratings which will cover their materials requirements for three months at a time. Under the new plan, the number of separate applications for priority assistance to expedite single orders will be reduced to a minimum.

Applications filed in accordance with the Production Requirements Plan will contain information needed by the Office of Production Management for a clear picture of existing inventories and prospective needs for scarce materials.

A manufacturer who applies for priority assistance under the Production Requirements Plan will show the type and volume of products he has been making, their use in relation to defense or essential civilian needs, the amount of scarce materials he has on hand, and the additional amounts he will require to fill his production schedule for the next calendar quarter.

In determining what priority may be granted to the applicant, the Priorities Division will take into account (1) the amount of defense or essential civilian production involved, (2) the end use of the products, (3) the materials required for production, (4) the overall policies of the Supply Priorities and Allocations Board, and (5) the recommendations of the appropriate industrial branches of the OPM.

After considering all of these factors, the Priorities Division will be able to grant the manufacturer a preference rating, geared to his needs and the importance of his products, which can be used continuously over a calendar quarter to obtain critical materials.

Requires Fewer Applications

Ratings under the new plan may apply to all or to any specified part of the producer's materials requirements. If all of the products covered in his application are destined for defense or essential civilian use, he may be given a priority rating covering 100 per cent of his needs. In other cases the rating may apply only to the percentage of his materials requirements which will be directly incorporated in products regarded as being of basic importance in defense or in the national economy.

It is expected that this new device will permit an eligible manufacturer to use his rating to get all of the materials covered, and he will not have to bother to apply for aid by filling out PD-1's (the standard application form for an individual rating) or to extend each of the individual ratings on the orders he receives.

Before the inauguration of the Production Requirements Plan, a manufacturer whose products were used partly by the Army and Navy, partly by defense plants or by vital public services such as municipal fire and police departments, and partly by ordinary civilian industry might have had high priority ratings on some of his orders, lower ratings on others, and no rating at all on the rest.

The net result was that he had to use a number of different processes in order to operate. The only courses open to him were to extend the high ratings on his orders in each individual case, or to use the Defense Supplies Rating Plan which gave him an A-10 rating for his defense orders only, or to make many separate applications.

The new plan will simplify this substantially. The manufacturer will first obtain form PD-25A. On this form he will show the kind and volume of products he has been making, the priority rating of orders he has filled in a recent quarter, the destination or end use of his products, and the inventory of materials which he has on hand, together with his anticipated materials requirements for the next calendar quarter.

As this information is obtained from all manufacturers handling defense or essential civilian orders, the Office of Production Management will be able to build up an overall picture of materials use and prospective requirements for defense.

When the picture is reasonably complete, it will be possible to assign priority ratings with more exact relationship to the importance of a particular manufacturer's product and the total volume of materials available.

The new plan is to be applied first on a company basis. It is expected to form the foundation for similar plans on an industry basis as rapidly as the overall needs of the various industries are known in the OPM.

Since the anticipated requirements of a manufacturer may change if the pattern of his defense orders changes during a calendar quarter, the Production Requirements Plan provides that interim reports may be filed. The first quarter for which applications under the new plan will be received is from Jan. 1 to March 31, 1942.

May File for Two Quarters

Where necessary because of long-term commitments or the nature of his business, a manufacturer may file an additional application covering the second quarter at the same time he files for the first. All applications must be for calendar quarters, however, so that the information obtained by the OPM will be uniform as to dates.

A list of critical materials known as Materials List No. 1 is part of the plan. The preference rating granted may be used only to obtain materials on this list except when other items are specifically named on the form in a section provided for that purpose.

The rating will apply only to materials needed for defense or essential civilian production, and cannot be used to obtain capital equipment. Such capital items—for example, machine tools and other production goods—must be obtained in the usual way by filling out application form PD-1, if they cannot be obtained without aid.

Application form PD-25A, available from the Priorities Division and its field offices, see page 44, may be reproduced by anyone who wants to use it so long as it is reproduced exactly in its original form, size, color, and phraseology.

All communications and applications should be addressed to the Production Requirements Plan Section, Division of Priorities, Office of Production Management.

An applicant granted a rating under the plan serves the rating on his suppliers by a prescribed endorsement on his purchase orders.

Suppliers of the applicant may extend the rating to obtain delivery of materials which are to be physically incorporated in the applicant's products, in accordance with the terms of the preference rating order issued in connection with the plan.

No preference ratings other than those authorized in form PD-25A may be used by the producer operating under the plan to obtain deliveries of production materials or maintenance, repair and operating supplies unless specific authorization is granted.

Form PD-25A has been designed to enable the manufacturer to present a complete picture of his operations in relation to defense and essential civilian needs, and to state his production requirements for these purposes.

Applicant should report information on the basis of the smallest breakdown of their operations which existing inventory records permit. If it is not practicable to make application for each separate class of products, the form may be submitted for a department, division or plant.

Use Present Inventory Records

Existing inventory records determine the breakdown by classes of products. For example, if one inventory is maintained and one class of products manufactured, one application should be submitted. If two inventories are maintained and two or more classes of products manufactured, two applications should be submitted, and so forth.

Five copies of each application are required.

The earlier PD-25A is submitted the earlier the manufacturer will receive priority assistance.

Sections of PD-25A include: B, classes of products manufactured by applicant for which application is made; C, inventory report covering classes of products included in section B; D, report of analysis of total dollar volume of shipments; E, report of all materials shown on Materials List No. 1 incorporated in products included in section B; F, report of other materials for which a preference rating is requested; G, report of supplies (maintenance, repair and operating); H, total materials and supplies to be purchased.

Scrap from the Library

■ WASHINGTON: Scrap metal from the staid halls of the Library of Congress was removed last week "to alleviate the steel shortage." Total from this one building alone was 150 tons. Metal also was removed from other government buildings. Navy yard will melt it. NEA photo

Refrigeration Exposition To Be Held Jan. 12-15

■ Directors of the Refrigerator Equipment Manufacturers Association recently voted down a suggestion the fourth All-Industry Refrigeration and Air Conditioning Exhibition be suspended, and announced the show will be held at Stevens hotel, Chicago, Jan. 12-15.

Commitments already received indicate the exhibition may surpass prior shows in number of exhibits. Aside from new developments in refrigeration and air conditioning, the industry's part in military and civilian defense will be stressed.

Coal Strike Cost: 21,000 Tons Steel; 20,000 Tons Iron; 10,000 Tons Coke

PITTSBURGH

■ LOSSES caused by the recent strike totaled 21,000 tons of open-hearth steel, 20,000 tons of pig iron, 10,000 tons of by-product coke and nearly a week's output from 4000 beehive coke ovens.

All operating units were back to normal by last Thursday. The last to regain normalcy were the beehive coke plants which were hampered by lack of coal stocks and also by the fact that ovens had been allowed to cool.

Most vital point in the strike was the largest by-product coke plant in the world, Clairton works of Carnegie-Illinois Steel Corp. Coal stocks at this plant are now sufficient for only five days' operation. Because of the vast amount of coal required to operate this plant which consumes 35,000 tons daily, shipments must be made by river barge. The Carnegie-Illinois river fleet which was tied up by the strike will require 60 days' operation at capacity to rebuild stocks at the coke works to normal supply. Rail shipments may augment the supply.

Shipment losses during the strike amounted to 250,000 tons of coal. All blast furnaces made idle by the strike have resumed as have the open hearths that were affected. All the blast furnaces were operated by Carnegie-Illinois and they resumed production Nov. 24. This includes one stack at South works, Chicago, taken off Nov. 19; one at Gary, Ind., works, off Nov. 20; four in the Pittsburgh district, off Nov. 19; and five additional Pittsburgh stacks banked Nov. 21. (This compilation does not include the three southern furnaces which were banked).

Total production lost amounted to 44 furnace days. Independent producers were unaffected by the strike although stocks of coal and coke reached low levels before new shipments began to flow in last week.

Operations were reported normal by commercial coal operators in the Pittsburgh district, with demand for deliveries heavy.

Efforts were made last week by coal mine operators to have railroads divert additional cars into the area temporarily in order to aid replenishment of coal stocks at beehive ovens and to industrial consumers.

Arbitration Board Seeks Solution to Mine Dispute

The three-member arbitration board which is seeking a solution to the captive mine dispute started sessions last week, had reached no agreement by late Friday.

Uncertainty as to whether or not the steel companies owning the captive mines would accept the board's decision as binding was expressed.

Dr. John R. Steelman sent telegrams to nine companies asking these questions:

"Do you accept the decision of the arbitration board as binding on your company?

"Do you desire that your statement before the full National Defense Mediation Board as of Nov. 3 or Nov. 4 is a complete statement of your position in respect to the controversy?

"Do you wish to appear before the board?"

Questioned at his Friday press conference as to whether he had heard whether the steel companies would abide by the arbitration board's decision, President Roosevelt said he had had no direct communication from any of them and that all he knew was what he had read in the newspapers.

Meanwhile four congressional committees—the labor and judiciary groups in each house—prepared antistrike measures.

Labor organizations rose to oppose all the restrictive proposals.

Charles R. Hook, president, American Rolling Mill Co., Middletown, O., representing the National Association of Manufacturers, told the house labor committee he opposed compulsory arbitration but suggested that compulsory mediation might be required.

■ Arbitration board appointed by the President to decide the captive coal mine issue in session in New York last week. Left to right, Benjamin F. Fairless, president, United States Steel Corp.; Dr. John R. Steelman, chairman of the arbitration board and director, United States Conciliation Service, representing the public; and John L. Lewis, president, United Mine Workers. NEA photo

SWOC Asks Exclusive Bargaining Pact at Gary

Steel Workers Organizing Committee-CIO has filed a petition with the National Labor Relations Board asking exclusive bargaining rights for 33,000 Carnegie-Illinois Steel Corp. workers in the sheet and tin mills and steelworks at Gary, Ind.

SWOC at present has a contract with the company which affects only its own membership, which, however, is largely in the majority.

Week's Strikes Cause Loss of 5,076,060 Man-Hours

Total of man-hours lost through 13 strikes involving workers in defense plants in the week ended Nov. 21 was 5,076,060, according to a compilation by the National Association of Manufacturers. The survey, covered only strikes reported in metropolitan newspapers and did not purport to cover all work stoppages in progress.

In four weeks ended Nov. 21, total of man-hours lost was 9,817,344, equal to 1,252,168 man-days. This result of the current "strikes as usual" policy, the association declared, was but slightly less than the average monthly man-days lost for all strikes in 1939. In that year, "sitdown strikes" resulted in more

work stoppages than at any time since 1929.

The national defense program has suffered few, if any, such serious setbacks in one week's time as it did in the period ended Nov. 21, the association asserted. In virtually every strike recorded, the lost production was a hindrance to another plant or project dependent upon the strike-bound firm for supplies or materials.

Estimating 4,784,000 man-hours lost during the coal strike, coal production diminished 2,990,000 tons in one week. Because the mines had been operating at capacity, this production cannot be made up until after the national emergency is ended, it is reported.

Summary of the association's compilation:

Week Ended	Number of Strikes	Men Involved	Man-Hours Lost in Week
Nov. 21	13	222,821	5,076,060
Nov. 14	14	15,084	414,184
Nov. 7	25	23,370	918,940
Oct. 31	9	73,910	3,408,160
Total			9,817,344

Pay Bonuses to 3000

National Enameling & Stamping Co., Milwaukee, has announced bonuses totaling $202,000 will be distributed to 3000 production workers Dec. 15. Employes who have worked for the past year will receive 5 per cent of their earnings during that period. Those not on the active payroll but who were employed by the company for more than six months, also will receive 5 per cent of their earnings. Company plants are located in Granite City, Ill., Milwaukee, Baltimore and New York.

New York Scrap Workers Granted 5-Cent Pay Increase

Increase of five cents an hour in the basic wage for the scrap iron and steel industry in New York was announced last week by a board of arbitration to which had been submitted earlier a revision of a labor contract between the New York chapter, Institute of Scrap Iron and Steel Inc., and a local AFL union.

The three arbitrators also signed a separate resolution and included a recommendation in their signed award, that both employers and the union should seek jointly from the Office of Price Administration a revision of either the scrap ceiling prices for New York, or modification of the section of the price schedule which fixes cost of scrap preparation.

This was made in view of the arbitrators' opinion such margin is insufficient, "and more particularly so in light of the wage adjustments hereby granted."

Effective for one year from Oct. 1, 1941, the amended wage schedule provides a minimum wage for the industry of 62½ cents per hour.

Benjamin Schwartz, former director general of the institute, represented the New York chapter at the arbitration hearings.

Living Cost Advances Trail Hourly Wage Increase

Hourly wage rate increases have advanced more rapidly than have living costs, according to a report by the National Association of Manufacturers. Since January, 1941, living costs have increased 5.6 per cent, while the average hourly earnings have advanced 11.3 per cent. Net result has been a 5.3 per cent increase in the purchasing power of average hourly earings.

Steel Strikers Declare Truce "Over the Week-End"

■ Negotiations for a settlement of the wage dispute at Columbia Steel Co.'s Pittsburg, Calif., plant were in progress last week.

To recapitulate: 218 finishers in the foundry department asked for a raise of 15 to 25 cents an hour. They went out on strike Thursday, Nov. 20. Employes in other departments went out "in sympathy"; then there were 3200 idle, and operations were suspended. Pickets were posted, as illustrated. The plant was working on defense material for shipyards.

A 24-hour truce in the strike was declared over that week-end. Tuesday evening, Nov. 25, the employes returned, after having been instructed by David J. McDonald, SWOC national secretary, to resume work and to negotiate. NEA photo

Estimates Coke Output as 65,000,000 Tons for 1941

■ Production of by-product and beehive coke for the first nine months this year totaled 47,980,221 net tons, 16 per cent more than during the corresponding period last year, the Bureau of the Census reports. Production has been sufficient to meet increased demand of the national defense program. Since a large proportion of this increase should be maintained to the close of the year, the Bureau believes, owing to increased steel demand and new coke capacity due to come into operation soon, probable total production in 1941 will exceed 65,000,000 tons, largest in history.

Data gathered by the Bureau indicates that by the end of 1941 potential annual coke producing capacity will be about 72,000,000 tons. Of this capacity 2,000,000 to 3,000,000 tons represent beehive ovens needing repair.

Coke stocks on hand at by-product coke plants Oct. 1 were 1,587,650 net tons, equivalent to about 10 days' production at the September rate. Stocks of coking coal at these plants Oct. 1 totaled 7,291,698 tons, about 32 days' supply. Stocks at the same date last year were 2,057,536 tons of coke, 13 days' supply, and 8,860,532 tons of coal, 40.2 days' supply.

Coke consumption by principal uses in 1940 was as follows: Blast furnaces, 74 per cent; foundry use, 3.5 per cent; water gas, 4 per cent; other industrial use, 3 per cent; domestic, 14 per cent; producer gas, 1.5 per cent.

Chromium Control Tightened by New Priorities Division Orders

WASHINGTON

■ USE of chromium and chrome steel were sharply curtailed by two orders issued by the Priorities Division last week.

The first, M-18-a, places in the hands of the Director of Priorities direction of all deliveries of chromium. The second, an amendment to M-21-a, prohibits the manufacture and delivery of alloy iron or steel containing 4 per cent or more chromium except on A-10 or higher preference ratings.

Effect of the two orders will be to retain for defense manufacture all the high chromium content alloy steel produced after Dec. 1, and to earmark for defense the nation's stock of chromium.

Three Main Provisions

Main provisions of the amendment to M-21-a are:

Except under a specific rating of A-10 or higher, or specific permission of the Director of Priorities, no producer shall process beyond ingot, bloom, billet, sheet, bar or slab, or after Dec. 1, deliver, any alloy iron or alloy steel containing 4 per cent or more chromium.

The Director of Priorities may issue directions allowing or forbidding specific deliveries of chrome alloy steel.

The Director of Priorities may issue other specifications in regard to chrome steel, or on any other alloy of steel.

Main provisions of M-18-a are:

Full control of deliveries of chromium is lodged in the Director of Priorities and monthly requests for chromium must be made to producers.

The aggregate chromium oxide content of chemicals is limited in each month to one-twelfth the amount of ore used in chemicals actually delivered in the 12 months ended June 30, 1941.

The order revokes Order M-18, issued July 7, 1941, and amended Aug. 22. It became effective Nov. 29.

Chromium has three general uses, in manufacture of stainless and hardened steel, as a refractory in the manufacture of steel, and in the chemical industry for tanning leather and also as a dye pigment.

Approximately 55 per cent of the total chromium supply in 1941 was used for alloying steel, with refractory use second in volume. More than 70 per cent of metallic chromium currently is being used for defense and essential civilian purposes.

While domestic production of chromium has increased greatly since the start of the defense program, more than 90 per cent of all our chromium must be imported.

A. I. Henderson May Be New Iron, Steel Section Chief

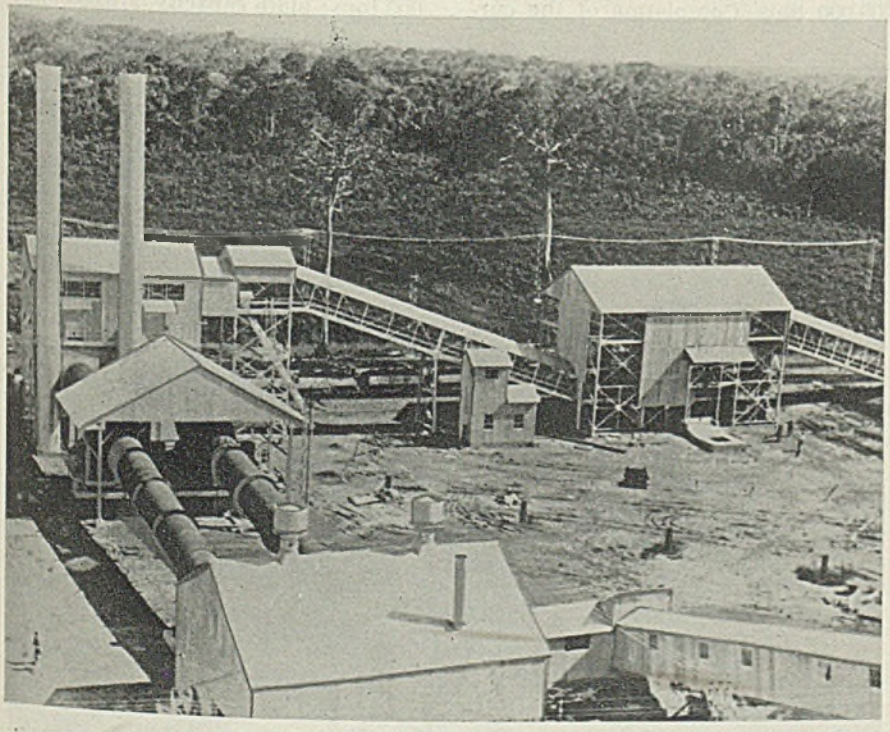
Alex I. Henderson is being mentioned as successor to Arthur D. Whiteside as chief of the Iron and Steel Branch of OPM. Mr. Henderson at present is deputy chief of the Materials Division under W. L. Batt.

Before joining the defense organization, Mr. Henderson was an attorney in New York.

Frank Purnell, president, Youngstown Sheet & Tube Co., has decided definitely against accepting the position. Mr. Purnell, who had often been mentioned for the job, made his decision after conferring with Washington officials last week.

Alex Taub, Pontiac, Mich., engineer, has been appointed chief of the conversion section of the OPM Division of Contract Distribution. He will direct the development and execution of program for the conversion of additional industries from nondefense to defense production.

U. S. Troops To Guard This Surinam Bauxite Mine



■ Bauxite mining installations on the Surinam river in Dutch Guiana to be guarded by American troops, in fulfillment of the agreement announced by the White House last week. More than 60 per cent of the American aluminum industry's requirements are reported supplied from the Dutch Guiana bauxite mines. NEA photo

Report U.S. Buys All Argentine Tungsten

■ Metals Reserve Co. has entered into a three-year contract for all of Argentina's tungsten up to a maximum of 3000 net tons annually, according to the *New York Times* correspondent at Buenos Aires. The base price will be $21 per unit for concentrates of a specified quality, with deductions or bonuses for lower or higher grades.

According to New York information, Argentina normally produces about 1200 tons and now has production up to 1400 to 1500 tons. It is considered doubtful if Argentina will be able to obtain an output of much more than 2000 tons. Normally the Argentine output went largely to Europe. Since the outbreak of the war Japan has been an increasing buyer, although for several months the United States has been entering the picture more actively. The new contract is similar to that entered into last summer with Bolivia, although the United States has agreed to take the entire Bolivian output, which is estimated at about 4000 tons annually.

Columbia Steel Co.'s Expansion at Provo, Utah, To Cost $126,000,000

■ COLUMBIA Steel Co., United States Steel Corp.'s West coast subsidiary, has been authorized to construct additional facilities near Provo, Utah, at a cost of $91,000,000, to be used in the production of pig iron, steel and steel plates.

These facilities, with the two blast furnaces at Provo provided in a contract between Defense Plant Corp. and Columbia Steel last October and which are estimated to cost $35,000,000, will have an estimated annual capacity of 1,450,000 tons of pig iron, 840,000 tons of open hearth ingots, and 500,000 tons of plates.

Total cost of the facilities, which will be owned by Defense Plant Corp., will be $126,000,000.

Defense Plant Corp. to date has authorized the following expansions:

Carnegie-Illinois Steel Corp. for plants at Braddock, Pa., $22,000,000.

Carnegie-Illinois for plants at Homestead, Pa., and Duquesne, Pa., $85,000,000.

Columbia Steel at Provo, $91,000,000.

Columbia Steel at Provo for blast furnaces, $35,000,000.

Republic Steel Corp. for additions at Cleveland, Youngstown, Warren, O., and Birmingham, Ala., $58,312,000.

Bethlehem Steel Co. for expansions at Bethlehem, Pa., Steelton, Pa., Sparrows Point, Md., and Lackawanna, N. Y., $55,777,000.

Inland Steel Co., Chicago, $34,000,000.

Grand total authorized, $391,089,000.

Bethlehem Lights New 1200-Ton Blast Furnace

Bethlehem Steel Co., Bethlehem, Pa., lighted its new H blast furnace at the Lackawanna, N. Y., plant Nov. 22, increasing the number of stacks at that works to six. Reported by the company to be one of the world's largest blast furnaces, the new stack has a rated daily capacity of 1200 tons and cost more than $1,500,000.

Height of the furnace is 105 feet; hearth diameter, 27 feet; thickness of plate forming shell, one inch; thickness of lining at hearth jacket, 4 feet 1½ inches; thickness of lining above mantle, 4 feet 10½ inches.

Raw materials requirements, for normal operations, will be 2160 tons iron ore, 384 tons limestone and 996 tons coke daily. Volume of air required will be 80,000 cubic feet at 22 pounds pressure per minute.

A new indicating device, it is said, will automatically show to what height the furnace is charged. Elevator of 6000 pounds capacity will take men and equipment to the top platform.

Iron production at the Lackawanna plant will not be greatly increased at present by addition of this unit, company officials declared, as two of the five old stacks will be taken off for relining in the near future. Blowers on the old furnaces will be used on the new stack until a turboblower outfit is received. Construction of the furnace was started in March.

Report Additional 15,000,000 Tons Pig Iron Capacity Needed

Increase of 15,000,000 tons per year in pig iron capacity will be required by the proposed expansion in steel ingot facilities, it was reported last week by OPM's Steel Expansion Unit. The estimate of additional pig iron capacity requirements was based on a survey worked out by the unit.

Steel ingot capacity in June, 1941, according to the survey, totaled 86,000,000 tons. Facilities comprising an additional 3,000,000 tons were reported under construction, to increase the aggregate to 89,000,000 tons. To this total, the unit was told to add another 10,000,000 tons. Completion of the current expansion program would give United States an ingot capacity totaling 99,000,000 tons.

Steel mills, according to the expansion unit's figures, will have a buying capacity totaling 18,000,000 tons of scrap, and will need 72,000,000 tons pig iron. The industry's pig iron capacity, as of June 30, was 57,830,610 tons.

Thirty-six more blast furnaces would have to be constructed to provide the added pig iron tonnage. Half that many, it is reported, have already been provided for by private financing and the Defense Plant Corp.

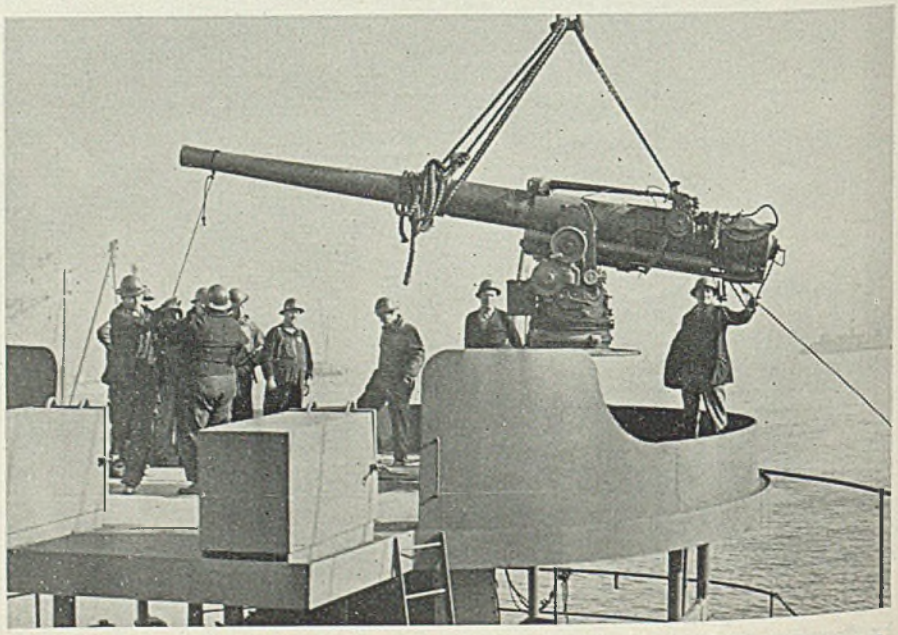
New OPM Section Established To Expedite Blast Furnaces

Don Watkins and Tom Page have been appointed heads of a new OPM section under R. C. Allen, head of the raw materials division, to expedite the construction of new blast furnaces. Several groups have been working on this project and the new section was established to co-ordinate efforts.

Pig Iron and Plate Capacity At Houston Plant Authorized

Defense Plant Corp. last Friday announced it had authorized a contract with Sheffield Steel Corp. of Texas, subsidiary of the American Rolling Mill Co., to build a blast furnace ,and a rolling mill for plates on the Houston Ship canal, near Houston, Tex., to cost $22,670,855. Annual pig iron capacity will be 274,000 tons; plate capacity, 216,000 tons.

Mounting Deck Guns on American Merchantmen



■ Deck guns were hoisted aboard American merchant ships in Hoboken, N. J., last week, to be ready for service in a few days, under the revised neutrality act. NEA photo

Sheffield will operate them under a five-year contract, title to be retained by Defense Plant Corp.

This project ties in with the construction of a steel plant to have annual capacity for 200,000 tons of ingots, for which the Reconstruction Finance Corp., authorized a loan of $12,000,000 early this year. This is under construction.

Copperweld To Build Two Electric Furnaces at Warren

Copperweld Steel Co., Glassport, Pa., has executed contracts with the Defense Plant Corp. for the construction of additional electric steel facilities at the company's Warren, O., plant, it was reported last week. Two electric melting furnaces with combined annual capacity of approximately 85,000 tons are to be installed together with added finishing facilities which will expand and diversify Copperweld's products.

Total cost of the proposed expansion is estimated at nearly $4,000,000. Title to the new facilities will be retained by Defense Plant Corp. Contracts for erection of buildings and installation of foundations have been awarded to Uhl Construction Co., Pittsburgh.

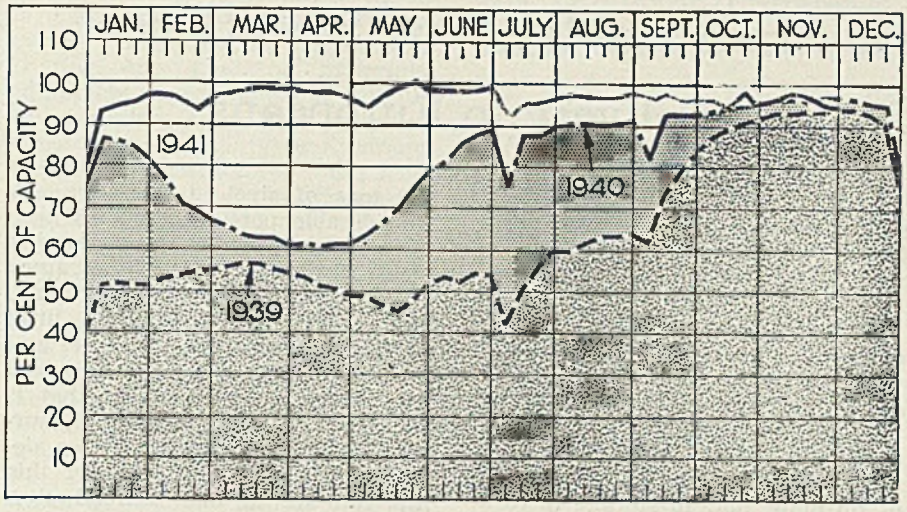
New Plant To Produce Synthetic Magnesite

■ Northwest Magnesite Co., Pittsburgh, jointly owned by Harbison-Walker Refractories Co. and General Refractories Co., has acquired rights in the United States to use the Chesny process of producing synthetic magnesite for refractory purposes. The company has acquired a large site at Cape May Point, N. J., and extensive dolomite deposits in eastern Pennsylvania.

A plant will be built at Cape May Point, the first unit to have capacity of 40,000 net tons annually. Plans are made for addition of other units as needed. The plant will be financed entirely by the company. OPM has granted priorities to permit the plant to be completed in six months.

The Chesny process has been used on a large scale in England and has rendered that country independent of natural magnesite formerly imported from Austria and Manchuria. The new plant gives reason for believing any possible demands for magnesite in the basic steel industry can be adequately met as they occur.

■ Malleable iron castings produced in September totaled 69,175 net tons, compared with 68,570 tons in August and 49,804 tons in September, 1940, the Bureau of the Census reports. Nine months production this year was 620,693 tons, against 385,758 tons in the corresponding period, 1940.



PRODUCTION . . . . Down

■ PRODUCTION of open hearth, bessemer and electric furnace ingots last week dropped ½-point to 95 per cent, the aftermath of the coal strike. Six districts declined, three advanced and three were unchanged. A year ago the rate was 97 per cent; two years ago it was 94 per cent.

Chicago — Four plants taking equipment off for repair brought a decline of 2 points to 99½ per cent. Except for the week ending Oct. 11, the Chicago rate has not been below 100 per cent since the week ending May 3. Inland Steel Co. will cut production 10 per cent this week because of scrap shortage.

Wheeling—Gained 10 points to 92 per cent, due to resumption by a plant down the previous week.

Detroit—Slight change in active equipment dropped the rate 1 point to 95 per cent.

Central eastern seaboard—Removal of two hearths by one interest cut the rate 1 point to 90 per cent. Further curtailment is expected as scrap supply dwindles.

Cleveland—Addition of an open hearth all week and another part of the week increased production 3½ points to 95½ per cent.

St. Louis—Removal of an open hearth for repair reduced the rate 4½ points to 93½ per cent. Scrap scarcity is expected to cause further reductions soon.

Pittsburgh—Down 3 points to 96 per cent as result of coal strike.

Birmingham, Ala.—Unchanged at 90 per cent with 22 open hearths in production.

Cincinnati—One open hearth was removed for repair, cutting the rate 4 points to 87½ per cent.

New England—Increased 8 points to 100 per cent, all open hearths resuming after repairs.

Buffalo—Held at 79 per cent for fourth week. Pig iron output is increased by new Bethlehem stack.

Youngstown, O.—With 72 open hearths and three bessemers active the rate was steady at 88 per cent.

District Steel Rates

Percentage of Ingot Capacity Engaged In Leading Districts

	Week ended Nov. 29	Change	Same week 1940	Same week 1939
Pittsburgh	96	— 3	97	94
Chicago	99.5	— 2	99.5	94
Eastern Pa.	90	— 1	94	88
Youngstown	88	None	93	92
Wheeling	92	+10	98.5	93
Cleveland	95.5	+ 3.5	89	90
Buffalo	79	None	95.5	93
Birmingham	90	None	100	94
New England	100	+ 8	82	100
Cincinnati	87.5	— 4	91.5	80
St. Louis	93.5	— 4.5	87.5	81
Detroit	95	— 1	97	93
Average	95	— 0.5	97	94

Estimate Scrap Melt at 52,000,000 Tons in 1941

■ Consumption of steel and iron scrap in October was 4,649,000 gross tons, just short of the all-time record of 4,662,000 tons set in March, this year, according to the Institute of Scrap Iron and Steel Inc. The October tonnage was moderately above 4,392,000 tons consumed in September and 4,233,000 tons in October, 1940.

In the first ten months of 1941 total consumption is estimated by the Institute at 44,507,000 tons, compared with 33,815,000 tons in the comparable period in 1940 and 24,693,000 tons in the like period, 1939. The Institute estimates that total consumption for 1941 will approximate 52,000,000 tons, which will compare with the previous record of 41,687,000 tons in 1940 and with 26,800,000 tons in 1917, the first World war record year.

Government May Seize Steel Once Sold for Delivery to Europeans

NEW YORK

■ WHAT may be the first move in the requisition by the government of a heavy tonnage of miscellaneous steel products in the metropolitan district—originally purchased for shipment to European countries which later came under control of Germany—is indicated by the reported plan of the Office of Export Control, Washington, to take over $65,000 to $100,000 worth of tin plate, now in storage in New York warehouses.

According to Washington reports, the Office plans to appear before the federal courts in New York within a few days for such action.

The tin plate is said to represent part of a consignment ordered some time ago by one of the Balkan countries and is a comparatively small part of 144,000 boxes reported as being held under similar circumstances in warehouses in various parts of the country.

In some quarters it is believed this step will be followed later by the government in confiscating what may amount to close to 200,000 tons of steel in this area. A considerable portion originally was intended for France. Much of this steel has been held here since France's surrender to Germany. Some of the steel has had little protection from the weather and is said to have become pitted and corroded to such an extent that it could not serve its original purpose. Some informed sources declare 2500 to 3000 carloads of this material are at one railroad storage yard alone.

The amount of tin plate likely to be requisitioned here is relatively small—something like 18,000 base boxes, according to trade estimates. In view of the high premiums offered for the material earlier in the summer, it is surprising that this much is lying around. In June and July offers were reported made by foreign buyers as high as $33 per double box, seaboard. This compares with the established price of $10.70 per double box, or $5.35 per single box, in the domestic market.

No business was reported at $35, although sales of 1000 boxes were reported as high as $24. One lot of 1000 boxes was sold third-hand at this level after having been bought, second-hand, at $18.

As the summer progressed and there was increasing talk of a ceiling on resale export prices—talk that persists today—offerings tapered, although it is understood that even now offerings of $20 to $22 are made for scattered lots.

Incidentally, the premiums did not really begin to soar until early summer. In May, for instance, a lot of 75,000 to 80,000 base boxes originally intended for shipment to Continental Europe, was sold by a local bank at a moderate premium of about $1.50 per box.

Barge Canal Shipments Off 272,000 Tons in 1941

■ Net tonnage moved over the 800-mile New York barge canal system in the season just ended declined 272,000 tons from the aggregate last year. The decrease was said to be due largely to a shortage of sea-going vessels in the coastwise trade.

Pig iron shipments on the canals were down 95,000 tons, semifinished and finished steels, 87,000 tons. Scrap shipments, however, were 24,000 tons greater than in 1940, and combined ore movement was up 84,000 tons.

Eight Months' Iron and Steel Imports Only 14,314 Tons

■ Iron and steel imports in August, excluding scrap, increased to 1975 tons, valued at $462,232, from July tonnage of 1631, valued at $219,276, comparing with 2089 tons, valued at $516,187, in August, 1940.

Department of Commerce's compilations of August figures were delayed by pressure of other work, and consequently were not ready for publication until several weeks later than usual.

Cumulative imports for eight months were 14,314 tons, valued at $2,429,584, compared with 44,267 tons, valued at $5,367,590 in the like period in 1940.

Rails and track material formed the largest item in August, 607 tons, all from Canada. Flat wire and steel strip, 493 tons, all from Sweden, was second, and ferromanganese, 385 tons, all from Canada, was third. Canada was chief supplier with 1390 tons, followed by Sweden with 517 tons. The United Kingdom and Norway supplied the remainder.

Imports of scrap totaled 16,405 tons, an increase of 6987 tons over 9418 tons in July and compares with 16 tons in August, 1940. Canada supplied 8803 tons and Cuba 5523 tons, with small lots from the Netherlands West Indies, Surinam, Haiti, Mexico, Turkey and Russia.

U. S. FOREIGN TRADE IN IRON AND STEEL, INCLUDING SCRAP

Gross Tons

	1941		1940	
	Exports	Imports	Exports	Imports
Jan.	698,853	423	583,521	8,274
Feb.	600,240	796	671,301	6.740
Mar.	567,227	6,273	663,980	5,096
April	635,809	4,286	612,906	6,674
May	472,734	5,633	783,964	7,759
June	457,685	10,190	936,047	5,505
July	537,921	11,049	1,034,938	3,542
Aug.	697,732	18,380	1,402,075	2,105
Sept.	706,580	.....	1,221,052	2,598
Oct.	.....	.....	1,105,510	3,966
Nov.	.....	.....	788,176	980
Dec.	.....	.....	805,158	4,064
Tot.	.....	.....	10,608,628	57,303

ORIGIN OF AUGUST IMPORTS

Gross Tons

	Iron ore	Manganese ore	Ferromanganese
Canada	41,937	.....	385
Mexico	127	.....	.....
Cuba	19,626	9,908	.....
Chile	130,800	736	.....
Newfoundland	6,265	.....	.....
Brazil	24,700	21,391	.....
British India	.....	13,750	.....
Philippine Islands	.....	4,091	.....
South Africa	.....	3,040	.....
Gold Coast	.....	9,649	.....
Total	223,455	63,465	385

	Sheets, skelp and sawplate	Structural steel	Steel bars
Canada	1	.....	.....
United Kingdom	.....	9	.....
France	.....	.....	79
Sweden	.....	.....	16
Total	1	9	95

IRON AND STEEL PRODUCTS IMPORTED

Gross Tons

Articles	Aug. 1941	Aug. 1940	Jan.-Aug. 1941
Pig iron	.....	382	.....
Sponge iron	.....	1	23
Ferromanganese[1]	385	267	393
Spiegeleisen	15	75	2,941
Ferrochrome[2]	3	..	72
Ferrosilicon[3]	125	105	2,330
Other ferroalloys[4]	1	....	1
Steel ingots, blooms, etc.	60	....	61
Billets, solid or hollow	.....	....	56
Concrete reinforc. bars	...	....	3
Hollow bar, drill steel	7	10	160
Bars, solid or hollow	95	43	297
Iron slabs	.....	.....	.....
Iron bars	.....	.....	15
Wire rods	.....	5	105
Boiler and other plate (including skelp)	40	1	49
Sheets, skelp, saw plate	1	11	45
Die blocks or blanks, etc.	1	.....	9
Tin plate, taggers' tin and terneplate	.....	6	69
Structural shapes	9	19	61
Sashes and frames	11	.....	192
Sheet piling	.....	.....	.....
Rails and track material	607	28	4,114
Cast-iron pipe, fittings	.....	.....	.....
Malleable iron pipe fittings	.....	.....	.....
Welded pipe	.....	.....	.....
Other pipe	80	190	748
Cotton ties	.....	.....	.....
Other hoops and bands	.....	.....	.....
Barbed wire	.....	.....	.....
Round iron, steel wire	1	43	29
Teleg., telephone wire	.....	.....	.....
Flat wire, steel strips	493	396	2,172
Wire rope and strand	.....	19	92
Other wire	.....	.....	1
Nails, tacks, and staples	1	2	23
Bolts, nuts, and rivets	2	1	28
Horse and mule shoes	.....	.....	.....
Castings and forgings	38	35	223
Total	1,975	2,089	14,314
Iron and steel scrap	16,405	16	42,716
GRAND TOTAL	18,380	2,105	57,030

[1] Manganese content. [2] Chrome content. [3] Silicon content. [4] Alloy content.

Distribution Emerging From "Boy Scout" Stage

■ The next few months will see a gradual easing of shortage problems, because recent experiences have taught the national administration a better appreciation of industry's normal distribution systems, E. L. Shaner, president, Penton Publishing Co., and editor-in-chief, STEEL, stated last week, at a meeting of the Cleveland Association of Purchasing Agents.

Mr. Shaner said that other factors leading to this easing of shortages were a more realistic administration of defense activity and the development of better distribution. Tracing the history of defense activities in the United States, he asserted that the national hysteria about shortages which American industry experienced last summer came as a result of the government's attempt to put a ceiling on prices of some materials, which came concurrently with Washington's warnings about imminent shortages, seizure of private industry, and restrictions on civilian goods.

"Now, more than 90 days after the peak of confusion in priorities, signs of a moderate improvement in distribution are beginning to appear. The entire system of controlling the flow of materials, equipment and supplies is definitely emerging from the boy-scout stage into the reality of a serious business proposition. . . . We have been forced to see that the distribution of the current output of industry is the key to most of our supply problems".

The government had also learned that defense had to be fitted to industry's tested system of distribution, rather than that industry's method of distribution should be altered to fit an academic theory of defense procedure. Furthermore we are shifting from priorities, which do not take into account the volume of supply, toward allocation, with consideration for the amount available. The result is a brighter outlook for the defense program.

Mr. Shaner emphasized the fact 1800 mill supply houses in the United States play a large part in safeguarding the defense program, providing a cushion against variation in supply and demand.

More than 500 purchasing agents and representatives of mill supply houses attended.

Crucible Steel Receives Navy "E" Pennant

■ Navy Department last week presented the coveted "E" pennant and Bureau of Ordnance flag to the Atha Works of Crucible Steel Co. of America in a ceremony witnessed by 7000 employes and citizens at Harrison, N. J.

Atha Works is one of the outstanding ordnance producers in the country. Its contracts for the United States armed forces, Great Britain and Canada total between $80,000,000 and $100,000,000. Photo shows, left to right, front row, A. E. Van Cleve, Atha Works manager; Rear Admiral H. G. Bowen, Federal Shipbuilding & Dry Dock Co., Kearny, N. J.; Rear Admiral H. P. Blandy, chief of the Bureau of Ordnance in Washington; Mayor F. B. Gassert of Harrison; and F. B. Hufnagel, chairman of the board of Crucible.

Six Thousand Employes At Bethlehem Ceremony

BETHLEHEM, PA.

■ Colorful ceremonies marked the presentation of the Bureau of Ordnance flag and Navy "E" to the local plant of the Bethlehem Steel Co., here last week.

The award was made in what was described as the "largest single shop in America's oldest and largest armament plant." It was in this shop in the early 90's that "the first guns and armament were made for the beginning of a modern United States Navy," according to R. A. Lewis, general manager of the plant.

Before more than 6000 employes grouped at one end of the 1500-foot unit, with many perched on the girders and at other points of vantage, Admiral A. E. Watson made the official presentation of the two emblems to Mr. Lewis, "in recognition of outstanding effort in the production of ordnance materials vital to national defense."

Presiding, Mr. Lewis welcomed the guests and high ranking naval officials, while Mayor Robert Pfeifle bid them welcome to Bethlehem. Witnessing the ceremonies also were leading officials of the Bethlehem corporation, headed by Eugene G. Grace, president.

J. M. Sylvester, assistant general manager, acted as master of ceremonies, which included addresses by Senator James J. Davis and Representative Francis E. Walter, of Pennsylvania.

Back of the speakers' platform, which provided seats for 250 guests, was a large American flag, which spanned the entire main section. This and a profusion of bunting gave a gala touch to the grim and businesslike surroundings. Music was provided by the Lehigh university band.

Mr. Walter said that ever since 1887, less than 100 years after the establishment of the present government in Washington, "the people have looked to Bethlehem for guns and armor in an emergency."

He emphasized the responsibility imposed by the work at Bethlehem and warned that "the blessings of liberty can and will be lost if there is any serious interruption in the production of those implements of modern warfare enemies of Hitlerism must produce with free labor."

Senator Davis, one time Secretary of Labor, sounded a similar note, when he said: "If differences arise, arbitrate, conciliate, mediate—but keep working; production is vital!"

Following the ceremonies, Admiral Watson and his staff visited the new $23,000,000 forging plant, which will more than double the local plant's capacity for specialty products for the Navy.

MEN of INDUSTRY

■ **O. W. YOUNG,** general manufacturing manager, Buick Motor Division of General Motors Corp., Flint, Mich., has been named executive assistant to Harlow H. Curtice, general manager, in charge of all manufacturing, a new post created to coordinate all automotive and defense manufacturing operations.

Other changes and promotions in the Buick organization are:

W. N. Larke, general superintendent, becomes manager of manufacturing in charge of Flint operations; **B. H. Newell,** heretofore assistant general superintendent, has been appointed general superintendent in charge of automobile production; **A. R. Middleton,** formerly superintendent of the sheet metal plant, becomes assistant general superintendent of automobile production; and **James Langford** succeeds Mr. Middleton as superintendent, sheet metal plant.

Fred Letts, the past several months in charge of aviation engine manufacturing operations, has been made general superintendent of all Buick defense production in Flint. **Fred W. Moore,** heretofore superintendent of tool room, will be assistant general superintendent of defense operations. Succeeding Mr. Moore as superintendent of tool room will be **Norman Harvey,** while **Henry Jackson** has been named assistant tool room superintendent.

Fred Pyper, master mechanic, has been named general master mechanic. **Homer Schultz,** assistant master mechanic, has been promoted to master mechanic and he will be assisted by **James H. Nelson.**

John A. Hoholik, assistant superintendent of the axle plant, has been named to the new post of tank manufacture, while **F. W. Hertrick** has become divisional engineer of tank manufacture and **Stephen A. Bendure,** chief inspector of that division.

Frank A. Henny has been made assistant superintendent of tank production, and **Carl A. Savage,** assistant superintendent of the axle plant, replacing Mr. Hoholik.

♦

Eugene Bouton, since 1928 supervisor of production standards, tractor plant, J. I. Case Co., Racine, Wis., has resigned to become associated with the OPM office in Milwaukee.

♦

W. P. Childs, 845 Memorial drive, S. E., Atlanta, Ga., has been appointed representative in that area by Progressive Welder Co., Detroit, to handle the company's line of resistance welding equipment.

♦

Charles G. Wallis has been appointed works manager, Westinghouse Electric Elevator Co., Jersey City, N. J., succeeding **Ellis L. Spray,** recently named manager of a new Westinghouse plant near Philadelphia.

♦

Wilber H. Winters, vice president, American Brake Shoe & Foundry Co., New York, has resigned to direct the handling of a $12,000,000 government order for antiaircraft gun mounts placed with members of the American Washer and Ironer Manufacturers' Association.

♦

Paul M. Lockwood has been appointed general sales manager, Kron Co., Bridgeport, Conn. Mr. Lockwood has for several years been a member of the managerial staff of Worthington Pump & Machinery Corp., Harrison, N. J.

♦

Stewart McDonald, chairman of the board, Maryland Casualty Co., Baltimore, and **E. E. Tross,** works manager, United Engineering & Foundry Co., Youngstown, O., have been elected directors, Federal Machine & Welder Co., Warren, O., increasing the board from three to five members.

♦

A. A. Bull has been elected president, Michigan Wire Cloth Co., Detroit. He formerly was president, Handy Governor Corp. Other new officers of the company are: **S. W. Farnsworth,** New York, treasurer, and **Harold A. Wilson,** vice president and general manager. **W. H. Blodgett** continues to head the sales department.

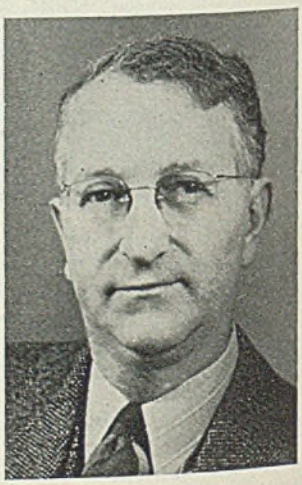
♦

L. C. McAnly, for several years in charge of manufacture, Rockwood Mfg. Co., Indianapolis, has been appointed works manager, Fruehauf Trailer Co., Detroit. Following graduation from Purdue

O. W. Young

B. H. Newell

A. R. Middleton



W. N. Larke

University in 1917 he joined the Rockwood company, starting in the purchasing department. He was factory superintendent from 1920 until 1934 at which time he joined Maytag Co., Newton, Iowa, as assistant factory manager. He returned to the Rockwood organization in 1936 as factory manager.

♦

R. V. Mann, heretofore assistant to the president, Carpenter Steel Co., Reading, Pa., has been named general sales manager. Mr. Mann joined Carpenter Steel in 1911, resigning in 1917 to enter the United States Army. Following two years of service as a captain in the Ordnance Department, he returned to civilian life as district sales manager, Peerless Drawn Steel Co., and in 1925 returned to Carpenter as assistant to the president.

O. V. Greene, assistant metallurgist of Carpenter Steel, has been appointed manager of tool steel sales. He has been associated with the company since 1928.

O. V. Greene

♦

Paul K. Povlsen has been elected vice president in charge of production, J. I. Case Co., Racine, Wis. Mr. Povlsen, who joined the company last January as assistant to the president, succeeds **H. H. Biggert,** resigned. He formerly was associated with New York Telephone Co., New Jersey Bell Telephone Co., and Diehl Mfg. Co.

♦

Herman W. Steinkraus, vice president and a director, Bridgeport Brass Co., Bridgeport, Conn., has been elected general manager. He continues as vice president and a director.

♦

P. H. MacGregor, for several years general manufacturing manager of Pontiac Motor Division automobile plants at Pontiac, Mich., has been named assistant to the general manager in charge of production for both automotive and defense activities. **Stanley Ostrander,** formerly general plant superintendent, becomes plant manager in charge of automotive production. **Robert H. Ahlers** continues as manager of defense production.

R. V. Mann

William Vann is advanced from chief inspector to assistant plant manager, while **O. F. Marsal** has been promoted from general supervisor to chief inspector, and **Ray Powers** becomes assistant chief inspector.

Similar changes have been made in the department of purchases and supplies. **F. J. McLaughlin,** veteran Pontiac purchasing agent, becomes assistant to general manager in charge of all supplies, both automotive and defense. **Fred Gordon,** formerly an assistant purchasing agent, becomes automotive purchasing agent, with **Martin Rummel** as assistant automotive purchasing agent.

L. Redford Jr. continues as defense purchasing agent under Mr. McLaughlin, with **H. F. Decker** as assistant defense purchasing agent.

♦

A. A. Gustafson, the past year and a half employed by the United States government as a safety engineer organizing and directing safety divisions for federal works projects, has been appointed director of personnel and safety for Buda Co., Harvey, Ill.

♦

K. E. Dinius has been appointed chief engineer, South works, Carnegie-Illinois Steel Corp., South Chicago, Ill. He joined the South works in 1924 as a repair man in the electrical department, serving in that capacity until 1929 when he was made testing engineer. In 1935 he became superintendent, electrical department, and a year later was transferred to the engineering department as an electrical engineer.

♦

Gregory Jamieson Comstock, associate professor, has been appointed professor of powder metallurgy, Stevens Institute of Technology, Hoboken, N. J. **Eugene D. Polushkin,** assistant professor, has been named associate professor of powder metallurgy, and **Thomas H. Lashar** has been made instructor in this subject.

♦

J. M. Chapple, until recently associated with the Detroit office of Lincoln Electric Co., Cleveland, has been placed in charge of the company's newly established offices in Jacksonville, Fla.

H. W. Steinkraus

Unite To Seek Defense Work for Small Shops

■ Cincinnati Tool and Die Manufacturers' Association was formed recently in Cincinnati to function as a contact agency with OPM in a collective effort to acquire defense business for small shops, it was reported last week.

Officers include H. T. Colling, president; Mathew Rubendunst, vice president; William R. Steltentohl, secretary; S. D. Kreager, treasurer. Together with Carl Kloos, Herbert C. Murrer and K. R. Knowlton, the officers comprise the new body's board of directors.

$100,000,000 Insurance For 65,000 Employes

■ International Harvester Co., Chicago, has adopted a group life insurance plan under which employes receive paid-up insurance which belongs to them individually, regardless of whether they remain in the service of the company or not.

Approved by 80 per cent of the employes, the plan will go into force Jan. 1, providing approximately $100,000,000 life insurance for 65,000 employes. The company estimates cost of the new plan, plus additional sickness, accident and hospital protection, at $76,000 a year.

An existing group plan, under which term life insurance will remain in force during employment by the company, will be continued.

Windows of WASHINGTON

Contract Distribution Division organization to follow state lines . . . Army transports carrying scrap metal to this country . . Tacoma Narrows bridge to be salvaged . . . Iron and steel preference orders extended . . . OPM delegated authority to requisition materials and property . . . Priority assistance granted to manufacturers of heat treating furnaces . . . Lead, tin foil wrappings banned

By L. M. LAMM
Washington Editor, STEEL

WASHINGTON

■ TEN PER CENT cut in production by large manufacturers of vacuum cleaners for household use has been ordered by the Priorities Division.

The reduction is based on average monthly factory sales for the 12 months ended June 30, and covers the period from Oct. 1 to Dec. 31, 1941.

Curtailment of the vacuum cleaner industry is relatively small compared to cuts ordered for other consumers' durable goods industries. Vacuum cleaners require only small amounts of raw materials. The industry has a high ratio of employment compared with the amount of materials consumed.

Total steel consumption by the industry in 1940 was less than 10,000 tons, while factory employes numbered approximately 8500. The comparative factory employment figures per 1000 tons of annual steel consumption are approximately 850 in the vacuum cleaner industry, as against 100 in the domestic mechanical refrigerator industry and 140 in the washing machine industry.

Maximum Prices Established For Second-Hand Steel Drums

Prices of second-hand steel drums will be brought down sharply in a schedule of ceiling prices announced by OPA.

As compared with a price of $2.72 each for new containers, reconditioned standard steel drums of 55-gallon capacity have been selling in Eastern markets at from $3.50 to $4.50. The OPA schedule, effective Dec. 1, sets a maximum delivered price of $2.25 each for used containers of this type.

P-22 Cannot Be Used To Obtain Packaging Material

Containers Branch of OPM has pointed out that packaging material may not be obtained with the assistance of Preference Rating Order P-22, commonly known as the Maintenance and Repair Order.

It was emphasized that no packaging materials are included under this order, and that no preference rating under it can be applied for the obtaining or placing of purchasing orders for any packaging material.

Study Stabilization of Mining Machinery Prices

A meeting of manufacturers of mining machinery was held last week with Leon Henderson, administrator of OPA, looking to stabilization of mining machinery and equipment prices.

Producers have before them a request from Mr. Henderson to refrain from advancing prices, which has been pending for some time. As a result of the meeting, a decision will follow whether or not a price ceiling on such machinery is necessary.

Army Transports Carrying Scrap Metals to U. S.

First arrival of off-shore scrap metal, under a new procedure instituted by the War Department, has been reported, with between 2½ and 3 tons of secondary aluminum scrap from the Philippine Islands being docked at San Francisco.

The plan is to load incoming Army transports from Manila or other outlying sources touched by American vessels, with any available metal, carrying it as ballast, or tucked in wherever cargo room can be found.

Asks Maintenance of Prices on Small Electrical Applicances

Requests to refrain from advancing prices of small domestic

Highspots of the Week's Washington News

Production Requirements Plan formulated to facilitate priority assistance for defense and essential civilian manufacturers; uses Form PD-25A; replaces Defense Supplies Rating Plan (p. 29).

Automobile replacement parts limitation order amended to alleviate hardships (p. 41).

Titanium dioxide placed under full priority control (p. 44).

Steel, pig iron preference orders, M-21, M-21a, M-21b and M-17, extended to Dec. 31, 1942 (p. 44).

Foundry equipment and repair parts order, P-31, extended to May 30, 1942 (p. 44).

OPM granted authority to requisition materials and property (p. 45).

Lead and tin foil wrappings prohibited for tobacco, candy, photographic film, and other packaging (p. 45).

Heat treating furnace manufacturers granted A-1-c preference rating (p. 45).

"Minor" improvements and capital additions under P-46, utilities repair and maintenance order, defined by OPM (p. 41).

Small electrical appliances price maintenance asked (p. 40).

Vacuum cleaner production by large manufacturers curtailed 10 per cent (p. 40).

Additional steel expansion at Provo, Utah, to cost $91,000,000, authorized by Defense Plant Corp. (p. 34).

Control over chromium and chrome steel tightened (p. 33).

electrical appliances above the levels of Nov. 1, have been sent to about 240 manufacturers by OPA.

A longer range price program for the industry is expected to be made public shortly.

Products classified as small electrical appliances for household use include: Irons, toasters, roasters, waffle irons, coffee makers, hotplates and grilles, heaters and heating pads, warmers and sterilizers, vibrators, dryers, mixers and juicers, clocks, fans and shavers.

Tacoma Narrows Bridge To Be Salvaged for Scrap

Approximately 3500 tons of scrap steel, originally scheduled to be thrown into Puget Sound, will be salvaged and eventually routed into the nation's defense program.

The "rescue" of the scrap steel, which resulted from the collapse of the Tacoma Narrows Bridge in November, 1940, was accomplished through the joint efforts of several branches of OPM co-operating with the Washington Toll Bridge Authority.

OPM Defines "Minor" Capital Additions and Improvements

OPM has defined what is meant by "minor improvement" and "minor capital additions" for utility systems covered by Preference Rating Order P-46.

Under this order a preference rating of A-10 is assigned to supplies needed for repair, maintenance and operation, and for "minor improvements" and "minor capital additions." This led to uncertainty among utilities as to what constituted "minor improvements" or "minor capital additions."

Amendment No. 2 to P-46 puts an end to the uncertainty by providing that a minor improvement or minor capital addition is an expenditure for material not exceeding $1500 in the case of underground connections, or $500 for other capital additions. A job may not be split up in order to come within those limits.

Another clause in the amendment liberalizes the acquisition or withdrawal of supplies needed to repair property or equipment damaged by fire, flood, or other climatic occurrences.

State Setup for Contract Distribution

■ Appointment of state directors and chairman of state advisory committees of the OPM Division of Contract Distribution were announced last week by Floyd B. Odlum, director, in line with an earlier announcement that the division's field staff will be organized along state lines. Local offices still are being established and those already organized will be continued.

State directors are in charge of operations within their state, while the advisory committees consult and advise with them. Those announced to date:

State	Chairman, State Advisory Committee	State Director
Michigan	Clarence Avery, Detroit	Warren H. Clark, Detroit
Iowa	Vernon L. Clark, Des Moines	George Beese, Des Moines
North Carolina	Frank H. Cothran, Charlotte	.....
Massachusetts	Albert M. Creighton, Boston	Edward V. Hickey, Boston
Tennessee	Arthur J. Dyer, Memphis	Arthur M. Field, Memphis
Pennsylvania	Thomas S. Gates, Philadelphia	Orville Bullitt, Philadelphia
Oklahoma	Fred Jones, Oklahoma City	Morton R. Harrison, Oklahoma City
Georgia	Wiley Moore, Atlanta	.....
Montana	J. E. O'Connell, Helena	R. E. Towle, Helena
Louisiana	A. B. Paterson, New Orleans	R. E. Judd, New Orleans
Colorado	William L. Petrikin, Denver	Clyde C. Hartzell, Denver
Maryland	W. F. Roberts, Baltimore	G. W. Creighton, Baltimore
Wisconsin	Harold H. Seaman, Milwaukee	Clifford E. Ives, Milwaukee
Minnesota	Roger Shepard, Minneapolis	.....
Florida	George W. Simons, Jacksonville	Charles C. McCubbin, Jacksonville
Kansas	George B. Weeks, Wichita	Harold Hartzell, Wichita
Connecticut	.....	Carl Grey, Hartford
New Jersey	.....	R. L. Kennedy, Newark
Arkansas	.....	Alfred M. Lund, Little Rock
Rhode Island	.....	Walker Mason, Providence
Maine	.....	Herbert Payson Jr., Portland
Nebraska	.....	Arthur Walker, Omaha
Ohio	Herman Lind, Cleveland	C. R. Terry, Cleveland

Government Forms Are Available

■ Forms P-22, PD-73, PD-25-C, PD-25-D are available to STEEL's readers, shipments being made 24 hours after orders are received.

These forms can be obtained from STEEL, Readers' Service Department, Penton Building, Cleveland, at the following prices:

Quantity of			
100	$1.00, additional hundred 50c per to 500		
500	$3.00	1,000	$3.55
2,500- 5,000	$3.25 per M		
5,000-10,000	$2.95 per M		

NOTE: Postage is not included in above prices. If your order originates in Ohio, please include sales tax.

Ease Limitation on Output of Auto Replacement Parts

Hardships resulting from the base period established under Limitation Order L-4, which affects production of replacement parts for passenger cars and light trucks, will be relieved by an amendment issued by the Priorities Division.

Original limitation order provided that a spare parts producer may make during the period from Sept. 15 to Dec. 31, 1941, 60 per cent of the number of parts sold by him for replacement purposes during the period from Jan. 1 to June 30, 1941.

Reports reaching the Automotive, Transportation and Farm Equipment Branch of the Division of Civilian Supply showed that many producers have their heaviest output in the months from July to December. The base period set forth in the order has caused these seasonal producers hardships.

Under the terms of the amendment, which is effective immediately, a producer may select either Jan. 1-June 30 or July 1-Dec. 31 as the base period on which to figure total pro-

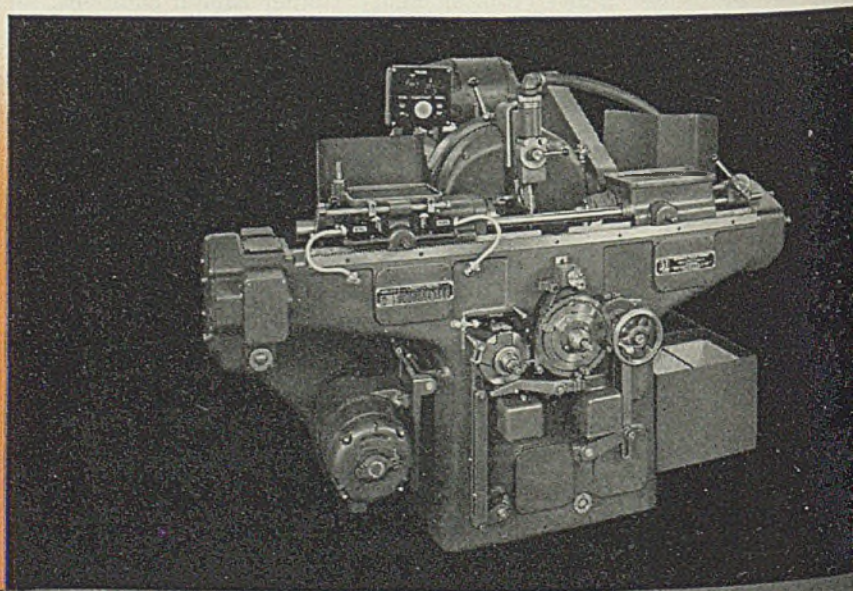
(*Please turn to Page* 44)

Nicainor Kendall

1834

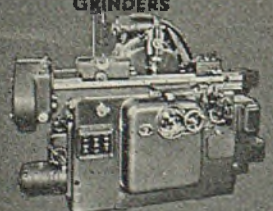
WHEN Nicainor Kendall pulled his rifle from under the robe of his sleigh, the hammer caught and the piece went off — nearly killing his fiancée. This accident led him to design the peculiar "underhammer lock" — one of the first safety devices ever built in a firearm. Not only was it safer, but this lock was simpler. It had fewer working parts — and parts were interchangeable from lock to lock. Here is one of the earliest examples of successful application of a fundamental principle of modern machine tool technique. Other examples have followed in constant succession. Thus, from Nicainor Kendall's little Vermont shop, Jones & Lamson Machine Company traces more than a century of continuous progress.

JONES &



Jones & Lamson Automatic Thread Grinder
Model TG-615.

AUTOMATIC THREAD GRINDERS



OPTICAL COMPARATORS

RAM TYPE UNIVERSAL TURRET LATHE

strove for safety

and achieved simplicity

THE underhammer rifle that Kendall first designed has long been superseded by faster, more accurate, more powerful weapons. The mechanical principles by which Nicainor Kendall worked have long been the common property of progressive engineers.

But leadership in the application of those principles did not die with Nicainor Kendall. Nor did it die with men like Robbins, Howe, Hilliard and Hartness, whose successors are responsible for the most recent advances in Jones & Lamson machine tool technique.

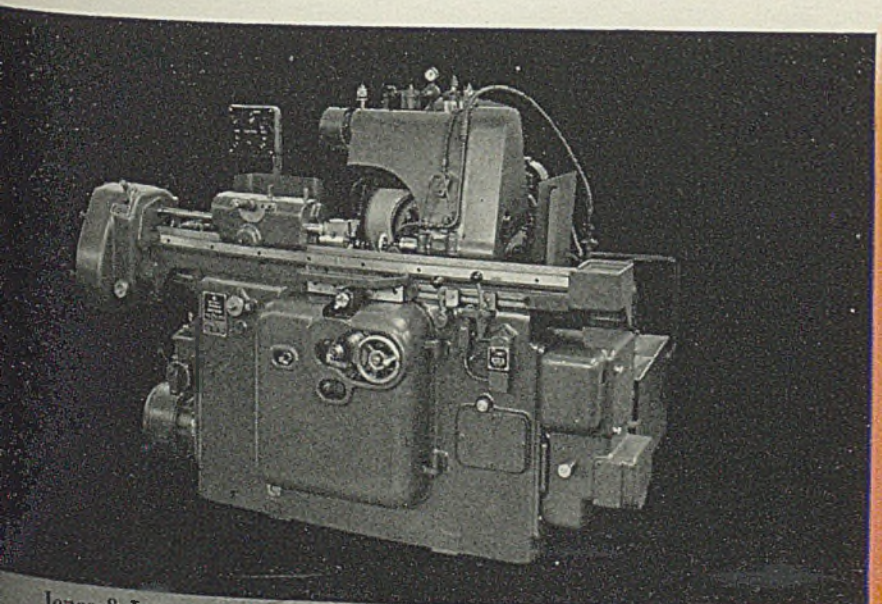
As a result of these advances, modern Jones & Lamson machine tools, optical comparators and threading tools embody numerous unique advantages.

In Jones & Lamson machine tools, these advantages are apparent, not only in refinement and ease of operation, but in ample reserves of speed, rigidity and useful power, enabling you to make the fullest possible use of each new development of hard alloy cutting tools. Thus you can speed production for defense and be prepared to meet the keen competition of a postwar world.

Write today to Jones & Lamson engineers regarding your production problems. Inquiries from large plants or small receive prompt and thorough study here.

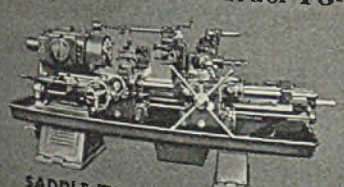
LAMSON MACHINE COMPANY

SPRINGFIELD, VT., U. S. A.



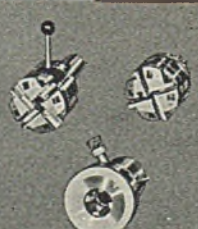
Jones & Lamson Automatic Internal Thread Grinder
Model TG-624.

Manufacturers of Ram & Saddle Type Universal Turret Lathes . . . Fay Automatic Lathes . . . Automatic Thread Grinding Machines . . . Comparators . . . Automatic Opening Threading Dies and Chasers



SADDLE TYPE UNIVERSAL TURRET LATHE

FAY AUTOMATIC LATHES



AUTOMATIC OPENING DIE HEADS

PROFIT PRODUCING MACHINE TOOLS

Windows of Washington

(*Concluded from Page 41*)

duction from Sept. 15 to the end of the year. This alternative base period will result in greater fairness to producers whose peak output comes in the last half of the year.

An A-10 preference rating has been assigned to deliveries of materials for the manufacture of the replacement parts listed in the limitation order.

Lend-Lease Aid Passes Billion-Dollar Mark

Total lend-lease aid to the democracies has passed $1,000,000,000, according to a report issued last week by Administrator E. R. Stettinius Jr. At the end of October, such aid amounted to $919,000,000 and has passed the billion dollar mark in November.

The steady increase in amount of lend-lease assistance is shown by the following monthly amounts: March, $18,000,000; April, $40,000,000; May, $60,000,000; June, $85,000,000; July $134,000,000; August, $150,000,000; September, $207,000,000; October, $225,000,000.

Mr. Stettinius also revealed:

Actual contracts have been let for more than 75 per cent of the first $7,000,000,000 lend-lease bill and 100 per cent of the funds therein have been allocated.

The new $6,000,000,000 appropriation is being allocated rapidly.

Since the beginning of the war, our exports to the British, including lend-lease aid, have amounted to approximately $5,250,000,000, most of which was financed by the British with their own dollars. In October, exports to the British were the largest of any month since the war began.

Titanium Dioxide Placed Under Allocations System

General Preference Order M-44, which directs the distribution of titanium dioxide for use as pigment, through a monthly allocations system, has been issued by the Priorities Division.

Purpose of the order, which becomes effective Jan. 1, is to set up a defense pool to take care of all mandatory orders and to prorate the remainder on an equitable basis to all customers. The defense pool for the first month is set at 20 per cent of each producer's daily production. The percentage may be changed from month to month as defense needs vary.

In addition to the armed services and the Maritime Commission, who are heavy users of titanium pigments in paint and other protective coatings, the Director of Priorities is authorized by the order to allocate supplies out of the pool to potential users who do not have a previous customer rating with the producers.

Titanium dioxide is produced from ilmenite ores, with the bulk of the United States' supply formerly coming from India. When the possibility of increasing shipping difficulties were realized, additional American mines were developed. These, with stocks on hand. will prevent any curtailment of output caused by the cessation of imports. American production of titanium pigments has more than doubled since 1937.

Steel Preference Orders Extended to Dec. 31, 1942

Priorities Division last week extended all general preference orders affecting pig iron, steel, steel warehouses and special types of iron and steel to Dec. 31, 1942. Prior expiration date had been Nov. 30, 1941.

General preference order M-21,

Priorities Field Service

L. Edward Scriven, Director

Following district managers, appointed by Office of Production Management, serve in an advisory capacity on priorities. Chief function is to assist holders of defense contracts to obtain priority ratings on materials. Usually, they have facilities for immediate communication with the Priorities Division of OPM in Washington. They may be contacted as district manager, Priorities Field Service, Office Production Management, as noted below:

Atlanta, Ga.—John B. Reeves, Federal Reserve Bank building.
Baltimore—Theodore M. Chandlee, Baltimore Trust building.
Boston—William P. Homans, 19 Congress street.
Buffalo—Paul R. Smith, M. & T. Bank building.
Charlotte, N. C.—J. E. MacDougall, Liberty Life building.
Chicago—Warren G. Bailey, 20 North Wacker drive.
Cincinnati—Bruce W. Burroughs, Union Trust building.
Cleveland—William T. Walker, Federal Reserve Bank building
Dallas, Tex.—James B. Crockett, Wood and Akard streets.
Dayton, O.—Harold B. Doty, 32 North Main street.
Denver—Virgil Board, U. S. National Bank building, Denver.
Des Moines, Iowa—505 Crocker building.
Detroit—Walter Hall, 160 Fort street.
Houston, Tex.—George L. Noble Jr., Federal Reserve Bank building.
Helena, Mont.—Oscar A. Baarson, Federal Reserve Bank building.
Houston, Tex.—George L. Noble, Jr., Federal Reserve Bank building.
Indianapolis, Ind.—Albert O. Evans, Circle Tower building.
Jacksonville, Fla.—George H. Andrews, Hildebrandt building.
Kansas City, Mo.—C. H. Carr, Federal Reserve Bank building.
Knoxville, Tenn.—Dyer Butterfield, Federal Reserve Bank building.
Los Angeles—G. H. Hutchins, 1151 South Broadway.
Louisville, Ky.—James T. Howington, Todd building.
Memphis, Tenn.—J. S. Bronson, Sterrick building.
Milwaukee—Frank J. Tharinger, First Wisconsin Nat'l Bank building.
Minneapolis—William F. Kiesner, Rand Tower building.
Nashville, Tenn.—George S. Gillen, 1015 Stohlman building.
Newark—176 Sussex avenue.
New Orleans—John A. Bechtold, Federal Reserve Bank.
New York—John D. Pollock, 25 Broad street.
Oklahoma City, Okla.—C. F. Aurand, Federal Reserve Bank building.
Philadelphia—Frederick W. Slack, 925 Chestnut street.
Pittsburgh—Charles C. Cruciger, Grant street and Ogle Way.
Portland, Oreg.—J. Fred Bergesch, Bedell building.
Richmond, Va.—Fred P. Wilmer, Federal Reserve Bank building.
Salt Lake City, Utah—Ralph E. Bristol, Utah Oil building.
San Antonio, Tex.—Carl L. Pool, 415 W. French Place.
San Francisco—Andrew L. Kerr, Federal Reserve Bank building.
Seattle, Wash.—William D. Shannon, Stuart building.
St. Louis—Lewis E. Crandall, 411 Locust street.

placing steel under priority, was reported most important of the series including M-17, M-21-a, M-21-b. Preference rating order P-31, providing limited blanket ratings of A-1-b and A-1-c to orders for certain materials essential to manufacturers of foundry equipment and repair parts, was also extended, to May 30, 1942.

Requisitioning Power Delegated to OPM

Delegation to OPM of the power to requisition materials and property for the national defense was granted a favorable reception by industry generally.

The move, which was made in an executive order appearing in the *Federal Register*, is expected to strengthen inventory control by defense officials. It empowers OPM to act promptly to acquire hoarded materials.

The order authorizes OPM to "requisition and dispose of such properties on its own account" or to provide for the requisitioning and disposition of such property through the War and Navy Departments or any other federal agencies engaged in the procurement of property of the type subject to seizure under the acts of Oct. 10, 1940, and Oct. 16, 1941.

United States marshals are empowered to requisition and dispose of property when requested by a government agency. Government agencies other than OPM may initiate requisition orders by submitting them to the OPM whenever they determine such property is of the kind authorized to be taken over under either of the two acts.

Lead, Tin Foil Banned as Wrapping for Tobacco, Candy

Lead and tin foil will disappear from cigaret packages, chewing gum, candy and a number of other package uses after March 15, as result of Limitation Order L-25 issued last week by the Priorities Division.

Order provides that no tin, lead or composition foil containing them shall be used in the manufacture of any decorative article or material or for the packaging of tobacco products, chewing gum, all beverages, confections, ribbons for typewriters and other business machines, friction tape and photographic film.

Until Jan. 15 manufacture of foils for the uses to be prohibited is limited to one-third of the amount manufactured for those same categories in the first three months of 1941.

Manufacture and sale of foil for any of the uses listed is prohibited after Jan. 15, 1942.

Basis for the order is the fact that lead going into foil manufacture has increased from approximately 2000 tons a month at the beginning of 1941 to 6500 tons at present, with the demand increasing monthly. Users of foil have swung rapidly into lead as aluminum stocks declined and they were unable to get more for that purpose. Tin savings under the order are estimated at 250 tons a month.

The tobacco industry uses about 85 per cent of the tin and lead foil consumed, with cigarets leading the list. The industry was told some months ago that restrictive orders on foil would be necessary, and studies of satisfactory substitutes have been carried out. The tobacco industry has already taken steps to reduce its use of lead in foil by one-half.

Heat Treating Furnace Builders Granted A-1-c Preference Rating

Manufacturers of furnaces used in the heat treatment of metals have been granted an A-1-c rating in acquiring the necessary materials, in an order issued by the Priorities Division.

Rating may be applied to purchase orders for the component parts and materials listed in Exhibit "A" attached to the order.

These are: Motors and other electrical accessories; mechanical parts and accessories; alloy and carbon steels in bars, forgings, castings, plates, sheets, shapes and tubes; ferrous and nonferrous castings and forgings; abrasives; indicating instruments and accessories; refractories and insulation; controlled atmosphere generators and accessories; burners and their accessories; paints and finishing materials; maintenance and shop supplies (this item applies to a producer's requirements only and is restricted to items necessary for proper operation and maintenance of a producer's manufacturing equipment and facilities); foundry supplies consisting of steel rail and other steel scrap, silvery pig iron, regular pig iron, coke, ferrosilicon, ferromanganese, vanadium, nickel, molybdenum and chromium.

The rating has been assigned to some 50 manufacturers of furnaces, both electric and combustion, to be delivered to fill defense orders defined in the order. Rating may be extended to their suppliers for the acquisition of material listed in the exhibit, and which is to be physically incorporated in the finished product. Each purchase order covered by the rating must bear the following statement:

"Material for Defense Products ——— Preference Rating A-1-c under Preference Rating Order No. P-74, Serial No. ———, with the terms of which I am familiar."

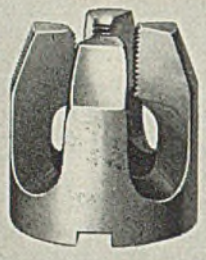
This statement should be signed by a responsible official of the company making use of the order.

Patterson Advocates Government Plant Seizure

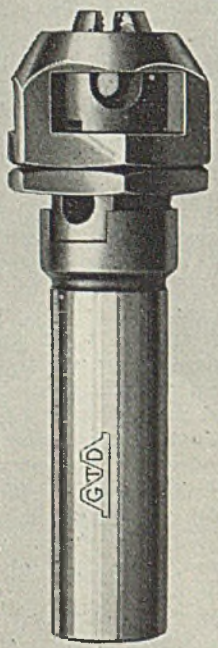
■ Undersecretary of War Robert Patterson, testifying before the Senate judiciary committee, urged passage of the Connally bill which authorizes seizure and operation of strike-bound defense plants by the government. The bill also would set up a wage board to adjust disputes in those plants for the duration of the emergency. Although local laborites have been quick to petition the President to "take over" plants, where they have been unable to enforce their demands, leaders are reported luke-warm on the proposition of a federal seizure law. NEA

RIGHT or WRONG?

. . . TEST YOUR KNOWLEDGE OF "ACORN" DIES



"*Acorn*" Dies are furnished in 5 different sized blanks.

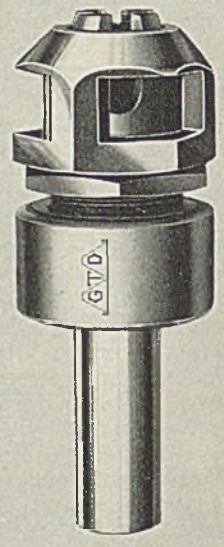


Regular "*Acorn*" Die holders for screw machines that reverse die or rod automatically.

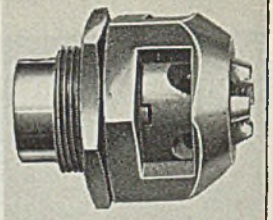
HERE are 12 questions about "*Acorn*" Dies. Out of 7 tool foremen who recently tackled them, only one was able to score 100%. How about you? Don't peek at the answers in the lower right corner till you've checked your knowledge.

1. "*Acorn*" Dies can be used on all makes of hand or automatic screw machines, turret lathes, bolt cutters, drill presses, etc. ☐ Right ☐ Wrong
2. "*Acorn*" Dies can only be used on fixed centers. ☐ Right ☐ Wrong
3. "*Acorn*" Dies are adjustable. ☐ Right ☐ Wrong
4. "*Acorn*" Dies do not require lead screws on machines on which they are used. ☐ Right ☐ Wrong
5. "*Acorn*" Dies can be used on any machines which reverse either the die or rod when the desired thread length has been cut. ☐ Right ☐ Wrong
6. There is only one size of "*Acorn*" Die blank for all thread sizes. ☐ Right ☐ Wrong
7. There are standard holders which permit "*Acorn*" Dies to be used with "button," spring or floating die holders. ☐ Right ☐ Wrong
8. Smaller than ordinary "*Acorn*" Dies can be used with a given holder. ☐ Right ☐ Wrong
9. Each size of "*Acorn*" Die holder is available with only one size shank. ☐ Right ☐ Wrong
10. Genuine "*Acorn*" Dies have an exclusive patented "heel" on the cutting lands that prevents tearing threads on reversal. ☐ Right ☐ Wrong
11. "*Acorn*" Dies are so uniform in size that they can be removed for sharpening, or changed without checking machine set-up. ☐ Right ☐ Wrong
12. A special fixture is needed to hold dies for sharpening. ☐ Right ☐ Wrong

For years "*Acorn*" Dies have hung up amazing records on various types of production work. Consider them for any job where dies seem to wear out rapidly.



Releasing "*Acorn*" Die holder for hand screw machines.



"*Acorn*" Die Adapter, for button, spring or floating holders.

GREENFIELD TAP AND DIE CORPORATION
GREENFIELD, MASSACHUSETTS
DETROIT PLANT: 2102 West Fort St.
WAREHOUSES in
New York, Chicago and Los Angeles
In Canada: GREENFIELD TAP AND DIE CORP. OF CANADA, LTD., GALT, ONT

This is one of a series of advertisements published by Greenfield Tap & Die Corporation to help users get greater production from their small tools in these critical times, through making useful facts more widely known

GTD GREENFIELD
TAPS • DIES • GAGES • TWIST DRILLS • REAMERS • SCREW PLATES • PIPE TOOLS

1. Right
2. Wrong
3. Right
4. Right
5. Right
6. Wrong
7. Right
8. Right
9. Wrong
10. Right
11. Right
12. Wrong

Mirrors of MOTORDOM

Little hope of absorbing automotive unemployment by stepping up truck orders, and projection of present defense orders to full production still leaves many thousands out of work . . . Lack of volume facilities for forging and machining heavy truck parts holds down output of this class of vehicle . . . Buses re-engineered to steel from aluminum 10-15 per cent heavier . . . Two new defense jobs shouldered

By A. H. ALLEN
Detroit Editor, STEEL

DETROIT

■ A LOT of glib talk is being passed about these days on the subject of absorbing disemployment resulting from curtailment of passenger car production by the simple expedient of boosting army truck orders. It may be well to examine this matter in some factual detail to explode such a myth.

The truck industry currently is operating at about 80 per cent of its 20,000 per month capacity and in the 1942 model season, ending next summer, will turn out somewhat over 700,000 civilian trucks against a ceiling of 800,000. Military truck orders are now being filled at a rate of around 5000 per week, and the year's schedule calls for around 389,000 vehicles. Present military truck orders will be completed between Feb. 1 and April 15, and as yet no orders have been booked for shipment after this time.

Present Requirements Covered

It is the feeling of truck officials that the army has placed its full requirements for the present-size force and further awards will be only for normal replacement and maintenance needs. Army buyers are not favoring purchase of trucks for storage against future unknown needs. Of course, should the administration decide to go all-out on its war offensive and proceed with the so-called "victory army" for overseas offensives sometime next spring, truck needs would burst present confines in short order. But for the present force of 1,400,000 men truck requirements are covered. Any new army business will be for replacement plus whatever lend-lease requirements come along for the "democracies."

Another thing—the truck industry needs from 120 to 150 days between placing of orders and delivery of first assembled units; this for lining up material sources and readying equipment. So many orders placed now would not start to be shipped until the latter part of April.

Three general classifications of trucks—light, medium and heavy—have become more clearly defined now, to the advantage of truck builders, so that light trucks are roughly those below 1¼-ton capacity; medium from 1¼ to 2½, and heavy all over 2½. Most civilian truck purchases are in the light category; most military needs in the heavy classification. Restriction on light truck production for January will hold it to 64 per cent of output for the same month a year ago, or about 44,000 units. No ceiling is imposed on heavy truck production, but there is a very definite natural ceiling on production facilities for this type.

In the first place, heavy machinery for handling truck axles and transmissions has been at low ebb for better than 20 years, so that today there are no "volume" facilities for this type of work. It is almost impossible to get any kind of delivery on heavy forgings, while gear cutting and heavy grinding equipment for truck work is scarce. Furthermore, metalworking plants specializing in truck axle and transmission production have seen a considerable share of their available man-hours drafted for ordnance work—tanks, for example.

In the second place, even under A-3 priority, it is difficult to obtain steel for trucks in much under nine weeks. This picture may get even worse under forthcoming allocations of all materials for manufacture.

As to the matter of changing over passenger car assembly line to truck assembly, it is estimated that this may be possible for trucks of ½-ton capacity and under, but for anything over this size, the change is impracticable, because of low headroom, insufficient strength in conveyor system and other physical limitations of passenger car plants.

Civilian truck business in general has dropped off since liquidation of field stocks in September, despite the fact fall months normally constitute the peak selling season for truck interests. While prices of new model trucks were marked up only 6-11 per cent, the prevailing scare talk, priorities and taxes have collaborated to hold down sales. However, field stocks still have not been built to normal levels.

Aluminum Lack Suspends Large Bus Production

In the bus manufacturing field, engineers consider they have been set back about six years by the inability to obtain aluminum any more. Last February, when aluminum went out of the picture for buses, a complete re-engineering program was rushed through for the changeover to steel, thereby cutting down production appreciably. The change in material surprisingly enough increased average weight by only 10-15 per cent, but the production loss meant that total output for the first six months of the year suffered unexpectedly. When the OPM set bus quotas for September to February on the basis of production for the first six months of the year, it did not realize that this meant actually a 40 per cent cut from normal production rates. Efforts are being made to correct this situation now.

Average bus production for the past five years has been 6200 units a year. Production this year will total about 6400, and estimates indicate a need for 9000 units in 1942. Principal reason for this increase is the sharp jump in numbers of workmen requiring bus transportation to outlying defense plants.

This is another of those anomalous aspects of the defense program. Hundreds of large defense plants, employing hundreds of thousands of

workmen, are located far from metropolitan centers of population, compelling workmen either to drive their cars or to ride buses to and from work. And at the same time, restrictions are placed both on assemblies of passenger cars and buses.

Large 54-passenger buses, double-deckers and transcontinental cruisers have had to be dropped altogether from bus manufacturers' programs because of the aluminum shortage. Those seating 40 or less passengers are still on the O.K. list.

So sharply has rider demand been pressing bus operators that they have had to sacrifice to a considerable extent all efforts at preventive maintenance, which eventually may cause a critical situation on bus lines.

Hardenability Rating Should Be Specified

Commenting on the age softening of 37-millimeter armor-piercing shot, discussed here briefly last week, H. B. Osborn Jr., research and development engineer, Tocco Division, Ohio Crankshaft Co., Cleveland, says his laboratories have examined the widely varying results obtained in the heat treatment of a number of different types of steels used in this ordnance material and have found that in order to produce a satisfactory shot the hardenability of the steel must be specified in addition to the chemical analysis, when the steel is purchased.

Present information indicates that a Jominy hardenability of 50 Rockwell C at 1½ inches from the end of the specimen, together with sufficient end hardness to produce the desired surface hardness of the shot, is satisfactory for armor-piercing shot. A present acceptable specification of hardenability on the 37-millimeter shot is 58 Rockwell C minimum in the center of a 1½-inch diameter by 6-inch long test piece (cut from the bottom of a billet), heated to 1600 degrees Fahr. and quenched in nonagitated oil at no less than 100 degrees Fahr.

As pointed out last week some shot have been hardened to a point which apparently exceeded the theoretical maximum hardness of the steel and then have tended to drop in hardness to a stable value, after a tempering treatment at 350 degrees Fahr., which corresponds to the normal hardness of the heat of steel being treated.

Conferences to determine the exact specifications for steel to be used in shot are being held, and it is the hope that definite data will be decided upon so that manufacturers then can order steel to such specifications and be assured of a satisfactory product.

Automobile Production

Passenger Cars and Trucks—United States and Canada

By Department of Commerce

	1939	1940	1941
Jan.	356,962	449,492	524,058
Feb.	317,520	422,225	509,326
March	389,499	440,232	533,849
April	354,266	452,433	489,854
May	313,248	412,492	545,355
June	324,253	362,566	546,278
July	218,600	246,171	468,895
Aug.	103,343	89,866	164,792
Sept.	192,679	284,583	248,751
9 mos.	2,570,370	3,160,060	4,031,191
Oct.	324,689	514,374	.....
Nov.	368,541	510,973	.....
Dec.	469,118	506,931	.....
Year	3,732,718	4,692,338	.....

Estimated by Wards Reports

Week ended:	1941	1940†
Nov. 1	92,879	118,092
Nov. 8	93,585	120,948
Nov. 15	92,990	121,943
Nov. 22	76,820	102,340
Nov. 29	93,495	128,783

†Comparable week.

To Make Tank Cannon

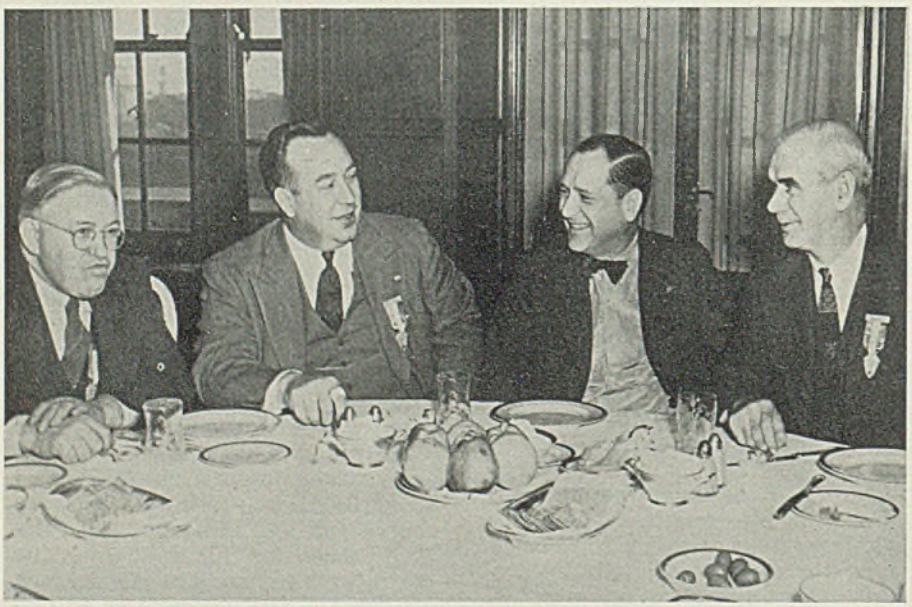
Two new defense projects in the Lansing, Mich., area were announced last week. One is a program to be launched at Oldsmobile Division for manufacture of 75-millimeter cannon to be mounted on tanks—this in addition to the contract Olds now has for production of the 20-millimeter Hispano-Suiza cannon. The second project involves the building of a new type of eight-wheel trackless truck mounting a 75-millimeter gun and armored, this to be handled by the Reo Motor Co. The truck is of entirely new design apparently, with eight independently sprung wheels.

De Soto's new building for the manufacture of Bofors antiaircraft gun parts last week has been completed and machinery is now going in place. It is adjacent to the main automobile plant of the company and provides 63,000 square feet of space.

Moraine Products Division of General Motors Corp., Dayton, O., has developed several new automotive parts of powdered iron. One interesting job is the clutch plates for the Oldsmobile and Cadillac Hydramatic drive. There are 16 of these plates or rings in the automatic drive mechanism. They are 5½ inches in diameter, 1/16-inch thick and about 1½ inches in annular width. They replace strip steel stock, and avoid the wastage incurred in stamping the rings out of such material.

Discontinuance of extensive chromium plating on automobiles, the deadline now being Jan. 1 instead of Dec. 15, is working hardships in plating shops in this vicinity. Some of them are switching over to hard chromium plating work, the latter being required extensively on gages. Ford is understood to have about 100,000 amperes of "hard" chromium plating now in production.

Meet Mr. Bennett, Mr. Murray and Friends



■Noteworthy in light of past events was this group comprising a Ford Motor Co. official and CIO leaders, lunching together in Detroit recently. Left to right: Allan Haywood, CIO organizing director; R. J. Thomas, president, United Auto Workers; Harry Bennett, Ford personnel director; and Philip Murray, president, CIO. NEA photo

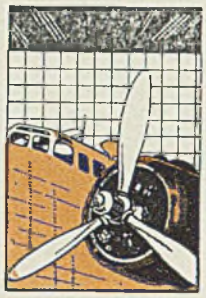
MASTER CRAFTSMEN

Josiah Wedgwood, famed student of the arts and sciences and benefactor to both, through his great talents, established standards for pottery making never excelled, but often copied.

Certain kinds of clay used in the production of Wedgwood pottery are largely responsible for the great reputation enjoyed by the famed potter, who centuries ago realized that the value of a product depended greatly upon the materials used.

Josiah Wedgwood

WING TIPS



Measure of auto industry's performance on aircraft production program still a year off, as tooling proceeds . . . Try to do unfamiliar job in familiar way to obtain optimum results . . . . Hesitate to retrench on factor of safety . . . Orphan flying boat now a hero of Atlantic . . . Engines given thorough tests after installation in pursuits

■ TWO billion dollars' worth of orders for aircraft, aircraft engines, subassemblies and parts had been dumped in the lap of the motor vehicle industry on Oct. 1—about half of the total defense orders received by this industry since September, 1939. This total does not include orders placed with companies which do not assemble automobiles, such as Briggs Mfg. Co. and Murray Corp. of America. They, too, hold large contracts for aircraft subassemblies.

The question naturally is asked: How is this huge volume of work coming along? The answer, according to production experts working between the airplane and motor companies, will have to wait another year for final determination. The contracts generally are still in the tooling stage which is necessarily drawn out over a longer period of time than that customary in the airplane plants because of the fact tooling is being extended far beyond what has been the fashion.

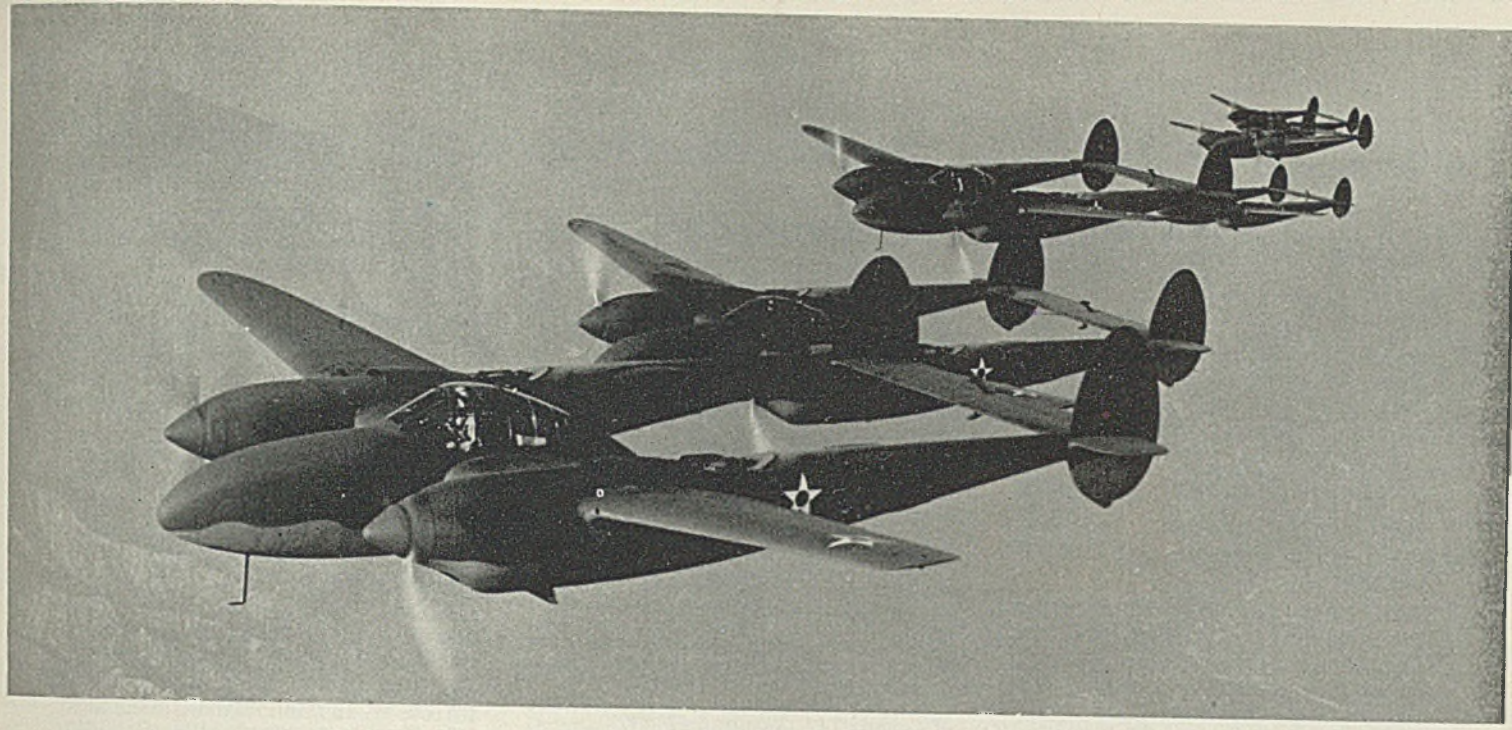
Tooling Must Be Extended

Right here is one of the fundamental differences between the manufacture of airplanes and the building of automobiles. Workmen in airplane plants, until the recent vast expansion there, have been for the most part skilled artisans, thoroughly schooled and trained in the various phases of airframe fabrication and assembly. Most of them are capable of taking a blueprint and following the specifications for a certain part to the letter, depending more upon their own knowledge of what is required in the part than upon a machine or tool to duplicate the blueprinted part.

In the motor industry, with its many thousands of workmen, nearly all doing some specialized task, the skill of the individual man is somewhat below that of the old-time airplane workmen, probably for the reason that special-purpose machinery has been designed to relieve the necessity for dependence upon skill of the individual workman.

So when you turn over a job like building a wing, a nose, a tail surface or a center section of an airplane to an automobile plant, you must extend the tooling considerably further than it is carried in the average airplane plant. This is now being done, but it takes time—one of the reasons why it will be next fall before the automobile industry really begins to click on airframe assemblies. Airplane manufacturers are fully aware of the situation, and they realize, too, that some of the tooling now in process is going to be a wonderful thing to behold when it gets into production. They are not worrying too much—yet—about the competitive aspects of auto companies moving into the airplane field. In the first place, they have too many production problems and expansion problems of their own right now to be overly concerned about eventualities of years hence. Furthermore, many of the top airplane company executives are former automotive company officials and hence are not inclined toward what might seem petty jealousies. In addition, the airplane companies recognize that automotive officials who are paid $100,000 a year salary are not getting such money because of their sweet dispositions. They are accomplished experts in planning and executing a production job in a highly competitive market and with

■ Preview of "biggest mass delivery of warplanes in history". Here you see some of the 123 basic training planes turned over to the Army and Navy in a single day by Vultee Aircraft Inc. The trainer, designed for the transition stage between primary and advanced instruction, is powered by a Pratt & Whitney engine



■ Mass flight deliveries of warplanes are beginning on a grand scale. Each day from coast to coast the planes roll off assembly lines and take to the air in groups of ever-growing numbers. Above are six flashes of "lightning" in the sky. At the controls of these P-38 Lightning interceptor-pursuits are Army Air Force pilots who took delivery on the ships at Lockheed Aircraft factory. Heralded as the world's fastest airplane, the Lightning's power is furnished by twin Allison engines. This and photo below, opposite page, from Aeronautical Chamber of Commerce, Washington

narrow profit margins. If men with talents like these can be pressed into service in the building of airframes, the result is pretty certain to be something worthwhile.

It is true that in the present emergency costs are of little moment. That is probably another reason why the motor companies are going ahead with such an extensive tooling job for airframes, with a production outlook only a fraction of what it takes to amortize a set of tools in automotive production. If the tools will insure getting the job done properly with at best hastily trained workmen handling unfamiliar material and parts, then the cost will be justified.

Stick to Precision Despite Hazards

The charge is often heard that airplane builders are too fussy about their production job, that they build too much of a factor of safety into their planes, thereby slowing output and increasing costs. No one can say for certain whether such a charge is justified. In military combat a plane requiring 100,000 man-hours of work, with four engines requiring another 10,000 man-hours, may be shot down in ten minutes. On the other hand, consider a ship like the Douglas DC-3, hundreds of which have been built and not a one ever suffering an accident as a result of a structural failure. With a record like that, Douglas designers are not inclined to retrench on their specifications, alluring though such a move might appear from the standpoint of cost and production time.

Speaking of airplane design, consider the case of the Consolidated PBY flying boat, which two years ago was consigned to the ashcan as obsolete by aeronautical engineers. First model built in 1934, the ship was considered to have outlived its usefulness so tools were dismantled and machinery stored in warehouses, making the PBY an orphan. But the emergency brought them out again and today the PBY is being built for both U. S. and British fleets, with the only change being two Plexiglass gun blisters on the sides. Several of the ships have performed front-page feats in service, outlasting and outmaneuvering German guns and planes in spectacular fashion.

Bomber Redesigned Six Times in Two Years

Bell Aircraft Corp. is well along with its new bomber parts division, which in February will start production on a $12,500,000 contract for elevators, stabilizers and rear gun enclosures for the B-17F or Flying Fortress bomber, on which Boeing, Vega and Douglas are co-operating along with a host of subcontractors and suppliers.

The B-17, incidentally, was built first in 1935, in a lot of 13, powered by 9-cylinder 1000-horsepower Wright engines. In 1939 a turbo-driven supercharger was incorporated on the engines and the design became B-17A. Some months later a B-17B set a transcontinental speed record of 265.38 miles per hour. Flat gun turrets were inaugurated in the B-17C which had a service ceiling of 36,000 feet. Then came engine cowl flaps, armor plate and leak-proof fuel tanks on the B-17D, after which a change to 1200-horsepower engines plus the addition of a stinger gun turret in the tail brought on the B-17E, immediate predecessor to model now going into mass production on which several further improvements have been made.

Tests Piled on Tests

In spite of all the thousands of inspections and two grueling test runs given airplane engines before shipment, they are saddled with further test runs after installation in planes. For example, the Allison-powered Bell Airacobra pursuit ship, minus wings, is blocked up tightly for engine test, with four cables holding the plane to the ground. Old spark plugs are placed in the engine which is warmed up to about 2000 r.p.m. to burn off storage oil. New plugs, kept dry in an electric oven, are placed in the engine for subsequent full-power tests. Full speed is maintained only about 30 seconds, during which time precautions are taken to simulate flying conditions in the cooling system by spraying water through the coolant and oil radiators. After this test, the engine is run at about 1100 r.p.m. for half an hour, using 73 instead of 100 octane gasoline, which washes lead off cylinder walls, valves and the induction system. Finally a quart of hot engine oil is sprayed through the induction system and the test is over.

Latest type two-way radio transmitters and receivers have been installed in 360 TWA transports at a cost of $4000 and 500 man-hours of labor per plane. Installations are designed so that radio racks will accommodate instrument landing and ultra-high frequency equipment, two of the newest developments in the communication field.

Canada To Build Lancaster Bombers; Cancels $33,000,000 Martin Order

TORONTO, ONT.

■ AT REQUEST of the British government, 4-engine Lancaster bombing planes will be built at three Canadian plants. Companies which will be awarded new contracts are National Steel Car Corp. Ltd., Malton, Ont.; Canadian Associated Aircraft Ltd., Malton, Ont., and Canadian Car & Foundry Co. Ltd., Ft. William, Ont.

In order to provide the necessary facilities for the production of this machine, it has been necessary to cancel the production order for the Martin B-26B bomber which was to have been built at the Malton plant of National Steel Car Corp. This latter machine now will be obtained from the United States. The order for the Martin bomber, now cancelled, called for construction of 200 planes at a cost of about $33,000,000.

National Steel Car's order for the Lancaster bomber will be for 200 to 300 to cost between $50,000,000 and $75,000,000. Figures are not available regarding orders to be placed with the other two companies.

Department of Munitions and Supply, in the week ending Nov. 11, placed 3630 war contracts with total value of $15,156,062, including orders to United States companies valued at $4,588,794. Canadian awards include:

Shipbuilding: Canadian Sumner Iron Works Ltd., Vancouver, B. C., $365,040; Halifax Shipyards Ltd., Halifax, N. S., $26,488.

Dockyard Supplies: Superheater Co. Ltd., Montreal, Que., $12,172; Dominion Wire Rope & Cable Co. Ltd., Montreal, $6992; Overseas Requisition, London, England, $6750.

Land Transport: Sicard Ltd., Montreal, Que., $6553; Eastern Steel Products Ltd., Montreal, $42,336; Arlington Cycle & Sports Ltd., Montreal, $75,000; International Harvester Co. of Canada Ltd., Ottawa, Ont., $12,354; General Motors Products of Canada Ltd., Oshawa, $218,980; Goodyear Tire & Rubber Co. of Canada Ltd., New Toronto, $11,868; Ross Cycle & Sports Ltd., Toronto, $19,551; Wilson Motor Bodies Ltd., Toronto, $14,688; Brantford Coach & Body Ltd., Brantford, $9684; Chrysler Corp. of Canada Ltd., Windsor, $18,743; Ford Motor Co. of Canada Ltd., Windsor, $765,479.

Aircraft: Canadian Pratt & Whitney Aircraft Co. Ltd., Longueuil, Que., $35,770; Overseas Requisition, London, England, $41,347; Canadian Car & Foundry Co. Ltd., Montreal, Que., $5011; Northern Electric Co. Ltd., Montreal, $9775; Amalgamated Electric Corp. Ltd., Toronto, Ont., $6376; Dunlop Tire & Rubber Goods Co. Ltd., Toronto, $9536; Smith & Stone Ltd., Georgetown, $8159; Fleet Aircraft Ltd., Ft. Erie, $12,065; MacDonald Bros. Aircraft Ltd., St. James, Man., $7153

Instruments: Overseas Requisition, London, England, $22,000; Research Enterprises Ltd., Leaside (Toronto), Ont., $30,996; Sutton-Horsley Co. Ltd., Toronto, $72,169.

Electrical Equipment: Overseas Requisition, London, England, $140,400; Aviation Electric Ltd., Montreal, Que., $107,550; Canadian Marconi Co., Montreal, $85,558; Federal Aircraft Ltd., Montreal, $7128; Canadian Fairbanks-Morse Co. Ltd., Ottawa, $31,200; Robert Mulhill Co. Ltd., Ottawa, $7300; Northern Electric Co. Ltd., Ottawa, $110,211; Small Electric Motors (Canada) Ltd., Leaside (Toronto), Ont., $13,500; Canadian Telephones & Supplies Ltd., Toronto, $9500; Kermath Mfg. Co. Ltd., Toronto, $15,586.

Machinery: Duke Equipment Co. Ltd., Montreal, $5077; Northern Electric Co. Ltd., Ottawa, Ont., $5626; J. D. Adams Ltd., Paris, Ont., $6757.

Tools: Aviation Electric Ltd., Montreal, Que., $8778; Craftools Ltd., London, Ont., $5984.

Ordnance: Overseas Requisition, London, England, $74,800; Sorel Industries Ltd., Sorel, Que., $196,441; Kelsey Wheel Co. Ltd., Windsor, Ont., $35,279.

Munitions: International Flare Signal Co. Ltd., Waterloo, Que., $35,532.

Fire Fighting Equipment: C-O-Two Fire Equipment of Canada Ltd., Toronto, Ont., $13,912; Pyrene Mfg. Co. of Canada Ltd., Toronto, $16,141; Dunlop Tire & Rubber Goods Co. Ltd., Toronto, $12,096; Goodyear Tire & Rubber Co. of Canada Ltd., New Toronto, $12,096.

War Construction: Angus Robertson Ltd., Montreal, Que., $1,530,000; Russell Construction Co. Ltd., Toronto, Ont., $936,926; Tomlinson Construction Co. Ltd., Toronto, $563,850; Storms Contracting Co. Ltd., Toronto, $195,000; Claydon Co. Ltd., Winnipeg, Man., $120,434; Williams, Trerise, Williams, Victoria, B. C., $80,000; W. C. Wells, Wilkie, Sask., $95,000; Tomlinson Construction Co. Ltd., Toronto, Ont., $138,000.

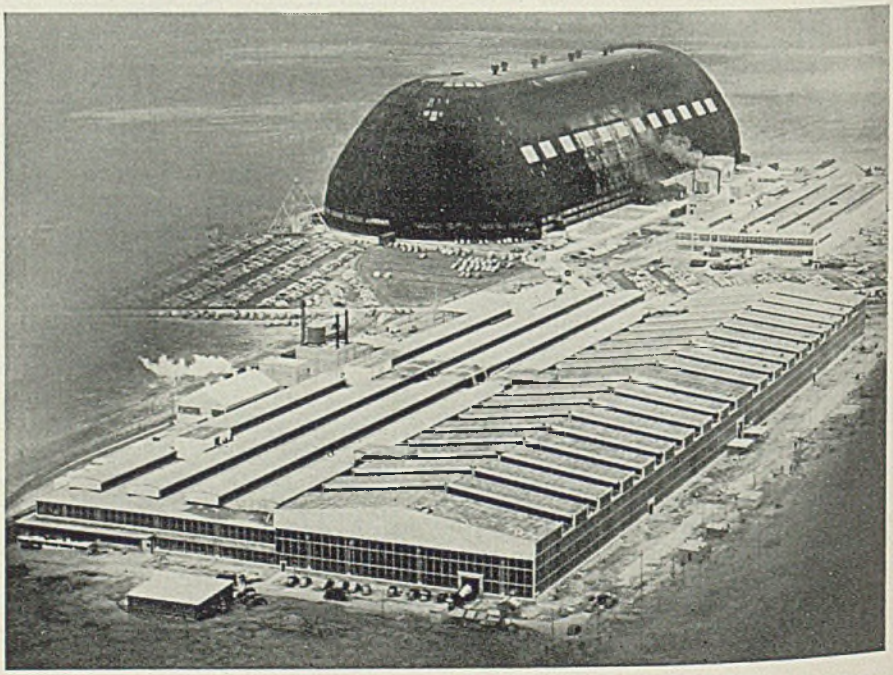
Miscellaneous: Collet Freres Ltd., Montreal, Que., $12,000; Canadian Comstock Co. Ltd., Montreal, $35,977; Standard Paper Box Ltd., Montreal, $111,025; Kraft Containers Ltd., Hamilton, Ont., $7883; Wilson Boxes Ltd., St. John, N. B., $7327; Waterman-Waterbury Mfg. Co. Ltd., Regina, Sask., $8200; Assiniboia Engineering Co. Ltd., Winnipeg, Man., $8636; Anthes Foundry Ltd., Winnipeg, $13,114; Central Bridge Co. Ltd., Trenton, Ont., $13,300; Dominion Rubber Co. Ltd., Ottawa, $59,500; Gutta Percha & Rubber Ltd., Toronto, $23,205; Berkel Products Co. Ltd., Toronto, $5750; Hobart Mfg. Co. Ltd., Toronto, $16,188; Kelvinator of Canada Ltd., London, $7661; Way Sagless Spring Co. Ltd., Toronto, $21,680; Universal Plumbing & Heating Co. Ltd., Toronto, $10,000; Henry Borger & Son Ltd., Winnipeg, Man., $108,000; Tomlinson Construction Co. Ltd., Toronto, $20,000; H. J. McFarland Construction Co., Pictou, Ont., $49,000; Connelly & Twizell Co., Montreal, $78,000; Henry Borger & Son, Winnipeg, Man., $15,000.

Spreading Plants for Plane Parts in Huddle with Dirigible Dock

■ This aerial view shows the vast three-unit manufacturing works of the Goodyear Aircraft Corp., subsidiary of Goodyear Tire & Rubber Co., Akron, O., rapidly nearing completion at the Akron municipal airport. More than 10,000 persons will be employed here within a few months in producing airplane subassemblies and airships.

In foreground is Defense Plant Corp.'s 400 x 1000-foot building, leased by Goodyear for fabricating subassemblies. To the rear and right of this structure is the company's new airplane parts building, while the great airship hangar or dock in the background has its entire floor and a large mezzanine area devoted to aircraft production.

Goodyear is or will soon be making parts for the following manufacturers: Glenn L. Martin Co., Consolidated Aircraft Corp., Grumman Engineering Corp., and Curtiss-Wright Corp.



War Department Reports $36,202,798 Defense Contracts Placed in Week

■ DEFENSE awards reported last week by the War Department totaled $36,202,798, with most contracts relatively small. Number of orders reported placed by the War Department in recent weeks has diminished considerably from the volume reported weekly in late summer and early fall.

Sanderson & Porter, New York, was awarded a contract for the design of an arsenal for the manufacture and assembly of incendiary munitions at Pine Bluff, Ark., by the Chemical Warfare Service. Supervision and construction of certain elements of the arsenal constitute an initial cost of $8,625,000. Optional supervision and construction of remaining elements constitute an added cost of $7,725,000.

Monsanto Chemical Co., St. Louis, received a $310,200 award for architectural-engineering services and construction of a plant to manufacture protective chemicals, adjacent to the company's existing plant at Monsanto, Ill. Monsanto will operate the new plant. Other contracts included:

Air Corps Awards

Air Conditioning & Refrigeration Supplies Inc., Charleston, W. Va., stand assemblies, $165,100.

Aro Equipment Corp., Bryan, O., propeller hub assemblies, $218,325.

Bell Aircraft Corp., Buffalo, parts for airplanes, $1,358,943.

Bendix Aviation Corp., Eclipse Aviation Division, Bendix, N. J., starter assemblies, $3,434,735.

Bird-White Corp., Chicago, vacuum pump assemblies, $60,000.

Bliss & Laughlin Inc., Buffalo, steel, $59,006.

Brochu & Hass Corp., Grand Rapids, Mich., washers, $10,428.

Butcher & Hart Mfg. Co., Toledo, O., washers, $31,747.

Butler Mfg. Co., Kansas City, Mo., portable, prefabricated hangars, $445,320.

Circle Wire & Cable Corp., Maspeth, Long Island, N. Y., cable, $14,418.

Clark Equipment Co., Battle Creek, Mich., tractors, $1,863,552.

Crosley Corp., Cincinnati, gun mount adapter assemblies, $396,600.

Crucible Steel Co. of America, New York, steel, $120,474.

Curtiss-Wright Corp., Buffalo, propeller assemblies and controls and parts for airplanes, $1,518,500; Airplane Division, Buffalo, parts for radio installation, $84,650; Curtiss Propeller Division, Caldwell, N. J., parts for airplanes, propellers, governors and controls, $466,799.

Douglas Aircraft Co. Inc., Santa Monica, Calif., parts for airplanes, tools and tool kits, $612,163.

Electric Storage Battery Co., Philadelphia, aircraft storage batteries, $102,836.

Elgin National Watch Co., Elgin, Ill., aircraft clocks, $172,080.

Fairchild Aviation Corp., Jamaica, N. Y., cameras, $2,298,104.

Garrett, George K., Inc., Philadelphia, washers, $43,334.

General Motors Corp., Aeroproducts Division, Dayton, O., hub and spinner assemblies and propeller blades, propeller blade assemblies, propeller assemblies and tools, $926,895.

Graybar Electric Co. Inc., Dayton, O., cable, $88,500.

Harrisburg Steel Corp., Harrisburg, Pa., gas cylinders, $94,650.

Hickok Electrical Instrument Co., Cleveland, thermometer indicators, $335,351.

Jacobs Aircraft Engine Co., Pottstown, Pa., parts for aircraft engines, $211,845.

Jacobson & Co. Inc., New York, portable engine test houses, $534,195.

Lewis Engineering Co., Naugatuck, Conn., thermometer indicators, $235,780.

Lockheed Aircraft Corp., Burbank, Calif., parts for airplanes, $73,561.

Oneida Ltd., Oneida, N. Y., bomb shackle assemblies, $200,626.

Platt-LePage Aircraft Co., Eddystone, Pa., plane equipment, $144,662.

Pump Engineering Service Corp., Cleveland, hydraulic pumps, $72,765.

Reynolds Metals Co., Louisville, Ky., alu-

Breakfast in a Bomb Shelter; How It May Happen in U.S.A.

ASHLAND, KY.

■ Fifteen thousand persons in this community know what to expect if they ever need a bomb shelter.

American Rolling Mill Co. provided the knowledge with an exhibition of one of its bomb shelters, the same as those being supplied to the Army and Navy and also those used in England.

It was camouflaged as in actual use. Interior fittings duplicated those in English shelters, including gasoline stove; dishes and cooking utensils; chemical toilet; water barrel; fire extinguisher; pick and shovel; food lockers; stretchers; surgical dressings, etc. A ventilating system insured a continuous supply of fresh air.

Adding realism, a recording of an air raid was played inside the shelter, giving visitors an understanding of warning sirens, bombs and antiaircraft fire. Opening included a breakfast for prominent citizens of the Tri-State area, including Ohio, Kentucky and West Virginia, "first breakfast ever served in a bomb shelter in America."

63% of Armco's November Shipments for Defense

Steel for defense will absorb 63.25 per cent of total November shipments from parent company plants of American Rolling Mill Co., Middletown, O., Charles R. Hook, president, stated last week. Defense shipments in October represented 58 per cent of deliveries from parent company plants.

Shipments for defense requirements of Sheffield Steel Corp., Kansas City, Mo., wholly owned subsidiary of American Rolling Mill, comprised 85 per cent of the total in September and 81 per cent in October. In November, according to Mr. Hook, defense shipments will constitute 95.4 per cent of total tonnage.

minum-foil, rod, sheet, tape, tubing, $988,262.
Roseman Tractor Mower Co., Evanston, Ill., lawn mowers, $249,200.
Shakeproof Inc., Chicago, washers, $12,-054.
Sharpsville Steel Fabricators Inc., Sharpsville, Pa., tanks and gaskets, $955,200.
Sparks-Withington Co., Jackson, Mich., airplane assemblies, $496,219.
Steel Products Engineering Co., Springfield, O., machine gun turret assemblies, $8,611,416.
Thompson Products Inc., Cleveland, fuel pumps, $1,461,075.
United Specialties Co., Chicago, hose clamps, $291,133.
Weaver Mfg. Co., Springfield, Ill., portable engine hoists, $261,750.
Weston Electrical Instrument Corp., Newark, N. J., position indicators, $299,-671.
Wright Aeronautical Corp., Paterson, N. J., tools for engines, $149,346.
Wrought Washer Mfg. Co., Milwaukee, washers, $73,179.

Quartermaster Corps Awards

Doehler Metal Furniture Co. Inc., New York, folding steel cots, $48,300.
General Motors Corp., Chevrolet Division, Flint, Mich., 1½-ton trucks, $594,981.
Harris-Hub Bed & Spring Co., Cicero, Ill., folding steel cots, $48,300.
Hercules Food Service Equipment Inc., New York, muffin pans, retinned, $5266.
International Harvester Co., Ft. Wayne, Ind., 2½-ton trucks, $744,944.
Metal Products Mfg. Co., Seattle, sole protectors, $4678.
Milcor Steel Co., Milwaukee, stovepipe hoods, $51,000.
Motor State Products Co., Ypsilanti, Mich., folding steel cots, $64,152.
Simmons Co., New York, folding steel cots, $80,500.
Smith & Davis Mfg. Co., St. Louis, folding steel cots, $80,050.

Coast Artillery Corps Awards

General Electric Co., Schenectady, N. Y., recording device, $5000.
Hardware & Supply Corp., Kansas City, Mo., galvanized wire rope, $3000.
Roebling's, John A., Sons Co., Trenton, N. J., galvanized steel rope, $16,306.

Corps of Engineers Awards

Belmont Metal Co. Inc., New York, standard steel buildings, $40,526.
Blaw-Knox Co., Pittsburgh, electro-forged grating, $16,422.
Bucyrus-Erie Co., South Milwaukee, Wis., shovels, $54,948.
Buffalo Gasoline Motor Co., Buffalo, gasoline-electric standby unit, $8560.
Chicago Bridge & Iron Co., Birmingham, Ala., water tank, $42,985.
Ehrbar, Edward, Co., Brooklyn, N. Y., jetting and centrifugal pumps, $8186.
El Paso Iron & Metal Co., El Paso, Tex., galvanized pipe, $2437.
Engineering & Equipment Co., Albany, Ga., plumbing supplies, $5292.
Fairmont Railway Motors Inc., Fairmont, Minn., target cars, $5837.
Lord & Burnham Co., Irvington, N. Y., footbridges, $58,050.
Patterson, C. T., Co. Inc., New Orleans, door and window hardware, $2543.
Taylor-Wharton Iron & Steel Co., Easton, Pa., oxygen cylinders, $4352.
Wallace & Tiernan Co. Inc., Newark, N. J., chlorinators and accessories, $7295.
Zork Hardware Co., El Paso, Tex., galvanized pipe, $5809.

Signal Corps Awards

Alden Products Co., Brockton, Mass., tuning units, $43,845.
American Automatic Electric Sales Co., Chicago, telephone dials, automatic telephones and central office equipment, watchmen's service equipment, attendants' cabinets, switchboard equipment, $191,754.
Ampro Corp., Chicago, motion picture reels and cans, $7640.
Anaconda Wire & Cable Co., New York, wire, $758,100.
Bell & Howell Co., Chicago, humidor cans and film reels, and repair equipment, $11,228.
Bendix Radio Corp., Baltimore, radio equipment, coils, $219,531.
Bicknell Mfg. Co., Rockland, Me., soldering irons, $2373.
Buckingham, W. H., Mfg. Co., Binghamton, N. Y., climbers, $4575.
Bunnell, J. H., & Co., New York, keys, $1361.
Burgess Battery Co., Freeport, Ill., batteries, $5415.
Camillus Cutlery Co., New York, knives, $1793.
Cardwell, Allen D., Mfg. Corp., Brooklyn, N. Y., dials, $2880.
Chicago Telephone Supply Co., Elkhart, Ind., volume controls, $3235.
Climax Engineering Co., Clinton, Iowa, generators, $46,400.
Connecticut Telephone & Electric Corp., Meriden, Conn., test sets, head sets, $11,198.
Continental Electric Co. Inc., Newark, N. J., generators, power units, $158,315.
Daven Co., Newark, N. J., radio equipment, $201,614.
Dicke Tool Co., Downers Grove, Ill., reel units, $2560.
DuMont, Allen B., Laboratories Inc., Passaic, N. J., oscillographs, $13,406.
Edison, Thomas A., Inc., Chicago, batteries, $7302.
Erie Resistor Corp., Erie, Pa., suppressor pins, $12,675.
Federal Mfg. & Engineering Corp., Brooklyn, N. Y., tuning units, $48,489.
Fischer, Charles, Spring Co., Brooklyn, N. Y., casings, nuts, shafts, $117,040.
Froiland Mfg. Co., Springfield, Mass., control units, $11,535.
Galvin Mfg. Co., Chicago, alignment tools and cord, radio equipment, $387,168.
General Cable Corp., New York, wire, $2,384,859.
General Dry Batteries Inc., Cleveland, batteries, $6456.
General Electric Co., Schenectady, N. Y., transmitting units, radio equipment, holders, switches, wire, ball bearings, dynamoter units, $407,266.
General Radio Co., Cambridge, Mass., signal generators, wavemeters, $10,-610.
Globe Sales & Mfg. Co., New York, panels, $26,546.
GMW Advertisers Display Corp., New York, cases, $4561.
Graybar Electric Co. Inc., Chicago, cables, reels, telephones, oscillators, cars, $62,899.
Gussack Machined Products Inc., Long Island City, N. Y., couplings, $55,225.
Hallicrafters Co., Chicago, components for radio equipment, $41,573.
Horni Signal Mfg. Corp., New York, tuning units, $56,038.
Horton Mfg. Co., Bristol, Conn., mast sections, $20,501.
Jacobson Mfg. Co., Racine, Wis., cranks, $3213.
Joslyn Co., New York, wire, $49,960.
Kellogg Switchboard & Supply Co., Chicago, handsets, headsets and receivers, $341,885.
Lear Avia Inc., Piqua, O., radio equipment, $4542.
Leich Sales Corp., Chicago, terminal boxes, $25,175.
Mallory, P. R., & Co. Inc., New York, switches, $2753.
National Carbon Co. Inc., New York, batteries, $5748.
National Co. Inc., Malden, Mass., radio receivers, coil assemblies, radio equipment, $31,387.
North Electric Mfg. Co., Galion, O., switchboard equipment, $12,021.
Oak Mfg. Co., Chicago, vibrators, $24,702.
Onan, D. W., & Sons, Minneapolis, charging sets, power units, $148,974.
Pan-American Airways System, New York, hydrogen generators, $18,737.
Radio Receptor, New York, rectifier power equipment and tube sets, $280,083.
Rauland Corp., Chicago, transmitter tuning units, $30,145.
RCA Mfg. Co. Inc., Camden, N. J., parts for control panels, chanalysts, converters, radio equipment, transmitting components and accessories, portable

"For Industrial Plants Throughout the Nation"

■ This defense production poster entitled "Men Working Together", for display in industrial plants throughout the nation, was designed to build morale on the production front. Produced and distributed by the Division of Information, Office for Emergency Management, the poster is 30 x 40 inches. NEA photo

public address sets, tuning capacitors, socket board assemblies, $310,306.
Remler Co. Ltd., San Francisco, plugs, $10,005.
Supreme Instrument Corp., Greenwood, Miss., test sets, $17,128.
Technical Appliance Corp., New York, antennae, socket caps, guys and specifications, $18,434.
Teletype Corp., Chicago, teletype sets and parts, $25,316.
Triumph Mfg. Corp., Chicago, signal generators, test sets, $2859.
United Transformer Corp., New York, coils, $3264.
U. S. Rubber Co., New York, wire, $279,000.
Utica Drop Forge & Tool Co., Utica, N. Y., pliers, $3136.
Utilities Service Co., Allentown, Pa., washers, $1435.
White, S. S., Dental Mfg. Co., New York, casings, $8930.
Whitney Blake Co., New Haven, Conn., wire, $231,000.
Widin Metal Goods Co., Garwood, N. J., mast sections, $12,785.

Medical Corps Awards

Boker, H., & Co. Inc., New York, forceps, $7780.
Grieshaber Mfg. Co., Chicago, knives, $15,805.
Hackensack Specialty Mfg. Co., Hackensack, N. J., forceps, $16,946.
Kelley-Koett Mfg. Co. Inc., Washington, X-ray tables, $1455.
MacGregor Instrument Co., Needham, Mass., needles, $15,002.
Oneida Ltd., Oneida, N. Y., forceps, $50,075.
Penn Surgical Mfg. Co. Inc., Philadelphia, forceps, $2091.
Schnafel Bros. Corp., Newark, N. J., forceps, $16,800.
Sklar, J., Mfg. Co., New York, forceps, $59,154.
Weck, Edward, & Co., New York, forceps, $16,800.
Zimmer Splint Co., New York, aluminum litters, $59,235.

J. G. Brill Gets Order for 360 Pack Howitzer Carriages

J. G. Brill Co., Philadelphia, manufacturer of passenger transportation vehicles, last week reported it had received an additional contract from the War Department for 360 pack howitzer carriages for 75-millimeter guns.

This award, with two previous orders for the same type of carriages, gives Brill a total of 554 carriages delivered and on order for the War Department.

Defense Contract Opportunities . . .

■ Contract Distribution Division of OPM recently issued more subcontract opportunities that have not been published heretofore in STEEL. The subcontracts are available to any manufacturer possessing the requisite facilities and not already engaged to capacity on defense work.

Further information concerning any of the following items may be secured from the district office which issued the list. In most cases, actual samples or drawings of the desired article are available for examination by prospective subcontractors. The opportunities:

Division of Contract Distribution, OPM, Federal Reserve Bank Building, Cleveland, is seeking contractors for the following work:

55-1031: Ohio manufacturer wishes to subcontract machine work including heat-treating and grinding 600 cast steel bevel gears, 10-inch diameter, various lengths up to 9¼ inches. Machine requirements covering critical operations are turret or engine lathes with chuck and boring facilities for 2 to 5½-inch diameter holes; gear hobbers or cutters for 6 to 10-inch P.D.; internal and external grinders. 60 gears wanted by Jan. 1, 1942. Rough steel castings furnished.

56-1103: Midwestern manufacturer wishes to subcontact work requiring machining facilities to fabricate large quantity of cap nuts. Work requires automatic screw machines capable of handling 1½-inch bar hex stock on 2 items, and equipment for upsetting and machining complete cap nut finished at 2⅛-inch overall and 1⅛-inch in diameter. Heat treating optional on all parts—if facilities are not available quotations still acceptable. Material, SAE-1112 and SAE-X1112, furnished. Delivery Jan. 1, 1942.

57-1104: Subcontractors required for machining and cutting teeth on 40 transversing racks. Rack measuring 92.750-inch O.D. x 3.750-inch (width) x 2.304-inch (thickness of ring). Bids acceptable on machining and cutting or cutting teeth only. Gear blank forgings or machined rack forgings will be furnished. Material WD1045.

58-1104: Subcontractors wanted for machining and cutting teeth on 140 elevating racks weighing approximately 100 lbs. Operations include turning O.D.; cutting 30 teeth on outside 49.457-inch radius, on surface 50.75-inch long and 1⅞-inch wide; drilling, reaming and counterboring 1½-inch hole; drilling and tapping 7¾-inch holes. Steel castings and patterns to be furnished by subcontractor.

59-1112: Eastern manufacturer requires forging facilities and die equipment on quantity of small forgings. Three (3) items ranging in size as follows: Item No. 1 approximately 2⅛ x 1 43/64, material SAE X4130; No. 2 approximately 2¼ x 3½, material SAE X4340 or 4640; No. 3 approximately 4¼ x 4¾, material SAE X4340 or 4640. Quantities from 3000 to 30,000 pieces. Priority A-1-b. Die equipment and material to be furnished by subcontractor. Blueprints are on file in this office.

60-1113: Midwestern manufacturer requires sources to furnish gooseneck-shaped pressure castings weighing 50 pounds each. Steam chest casting parts 100 to 115 pounds each. Adapter castings weighing 32 pounds each. Quantities 500 pieces per month. Material, molybdenum alloy.

61-1113: Local manufacturer wishes to subcontract machine work on nine items. In quantities ranging from 500 to 5000 pieces. Facilities required are turret lathes up to 1¾ bar, small milling machines, drills, and tapping. Material to be furnished by subcontractor.

Munitions Plant Survey Contracts Awarded

■ Two letters of intent for preliminary surveys in connection with recently announced munitions plants were reported by the War Department last week. Approved by the Office of Production Management, these letter contracts precede formal awards which will be announced later.

E. I. du Pont de Nemours & Co., Wilmington, Del., received a letter of intent for development of plant design and preparation of comprehensive estimates for an explosives plant at Newport, Ind., to be known as the Wabash River Ordnance Works (See STEEL, Nov. 24, p. 55). Expenditures are limited by the letter to $50,000.

Letter guaranteeing reimbursement to $200,000 was issued to Hercules Powder Co., Wilmington, Del. It authorizes aerial surveys to establish topographical maps of the proposed site for a smokeless powder plant at Merrimac, Wis. Soil investigations and other necessary surveys preliminary to award of formal contracts for construction are also included.

Government Finances More Plant Expansions

■ Defense Plant Corp. reported last week execution of a contract with Continental Roll & Steel Foundry Co., East Chicago, Ind., for constructing and equipping a plant at East Chicago at a total cost of $5,493,488. Ordnance equipment is to be manufactured at the new plant.

Approximately $1,444,487 of the total will be expended for land and buildings, it is reported, and the remaining $4,049,000 for machinery and equipment.

This commitment is in addition to previous authorizations comprising $5,031,650 for plants at East Chicago; Wheeling, W. Va.; and Coraopolis, Pa.

The Defense Corp. also contracted with Cleveland Graphite Bronze Co., Cleveland, for machinery and equipment totaling $1,393,648 for production of aeronautical items at Cleveland.

Chicago OPM Branch To Change Quarters

■ Headquarters of the Chicago district Contract Distribution Division, OPM, will be transferred from the present site in the Federal Reserve Bank building to a larger space in the Civic Opera building about Dec. 6, it was reported last week.

Regional headquarters of the Office of Civilian Defense, Training Within Industry, and Office of Price Administration will eventually be housed in the Civic Opera building also. The move is in line with a program to consolidate various divisions of the Office of Emergency Management.

Priorities Division, OPM, likewise was recently moved from the Federal Reserve Bank building to the Opera building.

■ Factory sales of mechanical stokers in September totaled 27,138 units, compared with 28,731 in August and 31,396 in September, 1940, according to Bureau of the Census. Total sales for first nine months this year were 149,630, against 109,201 for the comparable period in 1940.

Closed Shop Agreements Cover Third Of Workers in Ten Leading Industries

■ ABOUT one-third of the workers employed in ten leading American industries work under closed shop or union shop conditions, according to a survey by The Twentieth Century Fund, New York.

Union status takes one or more of the following forms:

Closed Shop: Only union members can be hired and workers must remain union members to retain employment.

Union Shop: Nonmembers may be hired, but to retain employment must become union members after a certain period.

Preferential Shop: Union members are given preference in hiring or layoff, or both.

Maintenance of Membership Shop: No one is forced to join union, but all present or future members must remain in good standing as a condition of employment.

Exclusive Bargaining Shop: The union is recognized as the exclusive bargaining agent for all employes, whether union members or not.

Bargaining for Members Only: The union is recognized as the bargaining agent only for its members.

In ten of the largest of some 50 industries covered by survey, about 34 per cent of the employes work in closed or union shops. These ten industries employ nearly 6,000,000 workers, almost one-sixth of all wage earners in the country. Some 4,000,000 are union members, who comprise about 40 per cent of the total union membership in the United States. None of these industries is completely closed shop.

Union Shop Prevails in Coal

The union shop prevails in the coal mining industry. Of the 540,000 employed in the mines 90 per cent work under union shop agreements, including about one-half of the workers in captive mines, some of which are owned by steel companies. Only the 53,000 workers involved in the current disputes have not had the union shop, although 95 per cent of these are members of the United Mine Workers.

Exclusive bargaining rights prevail in the five remaining big industries. They are: Automobiles (500,000 workers; more than 450,000 union members); rubber (120,000 workers; 64,000 union members); electrical manufacturing (400,000 workers; 218,000 union members); iron and steel (500,000 workers; 400,000 union members); and railroads (1,000,000 workers; 900,000 union members).

It may be observed from these figures that closed and union shops prevail in industries where unionism has been long accepted, such as printing, building construction and coal mining.

Railways, another veteran among unionized industry, is, however, the outstanding exception. In recent years the trend has been to substitute the exclusive bargaining shop for initial agreements calling for bargaining for members only—and once this step has been gained to press for preferential, union and closed shops.

Limits Choice of Workers

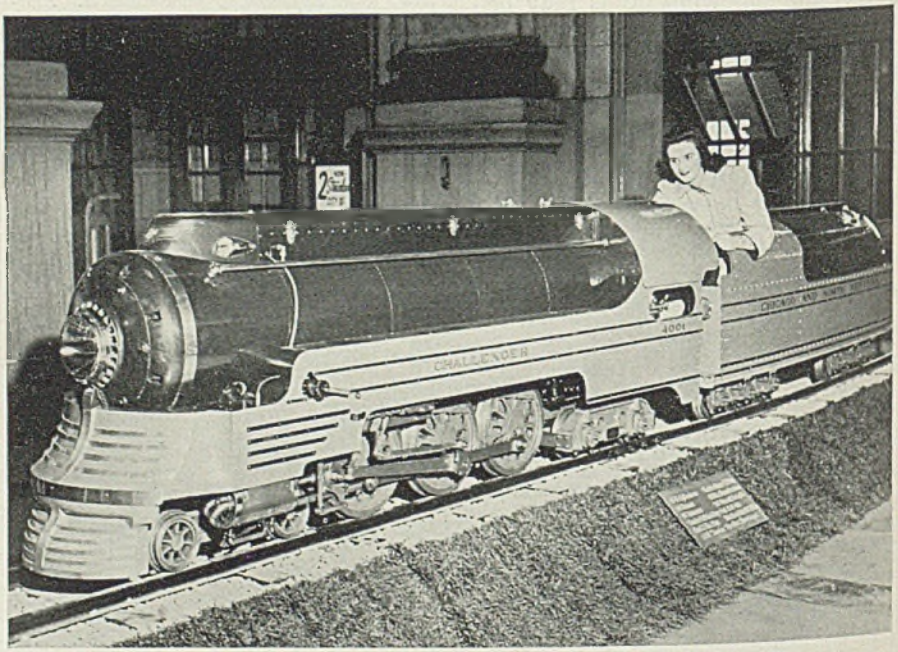
Employers opposed to closed and union shops maintain that their choice of workers is limited and that they are required to discharge those who have resigned or have been expelled from unions, yet whose work has been satisfactory. They further claim that some of their workers do not wish to join unions and that since employers are forbidden by law to prevent their workers from joining unions, they should not be forced to compel workers to do so. Some employers hold that closed shops are in effect monopolies, whereas they themselves are forbidden by antitrust laws to engage in monopolistic practices.

An analysis of the attitude of government shows that federal statutes both uphold and outlaw the closed shop. The National Labor Relations Act (the Wagner Act) specifically allows agreements with closed or union shop clauses. The Railway Labor Act disallows the closed shop by forbidding the carriers to compel their employes to join unions.

One state, Minnesota, forbids the closed shop. State courts have both upheld and outlawed strikes for the closed shop. Strikes for this purpose have been upheld by court decisions in California, Colorado, Connecticut, Florida, Idaho, Illinois, Maryland, Missouri, Montana, New Jersey, New York, Oklahoma, Rhode Island and Wisconsin. They have been declared illegal in courts of Delaware, Georgia, Maine, Massachusetts, Mississippi, New Hampshire, Oregon, Pennsylvania, Texas and Vermont.

■ Unit domestic bookings of electric industrial trucks totaled 513 in October, compared with 494 in September, according to the Industrial Truck Statistical Association, 208 South LaSalle street, Chicago. Total net value of chassis only booked in October was $1,812,363, against $1,916,283 in the prior month.

What 20-Foot Model of Modern Locomotive Can Do



■ Scale model of the streamlined steam locomotive of the Challenger, crack train to the Pacific coast, was exhibited last week in the Chicago & Northwestern station in Chicago. Twenty feet overall, it develops 40 horsepower with 150 pounds of steam pressure, can run 20 miles in an hour using two bushels of coal for fuel. It has a 14-inch gage, 14-inch drivers, 4 x 5-inch cylinders, weighs, in working order, 2½ tons. NEA photo

Ten Month's Finished Steel Output Up 39.5%

■ Steel produced for sale in October totaled 5,838,499 net tons, 453,682 tons more than 5,384,817 tons in September, a gain of 8.43 per cent, according to the American Iron and Steel Institute.

October production was 901,111 tons more than 4,937,388 tons made in September, 1940, up 18.25 per cent.

Exports in October amounted to 532,082 tons, 28,638 tons less than 560,720 tons in September, a decline of 5.11 per cent. Shipments to other members of the industry for further conversion totaled 367,669 tons in October, 41,881 tons, 12.86 per cent more than 325,788 tons in September.

Production in ten months this year totaled 54,284,448 tons, compared with 38,899,459 tons in the period in 1940, an increase of 15,384,989 tons, or 39.55 per cent. During 1940 the companies included below represented 97.9 per cent of the total output of finished rolled products.

Production for sale, less shipments to members of the industry for further conversion, related to estimated yield from ingots of 71.1 per cent, was 5,470,830 tons, 108 per cent in October. For ten months it was 50,677,975 tons, 102 per cent of capacity.

1940	Output	Exported	Pct. Exported
Oct.	4,937,388	783,652	15.87
Nov.	4,760,948	562,587	11.82
Dec.	4,909,448	713,802	14.5
Year	48,584,860	7,683,858	15.8
1941			
Jan.	5,163,912	558,198	10.8
Feb.	4,864,936	560,035	11.5
March	5,411,319	491,519	9.07
April	5,269,748	331,942	6.29
May	5,444,235	317,442	5.8
June	5,086,210	327,357	6.4
July	5,226,102	430,493	8.2
Aug.	5,573,666	516,540	9.3
Sept.	5,384,817	560,720	10.4
Oct.	5,838,499	532,082	9.11

AMERICAN IRON AND STEEL INSTITUTE
Capacity and Production for Sale of Iron and Steel Products

October - 1941
PERIOD

		Number of companies	Items	Annual Capacity Net tons	Production for Sale—Net Tons							
					Current Month				Year to Date			
					Total	Per cent of capacity	Shipments		Total	Per Cent of capacity	Shipments	
							Export	To members of the industry for conversion into further finished products			Export	To members of the industry for conversion into further finished products
Steel Products	Ingots, blooms, billets, slabs, sheet bars, etc.	42	1	xxxxxxx	668,144	xxx	216,266	181,684	5,736,350	xxx	1,621,225	1,735,666
	Heavy structural shapes	9	2	5,248,400	406,528	91.2	13,910	xxxxxxx	3,841,278	87.9	147,805	xxxxxxx
	Steel piling	4	3	422,000	28,121	78.4	2,013	xxxxxxx	294,856	83.9	28,568	xxxxxxx
	Plates—Sheared and Universal	20	4	5,624,360	592,822	124.1	26,085	5,351	4,819,712	102.9	281,836	34,716
	Skelp	8	5	xxxxxxx	83,716	xxx	8,384	43,078	848,478	xxx	133,780	357,121
	Rails—Standard (over 60 lbs.)	4	6	3,613,600	140,963	45.9	11,925	xxxxxxx	1,454,613	48.3	61,229	xxxxxxx
	Light (60 lbs. and under)	6	7	302,800	16,027	62.3	2,343	xxxxxxx	146,803	58.2	50,741	xxxxxxx
	All other (Incl. girder, guard, etc.)	2	8	102,000	3,577	41.3	456	xxxxxxx	22,823	26.9	3,007	xxxxxxx
	Splice bar and tie plates	14	9	1,299,600	50,661	45.9	1,254	xxxxxxx	586,811	54.2	12,702	xxxxxxx
	Bars—Merchant	41	10	xxxxxxx	563,212	xxx	24,295	60,103	5,330,571	xxx	385,224	631,105
	Concrete reinforcing—New billet	19	11	xxxxxxx	167,705	xxx	17,793	xxxxxxx	1,345,555	xxx	176,259	xxxxxxx
	Rerolling	19	12	xxxxxxx	30,690	xxx	2,139	xxxxxxx	209,240	xxx	13,887	xxxxxxx
	Cold finished—Carbon	25	13	xxxxxxx	107,102	xxx	2,622	xxxxxxx	1,050,944	xxx	21,277	xxxxxxx
	Alloy—Hot rolled	18	14	xxxxxxx	155,737	xxx	3,152	21,798	1,569,082	xxx	119,526	230,752
	Cold finished	19	15	xxxxxxx	21,805	xxx	1,923	xxxxxxx	159,642	xxx	25,173	xxxxxxx
	Hoops and baling bands	5	16	xxxxxxx	9,641	xxx	510	xxxxxxx	98,346	xxx	3,519	xxxxxxx
	TOTAL BARS	65	17	13,317,725	1,055,892	93.3	52,434	81,901	9,763,380	88.0	744,865	861,857
	Tool steel bars (rolled and forged)	17	18	180,470	14,749	96.2	616	xxxxxxx	126,218	84.0	6,339	xxxxxxx
	Pipe and tube—B. W.	16	19	2,242,040	172,352	90.5	7,681	xxxxxxx	1,466,497	78.5	98,476	xxxxxxx
	L. W.	8	20	895,260	40,997	53.9	1,466	xxxxxxx	413,829	55.5	24,479	xxxxxxx
	Electric weld	6	21	551,020	48,582	103.8	4,678	xxxxxxx	455,845	99.3	27,468	xxxxxxx
	Seamless	15	22	2,997,160	221,404	86.9	15,308	xxxxxxx	1,830,815	73.3	158,252	xxxxxxx
	Conduit	8	23	174,140	15,619	105.6	524	xxxxxxx	134,502	92.7	4,038	xxxxxxx
	Mechanical Tubing	11	24	393,570	32,056	95.9	2,882	xxxxxxx	287,886	87.8	21,514	xxxxxxx
	Wire rods	22	25	xxxxxxx	117,263	xxx	15,311	17,872	1,262,510	xxx	165,279	210,138
	Wire—Drawn	39	26	2,230,290	211,640	111.7	9,291	1,614	1,897,984	102.2	118,652	18,823
	Nails and staples	18	27	1,153,930	66,027	67.3	3,935	xxxxxxx	664,929	69.2	57,216	xxxxxxx
	Barbed and twisted	16	28	474,210	24,728	61.4	12,223	xxxxxxx	230,607	58.4	58,914	xxxxxxx
	Woven wire fence	16	29	777,785	22,915	34.7	82	xxxxxxx	259,420	40.0	1,746	xxxxxxx
	Bale ties	11	30	110,970	7,134	75.7	124	xxxxxxx	70,651	76.4	295	xxxxxxx
	All other wire products	7	31	41,380	1,958	55.7	-	xxxxxxx	17,845	51.8	3	xxxxxxx
	Fence posts	12	32	122,165	4,588	44.2	188	xxxxxxx	59,068	58.0	982	xxxxxxx
	Black plate	11	33	340,030	45,578	157.8	5,935	-	370,084	130.7	34,600	43
	Tin plate—Hot rolled	7	34	515,620	44,067	100.6	18,028	xxxxxxx	294,118	68.5	52,596	xxxxxxx
	Cold reduced	11	35	3,542,040	298,252	99.1	40,920	xxxxxxx	2,582,343	87.5	246,623	xxxxxxx
	Sheets—Hot rolled	26	36	xxxxxxx	647,245	xxx	27,388	15,880	6,328,654	xxx	260,552	177,462
	Galvanized	16	37	xxxxxxx	123,957	xxx	5,777	xxxxxxx	1,416,086	xxx	91,149	xxxxxxx
	Cold rolled	18	38	xxxxxxx	234,481	xxx	11,621	xxxxxxx	2,596,561	xxx	67,284	xxxxxxx
	All other	13	39	xxxxxxx	62,706	xxx	2,102	xxxxxxx	649,619	xxx	19,752	xxxxxxx
	TOTAL SHEETS	32	40	13,369,740	1,068,389	94.1	46,888	15,880	10,990,920	98.7	438,787	177,462
	Strip—Hot rolled	24	41	3,285,430	155,897	55.9	5,345	20,289	1,697,633	62.0	63,835	210,647
	Cold rolled	38	42	1,525,510	109,658	84.6	3,841	xxxxxxx	1,092,364	86.0	21,721	xxxxxxx
	Wheels (car, rolled steel)	5	43	422,820	26,769	74.5	695	xxxxxxx	217,178	61.7	2,153	xxxxxxx
	Axles	6	44	480,350	20,629	50.5	654	xxxxxxx	160,761	40.2	3,205	xxxxxxx
	Track spikes	11	45	325,770	14,958	54.0	397	xxxxxxx	143,637	52.9	3,205	xxxxxxx
	All other	8	46	96,600	5,839	71.1	-	xxxxxxx	41,700	51.8	79	xxxxxxx
	TOTAL STEEL PRODUCTS	163	47	xxxxxxx	5,838,499	xxx	532,082	367,669	54,284,448	xxx	4,696,165	3,606,473
Iron Products	Pig iron, ferro manganese and spiegel	29	48	xxxxxxx	694,199	xxx	14,438	292,521	6,711,406	xxx	448,993	2,226,457
	Ingot moulds	4	49	xxxxxxx	62,629	xxx	459	xxxxxxx	625,397	xxx	3,707	xxxxxxx
	Bars	13	50	175,915	9,408	62.9	184	551	83,402	56.9	990	4,563
	Pipe and tubes	3	51	109,300	6,682	72.0	185	xxxxxxx	57,895	63.6	2,316	xxxxxxx
	All other	1	52	56,000	2,089	43.9	438	-	16,381	35.1	3,404	-
	TOTAL IRON PRODUCTS (ITEMS 50 to 52)	14	53	276,715	18,179	77.3	807	551	157,678	68.4	6,710	4,563

Total Number of Companies Included - 186

The estimated average yield of products for sale from ingots produced by the companies included above is 71.1 *%, which applied to their total ingot capacity equals* 59,640,600 *net tons of finished rolled products.*
Production for sale, less shipments to members of the industry for further conversion, related to the estimated yield is as follows:
Current month 5,470,830 *N. T.;* 108.0 *%*
Year to date 50,677,975 *N. T.;* 102.0 *%*

Plan To Allocate Steel for Export; Britain Lists First-Half Requirements

NEW YORK

■ ALLOCATION of export steel not included under the lease-lend program or for Canada is expected to develop soon. The first product to be affected probably will be tin plate, according to leading steel exporters here.

Priorities, it is believed, will continue and will be worked out in greater detail than heretofore; allocations to govern the quantity to be spared for export, and priorities to regulate distribution. The proposed arrangement will affect primarily shipments to Central and South American countries, which the United States will endeavor to favor after essential lease-lend and Canadian requirements are met. It will also affect shipments to the Dutch East Indies.

May Apply to Old Orders

One matter of concern to exporters in this proposal is whether it will apply to various orders long on their books, before priorities on domestic tonnage went into effect. Some large sellers have heavy backlogs of this character which they have been unable to fill because of expanding domestic needs and requirements for Great Britain and her allies. It is expected the allocation system will apply to the old orders. This would eliminate red tape in cancelling and reinstating the orders.

Details have been worked out on a list of requirements for Great Britain for first half of 1942, under the lend-lease act. The total is 1,380,000 tons, including 500,000 tons of billets and slabs; 420,000 tons ingots; 180,000 tons shell steel; 60,000 tons wire rods; 120,000 tons rails, and 60,000 tons bolts and nuts.

No anticipatory action has been taken with respect to alloys and forgings or finished steel products in general. Shipments of plates scheduled for Great Britain are suspended entirely, it is said, with no indication of resumption. This undoubtedly reflects present domestic stringency in this product. On the other hand a rush order for a substantial tonnage of barrel sheets was allocated recently among ten producers for shipment to Great Britain before the close of the year.

Little finished steel has been shipped to England for some time, but such material has been sent to her colonies, tin plate being an important item. A few months ago 420,000 tons of tin plate was placed under lease-lend rules for shipment over 12 months to the colonies and other points where food was being packed for Britain and its allies.

All privately financed export tonnage for Central and South America has been handled under a licensing system, through the division of controls, State Department, working with other government organizations. General blanket licenses have been in effect on tonnage for Argentina, Brazil, Cuba and Panama. On orders for all other Central and South American countries, it is said, individual licenses are necessary.

In recent months a priorities system has been set up to apply where needed on shipments to these countries. It is in charge of what is known as the Co-ordinator of Inter-American Affairs, working with the State Department, SPAB, other government agencies.

As no figures are now being published on destinations of steel exports it is not possible to say how much tonnage is going to South America this year. Last available figures were for the first three months, 165,267 tons, at a rate of about 661,000 tons for 1941, against 1,048,314 tons in 1940, and 503,318 tons in 1939.

To facilitate trade with South America where steel and other material is available the Export-Import bank is in position to provide special credits under which shippers receive payment on shipment and the importer pays on delivery.

Cyanide Products Service Laboratory Opened

■ E. I. du Pont de Nemours & Co. has opened its new cyanide products service laboratory at Niagara Falls, N. Y.

Staffed by chemists, metallurgists and technical service men, the company reports the new laboratories will be used primarily for the study and solution of customers' problems and for development of improved metal treatment and electroplating processes.

A three-story brick building houses a cyanide products analytical and research laboratory, a metal treatment furnace room and an electroplating service laboratory.

Armour Foundation To Build Metallurgical Research Unit

Armour Research Foundation, at the Illinois Institute of Technology, Chicago, has let a contract for construction of a metallurgical research building. The new unit will comprise a floor area of 11,000 square feet and will cost $250,000 fully equipped.

Metallurgical investigations conducted by the foundation include counter-gravity die casting, dolomites, heat treatment of steels, die casting ferrous and nonferrous metals, open-hearth slags, wire alloys and drawing, metal polishing materials, nonferrous forgings, foundry molding materials, hard-tipping alloys, core oils and free-machining metals.

McKee Suggests Board To Schedule Steel Rollings

■ Establishment of a central board for the sole purpose of scheduling war emergency orders for iron and steel products on mills qualified to roll the material was recommended by Arthur G. McKee, president, Arthur G. McKee & Co., Cleveland, at a meeting of the Cleveland district section, Association of Iron and Steel Engineers, Cleveland, last week.

Headquarters for such a board should be at some location away from Washington and its members should be men who have had extensive experience in the iron and steel industry, he stated. Output of the steel industry cannot be increased in a little while by laying down additional facilities. Building new units requires time. If we schedule the equipment we already have and do it on an intelligent basis, we can produce more munitions than the rest of the world put together. It seems reasonable to increase in a sensible way our present steel producing facilities to meet requirements of the next two or three years rather than to lay down new units and overstep the bounds, according to Mr. McKee.

He pointed out that we have about 18,000,000 tons of strip capacity in this country. If 3,000,000 tons of plate gages rolled on wide mills is deducted, there still remains 15,000,000 tons of strip rolling facilities. If this country needs plates, he continued, "let us not build a new plate mill in the East and a new plate mill in the West; but instead let's adapt more strip rolling facilities to plate gages to satisfy additional requirements."

■ In ceremonies held at the George Washington university recently, the Packard Motor Car Co., Detroit, was awarded a certificate of achievement for development of national defense production. The presentation was made by Dr. Cloyd Heck Marvin, president of the university. The award is a result of Packard's double-barreled assignments in national defense, involving production of marine engines for torpedo boats and Rolls-Royce aircraft engines.

Industry Told of Materials Controls To Come at Priorities Clinics

■ PRIORITIES clinics in three of the leading defense manufacturing cities—Pittsburgh, Cleveland and Detroit—last week attracted overflow crowds. Two thousand at Pittsburgh, approximately 1700 at Cleveland, and a comparable number in Detroit heard officials of OPM Priorities Division explain the picture of defense needs, "shortages" in metal and other materials, need for conservation and sacrifice in nonessential industries.

Also outlined were the new Production Requirements Plan and the transition from preference ratings to allocations of materials.

Intense interest of industrial executives in how priorities and allocations will affect the future of their business was manifest not only in the large attendance at the meetings, but also in the number of questions submitted. These were so numerous that time necessitated limiting the answers.

John Martin, assistant policy director of the Priorities Division, emphasized that the coming of allocations will not make present priorities rules and regulations obsolete. Many of these will be retained and their observance will continue mandatory.

The transition to an allocations system, he added, will be gradual. It will develop as the need arises. Probably it never will be complete and the earlier system of preference ratings will prevail in many cases. The ultimate system probably will be a combination of preference ratings and allocations.

Difference between the preference rating system and the allocations system, Mr. Martin explained, is that preference ratings start with the finished product and supply the manufacturer with a rating. This rating, he added, does not guarantee delivery of the materials desired but actually is only a ticket assigning him permission to stand in line to buy the goods.

Allocations, on the other hand, start with the raw materials and assign a portion of the materials available to the manufacture of the needed or desired goods. Priorities start at the top and allocations at the bottom, Mr. Martin added.

Charles Halcomb, assistant chief of the OPM Iron and Steel Section, predicted that steel ingot production in 1942 would be lower than in 1941, due to the scrap shortage. Production this year, he estimated, will be about 82,000,000 tons of ingots, or 57,000,000 tons of finished steel.

Only answer to the scrap shortage, he continued, is pig iron, but added that from 12 to 18 months will be necessary to build the necessary blast furnaces to increase pig iron output.

Mandatory allocations of steel plates will begin Dec. 1, according to Stanley Adams of the Iron and Steel Section. General Allocation No. 1, effective Dec. 1, will cover all products rolled on plate mills, including plates, sheet bars, slabs, skelp, and other products whether of carbon or alloy steel.

Demand Exceeds Supply

Demand for plate mill products carrying an A-10 or higher rating will amount to between 850,000 and 900,000 tons in December, while total production will be only 600,000 to 625,00 tons, making allocation a necessity.

Although M-24 carries mandatory priorities for scrap, amounting to an allocation order, the mandatory features are not yet being made effective and probably never will be, said Mr. Adams. Purpose of Forms PD-149, 150 and 151 is to make a survey of scrap, who makes it, who collects it and who uses it. This information probably will be used more as a guide to the construction of additional pig iron facilities than anything else.

The OPM, according to Mr. Adams, holds no beliefs that effective priorities can be established for scrap. The scrap shortage is a fact, and probably will become worse.

Automobile radiators soon will be made of steel, with an interior coating of lead and tin, Harvey Anderson, Conservation and Substitution Branch of OPM, predicted. Radiator manufacturers have agreed that steel can be adapted to this use, resulting in large savings of scarce copper, he said.

Another saving in copper will result from the use of steel cartridge cases, now beyond the development stage and in the limited production stage.

Mason Manghum, head of the Industrial Contact and Education Unit, advised all manufacturers, whether working on defense orders or not, to carefully read Priorities Regulation No. 1, which, he said, is becoming more important to all industry every day.

Admiral Congratulates Defense Worker

■ Admiral William H. Standley congratulates Carl Murrin, veteran Heppenstall Co. employe, on his good work in helping turn out vital defense materials. R. B. Heppenstall, president, stands to the left. Admiral Standley met Murrin while on an inspection tour of the Heppenstall Pittsburgh plant preceding ceremonies commemorating Heppenstall's acceptance of the United States Navy Bureau of Ordnance flag and "E" pennant

STEEL

Wake Up to Lesson of 1918!

■ BECAUSE rather serious shortages of certain materials are indicated for the near future, some defense authorities are making alarming statements relative to the number of businesses which will be forced out of existence during the present emergency.

These statements may have some slight value in awakening public opinion to the seriousness of the nation's problem of material supply. No doubt it is wise to inform the man in the street that there is not enough copper, for instance, to meet the requirements of defense and civilian demand.

But to say without qualification that considerable numbers of business concerns must close their doors because of a lack of materials is unwise.

It is unwise because it exposes the administration to unnecessary criticism on several scores. It enables the owners, managers and employes of a private enterprise forced out of business to ask extremely embarrassing questions.

♦ ♦ ♦

For instance, they may well say to Mr. Roosevelt: "You speak of the necessity of making sacrifices in the present emergency. We are willing to sacrifice in proportion to the sacrifices of others. But is it fair for us to sacrifice our business and our jobs in their entirety while you refuse to exact any measure of sacrifice, however small, from labor unions?"

Or they might say to Mr. Roosevelt: "You are forcing us to quit our jobs and close up our business because your administration cannot supply us with the small volume of aluminum or steel or copper we require for operations. You are doing this before you have made any real effort to conserve materials, to reclaim articles from which these materials can be salvaged, or to increase the utilization of materials through simplification. Why did you not exhaust these possibilities before pronouncing the death sentence on our business and our jobs?"

Again they might say: "We need only a small amount of material. The volume of production lost because of the week's shutdown of the captive mines would have kept 1000 businesses of our size going for a year. Is it just to ask us to sacrifice everything because of your inability to control the excesses of union labor which you encouraged?"

♦ ♦ ♦

Mr. Wilson did not condemn businesses in 1918. No effort was made to classify any industry as "non-essential." On the contrary, the administration attempted to preserve every unit in every industry.

A committee appointed by Mr. Wilson to study this problem, reported in part as follows:

"We do not recommend absolute prohibition because—granting the possibility of selecting from all the products of industry those items which could be agreed upon as of relatively slight importance to the consuming public—the benefits to be derived for the war program by the total and sudden prohibition of the industries producing such commodities would be trifling compared to the economic loss during and after the war."

Washington does not know it yet, but in time, after considerable fumbling, it will come around to the same sane conclusion which the Wilson administration reached in 1918.

E. L. Shaner

EDITOR-IN-CHIEF

Dec. 1, 1941

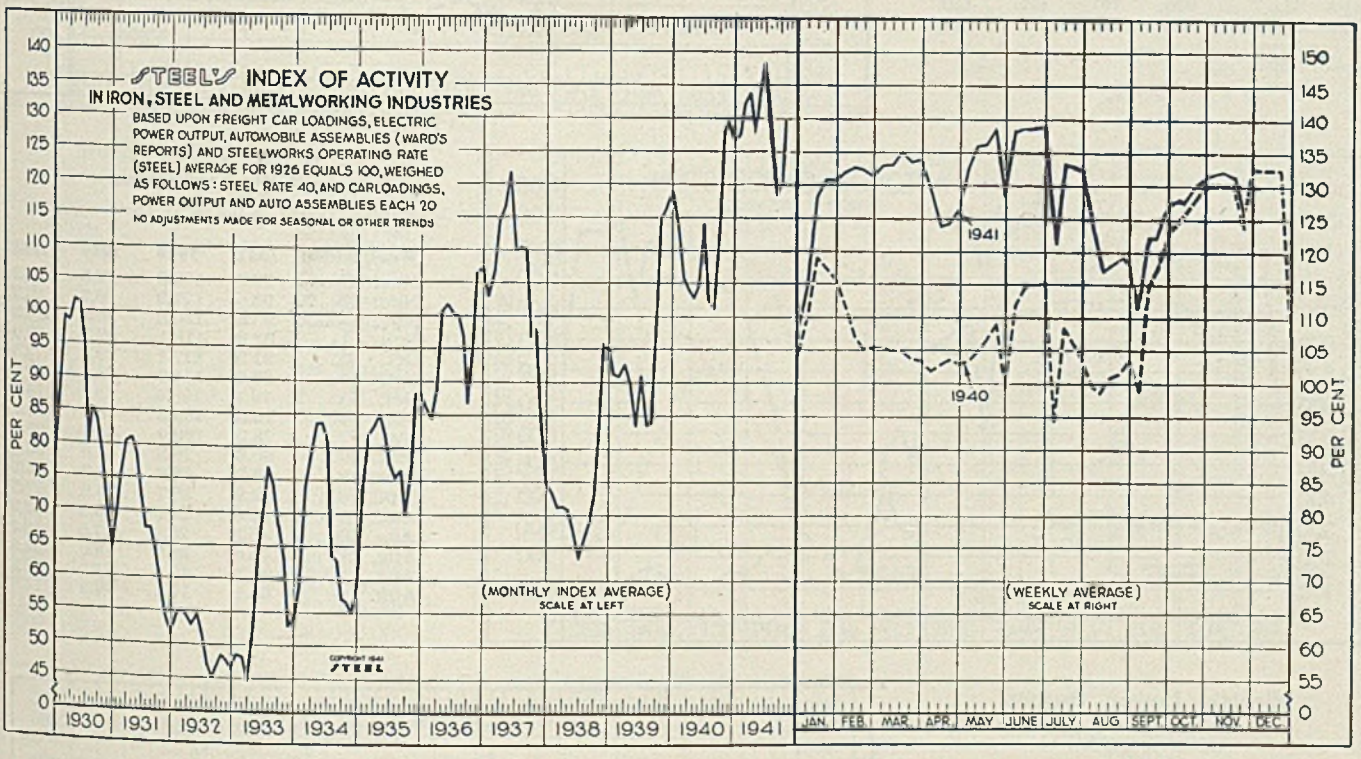
The BUSINESS TREND

Activity Index Recedes During Latest Period

■ IMPACT of defense orders on industrial activity is illustrated by recent employment trends. Number of jobs in the durable goods industries rose 31.5 per cent this year, against only 12.9 in consumer lines. More workers are now employed in the heavy industries than in consumer goods. The reverse was true during the 1929 boom period. Anticipated steady expansion in defense production over the coming months is expected to offset the expected further curtailment in output of consumer goods resulting from raw material shortages.

During the week ended Nov. 22 STEEL'S index of activity in the iron, steel and metalworking industries declined 7.7 points to 124.1. This represents the lowest level recorded by the index in the past two months and compares with 124.7 registered in the corresponding 1940 week.

Each of the industrial barometers composing the index receded during the latest period. The national steel rate eased 1.5 points to 95.5 per cent, compared with 97 per cent recorded in like period a year ago. Steelmaking operations were adversely affected by the coal strike during the week ended Nov. 22. Revenue freight carloadings declined to 799,386 cars.

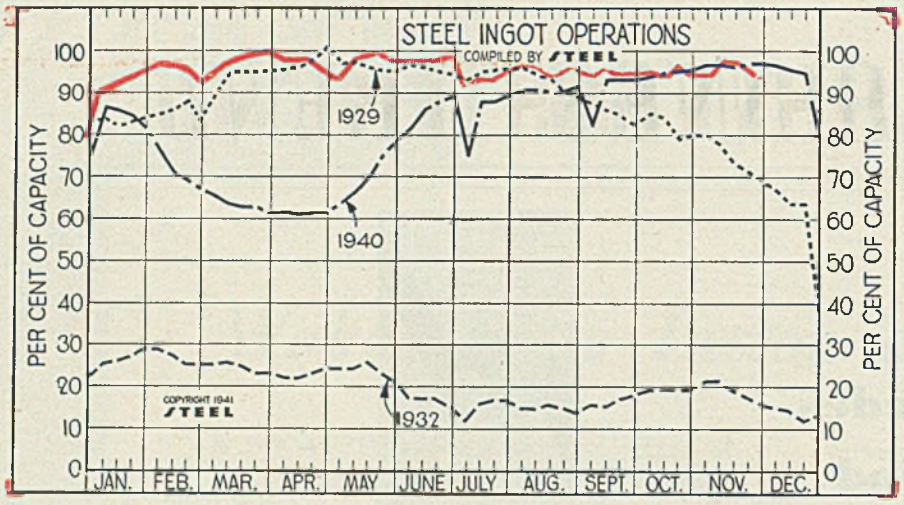


STEEL'S index of activity declined 7.7 points to 124.1 in the week ended Nov. 22:

Week Ended	1941	1940
Sept. 13	122.3	114.9
Sept. 20	122.9	124.4
Sept. 27	127.5	122.8
Oct. 4	128.0	124.4
Oct. 11	127.9	126.0
Oct. 18	130.2	128.3
Oct. 25	131.4	129.9
Nov. 1	131.9	130.2
Nov. 8	132.3	130.3
Nov. 15	131.8†	130.3
Nov. 22	124.1	124.7

†Revised.

Mo. Data	1941	1940	1939	1938	1937	1936	1935	1934	1933	1932	1931	1930
Jan.	127.3	114.7	91.1	73.3	102.9	85.9	74.2	58.8	48.6	54.6	69.1	87.6
Feb.	132.3	105.8	90.8	71.1	106.8	84.3	82.0	73.9	48.2	55.3	75.5	99.2
March	133.9	104.1	92.6	71.2	114.4	87.7	83.1	78.9	44.5	54.2	80.4	98.6
April	127.2	102.7	89.8	70.8	116.6	100.8	85.0	83.6	52.4	52.8	81.0	101.7
May	134.8	104.6	83.4	67.4	121.7	101.3	81.8	83.7	63.5	54.8	78.6	101.2
June	135.7	114.1	90.9	63.4	109.9	100.3	77.4	80.6	70.3	51.4	72.1	95.8
July	128.7	102.4	83.5	66.2	110.4	100.1	75.3	63.7	77.1	47.1	67.3	79.9
Aug.	118.1	101.1	83.9	68.7	110.0	97.1	76.7	63.0	74.1	45.0	67.4	85.4
Sept.	121.1	113.5	98.0	72.5	96.8	86.7	69.7	56.9	68.0	46.5	64.3	83.7
Oct.	129.9	127.8	114.9	83.6	98.1	94.8	77.0	56.4	63.1	48.4	59.2	78.8
Nov.	....	129.5	116.2	95.9	84.1	106.4	88.1	54.9	52.8	47.5	54.4	71.6
Dec.	.....	126.3	118.9	95.1	74.7	107.6	88.2	58.9	54.0	46.2	51.3	64.3



Steel Ingot Operations

(Per Cent)

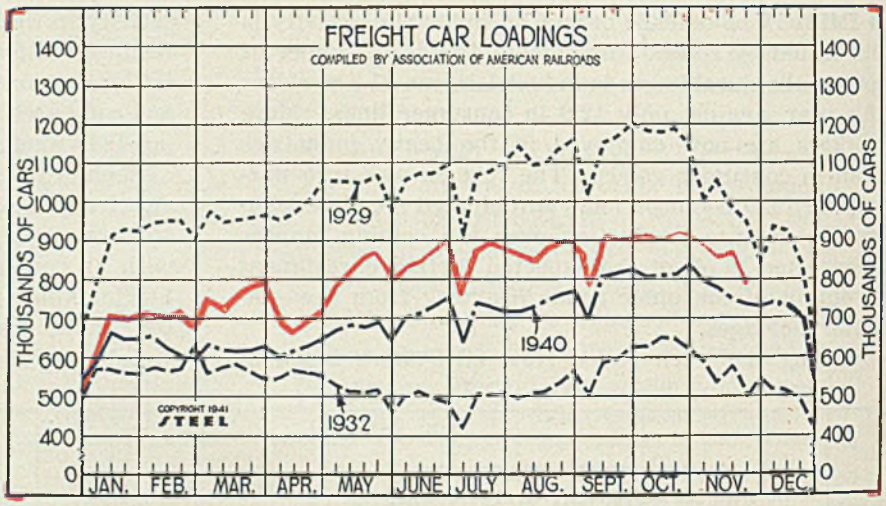
Week ended	1941	1940	1939	1938
Nov. 22....	95.5	97.0	93.5	62.0
Nov. 15....	97.0	96.0	93.5	63.0
Nov. 8....	97.5	96.5	93.0	61.5
Nov. 1....	95.5	96.5	93.0	57.5
Oct. 25....	95.5	95.5	92.0	54.5
Oct. 18....	96.5	95.0	91.0	51.5
Oct. 11....	94.5	94.5	89.5	51.5
Oct. 4....	96.0	93.5	87.5	48.5
Sept. 27....	96.0	93.0	84.0	47.0
Sept. 20....	96.0	93.0	79.5	48.0
Sept. 13....	96.5	93.0	74.0	46.0
Sept. 6....	95.5	82.0	62.0	41.5
Aug. 30....	96.5	91.5	64.0	44.5
Aug. 23....	96.0	90.5	63.5	43.5
Aug. 16....	95.5	90.0	63.5	41.5
Aug. 9....	96.0	90.5	62.0	40.0
Aug. 2....	97.5	90.5	60.0	40.0

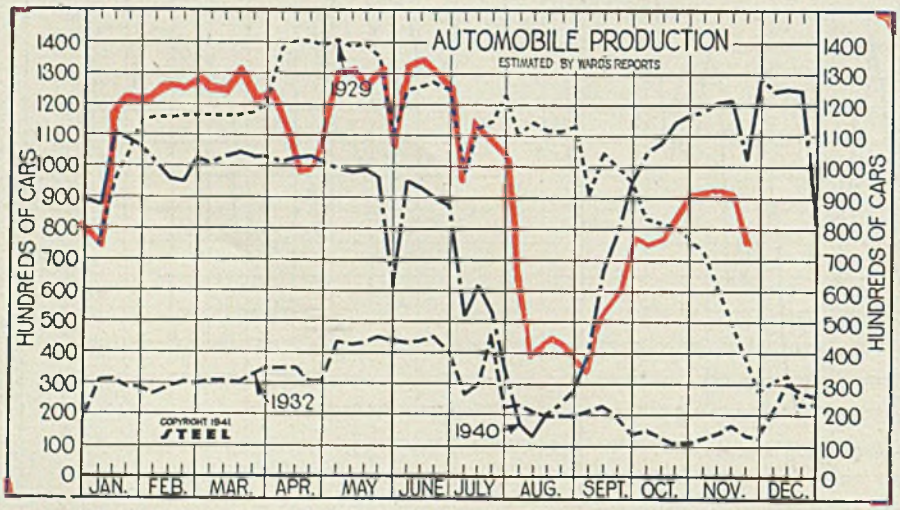
Freight Car Loadings

(1000 Cars)

Week ended	1941	1940	1939	1938
Nov. 22.....	799	733	677	562
Nov. 15.....	884†	745	771	657
Nov. 8.....	874	778	786	637
Nov. 1.....	895	795	806	673
Oct. 25.....	914	838	834	709
Oct. 18.....	923	814	861	706
Oct. 11.....	904	812	845	727
Oct. 4.....	918	806	835	703
Sept. 27.....	920	822	835	698
Sept. 20.....	908	813	815	676
Sept. 13.....	914	804	806	660
Sept. 6.....	798	695	667	569
Aug. 30.....	912	769	722	648
Aug. 23.....	900	761	689	621
Aug. 16.....	890	743	674	598

†Revised.





Auto Production

(1000 Units)

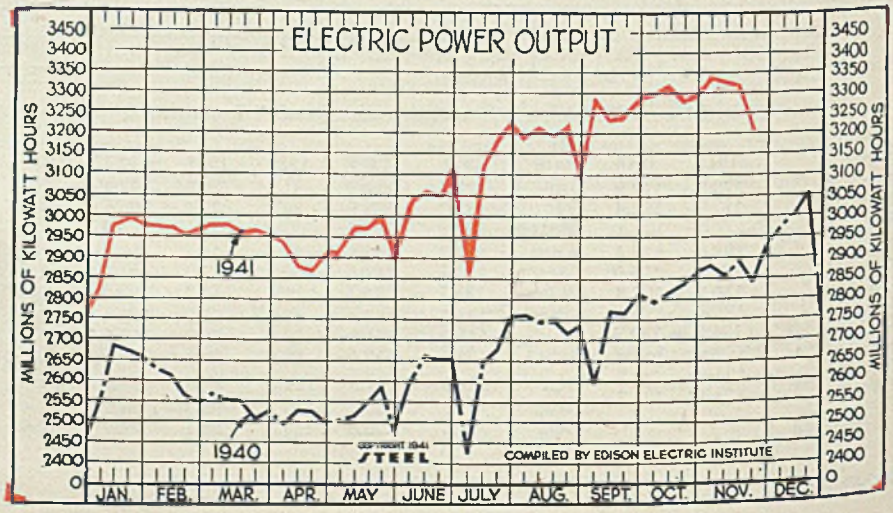
Week ended	1941	1940	1939	1938
Nov. 22....	76.8	102.3	72.5	84.9
Nov. 15....	93.0	121.9	86.7	96.7
Nov. 8....	93.6	120.9	86.2	86.3
Nov. 1....	92.9	118.1	82.7	80.9
Oct. 25....	91.9	117.1	78.2	73.3
Oct. 18....	85.6	114.7	70.1	68.4
Oct. 11....	79.1	108.0	75.9	50.5
Oct. 4....	76.8	105.2	76.1	37.7
Sept. 27....	78.5	96.0	62.8	25.4
Sept. 20....	60.6	78.8	54.0	20.4
Sept. 13....	53.2	66.6	41.2	16.1
Sept. 6....	32.9	39.7	26.9	17.5
Aug. 30....	40.0	27.6	25.2	22.2
Aug. 23....	45.5	23.7	17.5	18.7
Aug. 16....	45.6	20.5	13.0	23.9
Aug. 9....	41.8	12.6	24.9	13.8
Aug. 2....	62.1	17.4	28.3	14.8

Electric Power Output †

(Million KWH)

Week ended	1941	1940	1939	1938
Nov. 22.....	3,205	2,839	2,561	2,248
Nov. 15.....	3,304	2,890	2,587	2,325
Nov. 8.....	3,339	2,858	2,589	2,277
Nov. 1.....	3,339	2,882	2,609	2,271
Oct. 25.....	3,299	2,867	2,622	2,284
Oct. 18.....	3,273	2,838	2,576	2,281
Oct. 11.....	3,315	2,817	2,584	2,251
Oct. 4.....	3,290	2,792	2,554	2,229
Sept. 27.....	3,233	2,816	2,559	2,208
Sept. 20.....	3,232	2,769	2,538	2,211
Sept. 13.....	3,281	2,773	2,532	2,279
Sept. 6.....	3,096	2,592	2,376	2,110
Aug. 30.....	3,224	2,736	2,442	2,217

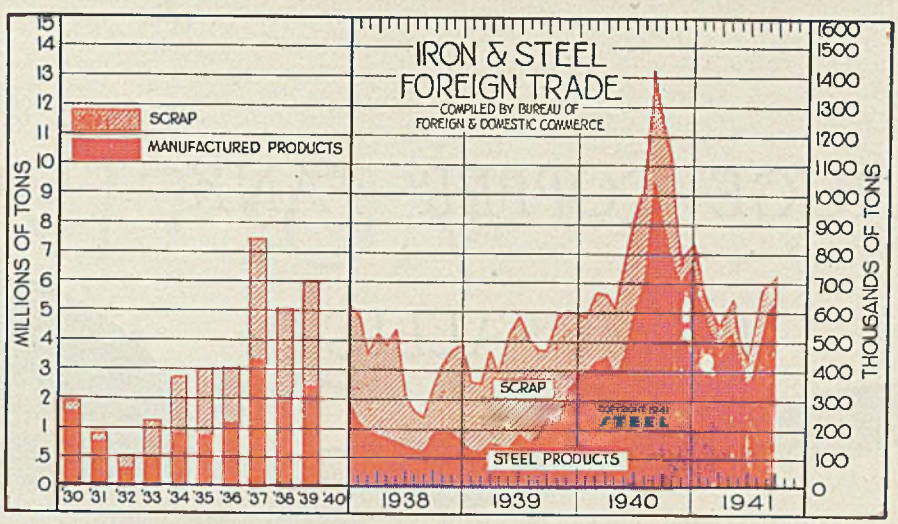
†New series: Includes additional governmental and power generation not previously reported.

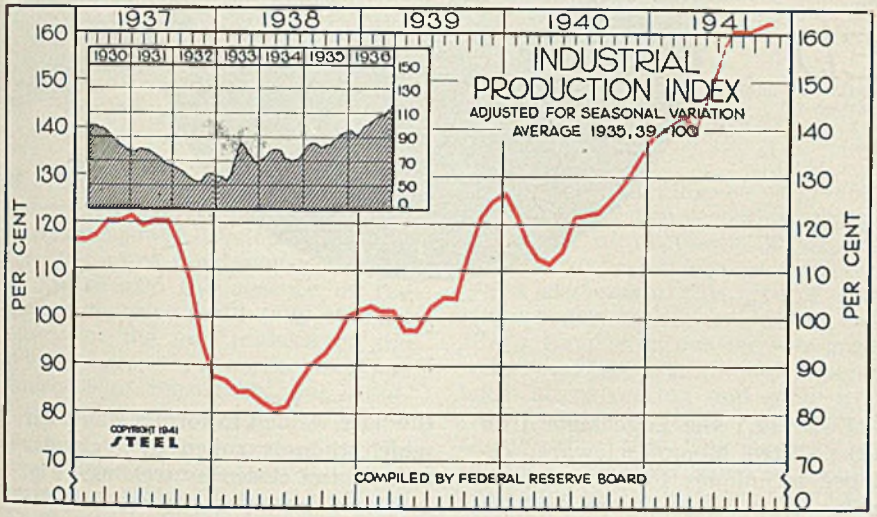


Iron and Steel Exports

(Thousands of Gross Tons)

	Steel Products		—Scrap—		Total
	1941	1940	1941	1940	1941
Jan....	653.8	396.1	45.1	187.5	698.9
Feb....	525.9	436.6	74.4	234.7	600.2
Mar....	512.8	457.1	54.4	206.9	567.2
April..	515.7	391.8	120.2	221.2	635.8
May...	409.8	471.5	62.9	312.5	472.7
June ..	398.7	617.7	59.0	318.4	457.7
July...	478.0	707.8	59.9	327.1	537.9
Aug. ..	617.5	1046.1	80.3	346.1	697.7
Sept...	641.1	965.4	65.5	251.1	706.6
Oct....	.....	846.6	.....	258.5	.....
Nov...	.....	713.8	.....	74.3	.....
Dec....	.....	735.2	.....	70.0	.....
Total..	.....	7,785.5	.....	2,823.1	.....





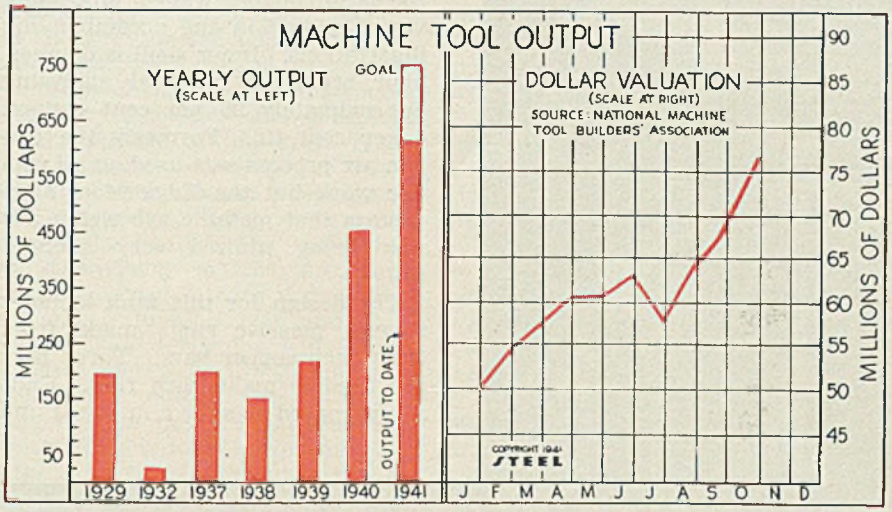
Industrial Production
Federal Reserve Board's Index

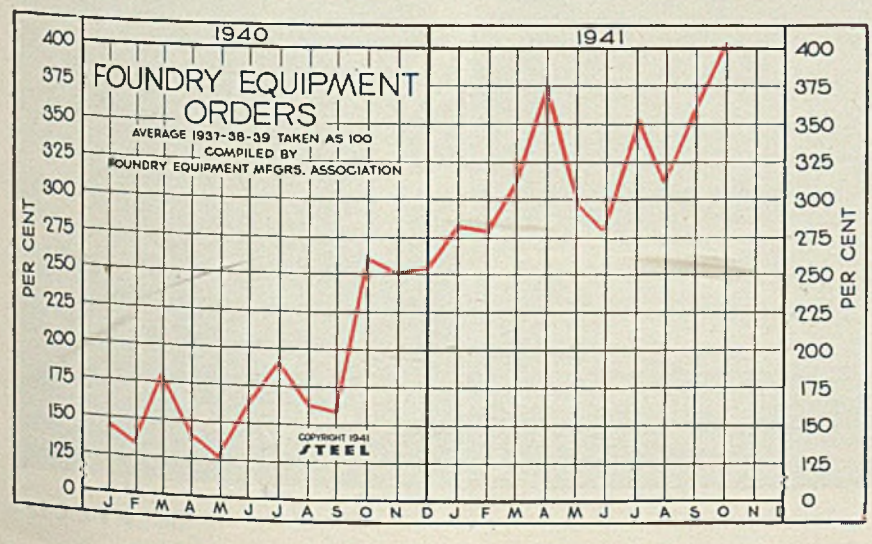
(1935-39 = 100)

	1941	1940	1939	1938	1937
Jan.	139	122	102	86	116
Feb.	141	116	101	84	117
March ...	143	112	101	84	120
April	140	111	97	82	120
May	150	115	97	80	121
June	157	121	102	81	119
July	160	121	104	86	120
Aug.	160	121	104	90	120
Sept.	161	125	113	92	115
Oct.	164	129	121	95	107
Nov.	...	133	124	100	95
Dec.	...	138	126	101	87
Year Ave. ...		122	108	88	113

Machine Tool Output

	1941
January	$50,000,000
February	54,000,000
March	57,400,000
April	60,300,000
May	60,800,000
June	63,000,000
July	57,900,000
August	64,300,000
September	68,400,000
October	77,200,000
10 Months	623,300,000
Year	
1929	185,000,000
1932	22,000,000
1937	195,000,000
1938	145,000,000
1939	210,000,000
1940	450,000,000
1941—Goal	750,000,000





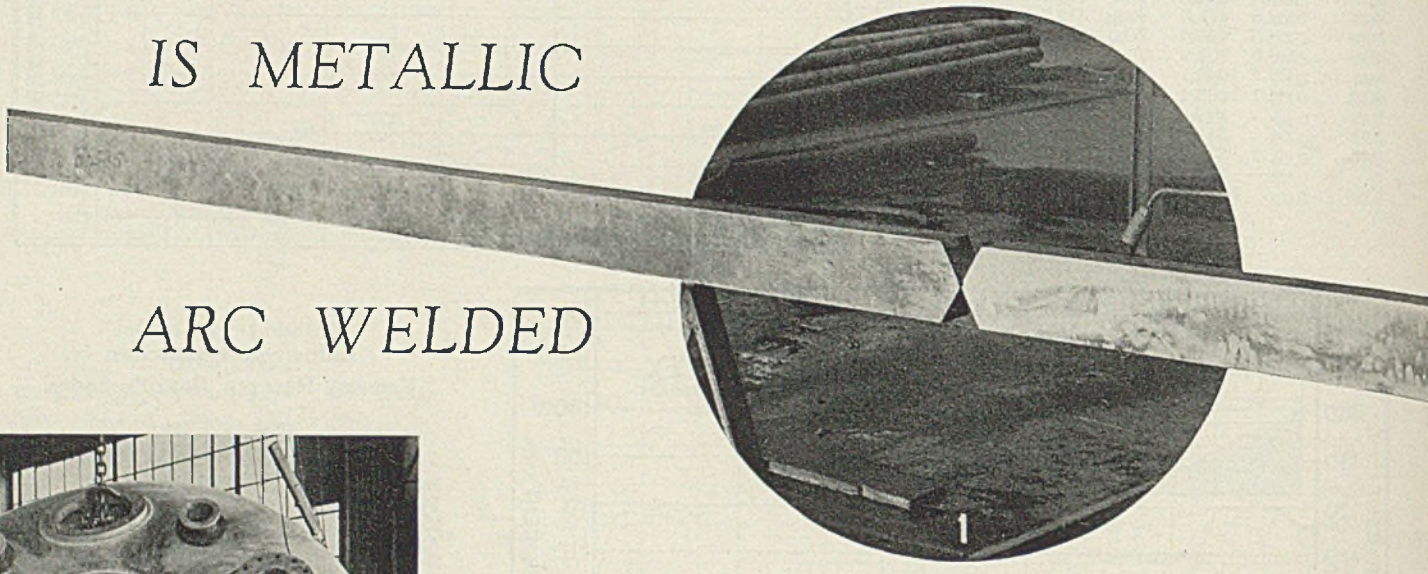
Foundry Equipment Orders

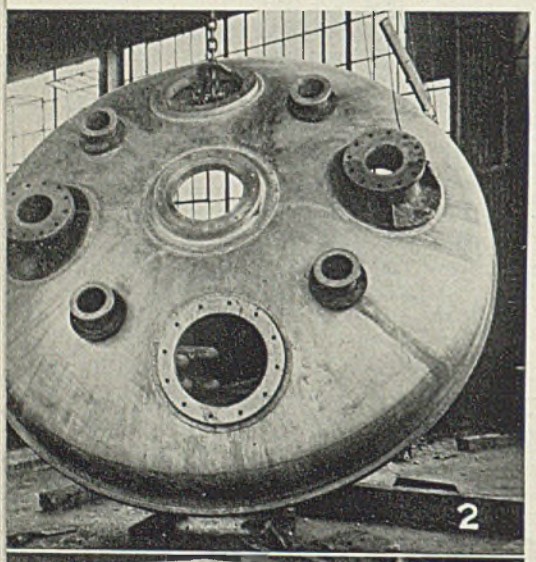
Monthly Average

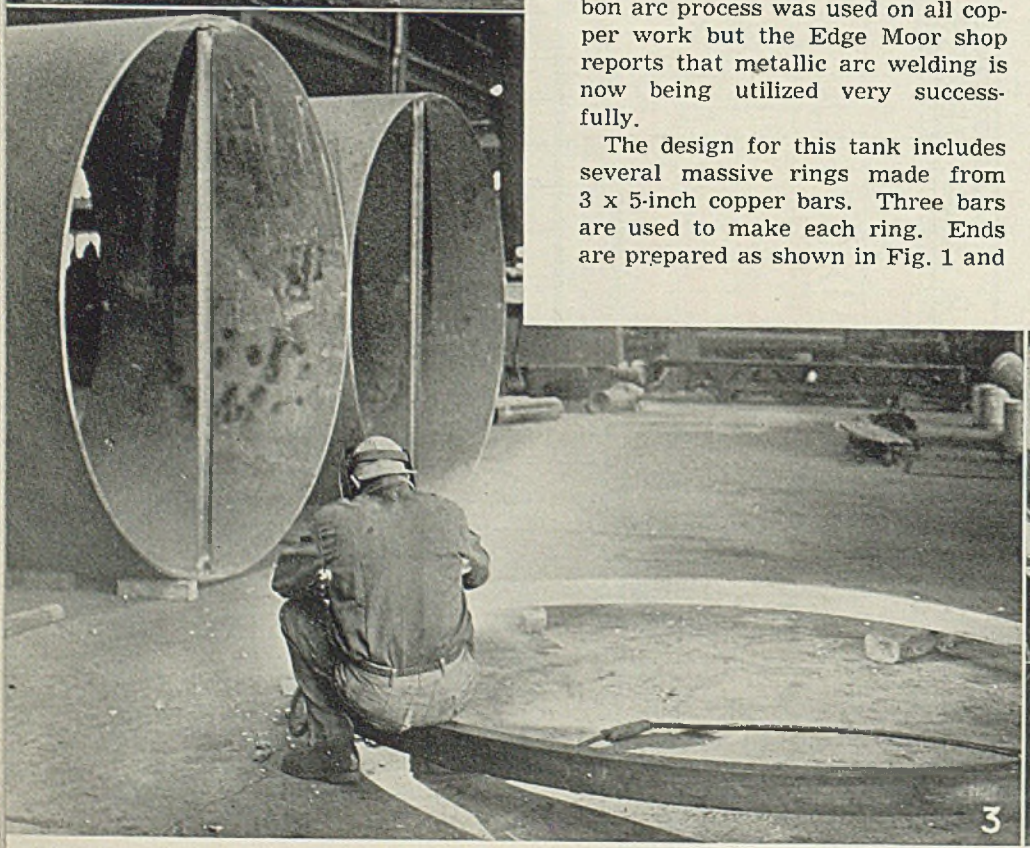
(1937-38-39 equals 100)

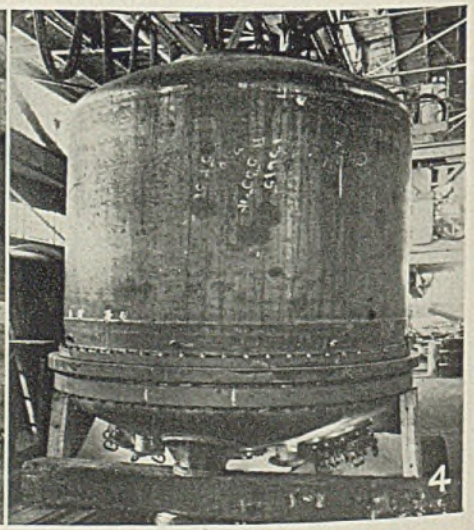
	1941	1940
Jan.	285.3	149.0
Feb.	281.1	135.7
March	315.2	183.2
April	377.2	145.2
May	298.7	129.1
June	281.1	164.9
July	358.1	194.4
Aug.	312.9	165.4
Sept.	363.8	161.2
Oct.	403.8	264.0
Nov.	....	254.2
Dec.	....	257.8

HUGE COPPER TANK IS METALLIC ARC WELDED









■ RECENTLY the Edge Moor Iron Works, Edge Moor, Delaware, developed techniques for metallic arc welding copper fabrications such as the large double walled processing vessel shown in the accompanying illustrations. Inner shell is of phosphor bronze, a material analyzing approximately 96 per cent copper, 4 per cent tin. Formerly the carbon arc process was used on all copper work but the Edge Moor shop reports that metallic arc welding is now being utilized very successfully.

The design for this tank includes several massive rings made from 3 x 5-inch copper bars. Three bars are used to make each ring. Ends are prepared as shown in Fig. 1 and the bars welded to form a single bar which then is rolled to a circular section and closed by welding. Fig. 3 shows an operator making the closing weld on one of these rings. In the background are the bronze shell and steel shell for the outer jacket. Inner bronze shell is 9½ feet in diameter, 8 feet high and ¾-inch thick.

Fig. 2 shows outside phosphor bronze head, 9½ feet in diameter, 21/32-inch thick, with nozzles welded in place. In Fig. 4 is shown the completed vessel. Note the Van Stone type joint between head and shell. All welds were X-ray inspected. Photos supplied by Wilson Welder & Metals Co., 60 East Forty-second street, New York.

AMMUNITION

For Modern Small Arms

By ARTHUR F. MACCONOCHIE
Head, Department of Mechanical Engineering
University of Virginia
University Station, Va.
And
Contributing Editor, STEEL

. . . . with data on 40 different types from 6.5 to 13 millimeter in size

This Is Number 40 in a Series on Ordnance and Its Production, Prepared for STEEL *by Professor Macconochie*

■ JUST as the lack of some prime mover sufficiently light in proportion to the power developed defeated the attempt of renaissance pioneers to fly, so also the absence of the modern machine tool fatally affected efforts of the gun makers of the middle ages to produce weapons which were reasonably gas tight.

Escaping gas between the revolving butt and the rear end of the barrel not only eroded the metal but proved a serious hazard in use. Furthermore, it is clearly evident that the machine gun as it is known today could not possibly be successful until some form of fixed ammunition constructed from a solid drawn brass (or steel) case which would serve as a gas check in the breech had been invented. Since ammunition for the revolver and machine gnn has played a major role in the progress of these arms toward their modern state of excellence, it may be of interest to make detailed reference to the trend in small arms cartridge design.

The accompanying charts and table, kindly supplied by Johnson Automatics Mfg. Co., Providence, R. I., exhibit in profile the small arms ammunition used by the principal governments of the world. In Table I are included the bullet description, bullet weight, powder weight in grains, case type, total weight of cartridge, chamber pressure in pounds per square inch, muzzle velocity in feet per second, muzzle energy in foot pounds, maximum accurate range in yards.

The development of military small arms cartridges of modern types began over a half century ago. General characteristics include a bottle-necked case—either rimmed, or more generally rimless; a metal jacketed bullet between .25 and .32-caliber, 130 to 230 grains in weight, round nose or pointed; and a charge of smokeless powder giving a muzzle velocity ranging between 2000 and 3000 feet per second. Chamber pressures run between 30,000 and 50,000 pounds per square inch.

The elements of this type of cartridge began to appear in the late 1870's. Smokeless powder was gradually developed from experiments with nitroglycerine and guncotton (nitrocellulose) begun in Europe shortly after 1840. The invention of the metal jacketed bullet is usually accredited to Switzerland about 1880. First cartridge of the modern type issued as standard by a major power was the 8-millimeter Lebel adopted by the French in 1886 and used since with little change except for modernization of bullets and powder. Military powers of the world generally changed to bolt-action box-magazine small-caliber repeating rifles, employing modern type cartridges, between 1888 and 1895. The two commonest actions are the Mannlicher used in both a straight-pull and a turning bolt and the Mauser, using a turning bolt. Rimless cases operate best in such arms, but many nations have never changed from the original rimmed cases adopted before the appearance of the rimless case about 1895. It will be observed there is a distinct but by no means universal preference for the rimless form of case where a groove has been cut to accommodate the extractor. Cases of this type load and feed better from charger and through bolt-action arms.

In most countries, little change has been made in either rifles or cartridge cases since the original adoption. Machine guns of rifle caliber require no special design of cartridge and usually are chambered for the same cartridge as the rifles of the nation using them. The .50-caliber machine gun, although larger, generally utilizes cartridges of the same form as the military rifle cartridge. This caliber was developed from the German antitank rifle cartridges of the first World war, which also were of regular rifle type.

The latest development in infantry rifles, the semi-automatic rifle, appears to require no change in design of present rimless cartridges as magazine and feeding arrangement differ little from those in bolt-action arms.

Loads of military rifle cartridges have been improved from time to time. The tendency at first was to change the bullet from a round nose, flat base missile to one with a pointed nose and to reduce the weight about 20 per cent, increasing the velocity correspondingly. This was done in a number of countries between 1903 and 1914, some nations using both types for different purposes at the same time.

Muzzle velocities have increased to some extent. The muzzle velocity of the British .303, for example, was 2180 feet per second in the last war, while it is listed now as 2440 feet per second.

Another change and one still going on is to increase the weight of the bullet about 15 per cent by lengthening the rear and giving it a boat-tailed base but without changing the forward section. Germany is understood to have done this recently with the 7.9-millimeter Mauser cartridge, and Mexico and a number of the South American countries are working along similar lines with the 7-millimeter Mauser.

Mauser and Mannlicher cartridges of 6.5 and 7-millimeter are perhaps the types in commonest use today. In different countries, the rifle models vary slightly, and the cartridges do not all have the same ballistic qualities. Some of the cases are interchangeable between two or more countries, but variations do exist between cartridges that carry the same designation. The 7-millimeter Mauser pointed bullet, rim-

less cartridge, for example, is listed to several countries in the chart. Naturally these countries use cartridges which vary in minor detail, but the limits of variation are given and the cases are all similar to the one shown.

In this country the first cartridge of modern type to be adopted was the .30-caliber Krag Jorgenson, adopted in 1892. It is also listed as the .30 Army. The Springfield model 1903 was adopted in that year. It had a rimless cartridge and round nosed bullet, which was replaced in 1906 with a pointed bullet of lighter weight and designated as U. S. .30-'06. Again in 1926 another change was made in favor of a 172-grain "boat-tail" bullet, listed as the .30 M1. Quite recently the earlier type bullet has been readopted, but improved powder gives a lower chamber pressure than the original

TABLE I—Data on Cartridges Shown in Accompanying Chart

No.	Type	Bullet Description	Bullet Weight, Grains	Powder Weight, Grains	Case Type	Total Cartridge Weight, Grains	Chamber Pressure Lbs. per Sq. In.	Muzzle Velocity, Feet per Second	Muzzle Energy, Foot-Pounds	Maximum Accuracy Range, Yards	Where Used
1	6.5 mm. Mannlicher	Round nosed, steel jacket, flat base	159	36	Bottle necked, rimless	348	40,300	2223	1900	800 to 1000	Greece
2	6.5 mm. Mannlicher Carcano	Round nosed, cupro nickel jacket, hollow base	161.8	34	Bottle necked, rimless	350	.....	2296	1925	800 to 1000	Italy
3	6.5 mm. Mannlicher Carcano	Pointed, cupro nickel jacket, flat base	123	..	Bottle necked, rimless	320	.....	2450	1850	800 to 1000	Italy
4	6.5 mm. Mannlicher	Round nosed, steel jacket, flat base	159	38	Bottle necked, rimmed	348	.....	2433	2050	800 to 1000	Holland, Rumania
5	6.5 mm. Mauser	Round nosed, cupro nickel jacket, flat base	155.8	..	Bottle necked, rimless	345	.....	2395	2000	800 to 1000	Sweden, Luxemburg
6	6.5 mm. Mauser-Vergneiro	Round nosed, cupro nickel jacket, flat base	155.3	37.7	Bottle necked, rimless	371.8	.....	2347	2000	800 to 1000	Portugal
7	6.5 mm. Krag-Jorgenson	Pointed, cupro nickel jacket, flat base	156.4	36.0	Bottle necked, rimless	372	.....	2460	2050	800 to 1000	Norway
8	6.5 mm. Arisaka	Pointed, cupro nickel jacket, flat base	139	33	Bottle necked, semi-rimmed	326	.....	2500	1950	800 to 1000	Japan
9	7 mm. Mauser	Round nosed, cupro nickel jacket, flat base	172	38.3	Bottle necked, rimless	377.4	45,000	2296	2056	800 to 1000	Spain, Serbia
10	7 mm. Mauser	Pointed, cupro nickel jacket, flat base	140 to 160	..	Bottle necked, rimless	345 to 365	34,000	2750 to 2900	2400 to 2500	1000 to 1200	Brazil*
11	7.62 mm. Schmidt-Rubin	Pointed, steel jacket, boat tailed	174	49.3	Bottle necked, rimless	404	.....	2720	2800	1000 to 1200	Switzerland
12	7.62 mm. Mosin-Nagant	Pointed, cupro nickel jacket, hollow base	148	50	Bottle necked, rimmed	348	.....	2830	2545	1000	Russia
13	7.62 Mauser	Pointed, cupro nickel jacket, flat base	148	..	Bottle necked, rimmed	...	.....	2830	2545	1000	Finland
14	.30 Krag-Jorgenson	Round nosed, cupro nickel jacket, flat base	220	40	Bottle necked, rimmed	...	42,500	2000	1910	800 to 1000	United States
15	U. S. 30-06	Pointed, cupro nickel jacket, flat base	150	50	Bottle necked, rimless	395	52,000	2700	2429	1000	United States
16	U. S. 30 M1	Pointed, gilding metal jacket, boat tailed	174.5	50	Bottle necked, rimless	415	48,000	2650	2675	1000 to 1200	United States
17	U. S. 30 M2	Pointed, cupro nickel jacket, flat base	150	..	Bottle necked, rimless	395	38,000	2700	2429	1000	United States
18	7.65 mm. Mauser	Round nosed, cupro nickel jacket, hollow base	215	42.5	Bottle necked, rimless	441	39,400	2034	2000	800 to 1000	Belgium, Ecuador
19	7.65 mm. Mauser	Pointed, cupro nickel jacket, flat base	154	..	Bottle necked, rimless	390	.....	2788	2700	1000	Turkey, Peru, Argentina
20	.303 M VI	Round nosed, cupro nickel jacket, flat base	215	30	Bottle necked, rimmed	425	35,000	2000	1950	800 to 1000	British Empire
21	.303 M VII	Pointed, cupro nickel jacket, flat base	174	37.5	Bottle necked, rimmed	384	39,000	2440	2350	1000	British Empire
22	7.9 mm. Mauser	Round nosed, steel jacket, flat base	227	40.75	Bottle necked, rimless	431	42,000	2093	2100	800 to 1000	Germany
23	7.9 mm. Mauser	Pointed, steel jacket, hollow base	154	49.5	Bottle necked, rimless	369	35,000	2882	2800	1000	Germany†
24	8 mm. Mannlicher	Round nosed, steel jacket, flat base	244	43.2	Bottle necked, rimmed	...	39,400	2034	2200	800 to 1000	Austria, Bulgaria, Hungary
25	8 mm. Krag-Jorgenson	Pointed cupro nickel jacket, hollow base	196	50	Bottle necked, rimmed	450.6	.....	2530	2750	1000	Denmark
26	8 mm. Lebel	Pointed, bronze alloy, boat tailed	197.6	46.3	Bottle necked, rimmed	426.2	35,500	2380	2600	1000	France
27	U. S. 50 M1	Pointed, gilding metal jacket, boat tailed	753	240	Bottle necked, rimless	1876	54,000	2500	10,765	....	United States
28	13 mm. Mauser Anti-Tank	Pointed, copper jacket, boat tailed		..	Bottle necked, rimmed	1811	.....	2560	12,097	....	Germany
29	U.S.-30-S.R. M1	Round nosed, gilding metal jacket, hollow base	110	14.1	Straight, rimless	194.2	41,000	1780	775	....	United States (Experimental)
30	7.5 mm. Nagant Revolver	Flat nosed, lead, flat base	108	5	Straight, rimmed	...	.....	725	122	....	Russia, Norway
31	7.63 mm. Mauser Auto Pistol	Round nosed, cupro nickel jacket, flat base	85	7	Bottle necked, rimless	...	.....	1300	329	....	Germany, Etc.
32	7.65 mm. Luger Auto Pistol	Round nosed, cupro nickel jacket, flat base	93	5.9	Bottle necked, rimless	...	.....	1200	300	....	Germany, Etc.
33	8 mm. Nambu Auto Pistol	Round nosed, cupro nickel jacket, flat base	102	4	Bottle necked, rimless	...	.....	....	....	....	Japan
34	8 mm. Lebel Revolver	Flat nosed, cupro nickel jacket, hollow base	120	11.5	Straight, rimmed	...	.....	625	104	....	France
35	9 mm. Luger Auto Pistol	Flat nosed, cupro nickel jacket, flat base	125	5.5	Straight, rimless	...	24,000	1075	320	....	Germany, Etc.
36	9 mm. Steyr Auto Pistol	Round nosed, steel jacket, flat base	116	6.2	Straight, rimless	...	.....	1200	370	....	Austria, Hungary
37	9 mm. Bayard Auto Pistol	Round nosed, cupro nickel jacket, flat base	126	5.6	Straight, rimless	...	.....	1148	365	....	Belgium, Denmark
38	.45 A. C. P.	Round nosed, gilding metal jacket, flat base	230	5	Straight, rimless	325	12,000	800	329	....	United States, British Empire
39	.455 M II Webley Revolver	Pointed, lead, hollow base	265	7	Straight, rimmed	...	.....	600	220	....	British Empire
40	.455 Webley Auto Pistol	Round nosed, cupro nickel jacket, flat base	220	7	Straight, semi-rimmed	...	.....	750	270	....	British Navy

*Also Columbia, Mexico, Uraguay, Chile, Honduras, China.
†Also Czechoslovakia, Poland, Belgium.

light bullet load, which is less fatiguing to shoot and less erosive to barrels, while giving satisfactory combat ballistics. It is listed as the .30 M2.

Another important development in small arms ammunition in the United States is associated with the trend toward utilization of the submachine gun for parachute troops, tank crews and other applications. This cartridge occupies a position intermediate between the ammunition of the automatic pistol and the rifle. It is a straight rimless cartridge of .30-caliber and medium power, intended to be used in a full automatic weapon weighing between 5 and 6 pounds.

Military pistol and revolver cartridges have never been considered of great importance in Europe. While most European pistol cartridges are capable of long range accuracy, they do not compare with the United States .45 ACP in knockdown ability.

Concerning revolver cartridges, the adoption of the automatic pistol as the standard side arm by most governments between 1895 and 1911 has tended to standardize the type of cartridge most generally used. This is a rimless design, slightly bottlenecked, usually having a metal-jacketed bullet. Most foreign nations use either the Mauser or Luger automatic pistol, caliber 7.62, 7.65 or 9-millimeter. These pistols were developed in Germany about 1900, and the ammunition is quite powerful although the small bullets lack stopping power in close range combat.

An interesting exception to this type is the Russian 7.5-millimeter Nagant, which employs a case that envelopes the bullet and enters the barrel to make a gas tight fit when the powder charge explodes. This is shown in the charts.

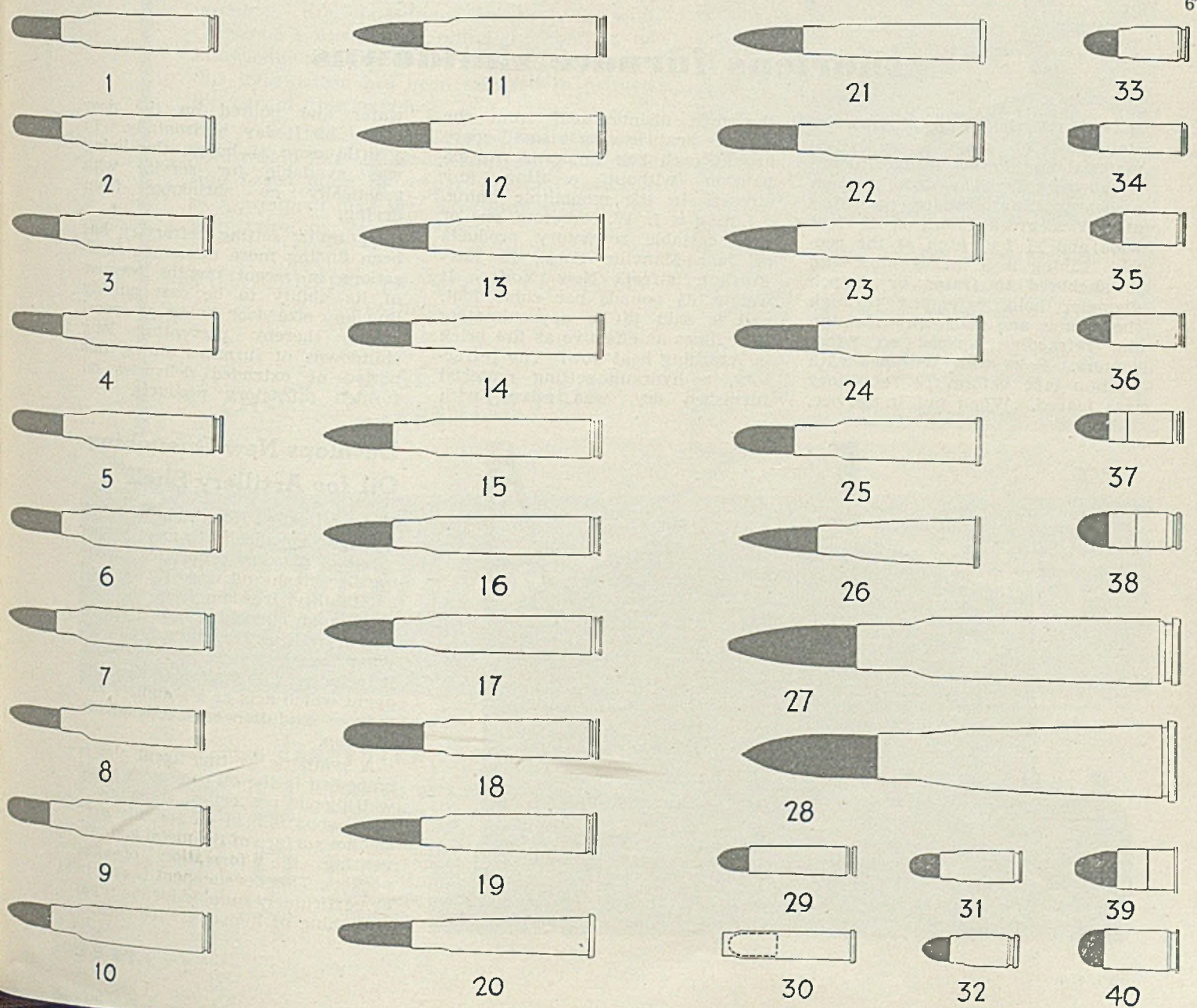
European sub-machine guns, playing an increasingly important part in recent warfare, are usually chambered for either the Mauser or Luger pistol cartridges.

England uses the largest military revolver cartridge now issued—the .455 Webley. The English also use the .45 ACP in the Thompson submachine gun.

The United States adopted the .45 Colt automatic pistol in 1911, accepting at the time the .45 ACP cartridge developed for the earlier model Colt automatic pistol in 1905. This cartridge superseded both the .38 and the .45-caliber revolver cartridges then in use, and the .38 Colt automatic pistol cartridge that had been experimentally issued. The .45 ACP has been the regular United States issue for all side arms since 1911.

Cartridge Material: Thus far brass has been the generally accepted material for the case for various more or less obvious reasons, including its resistance to cor-

Chart showing 40 different types of ammunition for modern small arms. Complete technical data as well as list of countries using these cartridges will be found in accompanying table in which reference is made to types shown here by number in first column of table



rosion, the ease with which it may be worked and its physical characteristics in the cold worked state. The head of a cartridge case must be strong enough to resist the pull of the extractor without tearing while the body must not be so brittle as to pull apart with the slight elongation which it suffers upon firing.

Then in firing, the cartridge case must first expand tightly against the gun bore or chamber to provide a perfect gas seal. Then as maximum pressure is reached by the exploding gases, the case must expand with that portion of the gun barrel in which it rests. As the gas pressure falls, the cartridge case must contract with the barrel and finally must contract more than the barrel to permit easy extraction of the cartridge case from the gun. A certain amount of elasticity is thus a most important requirement of the case material.

Today the only objection to the use of brass is the relative scarcity of the copper and zinc from which it is made. Thus at the present time interest is growing in the possibility of using steel cartridge cases. These, it is understood, are already being made from seamless tubing with a base flash welded on; as well as the case being drawn from a flat disk in some instances. Considerable development work is being done along these lines at the present time. The possibility of using steel is especially interesting in the larger sizes of ammunition which use important quantities of materials in the shell case.

The metal jacket of the bullet, generally fashioned of gilding metal (95 per cent copper and 5 per cent zinc) or cupro-nickel (70 per cent copper and 30 per cent nickel or thereabouts) is an invention generally accredited to the Swiss, who adopted metal jackets about 1880. Small arms bullets may have a solid lead on lead-antimony core; or they may, as in the case of the British bullets, have a lead alloy core and a point of aluminum or compressed paper. This paper point may be exchanged for a hard steel point for gas tank penetration, armor piercing and the like; or a steel slug of designated hardness may be embedded in a lead sheath within the outer envelope for similar operations and also for aircraft machine gun work.

In general the smaller caliber rifle bullet is designed as a killer without undue laceration; while the larger caliber revolver bullet is intended both to kill and stop, especially at close quarters.

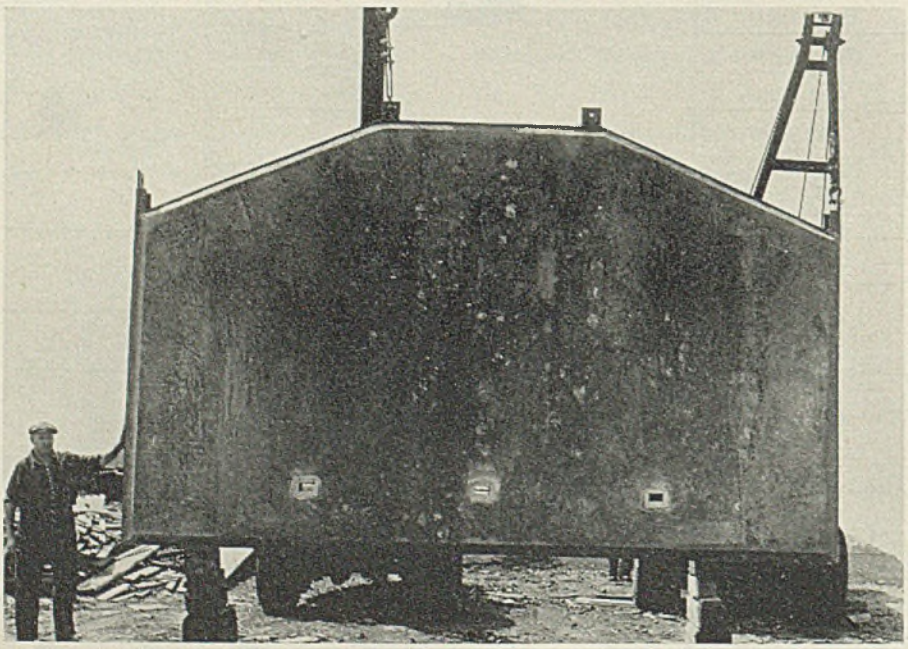
CASTABLE REFRACTORY

shortens furnace shutdowns

■ ONE OF the largest known installations of castable refractory material for lining furnace doors is shown below. This door, used on a heat-treating furnace operating at 2000 degrees Fahr., is 19 feet wide and 11 feet high at the center. Lining is 9 inches thick and is anchored to frame by ¾-inch diameter bolts extending through the frame and half way through the refractory, spaced on 2-foot centers. Bolts were wrapped with friction tape before the refractory was placed. When put in service, the tape disintegrated from the furnace heat, leaving a small space around each bolt to permit its expansion without creating any stresses in the monolithic lining.

Lining is L. W. Firecrete, one of four castable refractory products of Johns-Manville Corp., 22 East Fortieth street, New York. It weighs 65 pounds per cubic foot, and is said to be approximately four times as effective as fire brick in retarding heat flow. The refractory, a hydraulic-setting material furnished dry, was mixed with water and poured on the door frame as it lay horizontally. In a little over 24 hours, the lining was available for service with practically no shrinkage from drying.

Hydraulic setting refractory has been finding more numerous applications in recent months because of its ability to be cast quickly into any size door lining or specal shape, thereby preventing long shutdowns of furnaces during this period of extended deliveries on formed refractory products.



Develops New Quenching Oil for Artillery Shell

■ An oil called Houghton-Quench G designed specifically to meet proper range of physical properties, including fire, flash and viscosity, as well as stability, freedom from sludging and rapid quenching speed, is reported by E. F. Houghton & Co., 240 West Somerset street, Philadelphia. It includes in its make-up a chemical agent which acts as a stabilizer and reduces oxidation or fractional distillation.

A synthetic wetting agent also is embodied in the oil to provide rapid wetting-out properties, spreading a continuous film of oil speedily over the hot surface of the metal and preventing the formation of gas pockets. This development is said to be particularly suitable for the rapid quenching of high-explosive shell.

FOR

quick answers

TO YOUR

STAINLESS FABRICATING PROBLEMS

When you are up against a new or difficult fabrication problem these days, you know how important it is to find the right answer quickly. Getting it right the first time can save precious hours and days, and much vital material that is needed for national defense.

Helping Stainless users to solve fabricating problems is no new job to us at Carpenter. Ever since we pioneered the first bright finish, ductile Stainless Strip . . . ever since Carpenter's original development of free-machining Stainless . . . our representatives, metallurgists and research men have been in the front line when it comes to meeting new problems.

Out of it all has come the "know how" which time after time has helped us to make the "impossible" job, possible. In keeping with Carpenter's established policy of sharing its knowledge and experience with its customers—this information has been released in printed form from time to time.

It is available to any user of Stainless Steel who would like additional fabricating information based upon the experience and research of a group of men that have pioneered in the production of Stainless Steel.

THE CARPENTER STEEL COMPANY
READING, PA.

HANDY SELECTOR SLIDE CHART

This convenient pocket-sized guide will help you spot the Stainless analysis which best meets your Corrosion or Heat Resistance requirements. It quickly answers questions involving physical properties, and fabricating conditions.

GUIDE FOR THE DESIGN ENGINEER

Whether designing for new defense applications, or to meet tomorrow's sales problem, this booklet will help you. It shows practical ways and means of designing for Stainless—how to take advantage of the added strength and rigidity of Stainless Steel—how to design for faster and easier fabrication.

✓ CHECK THESE CARPENTER HELPS

Carpenter STAINLESS STEELS

BRANCHES AT Chicago, Cleveland, Detroit, Hartford, St. Louis, Indianapolis, New York, Philadelphia

---

THE CARPENTER STEEL CO., 139 BERN ST., READING, PENNA.

STAINLESS SELECTOR SLIDE CHART ☐

DESIGN BOOKLET ☐

STAINLESS DATA SHEETS
Each subject is condensed into a single sheet of data covering the particular operations mentioned. Check the problem on which you would like information.

Machining ☐
Blanking, punching, shearing ☐
Forming, drawing, spinning, cold heading ☐
Grinding, polishing, buffing ☐
Tumbling, ball burnishing ☐
Soldering ☐
Welding and rivetting ☐

A request on your company letterhead will bring you less of these Carpenter Stain in helps promptly. Good only U. S. A.

HIGH-EXPLOSIVE SHELL

. . . . including data on modern quenching and cooling system

By JAMES McELGIN
Metal Working Division
E. F. Houghton & Co.
Philadelphia

■ UP UNTIL the early fall of this year, high-explosive shell then being manufactured were of an analysis which did not require quenching to attain the physical properties specified by the Ordnance Department.

A change in steel specifications, together with an increase in yield strength requirements, has made it necessary to return to a heat treating practice similar to that used in 1914 to 1918. This has occasioned a great deal of interest in the underlying problems such as quenches and cooling ssytems for the oil quench which is an important part of the treatment.

Plans for exact analysis of steel to be used for both projectiles and bombs are now undergoing changes as a result of conferences between steel producers and ordnance officials, so it is yet too early to state the exact analyses to be used. One primary reason for the change from the former SAE X-1345, which had been preferred, is to reduce the alloy content (manganese). The minimum yield strength for shell bodies in sizes from 75 to 155 millimeters and larger may also be increased to 65,000 pounds per square inch. Carbon content is still a matter of debate. See STEEL, Nov. 10, 1941, p. 45, for latest information on shell steel.

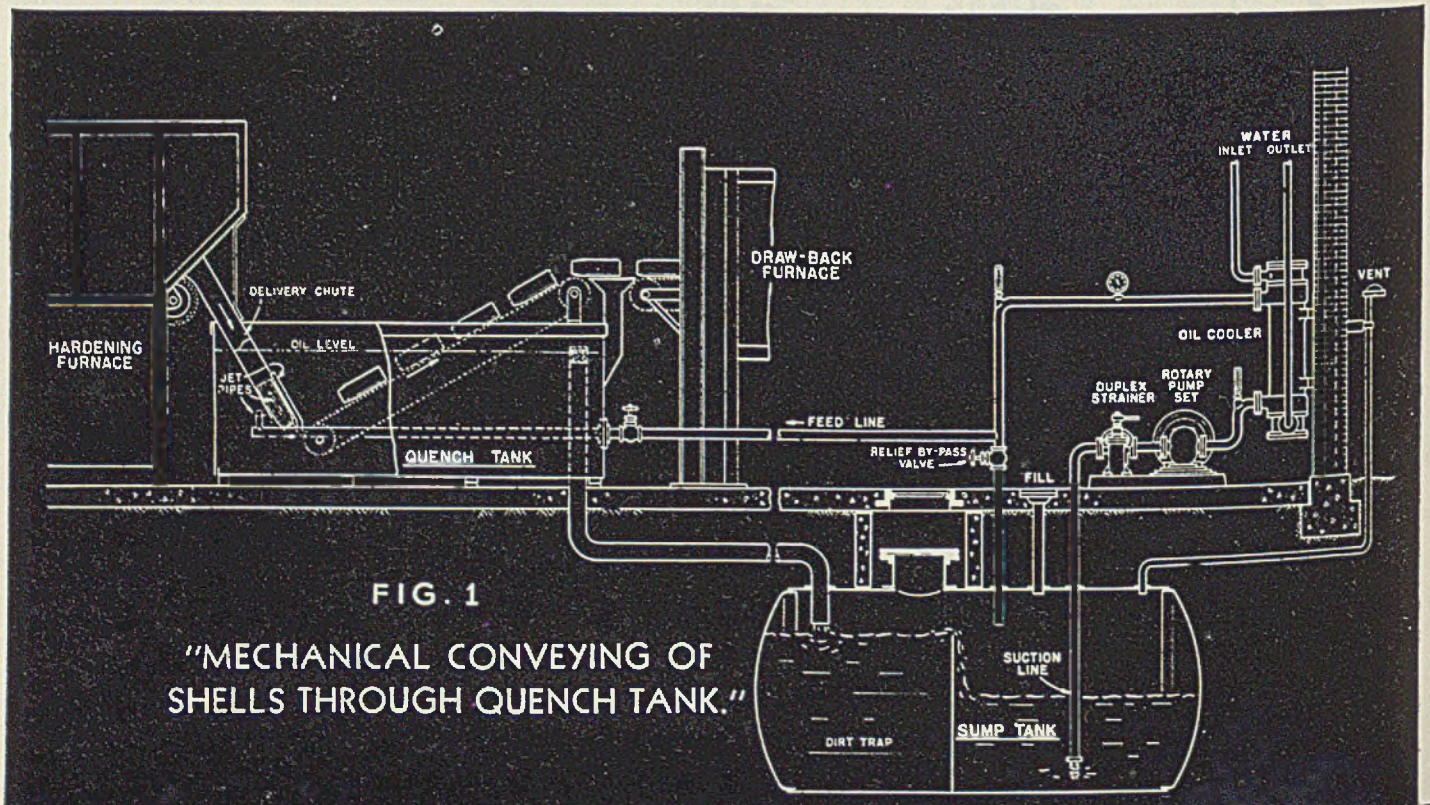
Regardless of final steel analysis that will be selected, manufacturers having shell contracts are desirous of learning details of proper heat treatment. A common heat treatment for these projectiles consists in heating them to a temperature of 1550 degrees Fahr., followed by a rapid quench in oil with the hardness subsequently drawn back at a temperature not exceeding 1000 degrees Fahr. The hardening furnace, quench tank and drawing furnace are usually arranged in line to eliminate unnecessary handling from the time the shell enters the process until it leaves the draw. Too, automatic mechanical conveyor systems play an important part in high-production setups such as used at most plants doing this work.

Problems arising in this heat treatment are largely due to the difficulty in obtaining uniform hardening in the pierced aperture and the danger of creating gas pockets with subsequent soft spots in the shell. An ordinary immersion in a still quench tank without agitation or pressure will not provide the necessary hardness and uniformity. The difference in thickness between the base and the nose of the shell requires forced circulation of the quenching medium to absorb the heat rapidly and attain a uniform hardness throughout in order to meet the specifications.

Constant agitation of the quenching tank is necessary and a means must be provided for rapid replacement of hot oil by cooled oil. Excessive scaling of the shell steel is avoided by using controlled atmosphere furnaces and by delivering the work to the quench through a chute closed to the atmosphere. Scale must be avoided as much as possible since it acts as an insulating layer to prevent proper cooling, thus making it difficult to get hardness desired.

Furnace manufacturers have been devoting much time to the develop-

Fig. 1—Typical arrangement showing how shell bodies drop from hardening furnace through tube into quench tank from which they subsequently pass out on flight conveyors to the draw furnace. Cooling system for quenching oil is shown

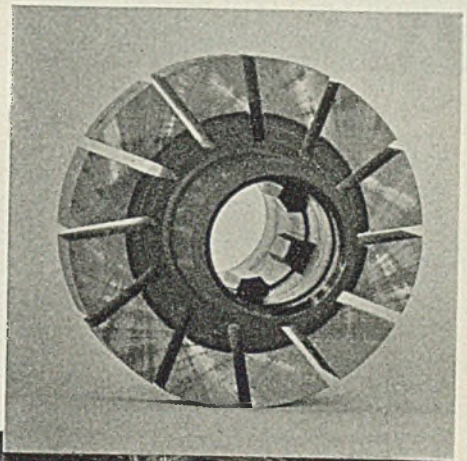


"TOOL ROOM" PRECISION in PRODUCTION by Broaching

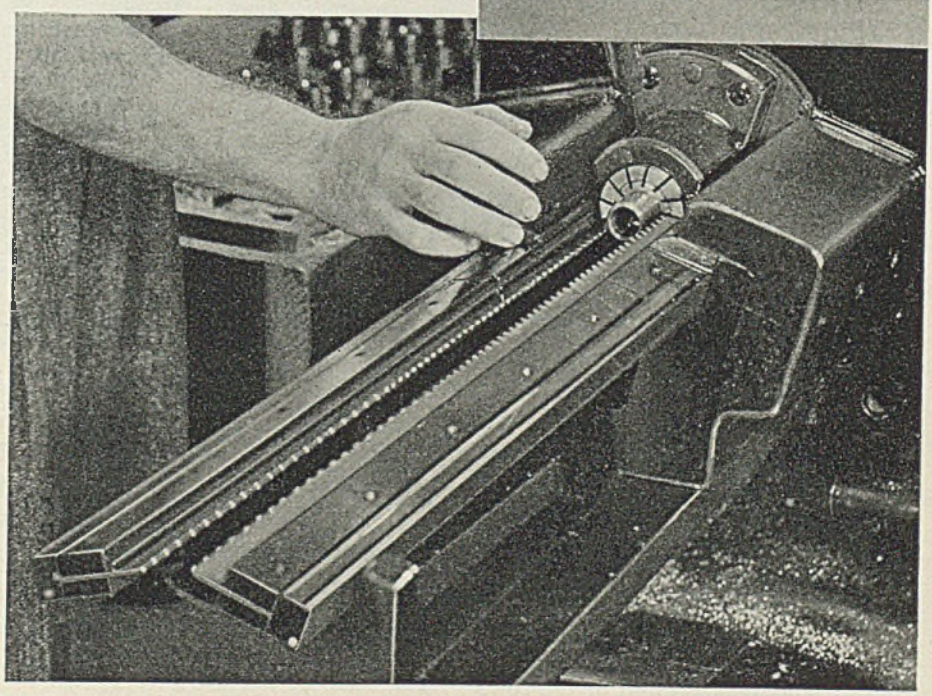
THE JOB: To put machining of pump rotor slots on production basis.

THE METHOD: Broaching two slots at a time in two passes.

THE RESULT: Lower cost per piece, fewer machines, tool room precision in production.



BROACHING PAYS IN JOB LOTS..No. 5



FACED with the problem of stepping up rotor production for precision hydraulic pumps from a-few-at-a-time to a capacity of several thousand per month, broaching was found to provide the answer to low-cost production accuracy.

On a job-lot basis, these slots —only about 5/64 inch across —are held to plus or minus two and one half ten thousandths with greater ease and uniformity by broaching than it was possible to hold the same parts, a few pieces at a time, by milling.

Even if the job could be done as well, it would have taken quite a few milling and drilling machines to do the same job as the single two-broach equipped Colonial.

More details on this operation are to be found in the current issue of "Broaching News". We'll be glad to send you a copy. Ask for issue No. 10.

COLONIAL BROACH COMPANY

147 JOS. CAMPAU ST.
DETROIT, U. S. A.

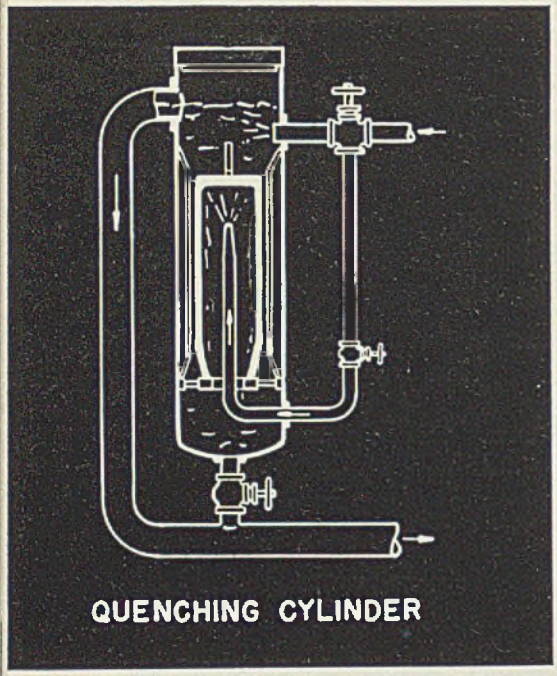


Fig. 2—Individual quenching cylinder for manual handling with quenching oil flow

ment of special equipment to provide progressive movement of the shell through the heat treatment. See the series of four articles on "Heating and Heat Treatment of Ordnance," STEEL, Sept. 15, 1941, p. 72; Sept. 29, 1941, p. 84; Oct. 13, 1941, p. 118; Oct. 27, 1941, p. 72. These furnaces and their conveying equipment can be divided into the following general types:

—Walking beam conveyor
—Pusher-type furnace
—Rotary-hearth furnace
—Conveyor-type heated by radiant tubes

One of the large furnace manufacturers, Surface Combustion Corp., Toledo, O., describes its walking beam conveyor system as follows:

"For heat treating medium and large size high-explosive projectiles such as 75 to 155-millimeter, the direct-gas-fired walking-beam hardening furnace, synchronized with a continuous convection-type draw furnace, is very popular.

"In the hardening furnace, the walking-beam conveyor makes possible the construction of furnaces of both small and large capacity; is adjustable for different size projectiles; eliminates the human element; makes possible a self-emptying furnace and provides for positive control.

"Furnaces of this type are usually built to handle six, eight or ten rows of projectiles at a time. Each row has its own conveyor consisting of two sets of parallel rails—a fixed set and a set of walking beams. The fixed rails extend beyond the furnace at the front to form the charging table onto which the projectiles are loaded. From there, the shell are picked up and moved through the furnace. The walking-beam rails are carried by alloy cross beams, on the bottom of which are wedge-shaped surfaces, which engage corresponding surfaces on two longitudinal drive rails to lift and carry the load. Projectiles rest on fingers on both fixed and moving rails to allow free circulation of the heat. The fixed rails rest on top of piers; thus space is provided for the walking beams as well as free circulation of the hot atmosphere.

"Projectiles, after attaining the necessary temperature in the hardening furnace are discharged through closed gravity chutes into an oil quench, open end down. Each projectile drops down over a conical ring of spray nozzles which quench internal surfaces. At the same time, another set of spray nozzles quenches the outside of the projectile. All spray nozzles are submerged in quenching oil. The internal spray eliminates the inside air pocket and thus promotes more uniform quenching. The outside sprays give the oil agitation needed.

Conveyors Clock Controlled

"When fully quenched, the projectiles are tipped mechanically and deposited on a flight conveyor which carries them up and into the convection-heated draw furnace, also equipped with a walking-beam conveyor. The quench tank conveyor moves intermittently in synchronization with the walking-beam conveyors, advancing each shell only as the projectiles in the furnaces are advanced. All conveyors are controlled by a timing clock which starts and stops all drives simultaneously at predetermined intervals."

A typical mechanical method for handling shell through the quench tank is shown in Fig. 1. The shell bodies are delivered, open end down, from the hardening furnace through a closed chute which extends beneath the surface of the quenching oil in the tank. Each shell drops over a spray nozzle which pressure sprays the oil internally. At the same time, another set of spray nozzles provides a pressure feed on the outside of the shell. Jets are beneath the surface of the oil in the tank and are so arranged that 20 per cent of the oil goes to the internal jets and the balance goes to the outside jets. The jets are best arranged to cover the surface on all sides, extending from the closed bottom of the shell for a little more than half its length.

Other methods used to obtain rapid cooling in the quench tank include high velocity circulating fans under the surface of the oil, also, a combination of high velocity and pressure through a single orifice.

To get best results, an oil circulation of 150 gallons per minute through the external and internal jets is necessary for each 1000 pounds of shell per hour. This circulation should be available at a pressure of about 25 pounds per square inch to produce adequate jet action and permit adjustment between the internal and external jets. This circulation figure has been found ample for all types of shell up to the 155-millimeter size.

Experience dictates that the most satisfactory temperature at which to maintain the quenching tank is between 130 and 140 degrees Fahr. Tests are now being run by some shell manufacturers to determine if the temperature of the quenching oil cannot be raised to a point between 180 and 200 degrees Fahr., it being claimed that greater hardness is obtained at this higher temperature. A careful selection of the correct type of oil will make this possible without danger of oxidation or sludging.

During quenching, the hot oil rises rapidly to the top of the tank and overflows through the return pipe to the cooling apparatus. The cool oil is delivered through the jets or special devices at the bottom of the tank.

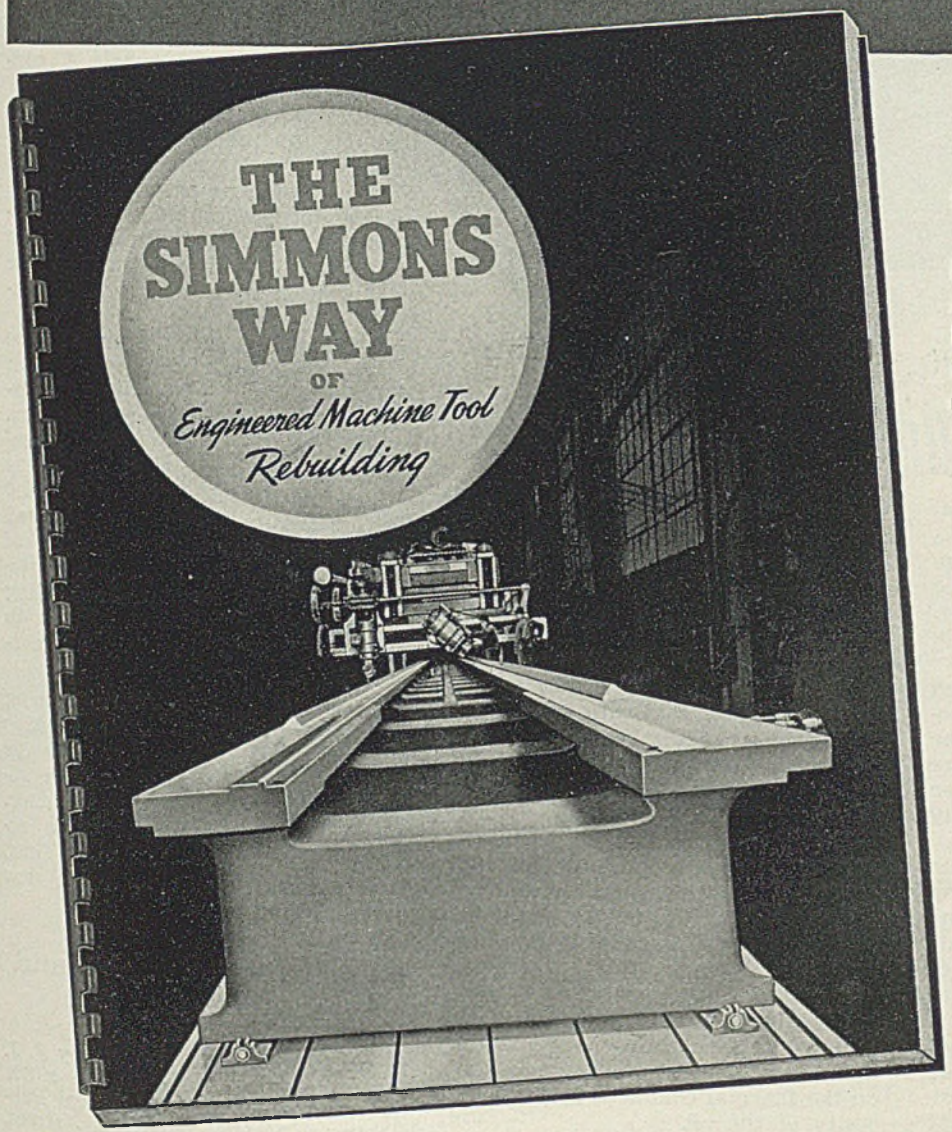
A typical cooling equipment installation will also be noted in Fig. 1. Oil cooling equipment usually consists of a suitable sump or receiver tank arranged to take the overflow from the quenching tank by gravity; a tank strainer; positive pressure oil pump and oil cooler with necessary pressure gages, thermometers and relief valves.

Temperature Control Imperative

Oil temperature control is important. If the oil temperature is too low, convection currents are slow and heat is not removed fast enough to secure the desired hardening effect. If oil temperature is too high, non-uniformity of physical properties results.

Where low manufacturing capacity calls for the use of more manual labor at a smaller expenditure for capital equipment, individual quenching units, Fig. 2, may be considered desirable. These may be used in multiple, the number required being dependent upon the rate of discharge from the hardening furnace as the projectiles must be kept in the oil bath until thoroughly cooled. In this type of quenching unit, the oil enters through a tube to the internal cavity of the shell and is also admitted from the above on the outside, with the whole flow leaving at the bottom. The rate of admission and discharge is so regulated that the shell is submerged

THE BOOK IS OUT!



WHY

MACHINE TOOL REBUILDING IS IMPORTANT TO YOU.

DEFENSE PROGRAM requires every existing tool in working condition. Know how all types of machine tools can be rebuilt and adapted to current problems.

- It describes and illustrates modern rebuilding methods — Engineered Rebuilding — as perfected by Simmons. Unusual photographs show a 990,000-pound Gun Lathe, with 110" swing, in various rebuilding stages.
- It reveals how Simmons motorizes obsolete equipment and installs Power Rapid Traverse to lathes, boring mills, milling machines and planers . . . how beds or tables are lengthened, housings widened, rails and heads raised.
- It shows how Simmons designs and builds special-purpose and standard equipment as a result of its wide rebuilding experience.

This 58-page catalogue illustrates today's most efficient methods of machine tool rebuilding. For the first time, through words and photographs, you have the complete answer to "What is a rebuilt machine tool?" Here you find photographic case histories of vitally needed machine tools rebuilt, re-designed and modernized by Simmons.

You who know the importance of your machine tools today should be familiar with this means of increasing their productivity.

A request on your company letterhead will place it on your desk.

SEND FOR IT To-day

SIMMONS ENGINEERED Machine Tool REBUILDING

SIMMONS MACHINE TOOL CORP.
1850 NORTH BROADWAY, ALBANY, N. Y.

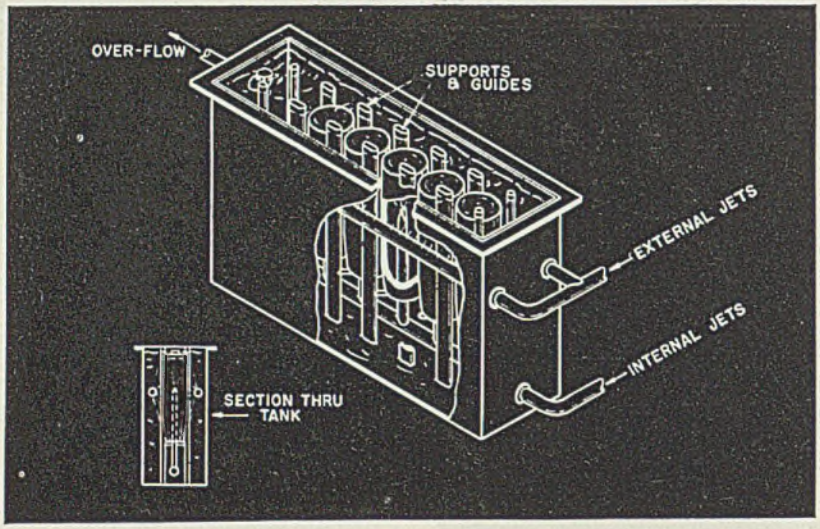


Fig. 3—Internal and external spray stations in multiple quench tank with oil fed to both internal and external sprays. Overflow is at top. Guides automatically assure correct positioning of the shell bodies

during the entire operation. The bottom discharge in this type is satisfactory because of the small quantity of oil in the cylinder at any one time. The oil is replaced rapidly, which is not the case with large tanks.

Fig. 3 shows another simplified arrangement. Here guides aid in positioning the projectiles over the internal jets. External jets are mounted so as to be in the proper position when the shell is correctly placed over the internal jet.

Of course, other arrangements may be devised to produce the same results. However, it should be borne in mind that manual handling tends to produce more scaling because of the exposure of heated projectiles to the atmosphere before quenching. Where conveyor systems are not used, the shell bodies should be placed on racks in an inverted position to permit thorough drainage of excess oil.

To attain the prescribed yield strength, it is necessary to use a quenching oil which has a rapid quenching speed, particularly when steels with lower carbon contents are being handled.

To provide rapid quenching speeds, the oil must wet out rapidly, providing a continuous film which spreads speedily over the hot surface of the metal. Rapid wetting-out prevents the formation of a gaseous film which would act as an insulator against cooling and thus reduce the quenching speed. While quenching must be fast, there is no danger of cracking or distortion when proper quenching oil is used.

Aside from quenching speed, other qualities which the oil must possess include stability, freedom from sludging, long life and the proper range of physical properties, including fire point, flash point and viscosity value.

The quenching cycle is divided into three stages. In the first stage, the surface of the metal is covered with a thin vapor film and the dissipation of heat depends entirely on conduction and radiation through this film. Rate of cooling is slow.

The second stage begins when the surface of the metal is wet out by the quenching medium. The faster the wetting-out, the sooner this stage will begin and the more rapid will be the heat dissipation through the critical range. Wetting-out by quenching oil under pressure carries away the vapor bubbles formed at the surface of the metal.

The third stage of quenching begins when the temperature of the surface of the metal is at the same temperature as the boiling point of the quenching medium. Cooling during this stage is due to conduction through and convection of the quenching oil. This third stage of cooling is considerably slower than the second and depends largely upon the thermal conductivity and viscosity of the oil.

Emphasis should be placed on the second stage of cooling. If the initial or true vapor stage persists for more than a few seconds due to slow cooling, the temperature of the steel may approach or fall below that point at which transformation occurs and either non-uniformity or lower hardness will result. It is for this reason that the careful choice of an oil having fast wetting-out properties, the maintenance of uniform temperature and a pressure system of quenching are all vitally important.

Device Helps To Prevent Gas Line Freeze-Ups

■ Due to a novel dew-point recorder, Colorado Interstate Gas Co., which furnishes Denver with natural gas, is able to prevent condensation of moisture and possible freezing of its gas lines during winter months. With the recorder, continuous temperature readings at which condensation occurs are made where gas enters the Denver metering plant.

Built by the company, the equipment consists of a small tank filled with anti-freeze solution into which is immersed a U-shaped highly polished gold-plated tube. A continuous flow of gas from a by-pass valve in the main pipe line is passed through the tube. Above the plate glass windows provided at each end of the tube are mounted a light source and General Electric photoelectric relay. These are located so that the light shines through the tube and is reflected to the phototube.

Antifreeze solution temperature is controlled by cooling tank with coils of a small domestic refrigerator and heated with strip heaters. As the cooling system reduces temperature of solution, the gas is chilled until condensate is deposited on the inside of the highly polished tube, thus reducing reflection of light to the phototube. The phototube in turn disconnects the cooling coils and connects the heaters to warm the solution until the condensate disappears.

A small motor-driven stirring paddle in the antifreeze solution equalizes the temperature of the bath. Solution temperature is recorded by a bulb-type thermometer. Natural gas pressure also is recorded on the same chart. Thus, from these two records, the dew point is calculated.

Handbook on Gears and Methods for Cutting

■ *Gears and Gear-Cutting*, by F. J. Camm; cloth, 144 pages, 5½ x 8½ inches; published by Chemical Publishing Co. Inc., 234 King street, Brooklyn, N. Y., for $2.

Gear design and methods of cutting gears have progressed so rapidly that work on the most recent practice is of value to all engaged in that trade. Accurate gears are so essential to a wide variety of machine tools and mechanisms that it has seemed worth while to elaborate on gear design, types, functions and methods of cutting, with formulas for the designer and operator.

Additional material deals with making end mills, hobs and gear-generating cutters. The old method of cutting spur gears by means of a rotary milling cutter, one tooth at a time, is still used in some shops and is included. Gear measurement, an important part of inspection, is also included.

ZINC IN DEFENSE-

NO. 3 OF A SE

PAINT

DIE CASTING

CERAMICS

BRASS

METAL SPRAYING

GALVAN-IZING

PHARMA-CEUTICALS

NICKEL SILVER

NO. 1 HULL PLATES

NO. 2 RUBBER

PAINT SERVES DEFENSE IN:

Aircraft
Camouflaging
Cantonments
Combat Cars
Guns
Industrial Plants
Marine Equipment
Pontoon Bridges
Scout Cars
Shells
Troop Carriers—
And In Many Other Ways

U. S. ARMY AIR CORPS PHOTO

THE ELEMENTS ARE ALSO DESTRUCTIVE!

The primary requirement of many defense items is the ability to withstand the destructive forces of war. But there are other forms of attack to be reckoned with as well—rust, chemical corrosion, and the destructive forces of the elements on land and sea. The answer to these problems is paint. Uncle Sam is faced with the biggest painting job in the history of the country—a job in which zinc pigments are playing a vital part.

No man can estimate the amount of zinc pigments needed to complete this job, but the final figure will be a staggering one. The camouflage painting, shown above, is only a small part of the story. Everything from shells to ships, from cannon to cantonments has already been covered by hundreds of exacting Government paint specifications—requiring quantities of zinc sulfide, zinc oxide, lithopone, zinc dust and zinc chromate.

Listed above are typical uses for paint coatings in defense. Zinc pigments are doing the same job in these defense paints as they have been doing in the paint industry year in and year out—protecting property and improving sanitation, too, when that is a factor. It is the increased demand for each of the zinc consuming products required in the Defense Program which is making it difficult for non-defense users to obtain all of the zinc they would like to use. This is part of the price that must be paid for national security.

PAINT PROTECTS AMERICA

zinc PROTECTS PAINT

THE NEW JERSEY ZINC COMPANY

MANUFACTURERS OF THE FAMOUS HORSE HEAD ZINC PRODUCTS

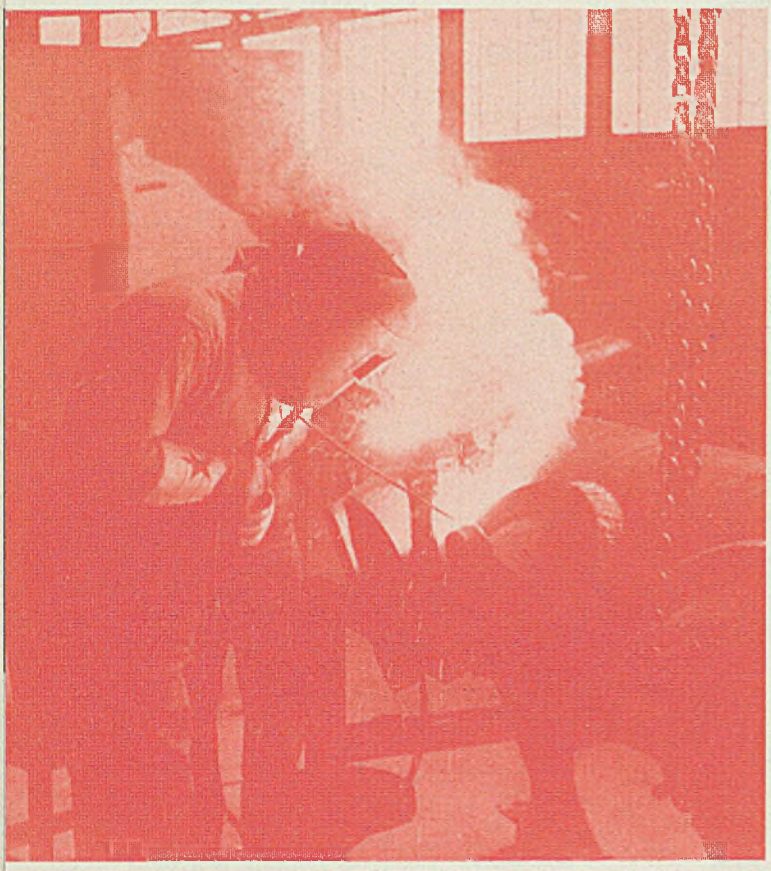


Fig. 1—For many fabrications such as power plant piping it is worth while to have chart records of the actual welding. Here records are being taken while welding headers

GRAPHIC RECORDS

For Quality Control In Welding

By HAROLD LAWRENCE
Metallurgist and
Welding Engineer

THE CONSTANTLY expanding use of welding has gobbled up all the available welders and has placed a heavy responsibility on the shoulders of all welding engineers charged with the duty of getting sound welding at a reasonable cost. For these welding supervisors are expected to maintain established records of performance with green and inexperienced personnel. Furthermore, their other activities have increased to the point where they are unable to give as much individual attention to each operator as they might wish. Nor can able foremen and welding supervisors be found very readily. And today little patience can be wasted on rework occasioned by poor welding.

These factors emphasize the need for graphic instrumentation for quality control because charts will reveal in minutes the performance of any welder over a period of hours and even days.

The Arconograph is a device that records the ratio between the formative period during which the globules of weld metal take shape on the end of the electrode and the deposition period during which actual metal transfer occurs. Since a too sensitive record would result from the precise recording of this type of data, inertia is introduced into the recording pen unit. In the completed assembly, only major variations of electrode activity are recorded.

Major variations are changes in operative procedure that take place when an electrode sticks or when the arc is extinguished. Interruptions of the nature of either of these are certain to be reflected in defective welds. Furthermore, changes in arc length are recorded in the level of the ratio on the chart. A longer arc moves the chart record to the right while a shorter arc moves the trace to the left.

The Arconograph, like any other mechanical recording device, must be used intelligently. In the beginning it is necessary to make charts with each type of electrode to be employed on the weldments. In addition, typical charts for each position are indicated when welding is to be carried out in more than one position. And, finally, destructive tests or nondestructive tests such as the X-ray are needed to correlate the findings of the tests with recorded charts. In this fashion standard charts are established showing the limits of variations that are permitted for good economical welding practice.

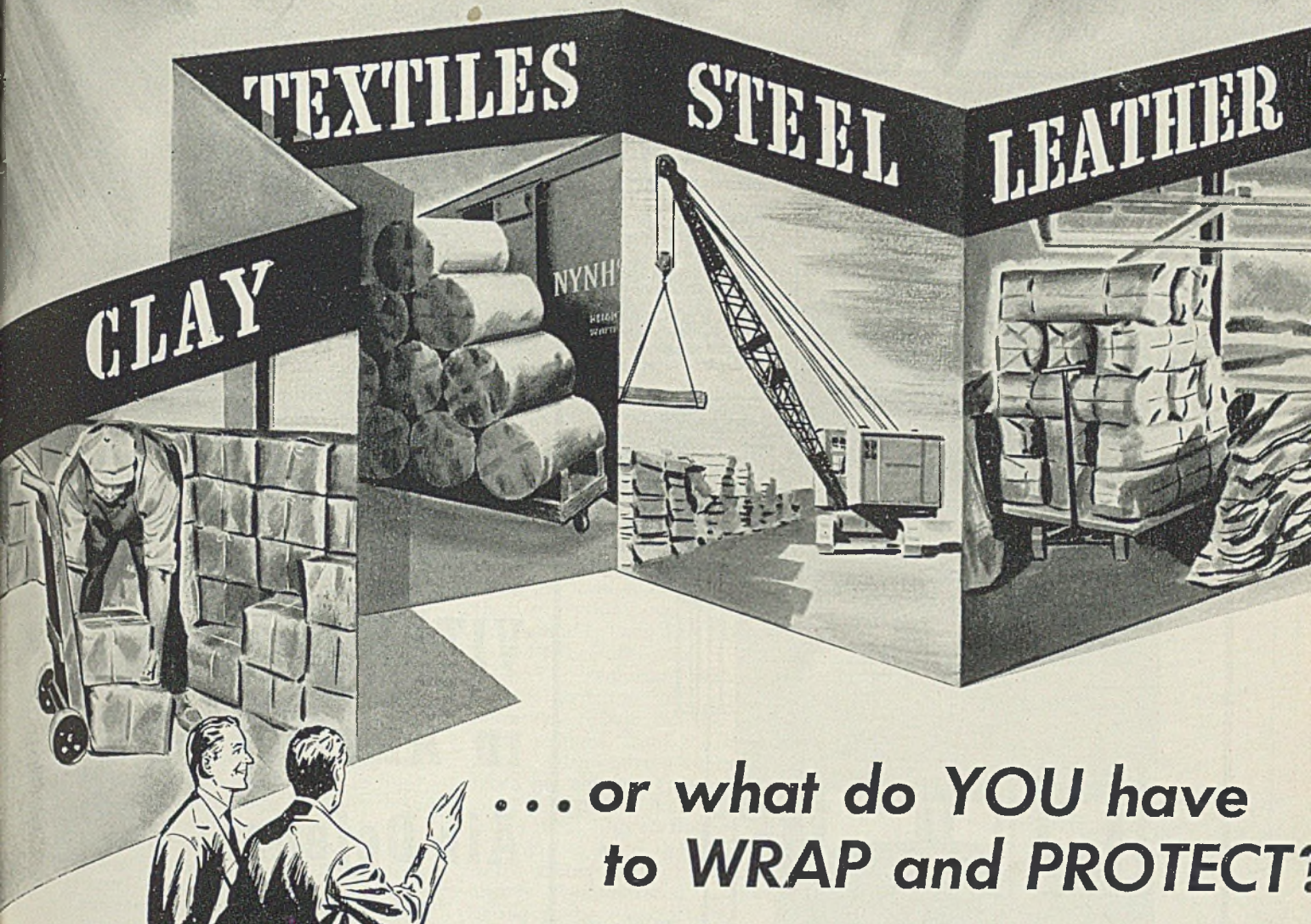
That the charts differ with each type of electrode is apparent from the following illustrations. In Fig. 2 is a chart made with a well known electrode of the AWS-ASTM E6010 type. The record falls between 80 and 90 on the chart. The cadence of deposition is exceedingly regular, indicating that a good deposit in the downhand position should result. There is almost no falling off of the record, showing that the arc voltage remains almost constant throughout the entire length of one electrode. Thus the chart is ideal for this type of electrode used in the flat position and may well be used as a standard of perfection. With the upper limit established, the only requirement for a plant adopting the Arconograph method of control is the setting of a lower limit of acceptability.

Fig. 3 was made with an electrode of the E6012 type. Since this class of electrodes has a deposit that is of the coated type with good slag covering, it is to be expected that the final trace will be regular. And so it is. The falling off that takes place indicates a lower voltage as the electrode becomes heated. This is a normal trend with class E6012 electrodes.

Fig. 4 may be puzzling at first glance. This chart represents an electrode in the E6020 group, recognized as being suited for either horizontal fillet welding or flat position groove welding. Electrodes in this group are noted for their smooth arc action and regular metal transfer. However the chart indicates a decidedly wider swing in the normal deposition cadence. Two factors—greater current and the need for changes in arc length to control the slag—may be the reason for the greater differences in pattern over those for the two types of electrodes previously illustrated.

By now the need for differing standards for the various classes of electrodes becomes apparent.

Next comes a typical chart of an



. . . or what do YOU have to WRAP and PROTECT?

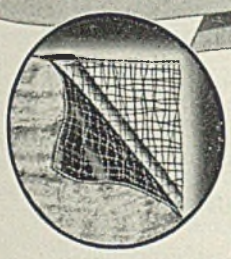
There's little or no similarity between these products. Each presents an entirely different problem in protection, during inside and outside storage as well as in transit — but FIBREEN serves them all — and hundreds of others too, large and small, in all types of industry.

Perhaps it can serve you. In factory after factory FIBREEN is doing a "better" job . . . speeding up the work in shipping rooms, reducing costs, and guarding against claims for damaged goods.

FIBREEN is amazingly strong and tough. It's waterproof, dirtproof, pliable and clean . . . an ideal wrapping and protective material, available everywhere at low cost.

Let us send you a supply of FIBREEN without cost or obligation, for you to try. Let The Sisalkraft Co. shipping experts offer recommendations. Simply write, explaining what you ship and how you now pack it.

FIBREEN



FIBREEN is 6 ply: TWO layers of strong kraft, reenforced with TWO layers of crossed sisal fibers embedded in TWO layers of special asphalt — all combined under heat and pressure. FIBREEN is pliable and clean — will not scuff—stands an astonishing amount of abuse and exposure. It is used either as a wrapping or a lining material.

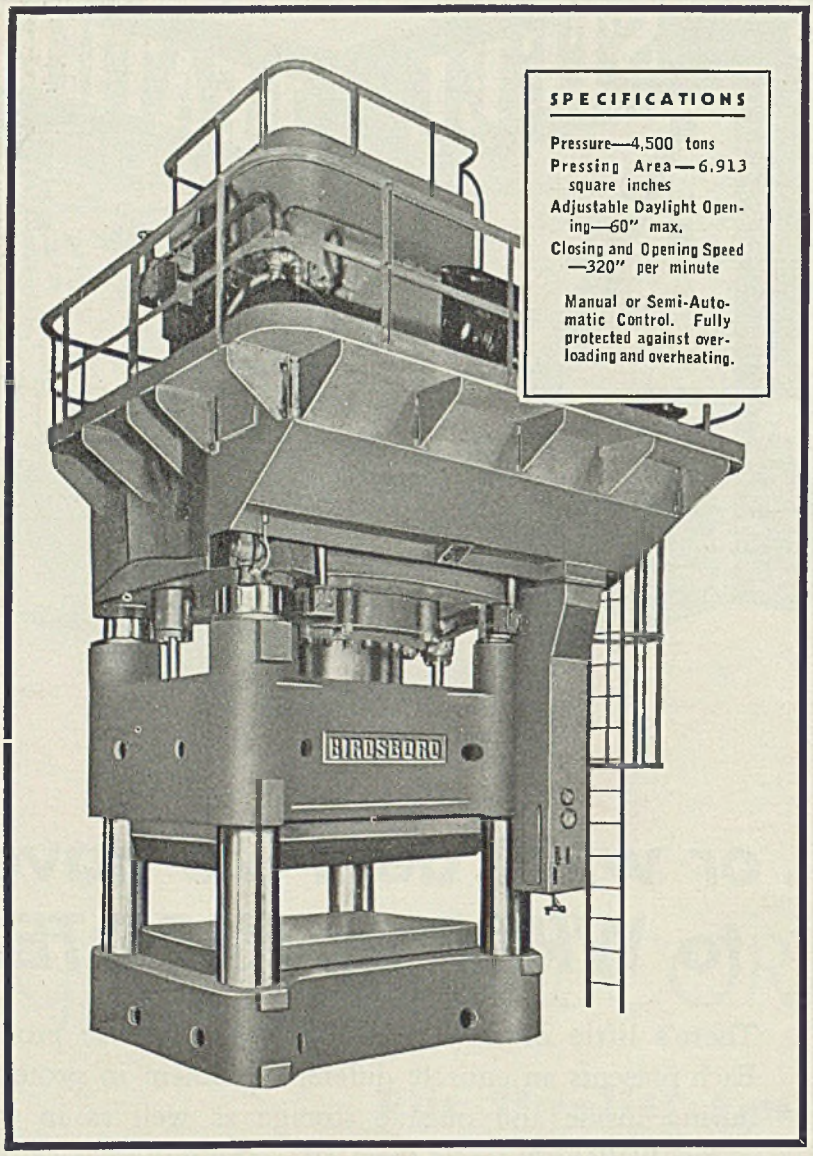
Soak it—twist it—try to tear it!

Only when you get a sample in your own hands can you realize that a *paper* can be so strong—so tough—and impervious to moisture. Write for sample.

FIBREEN is a product of The Sisalkraft Co.—also manufacturers of Sisalkraft, Sisal-X, Sisal-Tape and Copper-Armored Sisalkraft.

THE SISALKRAFT CO.
205 W. WACKER DRIVE · CHICAGO, ILL.
NEW YORK · SAN FRANCISCO · LONDON · SYDNEY

SERVING INDUSTRY CONSTRUCTION AND AGRICULTURE THROUGHOUT THE WORLD



Playing a VITAL ROLE in America's Air Defense

One of several presses now at work in a large West Coast aircraft factory, this 4,500-ton Birdsboro Hydraulic Press forms numerous airplane parts that play vital roles in America's defense effort. This Birdsboro giant is put through its paces at the touch of a button, and provides flexibility that makes routine production jobs of the airplane parts of today.

With that operating flexibility, Birdsboro Hydraulic Presses will also solve tomorrow's production problems economically. If it's a press problem, ask Birdsboro.

BIRDSBORO STEEL FOUNDRY AND MACHINE COMPANY

Plants at Birdsboro and Reading, Pa.

BIRDSBORO
Hydraulic Presses

BUILDERS OF: HYDRAULIC PRESSES · STEEL MILL EQUIPMENT · ROLLS · SPECIAL MACHINERY · CRUSHING MACHINERY

electrode in the E6030 group as pictured in Fig. 5. The wider swings seen in Fig. 4 are here repeated with an additional trend to the left that reveals a lowering arc voltage as the electrode heats up. Most welders are well acquainted with this phenomenon and speed up their rate of travel as the electrode is consumed. Instinctively they adjust their manipulation to the faster rate of deposit that goes with a shorter arc as the result of a hotter electrode.

Of course welding is performed with electrodes other than those of the mild steel grades that have been discussed so far. Among the nonferrous electrodes for which representative Arconograph charts are available are those for nickel in Fig. 6 and monel in Fig. 7. These charts are most interesting as they present information that is not appreciated by the welder controlling the arc common to nickel and monel electrodes. The deposit from either type appears to be very sluggish and heavy, globular transfer seems to be the method of transfering metal across the arc. However the traces do not coroborate this impression. Instead the formation and transfer of the globules is regular and even comparable in every way with the behavior of steel electrodes. The uniformity and evenness of the beads put down by the nickel and monel electrodes further serve to substantiate the graphic records.

Serves To Improve Work

Perfect charts, *and all of the charts illustrated are perfect,* serve a useful purpose in showing the best that can be done. A ceiling of good performance is charted thereby. But no welding in the field will produce mile after mile of perfect records. Field variations introduced by magnetic blow, poor fit-up and other conditions that are common to any commercial work change the pattern from the ideal to the practical. Therefore the first step in any quality control program must be the collecting of data to indicate the maximum permissible deviation from a perfect deposit.

No one should become alarmed at the thought of a maximum permissible deviation from a standard. The quality of workmanship shows a continual rise as is realized from the ease with which the high standards of yesterday are met today. Thus the acceptance of a reasonable pattern means that reliable work of a known standard is bound to result.

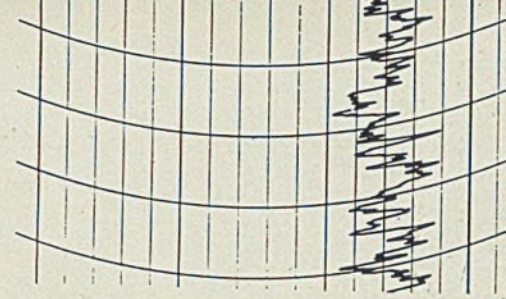
Perhaps the greatest benefit that comes from using graphic records for control is the understanding between welding engineer and welder that results. Mistakes occur and become the basis on an amicable discussion between supervisor and workman. From these discussions the welder gains an insight into the working of the instrument and as a rule resolves to improve his work. Frequent checking of the record enables the welder to appraise his own efforts. He strives continually to bring the level of his chart up to that provided as the best possible. The narrowness of the gap separating his record from that adopted as a standard furnishes an immeasurable amount of satisfaction to the welder while improving the quality of his deposit.

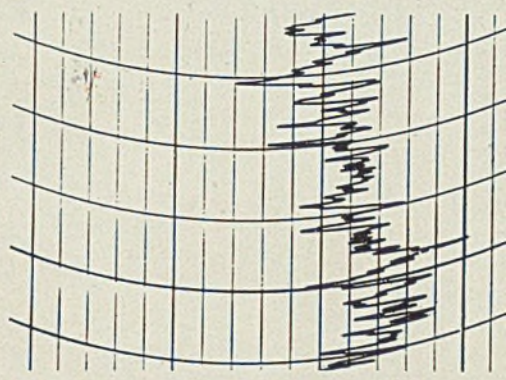
It is when arconograms are used for analytical purposes that they come into their own. Arconograms, as the name implies, are the records made by the Arconograph. For example, a poorly welded joint is discovered by the X-ray. The joint is completed. The welder when questioned about the nature of the weld while he was making it was sure that everything was going along as it should. Then the Arconograph record is brought out.

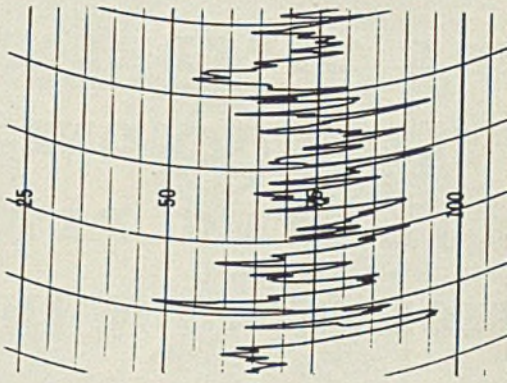
The arconogram shows quite clearly that too long an arc was held. The reason for the trouble is quite obvious from the chart. The welder with charted evidence to refresh his memory remembers a bad condition of magnetic disturbance that forced him to hold a long arc in order to keep the slag in place in the groove. With the reason being clearly demonstrated a reweld is bound to be satisfactory.

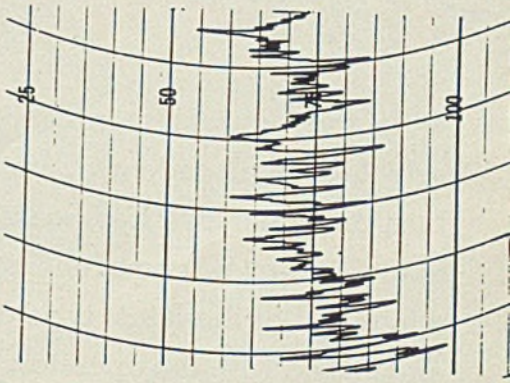
Without control the reason for the failure would have gone down the corridors of time unnoted. A second weld would have been made and very likely could have been as poor as the first. But with the finger of recognition placed on the cause of imperfection in the finished weld, the welder knows he must overcome the magnetic interference by changing the location of his ground or by some other means if a second inferior weld is to be avoided. His future work will be governed by the lesson he learned. The long term record will be better than it would have been without the graphic history of the case.

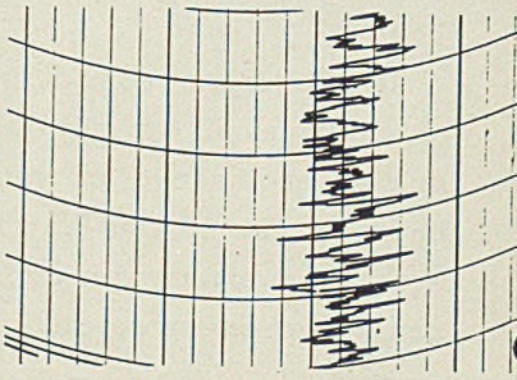
Quite a good deal of high-pressure











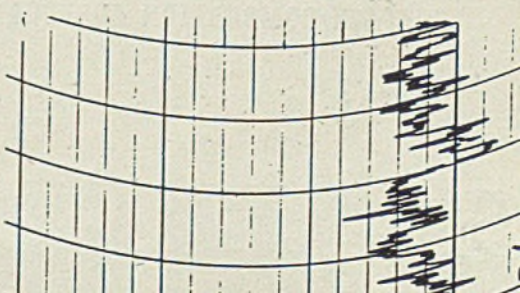


Fig. 2—Typical arconogram of a weld made with an E6010 type of electrode

Fig. 3—A perfect weld made with an electrode of the E6012 class

Fig. 4—Horizontal fillet welding electrodes of the E6020 group make this chart

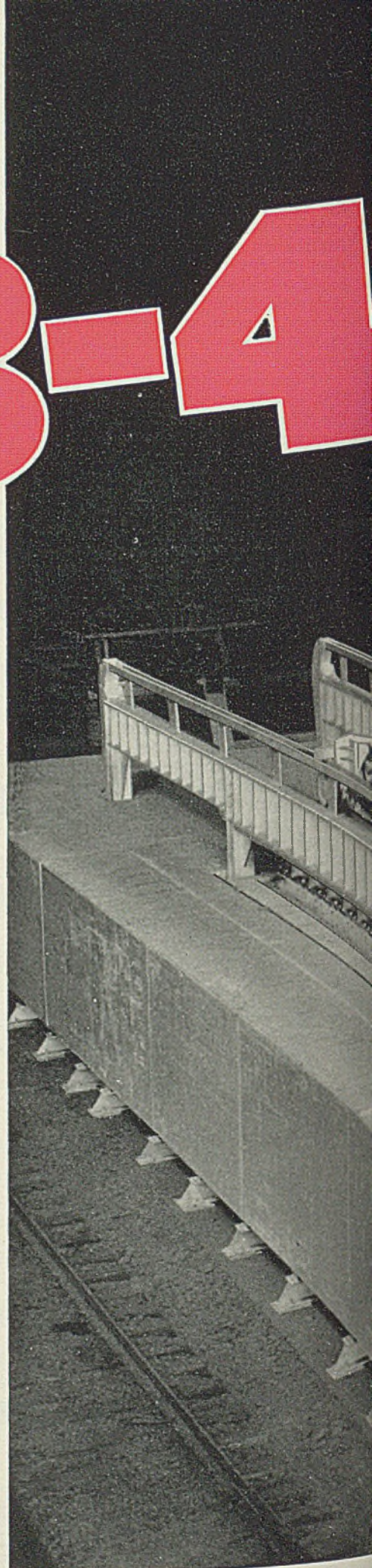
Fig. 5—Flat position welds with a flat position electrode in the E6030 class make this record

Fig. 6—Arc welding pure nickel gives an extremely irregular chart like this

Fig. 7—Metallic arc welds using monel metal electrodes produce this pattern

1-2-3-4

SIX DIFFERENT PLANTS SELECT SC ONE-WAY FIRED SOAKING PITS IN SIX MONTHS..AN INVESTMENT OF OVER $1,500,000



● In the past six months six different plants selected or placed in operation Surface Combustion One-Way Fired Soaking Pits. Each plant made its own comprehensive investigation, visited all of the latest type of pits in operation and talked with the operators before a selection was made.

If you, too, are considering the installation of additional pit capacity, ask a Surface Combustion engineer to tell you about the latest improvements to One-Way Fired Pits. If you wish, arrangements can probably be made for you to visit one or several recent installations.

SURFACE COMBUSTION CORPORATION · TOLEDO, OHIO

* SECURITY FOR AMERICA *

SURFACE COMBUSTION

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

-5-6

piping and pressure vessel attachments are made by welding in all positions with an E6010 electrode. The application of welds of this type requires a high order of skill. In rare cases leaks occur. What is the cause?

The arconograms for the weld may be studied to show insufficient fusion resulting from the sticking of the electrode in about the same location on several passes. An unsatisfactory design left the welder too little space for adequate electrode manipulation. Busy foremen did not catch the error due to the press of many other problems. But the ubiquity of the Arconograph saved the day. The patterns showed the fundamental fault which was later substantiated by the welder. A simple design change on subsequent units made the welding the matter of easy routine it should have been.

Present-day welding is a question of establishing a certified routine and following that recipe through to a logical conclusion in the form of a good weld. As welding has graduated from an art to a science, the fundamental laws underlying the manufacture of a satisfactory weld are well known. Therefore the major need of the welding engineer is the constant surveillance of the welders to make sure that the rules are obeyed. Under existing business conditions no engineer has time to watch his welders as closely as he would like. The available supply of good engineers with sufficient experience has long since disappeared. Luckily graphic instruments such as the Arconograph provide an inexpensive expedient to the problem of making one qualified welding expert do the work of ten.

Huge Machine Straightens 6-Inch Solid Rounds

■ ONE OF THE largest straightening machines ever built—one that has sufficient capacity to straighten 6-inch solid rounds with a maximum yield point of 70,000 pounds per square inch—was delivered recently to Page-Hersey Tubes Ltd., Toronto, Ont. by Mackintosh-Hemphill Co., South Ninth and Bingham streets, Pittsburgh. It features speeds of 80 to 320 feet per minute, straightening alloy as well as carbon steel bars from end to end and eliminating all end bends and camber. For ease of operation, its controls are grouped on one side, and all hand operated parts are spring balanced. The machine is powered by two 75-horsepower motors, and is equipped throughout with antifriction bearings, equipped with a one-shot lubrication system.

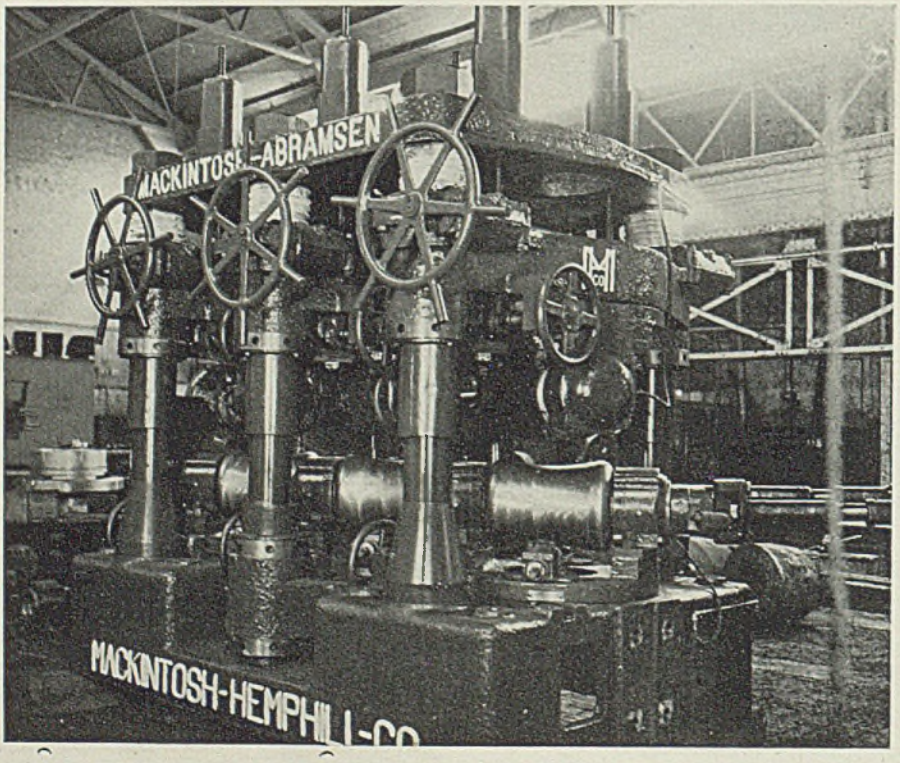
The unit (below) consists of three pairs of horizontal cross rolls, arranged in the form of symmetrical passes. These, forming the three passes, have identical contours. The three passes clamp the stock along straight lines on its surface and parallel to its center line. Vertical and angular adjustment of the rolls by handwheels provide exact settings for each size and kind of stock being run.

Straightening is accomplished by having the middle pair of rolls slightly out of line with respect to the other two pairs. The double roll middle pass prevents weaving or sidewise movement in the machine and causes straightening of long bends, or end camber to take place in two bending operations, instead of one.

Range of stock sizes and speeds of production are not limited by the forms of the rolls because passes are symmetrical and both rolls of the entering and leaving passes are driven. Inasmuch as the stock is held by a closed pass, a sufficient portion of the end bend is removed in the first pass to cause it to enter the second pass without guides.

The only relief given to the rolls of each pass is to round out the outside corners. Since both the upper and lower rolls of each pass have the same contour, the angular adjustment of the rolls may be set to produce a pass whose end view is a perfect circle. The machine also can be used as a sizer for both bars and pipe. Its maximum production speed is limited by the maximum rotation which can be imparted to the particular kind and type of stock to be straightened. The bottom rolls always remain at the same elevation for every size of bar or pipe. The tables are adjusted in height only to take care of roll wear.

The speeds of the motors are electrically and mechanically synchronized, and control of the speed of each over the entire range is accomplished simultaneously by a rheostat.



Practice Covering Metal Lath Again Revised

■ A new revision of simplified practice recommendation covering metal lath, further reducing varieties, is expected to result in a substantial conservation of steel, according to the Department of Commerce, Washington.

The revision, worked out under the auspices of the Division of Simplified Practice, National Bureau of Standards, will be identified as simplified practice recommendation R3-41. It reduces inventories required to be carried at the mills and in warehouses of dealers and jobbers by an estimated 30 per cent.

Mimeographed copies of this latest recommendation may be obtained from the Bureau of Standards without charge on request.

Houghton's QUENCHING OIL developed solely for HIGH SPEED QUENCHING OF SHELLS

History repeats itself. In the first World War Houghton helped establish a procedure for heat treating shell steel. Again the problem arises, as shortage of types of steel for projectile use, combined with higher yield strength requirements, make it necessary to quench high explosive shells.

The quench is the crucial part of the heat treat. It must be uniform. It must be rapid in cooling through the critical range. The oil must not sludge or clog up cooling systems. It must not oxidize nor fractionally distill.

These are the requirements—a speedy, uniform quench, yet not so fast as to cause any tendency to crack or distort.

HOUGHTO-QUENCH G has been developed to fill this need. Its merits are set forth on this page. It is made solely for quenching; by dilatometer test it has definitely faster quenching speed. It is an exclusively treated oil, superior on all counts to other quenching oils against which it has been tested for speed, depth of hardness and stability. Yet it is priced right to provide an economical installation.

WHY HOUGHTO-QUENCH "G" EXCELS:

1. Possesses faster quenching speed.
2. Provides uniform hardness; greater depth of hardness.
3. Stable; non-sludging.
4. Wets out steel surfaces rapidly.
5. Though fast in heat absorption, it will not distort or crack work.
6. Meets needs for flash, fire and viscosity.
7. Priced right for volume requirements.

For full data on HOUGHTO-QUENCH G and description of pressure quenching and cooling systems, write Dept. S.

E. F. HOUGHTON & CO.

Chicago - PHILADELPHIA - Detroit

HOUGHTO-QUENCH "G"

Better

HANDLING FACILITIES

Reduce Processing Time

. . . . in bonderizing large steel enclosures for switchgear and control equipment

■ BONDERIZING facilities for processing large steel enclosures for switchgear and electric control equipment at East Pittsburgh works of Westinghouse Electric & Mfg. Co. have recently been revised with an important reduction in handling requirements and with a large saving in time required for the bonderizing process.

Formerly these enclosures had to be bonderized in sections and subsequently welded together because some of these units are quite large, as can be seen from the accompanying illustrations. However, this was not satisfactory because the welding operation tends to destroy the bonderized surface, leaving an unsatisfactory paint base. Now the sequence has been reversed; that is the enclosures are completely welded first before they are bonderized. This has been found not only to eliminate the unsatisfactory surface caused by welding, but also saves much time and handling in the manufacture of these units.

Sequence of manufacturing operations involved in producing these steel enclosures is somewhat as follows: Since they are made from sheet steel, the first operation is to shear the sheets to the exact size. Next, the individual sheets are laid out or stencilled for the subsequent operations of punching and notching.

With the flat sheets cut exactly to size, punched and notched, the sheets are bent near the edges, producing flanges which stiffen the surface. Next, front panel surfaces are straightened, buffed and then drilled and tapped to receive the various instruments and switchgear.

After checking for flatness and straightening where necessary, the panels are assembled to complete the enclosure by welding on side pieces, angle supports, framework sections, shelves, etc. As shown in Figs. 2 and 3, these enclosures often are quite large. The new equipment is capable of handling such large assembled structures easily—one of the most important features of the new bonderizing layout.

After the enclosure has been completely fabricated by welding, the walls are ground smooth and the structure is moved to the bonderizing department by overhead crane. At this point, a truck is used to move the work inside the bonderizing room, where a large overhead crane is available to carry the work through the five tanks in succession as required.

Fig. 1 shows a general overall view of the bonderizing room as well as the overhead crane. It will be noted that this unit has two hooks—a feature necessary for handling large structures as is shown in Fig. 3. Tipping to drain the structures also is easy with two hooks, independently controlled. A pendant control station is suspended from the crane. It has sufficient push buttons to control all the crane movements as well as both hooks separately. This allows one operator to handle all of the operations involved in moving the work through the five successive tanks without climbing to a crane cab, since all operations are controlled from the floor level. Here it is easy for the operator to watch closely the movement of the work and to prevent damage to the tanks or to the enclosures themselves.

Sequence of operations involved in bonderizing here starts with the insertion of the work into the hot alkaline cleaning solution in the first tank. Previously, of course, the work has been cleaned of any heavy rust or loose scale by scraping, wire brushing or rubbing with adhesive cloth. Tarry substances as well as paint and heavy grease are removed with a putty knife and the metal washed clean, using a mixture of benzene and carbon tetrachloride.

The alkaline cleaner (Oakite) in the first tank is operated at a temperature of 194 degrees Fahr.

The second bath is a hot water rinse. If water bags appear on the surface of the work upon removal from the rinse water, the parts are not sufficiently clean and are returned to the alkaline cleaner until the surface is free from bags upon removal from the rinse water.

Third tank contains the bonderizing solution which is maintained at a temperature of 180 to 200 degrees Fahr. Here the work remains for a sufficient length of time, usually 2 to 5 minutes, to provide a satisfactory paint base. The solution is made up of 5000

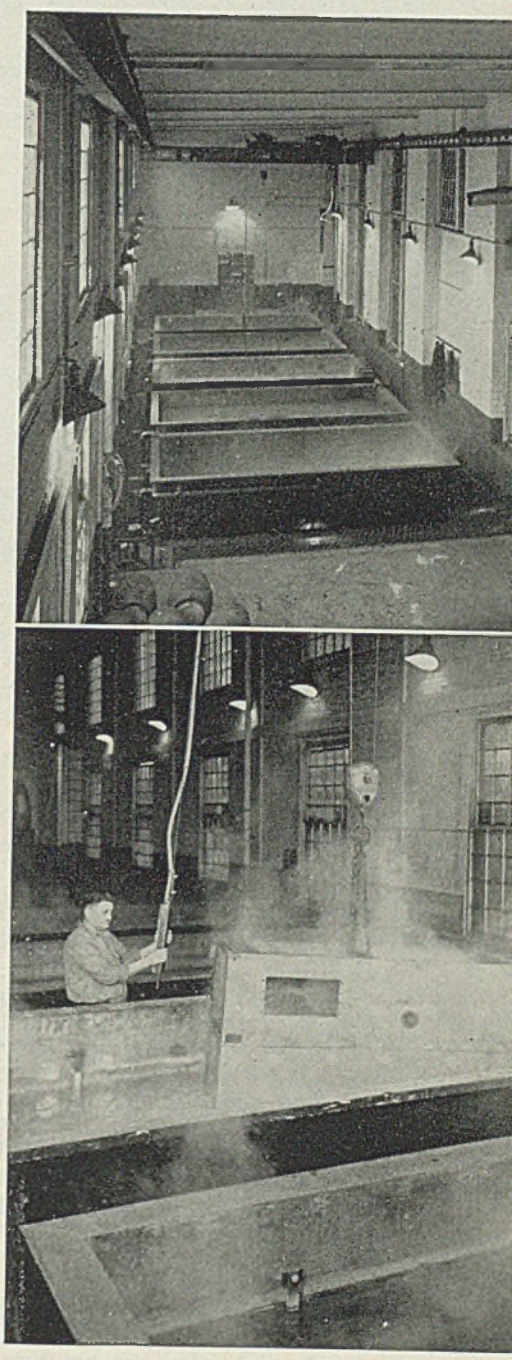


Fig. 1. (Above)—View of facilities in bonderizing department devoted to processing large switchgear enclosures. Five huge tanks accommodate largest assemblies

Fig. 2. (Below)—Reveals size of tanks and shows method of hanging heater coil frames from short brackets welded on inside of tank just above solution level

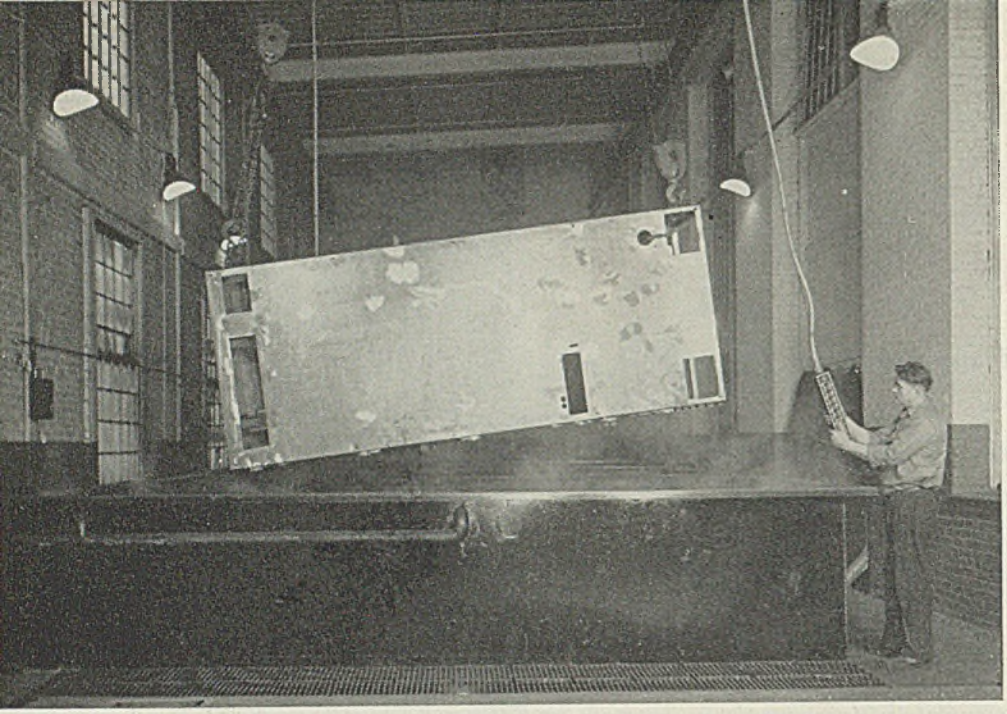


Fig. 3—The crane has two hooks independently controlled. Pendant push-button station allows operator to control all movements of work from floor level where he can watch clearances closely. Also eliminates necessity of two operators or of one operator climbing into crane cab every time a piece is to be moved

pounds of bonderizing compound per 1000 gallons of water. Additions of bonderizing compound are made daily to keep the solution up to the desired strength. The result is work is more uniform than if large additions were made occasionally.

Fourth tank is a cold-water rinse. Here the work is rinsed for 20 to 60 seconds. It is important that the enclosure be rinsed as quickly as possible after the bonderizing operation to avoid having the bonderizing solution dry on the hot metal. Rinsing solution is tested daily to be sure that it has not contaminated to any great extent by carryover from the bonderizing solution.

Fifth tank contains a chromic acid bath operated at a temperature of 180 to 200 degrees Fahr. Its purpose is to harden the bonderizing coating. This solution consists of 5 pounds of chromic acid per 1000 gallons of water. It, too, is tested daily and additions made to maintain desired strength. The parts are immersed in the bath not less than 20 seconds nor more than 60 seconds. The work is dried immediately following the chromic acid rinse. In the case of large enclosures, there is usually sufficient residual heat from the chromic acid rinse to dry the work. However, if this heat is not sufficient, it is necessary to force dry the parts, using an air blast. The air blast also is used to remove solution that may be trapped in crevices.

In the operations of this process, sludge is formed as a by-product and allowed to collect in the bottom of the bonderizing tank. Since it will cause dirty bonderizing if present in large quantities, it is removed regularly by allowing the sludge to settle to the bottom of the tank, after which the solution is pumped into a separate tank. The sludge then can be removed easily from the bottom of the tank.

Scale also forms on the heating coils so it is necessary to remove this periodically to maintain proper operation of the heaters.

Reference to the illustrations will show that these are probably the largest tanks ever built for this purpose. They are of arc-welded steel construction and extend almost twice as far below the floor level as they do above the floor level. Note steel gratings to afford drainage and good footing. Tanks are constructed of ¼-inch steel plate with U-channel welded flat side up around the outside top edge of each tank to form a flange.

Skimming gutters are built into the hot and cold-water rinse tanks. In addition to the channel at the top edge of each tank, four I-beams are utilized to reinforce the sides and ends of each tank at different depths. Then each tank is supported by four I-beams running lengthwise underneath it.

The four tanks containing hot solutions are heated by coils made from 1¼-inch seamless steel tubing. Each of the four coils required per tank contains 70 linear feet of pipe. All joints are welded, with the coils made from stock lengths of pipe of a length to make as few joints as possible. The four coils used in the bonderized tanks were sanblasted after fabrication and painted with two coats of Apexior No. 1 paint.

Heating coils are supported in the tanks on a framework made from ½ x 1¼-inch bars and Micarta spacers bolted together. A lifting lug is provided at top of each frame for handling the coil in and out of the tank. In Fig. 2 it is possible to see the upper end of the coil frames. They are suspended from short brackets welded to the inside of the tank.

This layout has performed exceptionally well, not only by reducing the actual amount of handling involved in processing these units, but also by affording a large and important saving in time required. In addition, a much better finished job is sent to the paint shop.

Book Covers Rebuilding Of Used Machine Tools

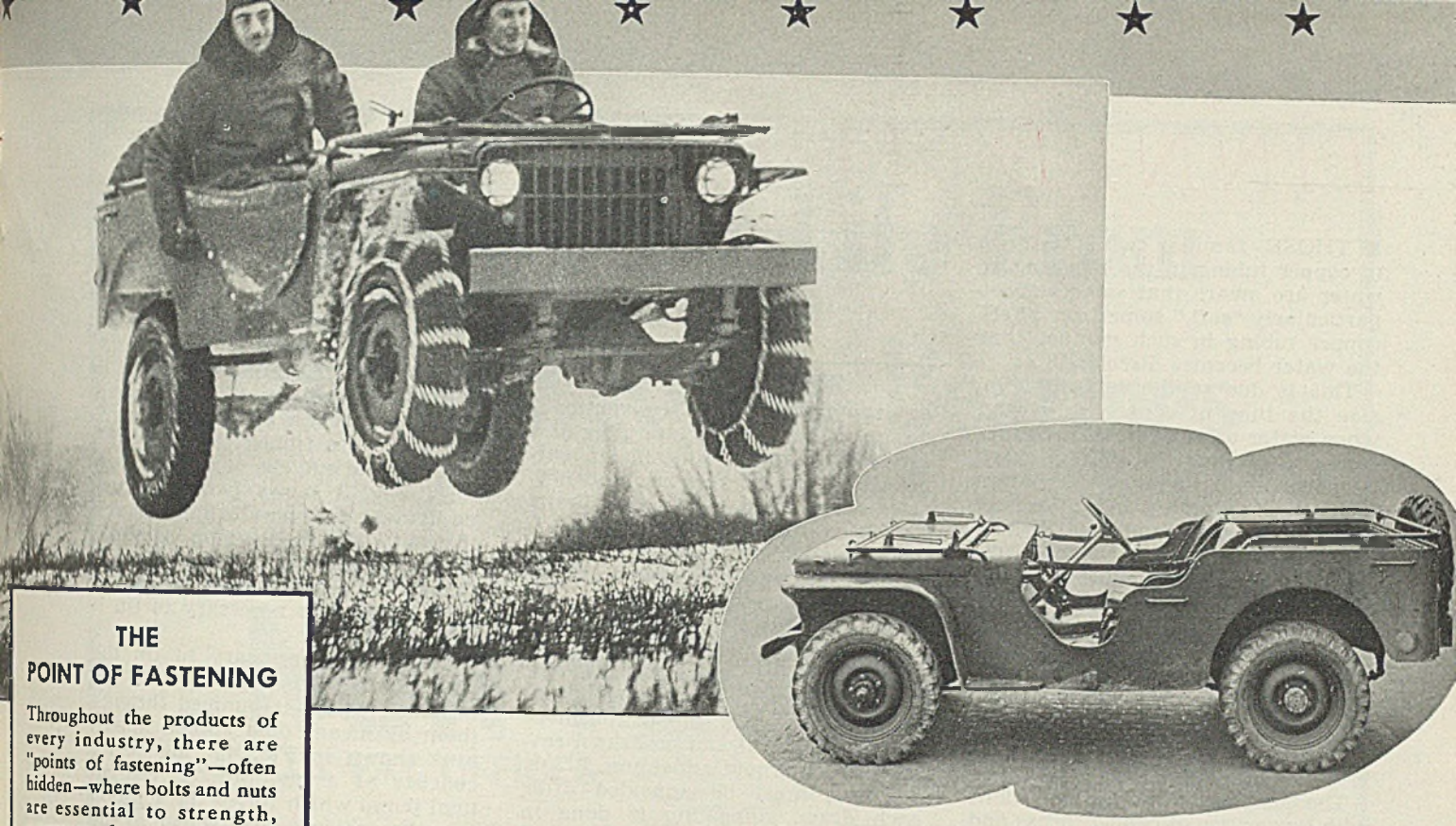
■ Simmons Machine Tool Corp., North Broadway, Albany, N. Y., announces a 58-page book describing and illustrating modern methods of engineered rebuilding and remodeling of worn and outmoded machine tools. As emphasized in Aug. 11 STEEL, in an article entitled "Reconditioned Machine Tools—Pinch Hitters in the National Defense Line-Up!", achievements such as are dealt with in this book—including enlarging of lathes, planers and other "critical" machines, to handle bigger work—are of prime importance to the defense program.

This fact was officially recognized by the government on Nov. 10, 1941, when Donald M. Nelson, director of priorities, Office of Production Management issued Preference Rating Order No. P-77 facilitating acquisition of materials, parts and equipment necessary for rebuilding machine tools.

Engineered rebuilding, this book reveals, differs little from new machine tool building, except that the "raw material" consists of parts which must be remachined and refitted instead of being machined from the rough. Plant, engineering department, personnel, and machining and material handling equipment essentially are the same as any other large well equipped machine tool company. Unusual ingenuity is demanded in devising restorations; improved feed works; motorization; etc.

Highly specialized equipment also is involved, including, for example, a combination milling, planing and grinding machine for refinishing beds and slides. This is probably one of the largest surface grinders in existence. Another unique device is a "putting on machine" for deposition of new metal on worn spindles and shafts prior to remachining to original size and finish.

Copies of the book are available to accredited persons by writing to the company.



THE POINT OF FASTENING

Throughout the products of every industry, there are "points of fastening"—often hidden—where bolts and nuts are essential to strength, necessary for security, and fundamental to proper adjustment. For bolts, nuts, and their modifications provide the *only* fastening method by which parts can be securely and rigidly held, yet readily tightened or loosened for adjustment, disassembly or reassembly at any time.

FORD Jeeps Travel as the crow flies

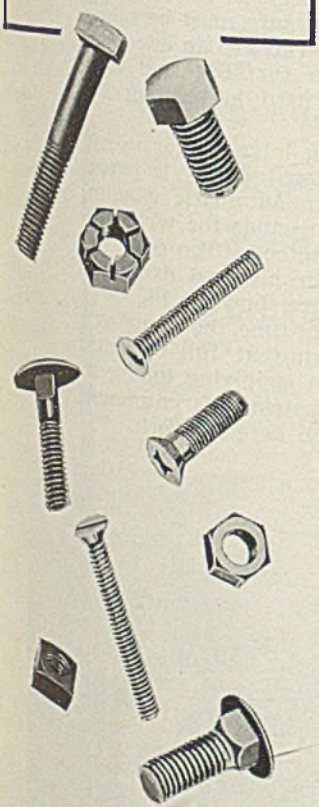
and Bolts and Nuts withstand the strain

Test drivers, the men who make a living laughing at danger, are demonstrating the outstanding qualities of the latest reconnaissance car built by Ford Motor Company for the U. S. Army.

Scout cars, like the one in the picture, can ride the highway or roll across country as the crow flies—they no longer waddle slowly over obstructions, but leap and bounce over rough terrain. They have speeds up to 55 m.p.h. in high gear.

The rough-and-tumble jolting and vibration of modern Jeeps impose terrific strain on bolts and nuts in many vital assemblies throughout each car—in the machines themselves and in the powerful engines that drive them. R B & W products have been purchased for many years by Ford for use in their passenger cars, trucks, tractors, and now for the Jeeps.

Throughout all industries, wherever precision and strength must predominate, EMPIRE Bolts and Nuts are known and used. Since 1845, R B & W has pioneered in producing threaded fastenings of the highest quality.



★★ AS WE STAND TODAY ★★★

The war effort has considerably changed the production picture.

Like many other manufacturers, R B & W realized several years ago that normal production schedules would prove inadequate and each month our plant facilities were gradually extended to cope with present increased demand.

Our engineers have been working long hours to develop and build better machines of higher speed and production capacity, all with a double plan in mind—to keep pace with the rapid increase of emergency demands and to deliver to our regular peacetime customers, the greatest possible supply of EMPIRE Bolts and Nuts for their own business.

966

BOLTS EMPIRE NUTS-RIVETS

RUSSELL, BURDSALL & WARD
BOLT AND NUT COMPANY

PORT CHESTER, N. Y. ROCK FALLS, ILL. CORAOPOLIS, PA.

TINNED TUBING

By B. J. HIGGINS
Metallurgist
Linderme Tube Co.
Cleveland

■ THOSE familiar with the use of copper tubing in the handling of water are aware that some waters, particularly "soft," sometimes affect copper tubing in such manner that the water becomes discolored.

This is due to the formation inside the tube of copper salts, and when water affected in this manner comes in contact with soap, a green discoloration becomes apparent which stains clothing and ultimately deposits on basins and tubs. To prevent this formation, Linderme Tube Co. uses a purely chemical method of tinning either or both the inside and outside surfaces of copper and brass tubing.

A comprehensive discussion of this process appeared in STEEL, July 29, 1940, p. 50, while the present article deals with the manner in which the tubing is processed.

The company starts its operations with large sizes of copper, brass and aluminum tubing which are redrawn to smaller sizes ranging from ⅛ inch to 2 inches in diameter. The first operation is to swage one end so that it can enter the drawing die. Swaging is generally done in a conventional rotary type swaging machine. The next operation is drawing the tube through a die and over a mandrel on drawing benches of conventional design. Both drawing and plug dies are usually made of tungsten carbide, and can be re-worked to new sizes when worn beyond the limits permitted for tube tolerances.

In some instances, tubing is drawn without the use of an inside mandrel, generally in cases where it is not necessary to hold the inner diameter within close limits.

Closely allied with the drawing process is that of annealing. Inasmuch as copper is among the more ductile metals, it can be drawn several times without annealing. Brass, however, must be annealed after each draw. Annealing is done in continuous bright-anneal furnaces made by Surface Combustion Corp., Toledo, O., and shown in Fig. 1. This furnace is fired with a special gas mixture and is provided with a continuous belt carrying the load. The speed of the belt can be varied to accommodate different annealing cycles. Both straight and coiled tubes are annealed. Temperatures run from 550 to 1350 degrees Fahr., with the length of time taken to go through the furnace determining the cycle applied. Sometimes it is of advantage to heat-soak the material for a certain time, which is done by stopping the belt motion.

Tubes to be shipped straight are straightened by passing them between rollers as shown in Fig. 2. A large percentage of the output is shipped in the form of coils wound on reels or drums of special design. The tubes are tinned on either the inside or the outside, or on both surfaces. Fig. 3 shows two operators manipulating some straight lengths of tubing in the tinning solution. This tank also is provided with racks on which the coiled material can be hung when it is necessary to tin it on the outside.

When it is necessary to tin the inside surfaces of tubes in coils, the tinning solution is pumped through them by means of a special apparatus shown in Fig. 4. This device consists of a motor-driven centrifugal pump which forces the solution into the pressure head shown at the top. Here will be seen four valves which control the flow of the solution through rubber tubes. These tubes are connected to the ends of the coils, and after a sufficient quantity of the solution has been pumped through the coils to insure the proper deposit of tin, the operation is complete.

While the process is comparatively simple, great care must be taken at every step to insure an adequate coating of the surfaces, and care must also be used in packing for shipment.

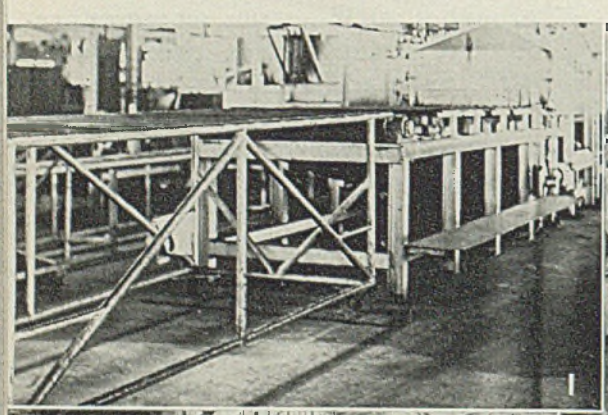
Coiled tubing intended for use in the refrigeration industry is paper-wrapped on an automatic winding machine which winds the wrapping evenly over the coils. The coils are then packed in plywood drums, a few of which are shown in Fig. 5.

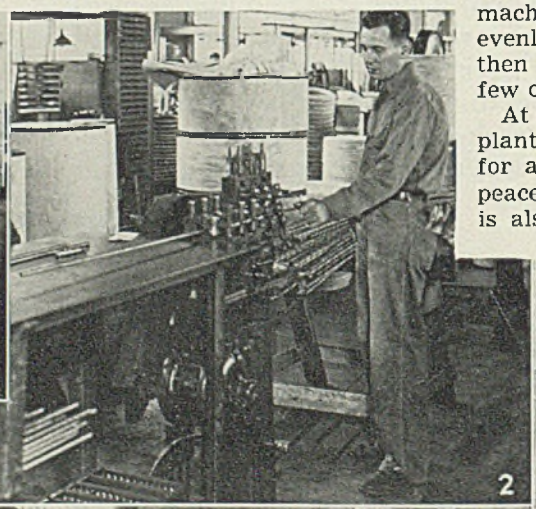
At the present time, the company's plant is working at full capacity, for aside from supplying tubing to peace-time industries, a large amount is also used on defense work.

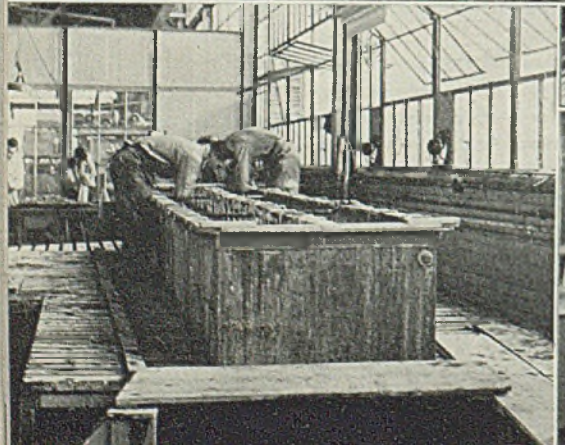
Fig. 1—Annealing furnace with special racks on casters for runout of tubing.

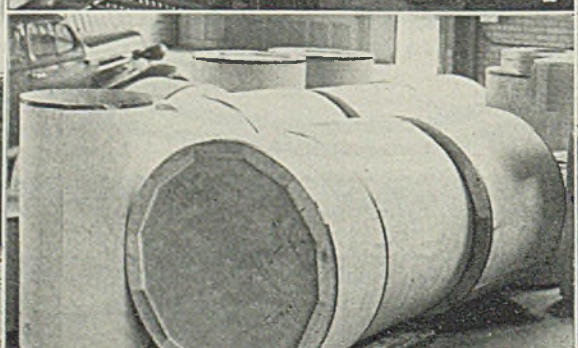
Fig. 2—This multiple roller device straightens the tubing. Fig. 3—Two operators manipulating lengths of tubing in the tinning tank. Fig. 4—Special circulating system for pumping tinning solution through tubing formed into coils or other shapes

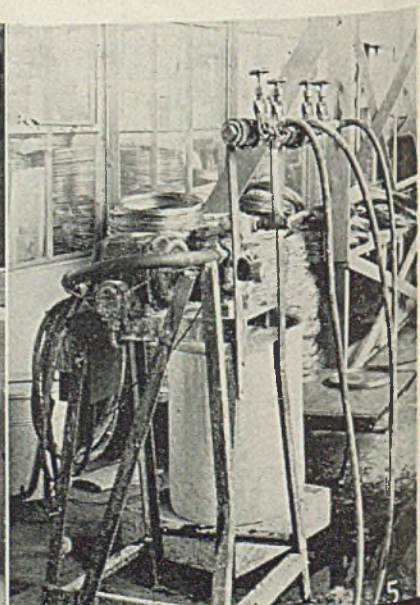
Fig. 5—Finished tubing is packed in boxes or coiled in drums as shown here











Insure Long Life From Ball and Roller Bearings

TRADE MARK REGISTERED

NON-FLUID OIL

IN U.S. PAT. OFFICE & FOREIGN COUNTRIES

Those you lose will be hard to replace! Defense needs are resulting in a shortage of wanted sizes. Why take chances with your ball and roller bearings?

NON-FLUID OIL safeguards bearing life by lubricating dependably. It protects bearings from pitting and corrosion, so guarantees long life and trouble-free operation. Recommendation by leading makers of ball and roller bearings proves it superior to ordinary grease.

Used successfully in leading iron and steel mills.
Send for testing sample today—
prepaid—NO CHARGE.

NEW YORK & NEW JERSEY LUBRICANT CO.
292 MADISON AVENUE NEW YORK
Works: NEWARK, N. J.

WAREHOUSES: Charlotte, N. C. Greenville, S. C. Atlanta, Ga.
Providence, R. I. Detroit, Mich. Chicago, Ill. St. Louis, Mo.

BISMUTH MAKES

Stainless Steels Free-Machining

■ LABORATORY machinability tests are not any too conclusive where but slight differences in machinability are to be evaluated. On the other hand, it is possible to recognize the differences and express them in rough quantitative values where the materials really differ in machinability. Comparative sawability and drillability tests previously found to work well in machinability testing were utilized here, taking the reference material as having 100 per cent sawability or drillability. The machinability index then in any case expresses the ratio of the time necessary to do the same cutting on the reference alloy and on the alloy being tested. Thus if it takes 200 seconds to make a certain cut or drilling in the reference alloy and the test material takes but 150 seconds, its index is 133. If it takes 250 seconds, the index is 80.

These sawability and drillability times were determined on 25 per cent chromium, 12 per cent nickel—and 19 per cent chromium, 9 per cent nickel—castings as reference alloys and on castings of similar composition to which sulphur, selenium, molybdenum, copper, phosphorus, silver, lead and bismuth and a few other elements had been added alone or in combination. Some of these were found helpful. Sulphur or selenium alone or in combination with other elements improved machinability but affected corrosion resistance to a degree not permissible under the aims of this investigation.

Silver gave erratic results in the laboratory, possibly due to difficulties in incorporating the material into the melt in uniform suspension.

Lead was helpful, but its introduction under the conditions obtaining in foundries entails some difficulties.

When bismuth was tried, its beneficial effect on machinability was at once apparent. Plant trials showed it to be entirely feasible to introduce bismuth under commercial conditions, so this investigation settled down to a comprehensive study of the effects of bismuth.

Results of these tests showed that compared to 18-8 stainless cast alloy with no bismuth having a drilling index of 100, the addition of bismuth raised this index to values varying from 132 to 265 for 0.11 to 0.37 per cent bismuth respectively. Other tests showed that additions of only 0.13 gave an index of 461 in one sample, an extraordinary improvement. The test results showed quite conclusively that bismuth is effective in increasing machinability of the corrosion-resistant cast alloys as a class and these laboratory indications were further corroborated by the opinion of the Battelle machine shop and likewise by the machine shops of Alloy Casting Institute members.

Impact Value Lowered

The surface finish obtainable with Carboloy tools and finish turning at 44, 85 and 118 feet per minute was undistinguishable from that of the bismuth-free alloy.

Charpy impact tests showed that impact value was lowered 10 points to 56 foot-pounds by the addition of 0.23 per cent bismuth in an average of four samples of 19 per cent chromium, 9 per cent nickel. With 25 per cent chromium, 12 per cent nickel, the addition of 0.21 per cent bismuth reduced the impact value from 65 down to 47 foot-pounds.

Short-time tension tests at room temperatures showed that additions of 0.26 per cent bismuth reduced tensile strength less than 9 per cent and reduced the percentage of elongation and increased the reduction of area in about the same proportion. At 1800 degrees Fahr., the tensile strength was reduced only slightly by addition of up to 0.26 per cent bismuth, but the per cent elongation was reduced from 50.5 to 7.5 and reduction of area from 58.7 to 11.9 per cent. Thus room temperature properties are not materially altered by presence of bismuth, and the strength at 1800 degrees Fahr. is only slightly affected, while ductility is decreased.

Hot working 12 per cent chromium alloy containing 0.10 per cent bismuth was found practicable as it forged and rolled well. Other alloy combinations forged well up to 1900 degrees Fahr. but had a tendency to crack at 2150 degrees Fahr.

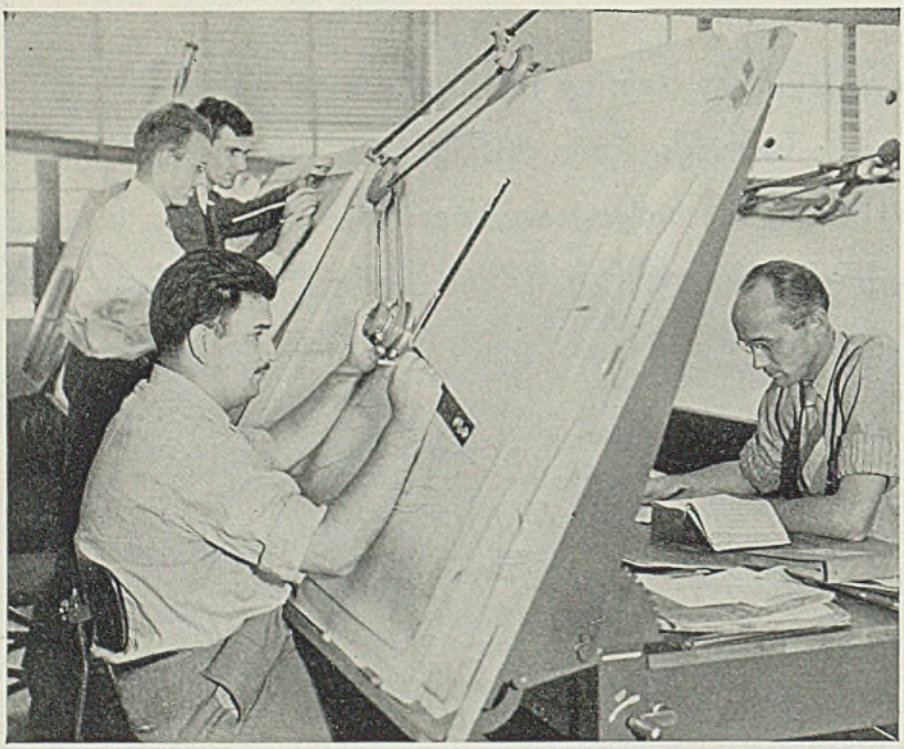
Galling propensities were tested in the Amsler machine and bismuth-containing alloys found to have increased resistance to galling by approximately 100 per cent under the particular test conditions.

Weldability of the material was

(*Please turn to Page 112*)

Abstracted from paper by H. Pray, R. S. Peoples and F. W. Fink, Battelle Memorial Institute, Columbus, O., presented at forty-fourth annual meeting of the American Society for Testing Materials, Chicago, June, 1941.

How To Take the Weight Off Your Stomach



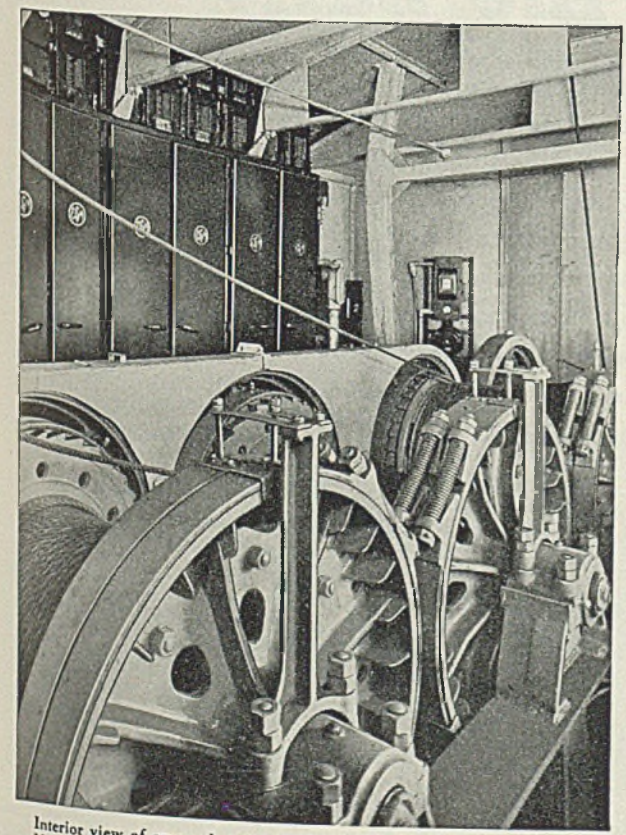
■ Out of a new industry comes a new development—typical of American ingenuity. Engineers of Glenn L. Martin Co., Baltimore, recently developed this new type engineering drafting board shown above. Now instead of following a life of standing or leaning on tables, the man who works at this board sits comfortably in a swivel chair. When not being used, the board lies flat on the desk. The draftsman, from his chair, twirls a small crank which raises the board to desired level. Then by a horizontal bar beneath edge of the board, adjusts it to proper level. Board is kept in firm position by a "dog" controlled by the bar, which drops into a notched sector

NO JAR • NO BUMP • NO JOLT

You can make a

CUSHIONED LANDING

When EC&M FREQUENCY RELAYS *Safeguard* A-c Motor Hoist



Interior view of crane showing EC&M Enclosed Controllers with Nickel Alloy Resistors on top of Cabinet. Compact EC&M Master Switches permit convenient grouping at operator's station shown in small view above.

AMERICA'S Railroads have a reputation for careful handling of *all* types of shipments,—large, small, heavy or bulky. One of the large Eastern railroads has recently improved its facilities with this new portal crane which is *outstanding* in its *ability* to lower a bulky shipment slowly through the restricted opening of a hatch or rest a heavy cargo carefully in the ship's hold.

The operator can attain results with this crane which previously have been impossible with cranes powered by A-c wound-rotor motors. The reason is that EC&M Frequency Relay Magnetic Control permits *weaker values of torque*—so essential to smooth and slow lowering of light and intermediate loads. It is perfectly safe to get slow speeds by means of these weak-torque points because Frequency Relays guard against overspeeding should these points be used to lower a heavy load.

Since the introduction of EC&M Frequency Relay Control, a new perspective has been drawn relative to A-c cranes. Engineers and management have been quick to alter their ideas on crane performance after witnessing this new control in operation. Perhaps there is an installation in your vicinity that can be visited. Consult with EC&M before writing A-c crane specifications.

THE ELECTRIC CONTROLLER & MFG. CO. EC&M CLEVELAND, OHIO

Specify EC&M FREQUENCY RELAY Control for A-c CRANE HOISTS

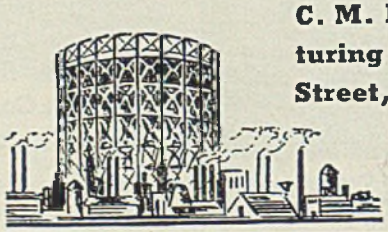
. . . . but his thumb got stuck in the ball!

Charlie's aim was deadly. His wind-up was something to behold. His reputation never failed to pack the gallery.

And now . . . all made futile by a detail . . . the size of a hole in the ball! No doubt Charlie burned with chagrin, but *he* got another chance. For America, there will be no other chance. Collectively, American industry must produce needed armament . . . or else.

Never was the steel industry, in general, better equipped for quality production at high speed. But what about your own plant? Kemp, in one way or several . . . can help to speed production, cut rejects, lower costs . . . in tin melting, in roll heating, in bright annealing. Kemp equipment, based on an exclusive, patented principle permits more accurate control, not merely of temperatures, but of flame characteristics and flame pressures, more complete utilization of fuel.

Ask steel men who are using Kemp equipment (it's in nearly every new plant in the industry) and write for details now, *before* you get your thumb in a tight place. Address The **C. M. Kemp Manufacturing Co., 405 E. Oliver Street, Baltimore, Md.**



KEMP of BALTIMORE

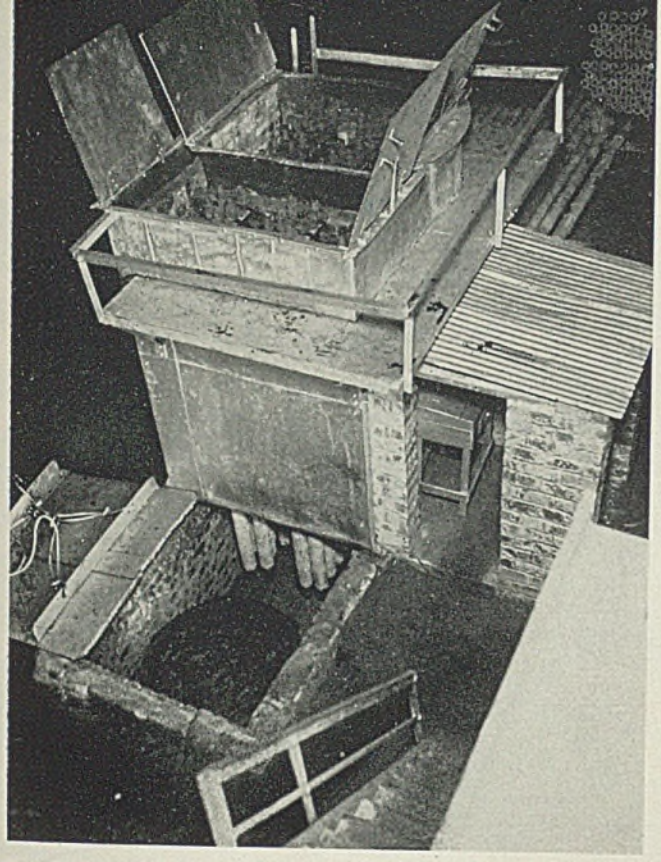


Fig. 1—Stopper rod oven made from salvaged plates showing pit for slag ladle and drying compartments for assembled rods

An Inexpensive STOPPER ROD DRYING OVEN

Efficient pouring practice at open-hearth shops is afforded by proper stopper rod conditioning. Simple rod drying oven built by one steelmaker out of used material employs slag as heating medium. Steel plate shell is lined with reclaimed open-hearth check brick. Details of construction and operation are presented in accompanying article

By H. T. KLEIN
Assistant Open-Hearth Superintendent
Continental Steel Corp.
Kokomo, Ind.

■ IN MAKING quality steel, too much emphasis cannot be placed on the value of good pouring practice. A number of important improvements in steelmaking have been made in recent years enabling the open-hearth operator to get quality steel into the ladle with a minimum of off-grade heats. Although it is still not possible to make a good heat from a poor one after it is in the ladle, it is a comparatively simple matter to reverse the procedure and ruin a good heat getting it from the ladle into the molds. Many defects in rolling and surface quality attributed to the open hearth are the direct consequence of a few minutes of improper teeming, completely nullifying the many hours spent in carefully melting and refining in the furnace.

Proper conditioning of stopper rods for open-hearth ladles is a most important factor in maintaining an efficient pouring practice. Good quality sleeves, stopper heads and cement should be used, but unless the assembled rod is thoroughly dried before it is placed in the ladle, irregularities in the teeming operation will inevitably occur. The presence of moisture in the cemented joints between sleeves and between the bottom sleeve and the stopper head will result in steel penetration that is often sufficient to either burn the rod in two or loosen the head. In either case, the probability of securing a clean shut off is remote, and usually a full running stopper is the result.

The drying oven for stopper rods which is in use at the Kokomo plant of the Continental Steel Corp., Kokomo, Ind., thoroughly dries the stopper rods both efficiently and economically. In order to insure more uniform performance, all rods are assembled by one stopper maker, who assumes full responsibility for any failures. The rods are assembled horizontally on a bench and remain there until they are removed to the oven for drying.

Slag remaining in the ladle after the steel has been poured is the only source of heat used for drying. Immediately after the last ingot has been poured, the molten slag is poured over the top of the ladle into a small slag thimble, and as soon as the slag has solidified sufficiently to be handled safely, the thimble is placed in the oven. One hot thimble each day is all that is required to maintain a temperature sufficient for thorough drying.

Figs. 1 and 2 show the general appearance of the oven. It is located in the open-hearth pit so that it is readily accessible to both the stopper maker's bench and to the ladles, since the transfer of rods from the bench to the oven, and from the oven to the ladles, is ac-

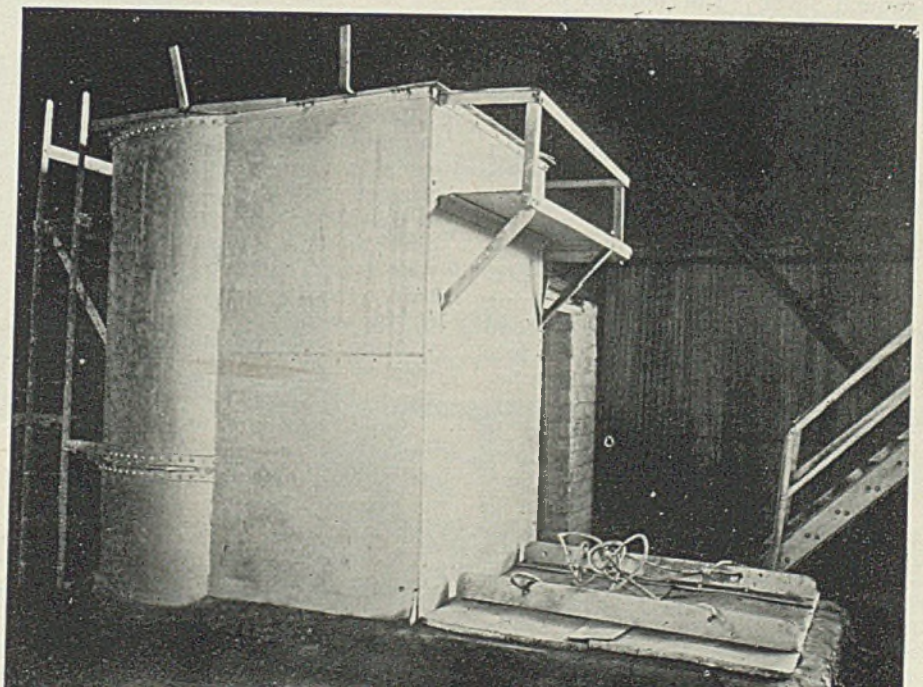


Fig. 2—View of stopper rod oven from floor level. One ladle of slag per day is sufficient for thoroughly drying the rods

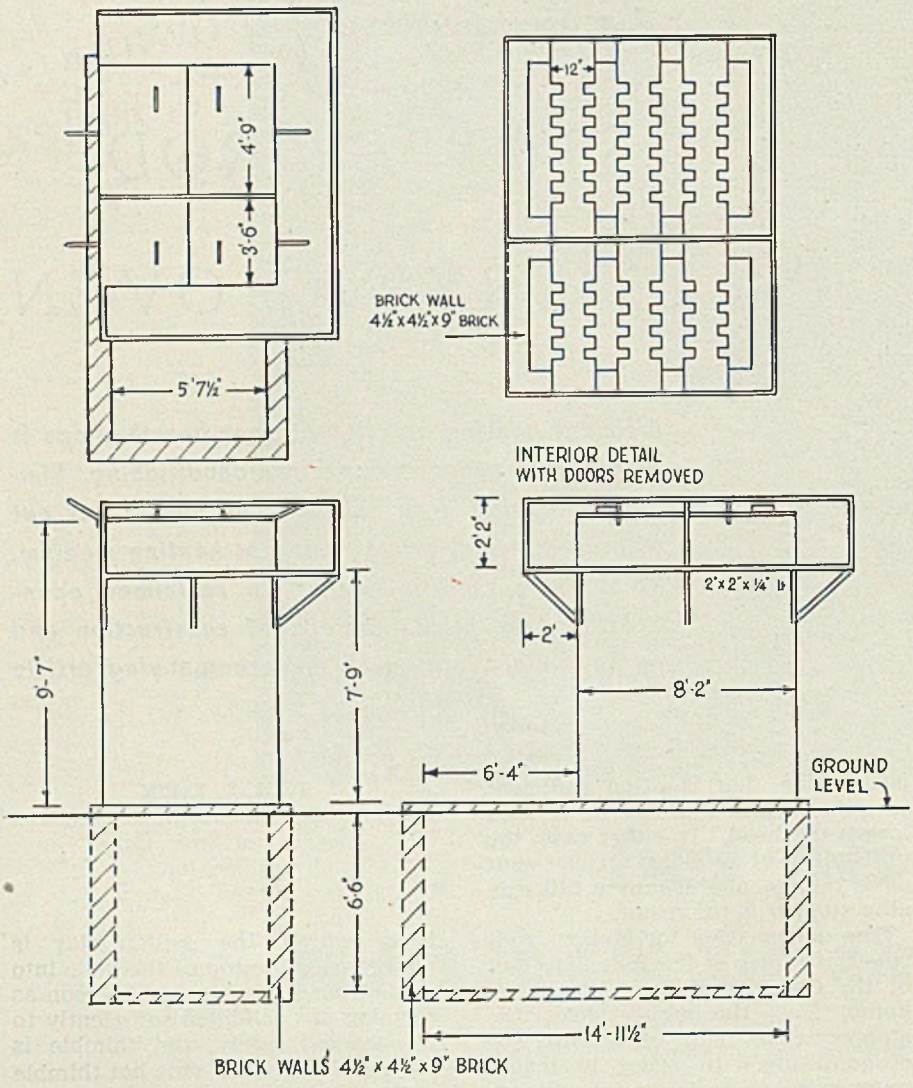


Fig. 3—Details of stopper rod oven which is adequate for treating a sufficient number of rods for a five-furnace shop

complished by use of the ladle crane auxiliary hoist. A nut with a loop welded on the top is used to hold the rods in making the transfer. This nut is screwed onto the top of the rod and provides the means of hooking it to the hoist.

Fig. 3 shows the exterior of the drying oven, both above and below ground level. The portion of the oven below the ground is a pit, 14 feet 11½ inches by 5 feet 7½ inches, and 6½ feet deep, and is lined with used checker brick. The superstructure, which is fabricated from steel plate, covers all but a 6-foot 4-inch by 5-foot 7½-inch opening to the pit. This opening allows the slag thimble to be lowered into the pit and is covered by a steel plate after the thimble is in place. The superstructure also has a firebrick lining supported by angle irons at the bottom of the plate; and is divided into two sections, the larger of which has a capacity of 36 rods and the smaller 24. The rods are suspended in the oven on notched plates as shown in Fig. 3, which are designed to support each rod by the nut used in securing the rod to the ladle stopper rigging. These plates are placed on top of the brick lining and are 15 inches below the top of the oven in order to allow clearance under the oven doors for the portion of the rod extending above the nut. Clearance between the stopper head and the floor of the pit is about 2½ feet.

Steel doors at the top of the oven are hinged at the sides and are kept closed except when rods are being transferred in or out. A steel ladder is permanently attached to the oven and a walkaway around three sides is provided for men hooking on to the rods.

Rods are removed from the dryer in sequence so that a definite drying cycle is always maintained. Two stopper ladles are used exclusively in this shop, and two spaces are left open in the oven so that the green rods from the bench may be placed before the dry rods and are removed to the steel ladle. To allow for expansion, the nut holding the stopper sleeves in place is loosened before the rod is placed in the oven.

Since the rods are held in a vertical position from the time they are placed in the oven until the heat is poured, there is little chance of cracking the joints or warping the rod. A screw-type stopper head is used and no trouble has been experienced from having the weight of the sleeves directly on the head. The capacity of the oven is ample for a five-furnace shop, and a most effective and economical operation has always been obtained. Construction of the oven is on a practical basis and maintenance costs are held to a low level.

Study of Metals at Low Temperatures

■ *Impact Resistance and Tensile Properties of Metals at Subatmospheric Temperatures,* by H. W. Gillett; board, wire ring binding; 112 pages, 6 x 9 inches; published by American Society for Testing Materials, 260 South Broad street, Philadelphia, for $2.50.

This report, providing voluminous data on impact resistance and tensile properties of metals at subatmospheric temperatures, results from two years' study by the joint ASME-ASTM research committee on effects of temperatures on properties of metals, the actual work being by a subcommittee headed by Francis B. Foley. The information from extensive circularization of laboratories known to be interested was referred to Dr. Gillett at Battelle Memorial institute, who classified it, added much material from literature and supplied critical comment, with assistance of his associates. A comprehensive bibliography was added as well as an index to major topics. Over 50 per cent of the material is in form of tables.

Following discussion on impact resistance, a section is devoted to impact data for nonferrous materials, followed by the most extensive portion of the publication, covering ferrous materials of a wide range. Fifteen pages relate to low temperature tensile properties.

Compressed Air Trade Standards

■ *Compressed Air Trade Standards,* paper, spiral binding; 110 pages, 8½ x 11 inches; published by Compressed Air Institute, New York, for $1.

In its fifth edition, this manual contains the trade standards of the institute and is an authoritative summary of nomenclature and terminology relating to air compressors, including Standards.

In the present edition the field has been broadened to include equipment of various types operated by compressed air. The entire volume has been revised to bring it to date.

SUNOCO *helps*

SAVE 23 MINUTES

on a 50-minute job!

PERFORMANCE DATA

OPERATION—Turning, boring, facing and necking Chuck Sleeve.

MACHINE—Warner & Swasey 3-A Universal Heavy Duty Turret Lathe, with new Adjustable Single Turning Head.

MATERIAL—S.A.E. 3150 steel forging.

CUTTING SPEED—200 S.F.P.M.

CUTTING LUBRICANT—1 part Sunoco to 20 parts water.

Courtesy of
WARNER & SWASEY CO.

NEW HIGH P-Q* SET IN MACHINING S.A.E. 3150 STEEL

Once again that perfect combination — skilled operator, good machine and SUNOCO Emulsifying Cutting Oil — teams up to make possible a new, higher P-Q* (Production Quota) on an important cutting operation.

Formerly it took 50 minutes to machine this Chuck Sleeve. Now, using a new type Adjustable Single Turning Head, carbide cutters and SUNOCO Emulsifying Cutting Oil, it takes 27 minutes. The manufacturer adds:

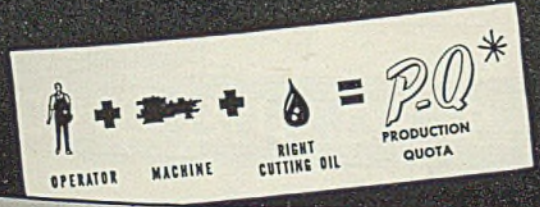
> "We readily appreciate the fact that the use of proper cutting oils is a big factor in helping us increase our turret lathe production."

Today the leaders look to SUNOCO for increased machine tool output . . . for the means to a higher P-Q*. They know SUNOCO's high lubricating and heat-absorbing qualities permit deeper cuts at faster speeds, longer tool life, nth degree accuracy and fewer rejects.

Test SUNOCO in your own plant . . . under your own operating conditions. Call in one of SUN's "Doctors of Industry"— a metal working expert — for recommendations. Write or wire

SUN OIL COMPANY • Philadelphia

Sponsors of the Sunoco News Voice of the Air—Lowell Thomas



SUN OILS

SUNOCO
EMULSIFYING
CUTTING OIL

PETROLEUM PRODUCTS FOR ALL INDUSTRIES

"GRAPHITIC" STEELS

. . . . some of their more important applications

■ ALL FIVE grades of the graphitic steel series have won universal approval in tool and die applications. For details on development, manufacture, metallurgy and heat treatment of these steels, see STEEL, Nov. 24, 1941, p. 80.

Microscopic examination of these steels shows a large number of minute openings filled with graphite which act as a reservoir for lubricant. This feature, combined with good machineability, ease of heat treatment, and the resultng high hardnesses obtained, account for graphitic steel's popularity in the tool and die field, according to metallurgists of the manufacturer of these steels, Timken Roller Bearing Co., Canton, O., who have furnished the following data on their application.

Properly hardened, dies and tools made from graphitic steels produce a product free from scuffing or scoring because the drawn metal slides over the working surfaces with greater ease. For this reason a larger number of pieces is obtained before repairs are necessary, and the product is more accurately formed. All the operations of converting metal into almost numberless articles, such as by blanking, forming, piercing, cold drawing, deep drawing, coining, upsetting, swaging, spinning, "hubbing", etc., are performed by parts made from these steels with very satisfactory results.

By FRED R. BONTE
Development Engineer
Steel & Tubes Division
The Timken Roller Bearing Co.
Canton, O.

The following sample applications illustrate representative applications of the five grades of graphitic steels.

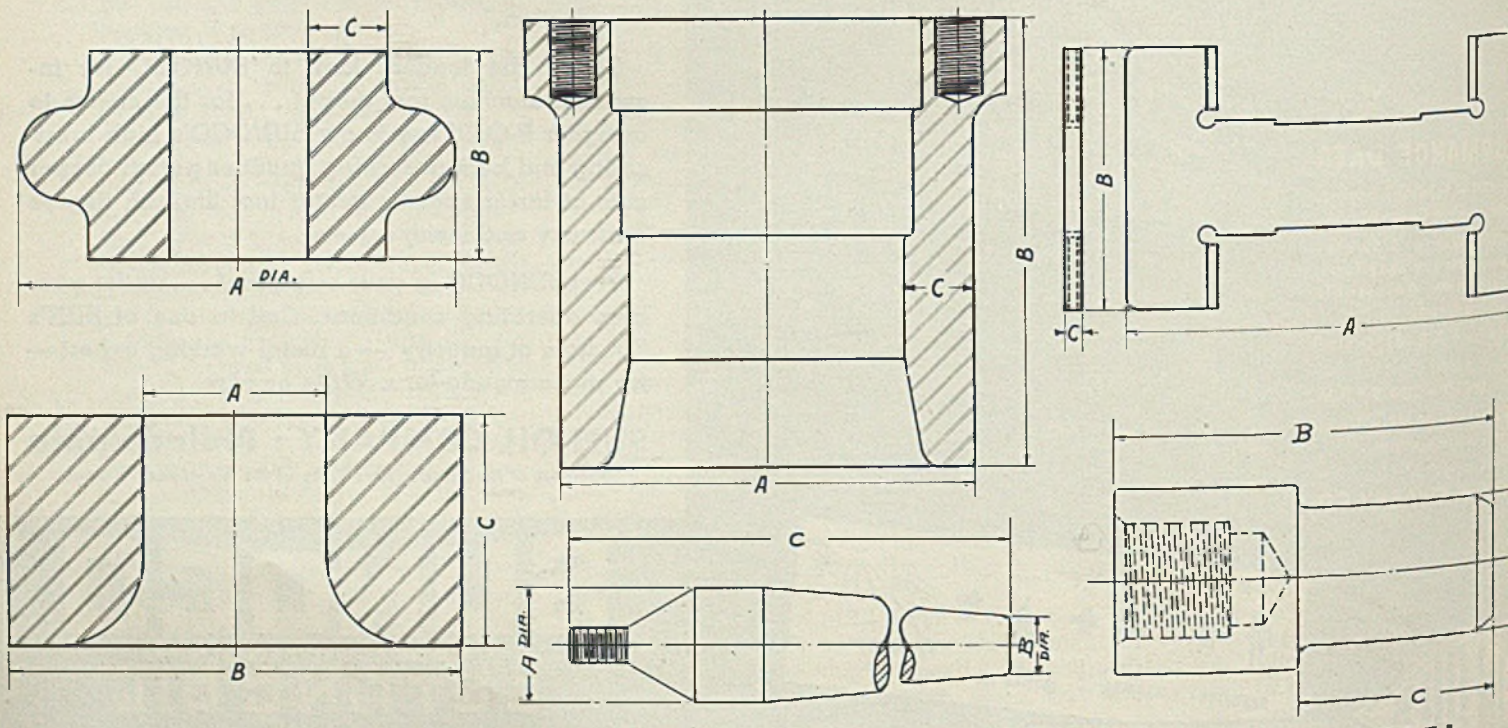
The metal spinning roll, Fig. 1, is one of the most severe applications to which a tool steel can be subjected. The tool used, either roll or solid section, must have a maximum resistance to wear so there will be no variation in the form imparted to the spun object. The steel must machine easily to provide the necessary contour and it must have a high hardness when heat treated. Because Graph-Sil appear to possess all of these characteristics to a marked degree, it has been highly successful in this and related applications. For approximate analysis of these steels and story of their development, see STEEL, Nov. 24, 1941, p. 80.

It is most desirable that blanking and forming punches such as shown in Fig. 2 should carry through an entire production run in order to maintain complete uniformity of the product. Graph-Mo has an unusual record in these applications because the blanking edges do not chip or spall; the forming surfaces permit the metal being worked to slide smoothly; and the physical properties are such that it withstands the severe and repeated impact to which the punch is subjected. Because of the nonuniform cross-sections of most blanking punches, the nondeforming characteristics of this steel are highly desirable for blanking and forming, too. And the free machining properties insure low production costs.

New work for defense has created an extraordinary demand for gages such as the unit in Fig. 3. Graph-

(*Please turn to Page* 111)

In group below are number of particularly well-suited applications for the graphic steels. Parts and the steels from which they are made are from left to right, top: 1, metal spinning rolls of Graph-Sil; 2, blanking and forming punches of Graph-Mo; 3, "go-not-go" gage for outside diameters of Graph-Mo; 4, bottom left, tube drawing mandrel of Graph-Sil; 5, bottom right, cold drawing die of Graph-Tung; 6, bottom center, Neuberth machine mandrels of Graph-M. N. S.



INDUSTRY-WIDE STANDARDIZATION ON ERIE HAMMERS

In The Nation's Aluminum Forge Shops

ALUMINUM FORGINGS are playing a stellar role in the Nation's defense program because they combine the lightness of aluminum and the added strength and ruggedness inherent to all forgings. Most of the aluminum drop forgings used in National Defense are being produced on Erie Hammers; for all of this country's aluminum forge shops are practically 100% Erie Hammer equipped.

This industry-wide standardization on Erie Hammers is proof of their *dependability* under abnormally heavy operating schedules—a highly desirable characteristic in any forge shop.

ERIE

ERIE FOUNDRY COMPANY
ERIE, PENNSYLVANIA, U.S.A.

DETROIT
332 Curtis Bldg.

CHICAGO
549 Washington Blvd.

INDIANAPOLIS
335 Postal Station Bldg.

FRANCE
Fenwick, S. A.

CANADA
John Bertram & Sons Co. Ltd.

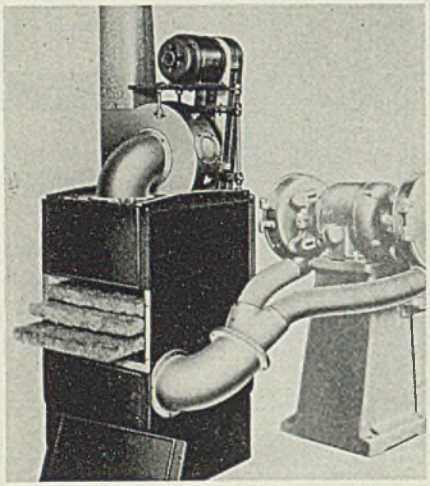
ENGLAND
Button, Griffiths & Co., Ltd.

ERIE BUILDS *Dependable* HAMMERS

Industrial

Exhauster and Filter

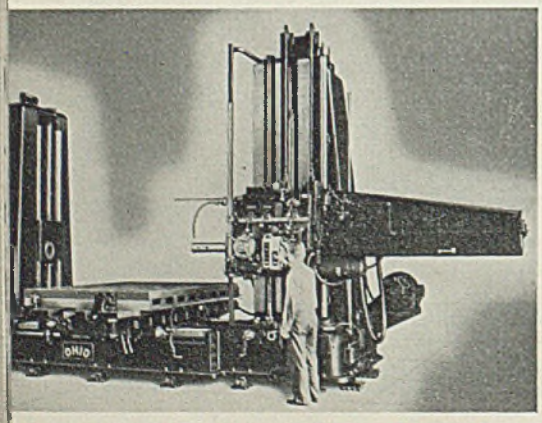
■ Hisey-Wolf Machine Co., Cincinnati, announces a new combination exhauster and filter for cleaning air exhausted from grinders and other similar units. It consists essentially of a cyclone collector, filters, fan and motor. Dust-laden air is drawn into the unit and passed through the cyclone collector which removes the coarse particles. Then after passing through the impingement-type filters which arrest the



fine dust, the air is so clean it can be recirculated into the room after leaving the fan. Heavy particles are cleaned out through a conveniently located clean-out, and the filters are readily removed for the same purpose. Although large and capable of producing high static pressure, the fan and motor are quiet in operation.

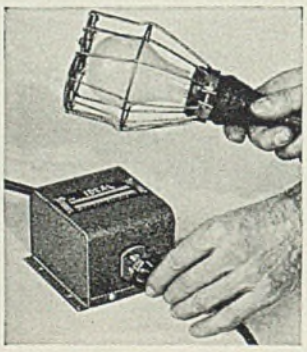
Milling Machine

■ Ohio Machine Tool Co., Kenton, O., is now offering a larger dreadnaught horizontal boring, drilling and milling machine. It features a 72 x 132-inch table and a bed 60 inches wide. Its measurements between the face plate and bar support is 10 to 20 feet, and vertical travel of the spindle head is 96 inches. The box-shaped, counterbalanced spindle head carries the speed and feed transmission, the loads from spindle and gearing being transferred to the column face. All feed and speed changes are grouped so the operator need not move from his normal position. A multiple-disk magnetic drive clutch gives complete spindle control through a portable push-button unit. The ratio between low and high speeds is 1:190 with a maximum speed of 600 revolutions per minute. This machine also is offered in a floor type with corresponding characteristics and a wide range of specifications to meet users' requirements.



Transformer

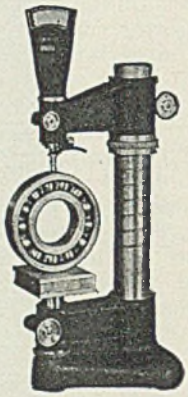
■ Ideal Commutator Dresser Co., 1032 Park avenue, Sycamore, Ill., is offering a new safety device, a Lo-Volt transformer, for workmen using electrical extensions in damp, all metal or otherwise hazardous locations. It is comprised of a step



down transformer that is easily plugged in between the power supply and the extension to reduce the extension voltage to a harmless 6 volts. The transformer has a 10-foot 3-conductor safety type primary cord. Its capacity is 50 watts with a 25-foot extension. It is available for 110-volt, 50-60 cycle or 25-cycle alternating current.

Measuring Instrument

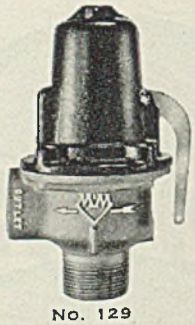
■ George Scherr Co., 128 Lafayette street, New York, announces a new heavy duty model 8 Comparitol designed to handle large and heavy precision work up to 8 inches in diameter. It is a measuring and inspection instrument for eliminating the human element of "feel" and skill in checking close tolerances. A simple patented knife-edge lever system is used in the mechanism. The model has a 2½-inch diameter column, heavy holder bracket to hold the measuring head and a 4 x 4-inch



steel table to handle large work. The base is rigid and sturdy with 3-point contact to guarantee stability. The unit is being used to check and inspect plug gages, bearings, pins, ball bearings and other parts and may be obtained with scale reading to 0.0001 or to 0.00005-inch. It is not affected by vibration.

Safety Relief Valve

■ McDonnell & Miller, Wrigley building, Chicago, has introduced a new No. 129 snap action relief valve for larger hot water heating boilers. Its capacity enables it to handle



No. 129

boilers with gross B.t.u. output up to 350,000 per hour. This greater capacity is due to a snap action mechanism which opens up full orifice capacity when the set relief

Equipment

pressure of 29 pounds is reached. Instead of a diaphragm, as in the No. 29, the No. 129 valve now makes use of flexible, leak-proof bellows.

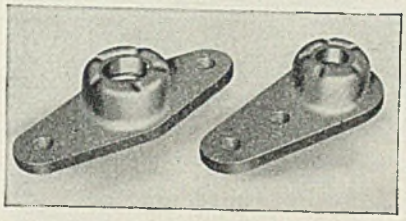
Melting Furnace

■ Insto-Gas Corp., 1900 East Jefferson, Detroit, has developed a new furnace for plumbing, heating and maintenance work. Its quick melting speed of 40 pounds of hot metal in less than 6 minutes has been slightly improved with lower fuel consumption. The economy of the new design comes from the prevention of heat dissipation before the flame reaches the melting pot, as the flame guard reaches down over the nozzle of the furnace burner. The

flame shield is cast integrally with the top plate of the furnace, making it possible to convert furnaces now in use by simply changing top plates.

Anchor Type Nuts

■ Elastic Stop Nut Corp., 2332 Vauxhall road, Union, N. J., is now offering anchor type nuts for blind-mounting applications on general industrial equipment. Designed to provide vibration-proof fastenings, they rivet permanently to the inside of the structure. The bolts, which are inserted from the outside, pass first through the removable plate, then through the structure into the stationary nuts. Nuts are offered in a wide range of sizes, materials, and thread systems, every nut incorporating the basic self-locking feature, a fiber locking collar which is an integral part of each nut. This locking fiber prevents the bolt from becoming loose after it is installed in the nut. In



such mountings, the bolts may be removed and replaced many times, the anchor nuts retaining their locking ability.

Circuit Interrupters

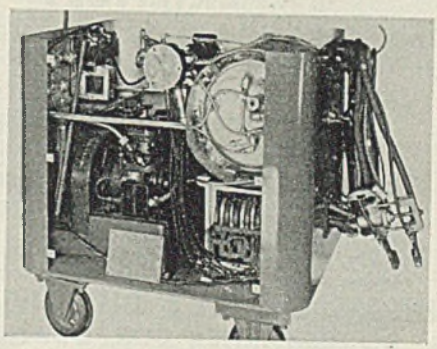
■ Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has introduced a new nonautomatic circuiit interrupter for disconnecting or interrupting alternating and direct current circuits in class I group D location where atmospheres contain gasoline alcohols, natural gas and other explosive vapors.

Manually operated, the De-ion circuit interrupter is furnished with a NEMA type 7 cast enclosure finished in aluminum with a closely ground fit between box and cover. Resistance to explosive pressures is assured by the heavy walls and strong fastenings.

Designed for 250 to 600 volts on alternating current circuits and 125 to 250 volts on direct current circuits, the units are rated from 50 to 600 amperes depending on the frame sizes. Interrupting capacity is 5000 to 10,000 amperes.

Carbon Brazer

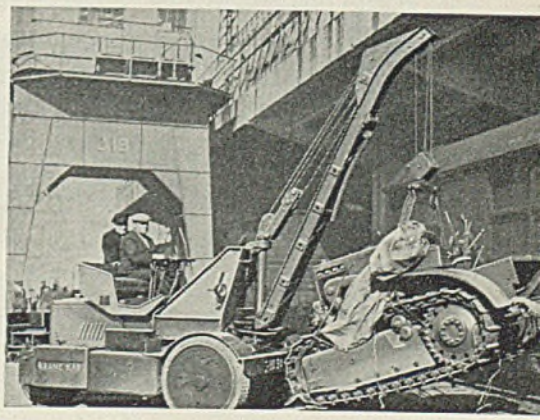
■ Acro Welder Mfg. Co., 1570 South First street, Milwaukee, has introduced a new machine for joining metals—an incandescent carbon brazer, developed for brazing electrical transformer connections. Shown in the accompanying illustration, the machine consists of tongs, water-cooled cables, water-cooled transformer, water storage tank, refrigerating compressor, heat changer, water circulating pump, and magnetic contactor—all grouped into a portable unit. Its operation is quite rapid with some joints made in 20 minutes without use of asbestos packing. In addition, it allows the operator to control the heat very closely. The machine operates from a 220 or 440-volt power supply. It features a special electronic timing device which allows a water circulating pump to circulate water through the transformer, cables and tongs for approximately five minutes. The brazer can be wheeled about or it can be hoisted in the air by a crane and held in position until the joint is completed. It weighs about 1800 pounds. The company also has available a unit for welding squirrel cage rotors up to 105 inches in diameter. The size of this machine is 50 kilovolt amperes, 50 per cent cycle duty. It consists of a water cooled, glass insulated transformer, and an individual acting air hydraulic cylinder on each carbon. Hydraulic cylinders are used to provide a smooth action of the rams. The unit can be adjusted to any height with a crank. It has a hand-operated



push button station for actuating action of the hydraulic cylinder. Another push button controls the transformer contactor. The latter also can be actuated by foot switch.

Tractor Crane

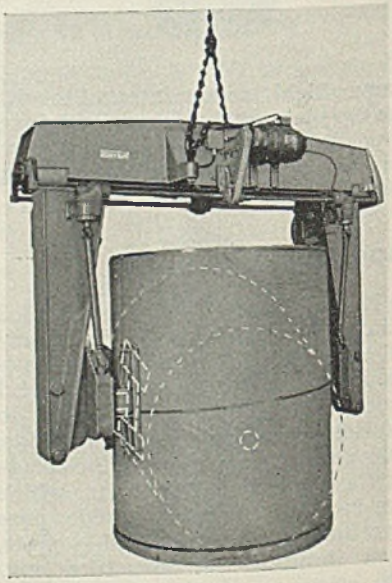
■ Silent Hoist Wench & Crane Co., 841 Sixty-third street, Brooklyn, N. Y., has introduced a Krane Kar swing boom tractor crane for use in handling materials of all types and relieving large cranes and track equipment for bigger jobs. In



the illustration it is shown handling a small tractor at a dock. Self-propelled, the unit is offered powered with either a diesel or gasoline engine. Its over-all dimensions, 66 inches wide by 84 inches high for model A, or 74 inches wide by 91 inches high for model AX, allow it to pass through narrow openings and low headroom. Traction wheels of the unit are in front. The steering wheels are close to the centerline of the tractor. Rear end of the tractor is made narrower than the front end. This makes it possible to pull away ahead without riding into obstructions close alongside. Power is obtained from the engine through a transmission power take-off which provides 2-speed gearing for all crane operations. Also, three separate and independently or simultaneously operable worm gear units, each with its own reverse (one for the load line, one for boom topping and one for boom swinging) are included. Hoisting, lowering, quick stopping, automatic braking and holding are all controlled by a single lever. No brakes are applied in any crane operation. When power is not applied, the load and boom are securely held in position automatically. The unit is offered in 2½, 5 and 10-ton capacities. Standard equipment includes electric starter, generator and battery; two head lights, tail light and electric horn; 2-man seat; heavy wheel-fenders; bumpers and four tow hooks.

Motorized Roll Grab

■ Cleveland Crane & Engineering Co., Wickliffe, O., reports a new completely motorized roll grab for use with its overhead materials handling systems. It will handle rolls

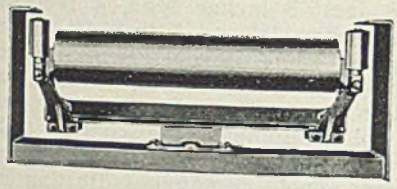


from 16-inch minimum to 60-inch maximum diameter in lengths up to 72 inches and weights up to 5000 pounds. All motions of the grab

can be controlled from the crane operator's cab. Three motors are provided. One spreads and retracts grab arms. Another squeezes the roll grippers after they have been brought close to the roll, locking the roll in position, and the third operates the turnover mechanism which makes it possible to pick up a roll in any position and place it in any other position. Thus a roll standing vertically can be picked up and placed in a horizontal position. The grab is especially suitable for handling all grades and thicknesses of paper, from light crepe and tissue paper, sound-deadening felt to kraft and hard box board. Variations of it are suitable for handling bales, barrels and boxes.

Self-Aligning Idler

■ Link-Belt Co., 220 South Belmont avenue, Indianapolis, announces a new swiveling, positive, self-aligning idler for automatically correcting misalignment of either carrying or return runs of non-reversing conveyor belts supported on flat-roll

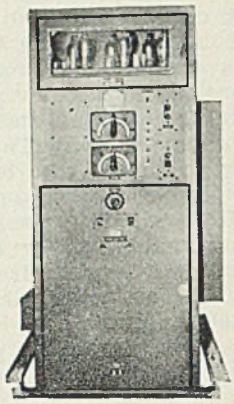


idlers. It has a centrally pivoted cross member which, besides being equipped with a flat idler roll for supporting the belt, has a vertically-mounted actuating roll at each end for lightly contacting the edge of the belt when its lateral misalignment exceeds a predetermined amount. A slight pressure of belt edge against actuating roll serves to swivel the idler unit on its pivot sufficently to guide the belt back to proper alignment. When used on return runs, one idler should be placed close to tail or takeup shaft so that the belt will be guided centrally on the pulley, and one at every ten or fifteen idler spaces. On the carrying run, one idler should be placed just beyond the loading chute, and one at every ten or fifteen spaces thereafter. Self-aligning idlers of special design are available for flat-roll belt conveyors that must operate in either direction

Capacitor Control

■ General Electric Co., Schenectady, N. Y., announces a new capacitor-discharge control for use with stored-energy type resistance-welding machines. Its cabinet contains up to 22 capacitors, any number of which can be used at one time. Two special tap switches select number

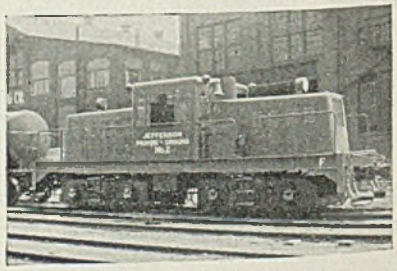
of capacitors desired in one-unit steps, each of 120 microfarads. A special circuit which prevents operation of the welding machine if



the capacitor voltage is more than 3 per cent below its preselected value reduces possibility of insufficient energy to produce good welds. The charging circuit quickly and automatically charges the capacitors to the preselected voltage regardless of the number used. The control is contained in a compact steel floor-mounted enclosing case, 8 feet, 8 inches high, 4 feet 3½ inches wide, and 3 feet, 4½ inches deep. The front portion of the case is divided into three sections, housing the rectifier tubes and their control equipment, the control dials and voltmeters, and a sequence control panel and voltage adjusting potentiometer. A blower is furnished to resist dust infiltration. Lifting eyes permit the enclosure to be moved by means of a crane, and the bottom is so constructed that the case can be moved by rollers.

Shop Locomotive

■ H. K. Porter Co., Inc., 4975 Harrison street, Pittsburgh, announces a new 65-ton, double power plant locomotive for general industrial and switching use. Powered with two Cummins supercharged diesel engines developing 200 horsepower



each, it has a tractive force of 39,000 pounds at 30 per cent adhesion. Overall size is 12 feet high by 9 feet, 6 inches wide by 33 feet long, from bumper to bumper. Total weight in working order is 130,000 pounds. The locomotive is offered for both standard and 36-inch gage track. Each engine is fitted with a fuel distributor, forced feed lubrication, cen-

trifugal cooling pump and a 32-volt automotive type starting motor with 350-volt generator. Radiators, engines and generators are mounted on bedplate of heavy steel construction, designed so entire unit with bedplate can be removed readily. Eight drive wheels, each 33 inches in diameter, are arranged on two 4-wheel trucks, each equipped with two high-speed generators and four high-speed motors. Each axle is driven by one motor with reduction gears, the gear ratio being 14.7 to one. The cab is of sheet steel with windows at front, sides and rear. Shatter-proof glass windows are secured by rubber glazing to prevent breakage.

Resistor Assortments In Metal Cabinets

■ International Resistance Co., 401 North Broad street, Philadelphia, has introduced assortments of resistors in handy metal cabinets for the convenience of engineering laboratories, schools, factory maintenance departments and service. The cabinets supply a convenient assortment of ½, 1 and 10-watt resistors in most frequently needed resistance ranges. The resistors are neatly arranged in drawer compartments making it easy to select needed

units. Three standard resistor assortments are available. No. 1 assortment includes 59 resistors including ½ and 1-watt type BT metallized resistors as well as type AB (fixed) and type ABA (adjustable) power wire wound resistors. No. 2 assortment includes 100 type BT-½ (½-watt) insulated metallized resistors in 28 ranges from 50 ohms to 2.0 megohms. No. 3 assortment contains 83 type BT-1 (1-watt) insulated metallized resistors, also covering 28 ranges.

Composing Machine

■ Ralph C. Coxhead Corp., 333 Sixth avenue, New York, announces an office composing machine which speeds up considerably the writing of specifications on tracing paper. It is said to save about 60 per cent of the draftsman's time. The machine is made up, basically, of the standard

Vari-Typer office composing machine equipped with changeable type faces. It can handle tracing cloth or tracing paper up to twelve feet in length.

Graduated Markers

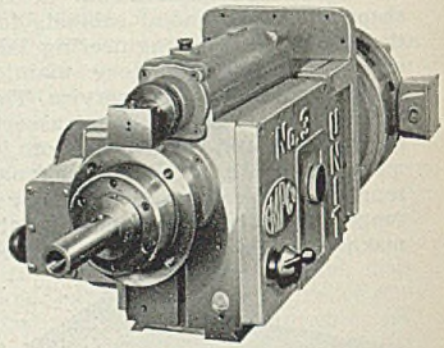
■ New Method Steel Stamps Inc., 145 Jos. Campau, Detroit, is now offering an expanded line of markers of various types suitable for cutting slots, notches, knurls, serrations, graduation and calibration lines on machinery, ordnance, dials, indexing or calibrating collars.

For use in any lathe, turret lathe, screw machine or other high-production machine tool, the marking rolls are suitable for use on any workable material. It also is possible for the calibration lines to be limited to a portion of the circumference or periphery, each roll marker being equipped with stops that prevent repeating the design or markings even though the lathe or screw machine spindle on which the part is mounted continues to rotate.

Proper registering devices to suit the design of the specific pieces on which the lines or serrations are to be cut may readily be obtained. Markers are available either with or without corresponding numerals. In some cases numerals may be added by a separate marker after the calibration lines have been made on the part. In addition to the cylindrical types with indexing lines or calibrations around the periphery, markers are also offered with bevelled edges, or may be of disk type for producing serrations on the sides of collars, ferrules, etc.

New Empco Unit

■ Enterprise Machine Parts Corp., 2731 Jerome avenue, Detroit, announces a new model E Empco unit incorporating features to increase its adaptability and capacity. Among the advancements in design are included oil seals at every opening to prevent the entrance of dirt and permit the entire operating mechanism to work in a bath of oil, hardened spindle quill and return cylinder rod, motor brackets that accommodate any standard NEMA frame and a screw adjusting type sub-base



to give micrometer adjustments to the outward position of the tool. The unit, however, retains its snail type cam since with metal band saws generally available, any cam can be quickly and economically produced in changing from job to job. Front face of the machine is keyed and tapped to accept lead screw brackets for tapping, drill guide bushing supports and outboard spindle bearings. Also its planed top surface will accept all overarm supports used when milling. A machined pad on the side permits attaching interlocking devices or index table drives. The unit's spindle rotates in either direction.

Honing Machine

■ Barnes Drill Co., Rockford, Ill., announces a new No. 1 horizontal machine which has a capacity for honing long bores up to 1½ inches in diameter. Its design with hydraulic cylinder and piston for reciprocating the carriage produces a smooth finish on the internal cylindrical walls of rifle bores, tubes, cylinders and other long work within its capacity. The unit's working stroke is 8 feet, however, it can be made with a shorter stroke. Main bed of the machine consists of a fabricated elongated frame provided with

Advertisement

DECEMBER, 1941

COPPER ALLOY BULLETIN

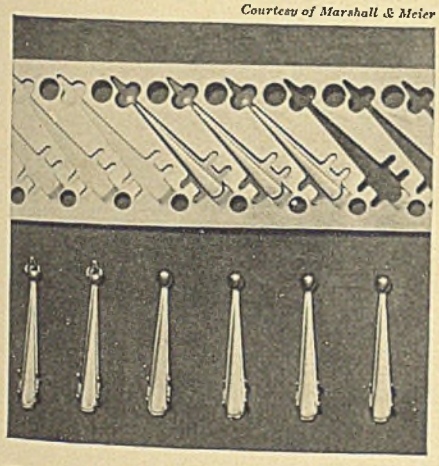
REPORTING NEWS AND TECHNICAL DEVELOPMENTS OF COPPER AND COPPER-BASE ALLOYS

Prepared Each Month by the Bridgeport Brass Co. "Bridgeport" *Headquarters for BRASS, BRONZE and COPPER*

Die-Stamped Parts Readily Produced From Brass Sheet

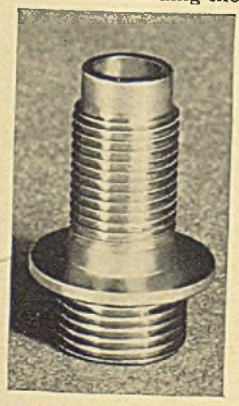
Small parts of accurate dimensions, such as clips for pens, pencils, and pocket thermometers, can be economically die-stamped from brass sheet of controlled quality. The accompanying illustration indicates how easily clips can be formed from Bridgeport brass sheet by multiple die-stamping operations. As the brass sheet is fed into the press, the trade name is stamped on the metal, the contour of the part is shaped, and the clip is punched out in rough finished form. Because of the clean cutting character of Bridgeport brass sheet, the rough stamped parts require no intermediate finishing. They are fed directly into a press designed to shape and "ball" the clip end in a single operation.

Courtesy of Marshall & Meier



Duronze* III Resists Attack by Fuel Oils

Exceptionally high corrosion resistance of Duronze III is demonstrated by its successful performance in the screw machine part illustrated, which is used in assembly of aircraft carburetors. In addition to withstanding the severe corrosive attack of hot gasoline in this application, Duronze III has the further advantages of very high strength, smooth, hard surface, and light weight.



Duronze III also displays high resistance to the action of the elements, sea water, dilute acids, and many other chemicals.

Proper Control of Annealing Is Essential in Brass Fabrication

Operation is One of the Most Important in its Effect on Strength, Ductility, and Other Characteristics of Brass

One of the reasons why brass is so useful is that the physical properties of a given alloy can be varied over a wide range, depending upon whether it has been finished by annealing or cold working, and further depending upon the severity of these operations.

In order that the properties of a batch be sufficiently uniform for the processes to which it is to be subjected, it is important that these operations be carefully controlled.

Too much emphasis cannot be placed upon the importance of the annealing or heat treating operation as applied to the brasses. Unlike steel, brass in its soft or annealed condition is a metal of moderate strength and excellent ductility. However, upon cold working, such as rolling or drawing, brass becomes stiff and hard, its tensile strength rising rapidly with decreasing ductility. Cold worked material can be made soft and ductile again, however, by annealing or raising the metal to a red heat. In other words, the nature and physical properties of brass depend mainly upon the final treatment which it receives: namely, annealing (softening) or cold working (hardening).

Relief Annealing

Since hardness and strength in brass are artificially induced by cold working, it often happens that finished articles made by forming, drawing or stamping contain serious stresses which may let go under certain conditions causing cracks or breaks in the material. Such stresses can generally be eliminated by relief annealing at a temperature too low for recrystallization or softening. Relief annealing is used in many cases where articles are to be kept in storage for long periods of time.

True annealing takes place when the material is heated at a sufficiently high temperature so that recrystallization actually takes place. In general, this change in structure is accompanied by softening. With rising temperatures of anneal, the crystals grow larger, with corresponding increased ductility and lower tensile strength.

Under the microscope the brass shows a crystalline structure—the size of the crystals increasing with rising temperature. By controlling the grain size, brass of various degrees of softness can be made. The coarse-grained material presents a rough surface after stretching resulting from forming or cupping. If it is necessary to polish or buff such a surface, considerable cutting down must take place, accompanied by higher finishing costs. A fine-grained material requires much less polishing and results in a better finish. A medium-sized structure is desirable for ordinary drawing operations.

(Above) Annealed yellow brass, medium grain size, Mag. 75X. Tensile strength about 45,000 pounds per square inch.

(Above) Cold worked yellow brass, Mag. 75X. Tensile strength about 62,000 pounds per square inch.

Types of Equipment

Although the type of furnace and nature of the fuel are important from an operating standpoint, nevertheless almost any annealing equipment will produce the desired results if careful attention is given to good annealing practice. Best results are obtained with a furnace large enough so that the batch of metal to be annealed can be brought up close to the indicated furnace temperature. In cases where the annealing equipment is too small, the common practice is to rush the annealing by maintaining the furnace considerably higher than the desired annealing temperature and pulling the material out of the furnace before it attains furnace temperature. Such practice is dangerous because of the uncertain time element—a little longer period in the furnace may bring the metal up to a higher temperature than required, while a shorter period may result in only part of the material attaining the annealing temperature. In other words, non-uniformity results from lack of annealing facilities.

Certain brass alloys, especially those which contain copper above 85%, oxidize rapidly when exposed to the air when in a

(Continued on page 2, column 2)

ALLOYS OF COPPER

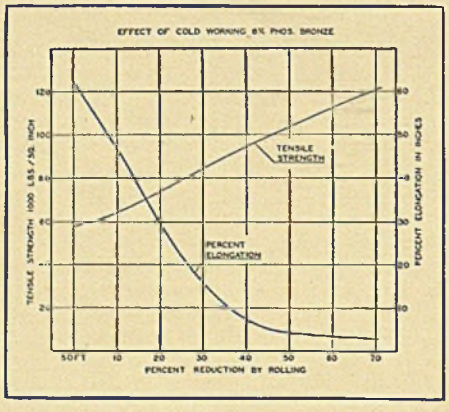
This is the twenty-ninth of a series of articles on the properties and uses of the copper alloys, and continues the subject of the copper-tin alloys.

PROPERTIES OF COPPER-TIN ALLOYS

The properties of the copper-tin alloys which have made them particularly useful are their combination of good fatigue life, corrosion resistance and spring characteristics. The last item is difficult to define exactly but seems to be related to high elastic limit and resistance to creep at room temperature. This combination of properties is responsible for the use of phosphor bronze clips in almost all types of electrical switch contacts. In order to secure these mechanical properties it is necessary to furnish the strip or wire in the cold worked condition.

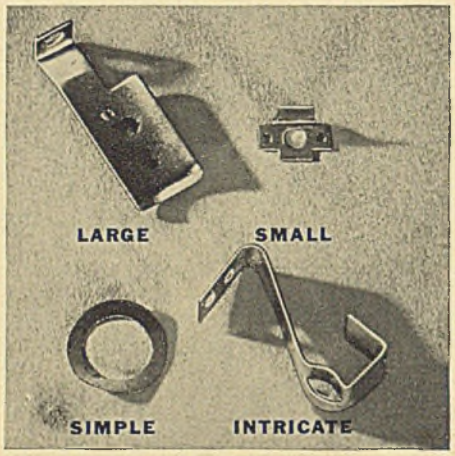
Because of their cost the alloys have only been used when cheaper alloys could not be used. This is unfortunate for the alloys have other properties which are highly desirable. In the annealed condition the 8% tin alloy has an excellent combination of ductility and strength, being actually superior to cartridge brass in those respects. These properties lead to the use of phosphor bronze in some of the highest quality thermostatic bellows, where ability to withstand severe stretching operations combined with good tensile strength and elastic properties are important.

It is apparent from the accompanying curves that the alloy has many attractive properties which have not been fully exploited because of the cost of the material. These curves cover the mechanical properties of the 8% tin phosphor bronze as affected by cold working and annealing.



Phosphor Bronze Is Readily Fabricated

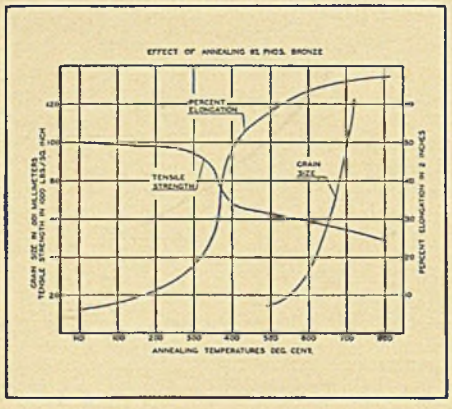
The ease with which Bridgeport New Phosphor Bronze is adaptable to the fabrication of many types of parts—large or small, simple, or intricate—is indicated by the accompanying photograph of typical phosphor bronze items. Bridgeport's carefully controlled methods of processing assure a phosphor bronze with the qualities that contribute to ease of fabrication as well as to long life and lasting resilience.



Annealing of Brass

(*Continued from page 1, column 3*)

red hot condition. Oxidation can be prevented by using non-oxidizing furnace equipment. Where this is not available the oxidized surface can be removed by pickling in a dilute sulphuric acid pickle. The best practice, of course, is to prevent oxidation in the first place.



NEW DEVELOPMENTS

An automatic thread-milling machine is said to be designed to produce internal and external threads of a high degree of accuracy at rapid speeds. Manufacturer says that the operator need only load and unload the machine and actuate the starting lever, all other machine functions being performed automatically. **(No. 270)**

A shell-spraying machine is provided with an electric eye control that shuts off the spray when there is no shell in the work holder, it is reported. Machine coats exterior and interior surfaces in one operation. **(No. 271)**

A pneumatic comparator gage is reported to amplify small dimensions accurately and show them on a dial type indicator. According to the maker, the gage is especially suitable for production work, because the "wear" factor is eliminated. The measuring points are actually air nozzles, which do not touch the piece being gaged, and are therefore not subject to wear. **(No. 272)**

A new precision machine is reported to be especially adapted to accurate milling, boring, facing, and routing operations in tool, die, and machine shops. V-belt drive provides a wide range of speeds. Suggested applications include the manufacture of small parts for instruments and munitions. **(No. 273)**

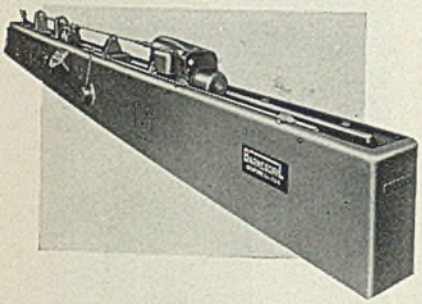
A pickling agent recently placed on the market is said to have exceptional advantages in the processing of copper and copper alloys. Maker says that it can be used successfully on brasses, including leaded brass, silicon bronze, phosphor bronze, and many other copper alloys, as well as on pure copper. Among the reported advantages of the new material are rapid and thorough pickling, prevention of red stains, improved surface appearance, and reduction in the danger of attacking the metal. **(No. 274)**

A sensitizing process for copper and brass is said to permit the making of templates by photographing drawings directly on the metal surface, thus eliminating considerable hand layout time. The process, which involves coating the metal with a photographic emulsion, can be applied also to the making of nameplates, instrument dials, and similar parts, it is claimed. **(No. 275)**

A new hardness tester is provided with an attachment that simplifies testing on irregular surfaces not easy to reach with conventional instruments. Tester is of the small portable type, and is said to be adapted to both metals and finishes. **(No. 276)**

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.

horizontally hardened bar way upon which the spindle head or carriage is supported. The carriage's reciprocating movement is provided by a hydraulic cylinder and piston controlled by an electrically operated hydraulic system. The latter also provides for adjustable stroke stops for any length of spindle travel from 2 feet up to full limit of travel. The reciprocating motion is imparted to the honing tool while the spindle rotates uniformly and reciprocates the spindle carriage and tool supporting spindle. The change in the direction of travel at each end of stroke is effected quickly and without shock with controlled overrun. The hone enters and withdraws from the bore without rotating. Four adjustable bronze bearings, mounted on the hardened bar ways support and guide the carriage. The short spindle proper is mounted on the reciprocating carriage. It in-



corporates a hydraulic cylinder and piston to actuate the hone and is driven by a built-in electric motor in the carriage. Filter and large reservoirs for coolant are contained in outboard work supporting bed of machine.

Ear Protectors

■ Mine Safety Appliances Co., Braddock, Thomas and Meade streets, Pittsburgh, is now offering Ear Defenders for reducing detrimental effects of noise upon workers. They reduce loud noises by 35-45 decibels

or to about 1/10 their former loudness, yet are so designed that warning signals and conversation can easily be heard. Essentially, each ear protector is a tapered tube molded from surgical-type soft rubber; consisting of two barriers, an outer one of metal and an inner one of soft rubber, separated by an air space. This tapered construction permits easy insertion and removal without any danger of coming in contact with the ear drum. The protectors can be cleaned easily with soap and water.

Protecting Tube

■ Elematic Corp., 12757 South Western avenue, Blue Island, Ill., has placed on the market a new Carbolast thermocouple protecting tube for use in molten metals and general heat-treating applications at temperatures up to 3000 degrees Fahr. Material of the tube is a metallized refractory possessing light weight and high mechanical strength. Because the tube disintegrates by sublimation rather than chemical action, there are no metals or temperatures to limit its use. It can be used readily in the molten aluminum alloys and the copper alloys without fear of contaminating either metal. The tube will not bend under its own weight when projected into the furnace. It has long life in all atmospheres, but is not recommended for applications under mechanical impact without protective shield, strong oxidizing atmospheres or in a stream of abrasive particles. Due to the replaceable jacket which completely envelopes the protecting

tube, it is possible to keep pyrometers working at peak efficiency at all times. The tube also is furnished as a complete fixture comprising 5, 8 or 12-inch protecting tubes, thermocouple wires and 10-inch extension to fit the manufacturer's lance pyrometer used in foundry work. It also is carried in lengths up to 6 feet and 2 inches in diameter for general applications.

Welding Benches

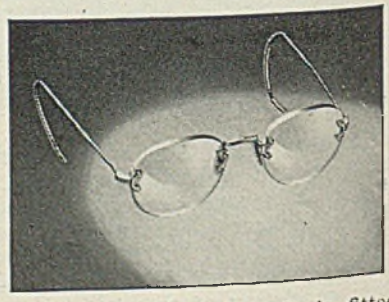
■ Lyon Metal Products Inc., 3119 Clark street, Aurora, Ill., is offering two new welding benches for use in vocational schools and machine shops. One is specifically for gas welding with its frame built to support a fire brick top 34 inches from the floor. It has a shelf with four separators for welding rods and additional space for storage. The other bench is for arc welding and has a 35-inch high shield on back and sides of a smooth heavy 10-gage steel working top 33 inches from the floor. This table also embodies shelf and rod separators.

Tool Grinder

■ Hammond Machinery Builders Inc., 1611 Douglas avenue, Kalamazoo, Mich., has introduced a new 10-inch carbide tool grinder combining facilities for straight wheel peripheral and cup wheel face grinding. Work tables on the unit tilt to 25 degrees—each degree of tilt accurately measured by a scale mounted below. Both tables slide easily to any point of adjustment, locking in selected position with a turn of the handle. Tables are slotted to accommodate the protractor angle-guide furnished with the machine and are grooved to keep the working surface free from grit and dirt. The table on the right is mounted on a heavy supporting shaft, directly over a casting which serves as a sludge pan. By releasing a clamp, the entire unit may be removed from the shaft, permitting cleaning of the sludge pan or replacement of wheels. For wet grinding with diamond cup wheel, right side of machine can be fitted with a reservoir mounted directly over the wheel on the cast iron guard. Drip-feed to the diamond wheel is controlled by a needle valve. Power is supplied to the spindle by adjustable V-belts driven by a powerful 1-horsepower motor. Grinder base or frame is a heavy casting with convenient opening in back permitting easy access to motor. Its overall height, floor to center of spindle, is 38 inches—size at base, 15 x 18 inches.

Safety Spectacles

■ Tulca Division, Univis Lens Co., Dayton, O., reports a new rimless-type, safety spectacle has been added to its eye protection line.

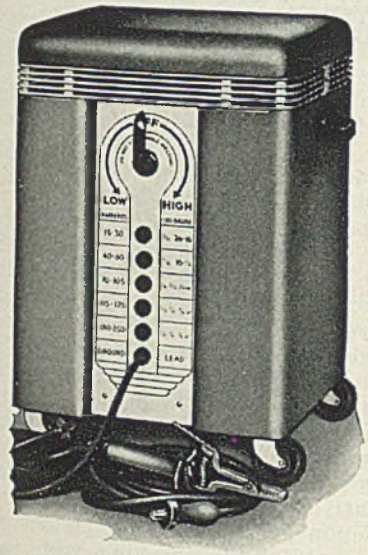


Called the Supervisor, it is fitted with Tulca safety lenses, and is offered with or without side shields. The spectacle is designed specifically for use by supervisors, checkers, in-

spectors, maintenance men and by visitors who are exposed to eye hazards in plants, even though they are not actively engaged in operations where the wearing of goggles is mandatory.

Arc Welder

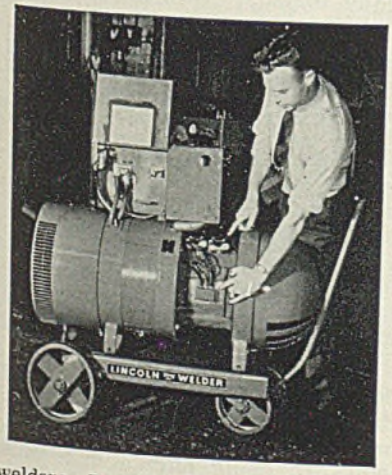
■ Allen Electric & Equipment Co., 1044 North Pitcher street, Kalamazoo, Mich., announces a new alternating-current arc welder suitable for all types of industrial services. It is designed to give in 30 different steps practically any welding current required between 15 and 250 amperes. The low heat ranges make it possible to weld light gage metal, while the high heats permit welding of heavy parts. The welder is equipped with swivel casters



and therefore portable. Standard equipment includes 20 feet of cable, 20 feet of ground cable, 20 feet of electrode cable and one electrode holder.

Control Device

■ Lincoln Electric Co., 12818 Coit road, Cleveland, announces a new overload protective control for



welders. It consists of two current transformers, the primaries of which are connected in series with the motor leads and the secondaries supplying power to operate two snap-action thermostats which are mounted directly on the motor lamination. Thermostats are connected to the lamination in such a way that they operate by means of heat conduction as well as by current passing through the thermostat. Therefore if welding machine exceeds the safe operating temperature, thermostats will trip open. They also reset when the motor returns to a safe operating temperature or when the current is reduced. A special circuit allows the starter button to be held "in" after the welder thermostats have been tripped. This allows machine to rotate with no load and the welder ventilation speeds up the cooling of the welder after the trouble has been rectified.

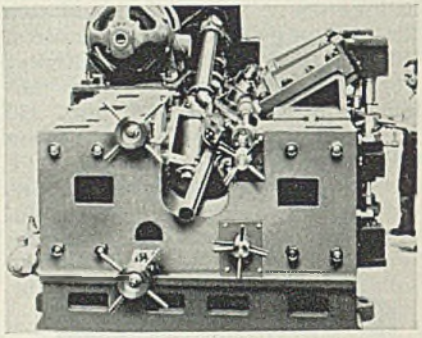
Inspection Sets

■ The Sheffield Corp., Dayton, O., announces a wide variety of Multicheks for fuze parts, shell, and cartridge case inspection. See p. 111 March 3 issue, STEEL. Units being offered are as follows: 20-millimeter, 40-millimeter, 37-millimeter, 60-millimeter, 75-millimeter, 90-millimeter, 105-millimeter—all for shell and case, 155-millimeter for shell,

and 3-inch for shell and case—pinions as small as ⅛-inch long and 3/32-inch in diameter. Some instruments are offered with three different gaging head sets, which are interchangeable on the same base.

Straightening Machine

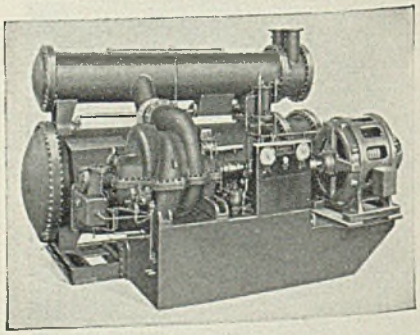
■ Sutton Engineering Co., Park building, Pittsburgh, recently introduced a new guideless 7-roll straightening machine for use in both ferrous and nonferrous industries. Elimination of guides, which is the chief feature of the machine, is compensated for by grouping three rolls, one driven and two idlers, in such a manner that the bar or tube being worked on is supported at three points. The machine consists of two groups of three rolls with an intermediate pressure roll. Straightening is done by the two sets of cross rolls as well as by the middle idler roll. These two changes on the machine, the elimination of the guides and grouping of the rolls, also has reduced time required in changing from one size work to another. The two idler rolls in each group are tied together with bevel gears and come in and out along a fixed angle so that they always position the work in exact center of the pass line regardless of material diameter. Two large handwheels control angling of the driven rolls and two sets of double handwheels angle the idler rolls. The wheel on the far side of the straightener frame in each set locks the angular position of the roll with wedges and the wheel nearest the machine is for adjusting the angularity of the rolls. Two additional sets of wheels on the opposite end of the unit angle the



two idlers in the outlet group. The middle idler roll is adjusted from the front of the machine. Method of locking idler rolls in both inlet and outlet groups by wedges makes it possible to release pressure from the material in case of a jam without altering setup. Frame of the machine consists of four pieces keyed together at the corners and preloaded by large set screws. The two large rolls are driven by means of universal couplings. The reduction drive is totally enclosed and runs in oil. Gearing consists of two high speed bevel gears at motor shaft, a series of single helical reduction gears, face spur pinions on the roll shafts meshing with two spur gears.

Cooling System

■ Worthington Pump & Machinery Corp., Harrison, N. J., has developed a new line of liquid cooling systems for air conditioning and industrial process requirements. Each centrifugal compressor in the line is of the volute design incorporating many unusual features — notably



dual lubrication, balancing of end thrust and side thrust by arrangement of impellers and volutes. Systems are being offered in a wide variety of sizes from 150 to 1200 tons refrigerating effect.

"Graphitic" Steels

(*Continued from Page 96*)

Mo has been made into a great variety of gages with excellent results because of its resistance to wear, freedom from movement after finishing to close dimensions, ease of machining, and ready response to heat treatment. High accuracy gages and standards made from Graph-Mo are given a so-called stabilizing treatment consisting of tempering four times at 350 degrees Fahr. and alternating with a cooling to 20 degrees.

Dies used for cold drawing bars, tubes and deep drawn articles from strip or sheet, see Fig. 4, must resist excessive abrasion and not scuff or score the material being worked. This is especially true where metal forming operations involve the use of heavy gage material or high working speeds. It is well known that tungsten in steel improves its wear-resisting qualities. The molybdenum and silicon content in Graph-Tung give a very satisfactory response to quenching in brine or water from the lower range of temperatures normally used and also permit quenching into oil for some of the lighter sections.

Machinability—A Factor

Machineability is also an important factor in the production of dies from steels containing 3 to 4 per cent tungsten. These, of course, present no problem in the Graph-Tung grade, which has the valuable property of shrinking when quenched through the hole.

Next to the cold finish dies in severity of service is the tube drawing mandrel, Fig. 5. It is subjected to high pressures and severe abrasion due to the tubing being drawn between it and the die. Impact is also a factor when the mandrel is inserted into the tube and when it is withdrawn.

The mandrel must have a working surface hard enough to resist wear, and the remainder of the structure must be ductile enough to minimize the effect of the various stresses. Such a structure can be obtained in low carbon and special alloy steels by carburizing, nitriding, etc., but for the higher carbon steels it is most economical to produce the desired structure by a simple quench into water or brine.

To accomplish this, it is necessary to decrease the hardenability wthout permitting soft spots on the working surfaces. In Graph-Sil, the silicon content promotes graphitization and, at the same time, acts as an aid in producing a deep hardening steel. Aluminum added in relatively small percentages acts as a graphitizer, but limits the depth of hardening to that required for this application, and also aids in securing a surface hardness of 60 to 69 rockwell C.

Graph-Al is recommended for cold drawing mandrels because the free graphite in the structure prevents pickup. It is free machining and responds readily to heat treatment. After quenchng it provides a combination of 68 to 69 rockwell C in the case and 39 to 40 rockwell C in the core.

A good example of a relatively long tool with small cross-section is the Neuberth mandrel, Fig. 6, used in cold forming tubing. These mandrels are used in conjuncton with a semicircular, taper grooved, reciprocating swaging block. The block rotates and by its action a tube is radically reduced in cross section by cold working. The mandrels are of necessity long and slender. Besides they must withstand the high pressure and abrasion of the cold worked metal without pitting, scoring or failing by fatigue due to the bending stresses.

Made from Graph-M.N.S., these mandrels are produced economically and show a satisfactory service life. This is an air-hardening steel. An effort to produce an air-hardening steel which would constitute an improvement over the present avail-

able steels disclosed that a normal content of alloys, such as nickel, molybdenum, manganese, chromium and enough silicon to induce graphitization, has all the desired properties. Graph-M.N.S. is free machining, has good hardness response when cooled from 1650 degrees Fahr., is remarkably free from distortion or movement, has good wear resistance, and has in addition all the qualities conferred by the free graphite in the structure.

Graphitic steels are being used successfully in many production applications such as oil seals, cylinder liners, air hammer parts, diesel pump parts, spindles, etc. In fact, they are suitable for any type of service in which there is a requirement for freedom from scuffing or scoring of the parts with adequate resistance to wear to insure long life.

More on Bismuth

(*Continued from Page* 90)

tested. It was found the bismuth content of the weld metal, weld-base metal interface and weld metal near the interface had been decreased by arc welding. The original bismuth content of 0.29 per cent in one instance was reduced to 0.06 per cent in the weld metal. However, this amount of bismuth was sufficient to indicate a sawing index of approximately 110 to 115, which represents some increase in machinability. While there appeared to be greater evolution of gas when using the bismuth-bearing rods, the weld deposits resulting from coated rods were sound and were found to be somewhat superior in corrosion resistance to the casting of the same composition on which they had been deposited.

With these indications that mechanical properties and weldability of the corrosion resisting casting alloys are not impaired to any important degree, it was desired to evaluate the effect of bismuth upon corrosion resistance in general.

Alloys of 19-9 and 25-12 with and without 3 per cent molybdenum, each of these with and without about 0.25 per cent bismuth, were subjected to the action of 5 per cent solution of ferric chloride plus 10 per cent sodium chloride for 24 hours and examined for pitting. No effect of bismuth in increasing or reducing pitting appeared. The beneficial effect of molybdenum was not impaired by the presence of bismuth.

Specimens with and without bismuth were studied as to intergranular attack and no effect of bismuth was shown in any case save that of sensitized 19-9 where its effect was to retard the rate of intergranular attack. In general the addition of bismuth decreases corrosion resistance when conditions are such that the alloys are in the active state of corrosion. This is least important. When conditions are such that the alloys are in the passive state of corrosion, the addition of bismuth either has no appreciable effect or in some instances increases the range of passivity.

Added in Lump Form

In these tests, the experimental heats were made in high-frequency induction furnaces, the bismuth added in the majority of cases as a master alloy of nickel-bismuth containing 70 per cent bismuth and 30 per cent nickel. It was also added as lumps of the granular form of the metal, as sodium bismuthate, as bismuth trioxide and as a master alloy of manganese-bismuth (80 per cent bismuth, 20 per cent manganese).

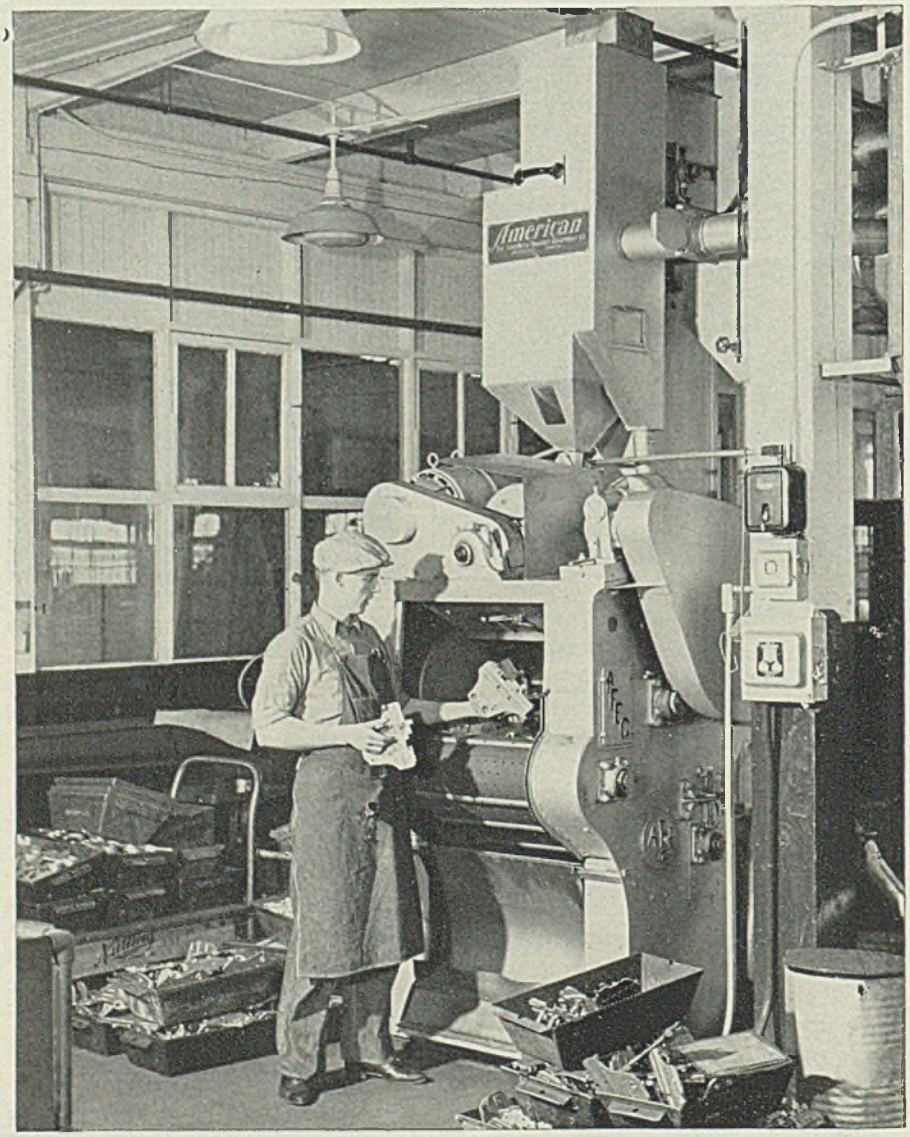
Considerable effervescence resulted when bismuth, regardless of form, was added to the alloy steels. The low boiling point of bismuth (about 300 degrees Fahr. below the temperature of the molten steel) undoubtedly was the cause.

The crucible used in melting the bismuth-containing alloys appeared in a better condition than the crucible used in preparing the bismuth-free alloys after an equivalent number of heats had been melted in both.

Commercial test melts show that arc furnaces also are suitable for the preparation of the bismuth containing alloys.

Metallographic Effect: Bismuth, at least in part, is present as metallic particles which appear to be practically pure bismuth. These hardly seem plentiful enough to account for the improved machinability and the presence of widely distributed

Whisking Off Burrs



■ Trouble in removing burrs on machined parts is being eliminated in several plants by the use of this American Foundry Wheelabrator Tumblast shown above. This unit, by blasting with a fine metallic grit, removes burrs from a variety of small machined parts. In instances where the finished part is later plated, enameled or given any other finish such as lacquering, metallizing, painting, etc., the unit not only removes the burrs but also provides a good bond for subsequent coating

submicroscopic dispersion of bismuth is suspected. Tentative interpretation of metallographic evidence to date indicates that the bismuth addition tends to favor the formation of ferrite, and there is some indication of increased carbon solubility in the presence of bismuth.

Conclusions: Small bismuth additions to the cast corrosion-resistant chromium and chromium-nickel alloys with and without molybdenum, columbium, titanium, etc., materially improve their machinability, affect the mechanical properties important in corrosion-resistant service in no important degree, improve the galling resistance, do not injure weldability and in general exert no deleterious effect on corrosion resistance to any corrodent so far studied. In some cases, corrosion resistance is slightly improved.

Improved machinability is gained without sacrifice of the important properties of these corrosion-resistant castings. A similar condition probably holds for the wrought alloys. While hot working of bismuth-containing 19-9 and 25-12 alloys is feasible, it must be carried out at somewhat lower than usual temperatures.

The decreased ductility in short-time tension tests at 1800 degrees Fahr. indicates care is necessary in applying the material to high-temperature service, but the maintained strength indicates that the load-carrying ability may be satisfactory.

Offers Motion Pictures On Lathe Operation

■ To speed up training of lathe operators for national defense industries, South Bend Lathe Works, Dept. 65, South Bend, Ind., is sponsoring production of a series of 16-millimeter sound motion pictures in color based on the book "How To Run a Lathe." These show practical shop methods as practiced in modern industrial plants and represent the most advanced technique for teaching lathe operation in industrial and vocational schools, universities, Army and Navy training stations.

The first reel, entitled "The Lathe" clearly shows the apprentice what a lathe is, what it is for, and how the various parts operate. Important lathe operations, including turning, facing and thread cutting, are demonstrated.

The second reel, "Plain Turning," shows in detail each operation performed in the machining of a straight cylindrical shaft between the lathe centers. Close-ups show locating and drilling of center holes, adjustment and setting of cutting tools, use of cross feed graduations, use of calipers and micrometers, use of quick change gear box, changing speeds, and operation of the lath carriage and apron.

Showing time for each of the two 800-foot reels now completed is approximately 20 minutes. Complete information on securing the use of these films can be obtained by writing to the company.

Machine Shop Theory And Practice Simplified

■ *Machine Shop Theory and Practice*, by Albert M. Wagener and Harlan O. Arthur; cloth, 306 pages, 8½ x 11 inches; published by D. Van Nostrand Co. Inc., 250 Fourth avenue, New York, for $2.28 in cloth, $1.60 in paper.

Mr. Wagener is instructor in shop theory at the Henry Ford trade school, Dearborn, Mich., and Mr. Arthur is head of the department of shop mathematics of the Ford Motor Co. apprentice and engineering schools. The textbook has been designed to meet the needs of beginners in the study of machine tools and their operation, for tool and die making apprentices. Most available books in this field are too advanced and complex and contain too much irrelevant material.

Presentation of the machine is in a practical and logical order, starting with the shaper and progressing in order of difficulty through the lathe, mill and grinder. Introductory

chapters cover precision and semi-precision tools found in the shop and the closing chapters describe uses of so-called bench and small hand tools. The text is abundantly illustrated by photographs and sketches.

Standard operations on each tool-room machine are described at length, making the book valuable to students who do not have access to class discussions and instruction.

Machine Tool Standards Simplify Wiring

■ A 2-fold purpose is embodied in "Machine Tool Electrical Standards" adopted by the National Machine Tool Builders' Association, 10525 Carnegie avenue, Cleveland, as of Sept. 5, 1941. One purpose is to relieve customers of the necessity of writing elaborate electrical specifications of their own—the other is to give them assurance that the machine tool they buy will be properly wired.

The standards, adoption of which was announced at the Edgewater Beach hotel in Chicago, Oct. 14, apply to machine tools coming within the following classifications: "Power driven, complete metalworking machines not portable by hand, having one or more tool and work-holding devices, used for progressively removing metal in form of chips."

According to the association, the standards will aid in expediting assembly of machine tools by removing the need of making every machine tool a special wiring job to meet special specifications. Copies of the standards are available at association headquarters for $1.

Two New Volumes on Principles of Aviation

■ *Aircraft Engines,* by Ray F. Kuns; cloth, 363 pages, 6 x 9 inches; published by American Technical Society, Chicago, for $3.25.

Metereology and Aircraft Engines, by Capt. Bailey Wright, W. E. Dyer and Rex Martin; cloth, 348 pages, 6 x 9 inches; published by American Technical Society, Chicago, for $3.25.

These volumes are part of a series constituting a general survey of fundamentals of aviation. The authors have had the collaboration of various other experts to make these volumes represent the latest in modern aviation practice.

Much has been written about aviation, a large part understandable only by those engaged in the aviation industry. These volumes are intended to present basic principles in simple language so that not only the general reader but also those who intend later to enter the air transport service may have a good foundation for further specialized study of aviation.

The first of these two volumes is devoted to descriptions of elementary engines,, aircraft fuel, fuel and ignition devices, light plane engines, radial engines, timing, lubrication.

The second volume discusses the atmosphere and its movements, weather map, airway weather service, aerial photography, airway markers and illumination, radio and aircraft instruments.

German Text on Wire

■ *Steel Wire* (Stahldraht), by A. Powy; cloth, 275 pages, 6¼ x 9 inches, 265 illustrations, 18 tables; published by Stahleisen, Dusseldorf, Germany, for 17 marks (about $7).

In spite of war conditions, Stahleisen, which is the publishing department of the German Iron and Steel Institute, has undertaken publication of an extended series of comparatively small books on well circumscribed subjects, in German.

The first, on steel wire, has been issued. It begins with properties of the hot-rolled rod and ends with testing the finished wire. All intermediate stages and processes are described in detail. The book is a combination of sound theory and advanced practice, as far as the latter has been released for publication.

Allocations Broader; Priorities Extended

Production resumed promptly after coal strike. Scrap shortage more intense in 1942. Will confiscate much export steel

MARKET IN TABLOID ★

Demand
Continues heavy in all lines.

Prices
Scrap schedule is amended.

Production
Down ½-point to 95 per cent.

■ NEW METHODS of handling priorities and allocations are being put into effect by the Office of Production Management, embodying changes brought about by experience in handling steel distribution.

General Allocations Order No. 1 goes into effect Dec. 1, covering all products of plate mills, including plates, sheet bars, slabs, skelp and others. A new plan for blanket ratings in the form of a new "P" order, to be known as the Production Requirements Plan, is being formulated, which will permit defense contractors to obtain a rating covering all their needs for defense orders, rather than separate applications for each item. A new PD-1 form is planned, which can be extended to suppliers after the rating is issued.

Priorities division, OPM, has extended all general preference orders affecting iron and steel products, pig iron, warehouses and special types of steel and iron to Dec. 31, 1942. They previously had been set to expire Nov. 30, this year. This includes order M-21, putting steel products under priority. Preference rating order P-31, affecting materials essential to manufacture and repair of foundry equipment, was extended to May 30, 1942.

First action toward releasing considerable steel bought by European countries which later came under German control, stored at tidewater, will be taken soon by the Office of Export Control. This will seek to recover about 18,000 boxes of tin plate bought for shipment to a Balkan country. Considerable tonnage of this sort is said to be available for government confiscation.

Ending of the captive coal mine strike last week removed one of the most important threats to steel production. Resumption of mining, coke production and blast furnace activity was immediate, in order to minimize loss of steel production. Banked blast furnaces resumed everywhere except for two in the Birmingham district where a strike is still in progress. A result of the interruption is reduced coal stocks and lessened coke reserves, which will require some time to replace.

Prompt resumption of production after the coal strike minimized loss but the national rate declined ½-point to 95 per cent. An upward movement is expected for this week. Pittsburgh declined 3 points to 96 per cent; Chicago 2 points to 99½ per cent; Detroit 1 point to 95; eastern Pennsylvania 1 point to 90; St. Louis 4½ points to 93½ and Cincinnati 4 points to 87½ per cent. New England gained 8 points to 100 per cent; Cleveland 3½ points to 95½, Wheeling 10 points to 92 per cent. Unchanged rates were maintained at Birmingham, 90; Buffalo, 79; Youngstown, 88.

Opinion is growing that lack of scrap will be even more acute in 1942 as a result of thorough combing of all sources of miscellaneous grades this year. Greater reliance must be put on pig iron, added productive capacity for which will begin to make itself felt during next year. Industrial and "home" scrap will be produced in the usual proportion to steel output but material from other sources is not expected to increase. The Institute of Scrap Iron and Steel estimates 1941 consumption of scrap at 52,000,000 tons, by far the largest annual tonnage in history.

Further adjustment has been made in the OPA scrap schedule to aid in providing better supply. Low phosphorus scrap base at Cincinnati, Middletown and Portsmouth, O., and Ashland, Ky., has been advanced $1. Heavy melting steel base has been advanced $2.50 and cupola cast scrap $1.50 at San Francisco and Los Angeles and Oregon has been added to states from which remote scrap can be moved and freight be absorbed.

A tentative schedule is being arranged to cover 1,380,000 tons of various steel products for export to Great Britain over first half, largely semifinished steel, with some rails and track fastenings.

Automobile production moved upward last week, turning out 93,495 cars, against 76,820 the preceding week. This compares with 128,783 in the corresponding week last year.

Steel and iron imports in August, announcement of which was belated by press of work in the Department of Commerce, totaled 1975 tons, excluding scrap, compared with 1631 tons in July. Scrap imports at 16,405 tons were approximately 7000 tons larger than in July, nearly all from Canada and Cuba.

Composite prices continue steady in absence of change in government ceilings. Finished steel is $56.73, semifinished steel $36, steelmaking pig iron $23.05 and steelmaking scrap $19.17.

COMPOSITE MARKET AVERAGES

	Nov. 29	Nov. 22	Nov. 15	One Month Ago Oct., 1941	Three Months Ago Aug., 1941	One Year Ago Nov., 1940	Five Years Ago Nov., 1936
Finished Steel	$56.73	$56.73	$56.73	$56.73	$56.73	$56.73	$53.36
Semifinished Steel	36.00	36.00	36.00	36.00	36.00	36.00	34.40
Steelmaking Pig Iron	23.05	23.05	23.05	23.05	23.05	22.05	18.63
Steelmaking Scrap	19.17	19.17	19.17	19.17	19.17	20.80	16.50

Finished Steel Composite:—Average of industry-wide prices on sheets, strip, bars, plates, shapes, wire, nails, tin plate, standard and line pipe. Semifinished Steel Composite:—Average of industry-wide prices on billets, slabs, sheet bars, skelp and wire rods. Steelmaking Pig Iron Composite:—Average of basic pig iron prices at Bethlehem, Birmingham, Buffalo, Chicago, Cleveland, Neville Island, Granite City and Youngstown. Steelworks Scrap Composite:—Average of No. 1 heavy melting steel prices at Pittsburgh, Chicago and eastern Pennsylvania.

COMPARISON OF PRICES

Representative Market Figures for Current Week; Average for Last Month, Three Months and One Year Ago

Finished Material

	Nov. 29, 1941	Oct. 1941	Aug. 1941	Nov. 1940
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	2.47	2.47	2.47
Shapes, Pittsburgh	2.10	2.10	2.10	2.10
Shapes, Philadelphia	2.215	2.215	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 ⅜-inch, Pitts.	2.00	2.00	2.00	2.00

Pig Iron

	Nov. 29, 1941	Oct. 1941	Aug. 1941	Nov. 1940
Bessemer, del. Pittsburgh	$25.34	$25.34	$25.34	$24.34
Basic, Valley	23.50	23.50	23.50	22.50
Basic, eastern, del. Philadelphia	25.34	25.34	25.34	24.34
No. 2 fdry., del. Pgh., N.&S. Sides	24.69	24.69	24.69	23.69
No. 2 foundry, Chicago	24.00	24.00	24.00	23.00
Southern No. 2, Birmingham	20.38	20.38	20.38	19.38
Southern No. 2, del. Cincinnati	24.06	24.06	24.06	23.06
No. 2X, del. Phila. (differ. av.)	26.215	26.215	26.215	25.215
Malleable, Valley	24.00	24.00	24.00	23.00
Malleable, Chicago	24.00	24.00	24.00	23.00
Lake Sup., charcoal, del. Chicago	31.34	31.34	31.34	30.34
Gray forge, del. Pittsburgh	24.19	24.19	24.19	23.17
Ferromanganese, del. Pittsburgh	125.33	125.33	125.33	125.33

Scrap

Heavy melting steel, Pitts.	$20.00	$20.00	$20.00	$21.50
Heavy melt. steel, No. 2, E. Pa.	17.75	17.75	17.75	19.75
Heavy melting steel, Chicago	18.75	18.75	18.75	20.25
Rails for rolling, Chicago	22.25	22.25	22.25	24.55
No. 1 Cast, Chicago	20.00	18.75	18.75	18.25

Coke

Connellsville, furnace, ovens	$6.25	$6.25	$6.25	$4.75
Connellsville, foundry, ovens	7.25	7.25	7.25	5.75
Chicago, by-product fdry., del.	12.25	12.25	12.25	11.75

STEEL, IRON, RAW MATERIAL, FUEL AND METALS PRICES

Except when otherwise designated, prices are base, f.o.b. mill, carloads.

Sheets, Strip

Hot-Rolled Sheets

Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Buffalo, Youngstown, Sparrows Point, Middletown, base 2.10c
Granite City base 2.20c
Detroit, del. 2.20c
Pacific ports 2.65c

Cold-Rolled Sheets

Pittsburgh, Chicago, Cleveland, Gary, Buffalo, Youngstown, Middletown, B'ham., base 3.05c
Granite City, base 3.15c
Detroit, del. 3.15c
Other Mich. pts., del. 2.25c
Pacific ports 3.70c

Galvanized Sheets, No. 24

Pittsburgh, Gary, Birmingham, Buffalo, Youngstown, Sparrows Point, Middletown, base 3.50c
Granite City, base 3.60c
Pacific ports 4.05c

Corrugated Galv. Sheets

Pittsburgh, Chicago, Gary, Birmingham, Buffalo, Youngstown, Sparrows Point, Middletown, 29 gage, per square 3.31c
Granite City 3.38c
Pacific Ports 3.73c

Culvert Sheets

Pittsburgh, Gary, Birmingham, 16-gage, not corrugated, copper steel 3.60c, copper iron 3.90c, pure iron 3.95c.

Pittsburgh, 24-gage, zinc-coated, hot-dipped, heat-treated 4.25c.

Granite City, copper steel 3.70c, copper iron 4.00c, pure iron 4.05c.

Pacific ports, copper steel 4.25c, copper iron 4.55c, pure iron 4.60c.

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 gr.	3.20c	3.95c	3.30c
Armat.	3.55c	4.30c	3.65c
Elect.	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. 2.20c
Other Mich. pts. del. 2.25c
Pacific ports 2.75c

Cold-Rolled Strip

Pittsburgh, Cleveland, Youngstown, 0.25 carbon and less 2.80c
Chicago, base 2.90c
Worcester, base 3.00c
Detroit, del. 2.90c
Other Mich. pts. del. 2.95c

Commodity C.R. Strip

Pittsburgh, Cleveland, Youngstown, base 3 tons and over 2.95c
Worcester, base 3.35c
Detroit, del. 3.05c
Other Mich. pts. del. 3.10c

Cold-Finished Spring Steel

Pittsburgh, Cleveland, base; add 20 cents for Worcester.
.26-.50 Carbon 2.80c
.51-.75 Carbon 4.30c
.76-1.00 Carbon 6.15c
Over 1.00 Carbon 8.35c

Stainless Steels

Base, Cents per lb.—f.o.b. Pittsburgh

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
304-20% clad	.....	*18.00	19.00	.....	.....
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
347	33.00	38.00	45.00	33.00	42.00
403	21.50	24.50	29.50	21.25	27.00
410	18.50	21.50	26.50	17.00	22.00
416	19.00	22.00	27.00	18.25	23.50
420	24.00	28.50	33.50	23.75	36.50
430	19.00	22.00	29.00	17.50	22.50
430F	19.50	22.50	29.50	18.75	24.50
431	19.00	22.00	29.00	17.50	22.50
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

*Includes annealing and pickling.

Tin, Terne Plate

Tin Plate

Pittsburgh, Chicago, Gary, 100-lb. base box $5.00
Granite City $5.10
Pacific ports, f.o.b. $5.75½

Tin Mill Black Plate

Pittsburgh, Chicago, Gary, base 29 gage and lighter 3.05c
Granite City 3.15c
Pacific ports, boxed 4.27½c

Long Ternes

Pittsburgh, Gary No. 24 unassorted 3.80c
Pacific Ports 4.55c

Special Coated Mfg. 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	25-lb.	$16.00
15-lb.	14.00	30-lb.	17.25
20-lb.	15.00	40-lb.	19.50

Steel Plate

Pittsburgh, Chicago, Gary, Cleveland, Birmingham,

Youngstown 2.10c
Coatesville, Sparrows Point, Claymont 2.10c
Gulf ports 2.45c
Pacific Coast ports 2.65c

Steel Floor Plates

Pittsburgh 3.35c
Chicago 3.35c
Gulf ports 3.70c
Pacific Coast ports 4.00c

Structural Shapes

Pittsburgh, Bethlehem, Chicago, Buffalo, Birmingham 2.10c
St. Louis, del. 2.34c
Pacific Coast ports 2.75c

Bars

Hot-Rolled Carbon Bars

Pittsburgh, Chicago, Gary, Cleve., Birm., base 20 tons one size 2.15c
Detroit, del. 2.25c
New York, del. 2.49c
Duluth, base 2.25c
Philadelphia, del. 2.47c
Gulf ports, dock 2.50c
All-rail, Houston from Birmingham 2.59c
Pac. ports, dock 2.80c
All-rail from Chicago.. 3.25c

Rail Steel Bars

Pitts., Chicago, Gary, Cleveland, Birm., base 5 tons 2.15c
Detroit, del. 2.25c
New York, del. 2.49c
Philadelphia, del. 2.47c
Gulf ports, dock 2.50c
All-rail, Houston from Birmingham 2.59c
Pac. ports, dock 2.80c
All-rail from Chicago.. 3.25c

Hot-Rolled Alloy Bars

Pittsburgh, Chicago, Canton, Massillon, Buffalo, Bethlehem, base 20 tons one size 2.70c
Detroit 2.80c

Alloy S.A.E.	Diff.	S.A.E.	Alloy Diff.
2000	0.35	3100	0.70
2100	0.75	3200	1.35
2300	1.70	3300	3.80
2500	2.55	3400	3.20
4100 .15-25 Mo.			0.55
4600 0.20-0.30 Mo.; 1.50-2.00 Ni.			1.20
5100 80-1.10 Cr.			0.45
5100 Spr. flats			0.15
6100 Bars			1.20
6100 Spr. flats			0.85
Carb., Van.			0.85
9200 Spr. flats			0.15
9200 Spr. rounds, squares			0.40
T 1300, Mn, mean 1.51-2.00			0.10
Do., carbon under 0.20 max.			0.35

Cold-Finished Carbon Bars

Pitts., Chicago, Gary, Cleveland, Buffalo, base 20,000-39,999 lbs. 2.65c
Detroit 2.70c

Cold-Finished Alloy Bars

Pitts., Chicago, Gary, Cleveland, Buffalo, base 3.35c
Detroit 3.45c
Galveston, add $0.25; Pacific Coast, $0.50.

Turned, Ground Shafting

Pitts., Chicago, Gary, Cleveland, Buffalo, base (not including turning, grinding, polishing extras) 2.65c
Detroit 2.70c

Reinforcing Bars (*New Billet*)

Pitts., Chicago, Gary, Cleveland, Birm., Sparrows Point, Buffalo, Youngstown, base 2.15c
Gulf ports, dock 2.50c
All-rail, Houston from Birmingham 2.59c
Pacific ports, dock 2.80c
Detroit, del. 2.25c

Reinforcing Bars (*Rail Steel*)

Pitts., Chicago, Gary, Cleveland, Birm., base. 2.15c
Gulf ports, dock 2.50c
All-rail, Houston from Birmingham 2.59c
Pacific ports, dock 2.80c
Detroit, del. 2.25c

Iron Bars

Philadelphia, com. del. 3.06-3.50c
Pittsburgh, muck bar ... 5.00c
Pittsburgh, staybolt 8.00c
Terre Haute com., f.o.b. mill 2.15c

Wire Products

Pitts.-Cleve.-Chicago-Birm. base per 100 lb. keg in carloads

Standard and cement coated wire nails $2.55

(Per Pound)

Polished fence staples .. 2.55c
Annealed fence wire 3.05c
Galv. fence wire 3.40c
Woven wire fencing (base C. L. column) 67
Single loop bale ties, (base C. L. column) .. 59
Galv. barbed wire, 80-rod spools, base column .. 70
Twisted barbless wire, column 70

To Manufacturing Trade

Base, Pitts. - Cleve. - Chicago Birmingham (except spring wire at Birmingham)

Bright bess., basic wire. 2.60c
Galvanized wire 2.60c
Spring wire 3.20c
Worcester, Mass., 10c higher on bright basic and spring wire.

Cut Nails

Carload, Pittsburgh, keg. $3.85

Alloy Plates (Hot)

Pitts., Chicago, Coatesville, Pa. 3.50c

Rails, Fastenings

(Gross Tons)

Standard rails, mill $40.00
Relay rails, Pittsburgh 20—100 lbs. 32.50-35.50
Light rails, billet qual., Pitts., Chicago, Bham. $40.00
Do., rerolling quality.. 39.00

Cents per pound

Angle bars, billet, mills. 2.70c
Do., axle steel 2.35c
Spikes, R. R. base 3.00c
Track bolts, base 4.75c
Do., heat treated 5.00c
Car axles forged, Pitts., Chicago, Birmingham.. 3.15c
Tie plates, base 2.15c
Base, light rails 25 to 60 lbs., 20 lbs., up $2; 16 lbs. up $4; 12 lbs. up $8; 8 lbs. up $10. Base railroad spikes 200 kegs or more; base plates 20 tons.

Bolts and 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., ⅞ 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

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.

Step bolts .....56 off
Plow bolts .....65 off

Nuts

Semifinished hex.	U.S.S.	S.A.E.
½-inch and less.	62	64
⅝-1-inch	59	60
1⅛-1½-inch	57	58
1⅝ and larger..	56	..

Hexagon Cap Screws

Upset 1-in., smaller .....60 off

Square Head Set Screws

Upset, 1-in., smaller ....68 off
Headless, ¼-in., larger ..55 off
No. 10, smaller .....60 off

Piling

Pitts., Chgo., Buffalo .. 2.40c

Rivets, Washers

F.o.b. Pitts., Cleve., Chgo., Bham.

Structural 3.75c
⅞-inch and under .....65-5 off
Wrought washers, Pitts., Chi., Phila., to jobbers and large nut, bolt mfrs. l.c.l .....$3.50 off

Tool Steels

Pittsburgh, Bethlehem, Syracuse, base, cents per lb.

Carb. Reg. 14.00 Oil-hardening .. 24.00
Carb. Ext. 18.00
Carb. Spec. 22.00 High car.-chr. 43.00

High Speed Tool Steels

Tung.	Chr.	Van.	Moly.	
18.00	4	1	...	67.00
18.00	4	2	1	77.00
18.00	4	3	1	87.00
1.50	4	1	8.50	54.00
....	4	2	8	54.00
5.50	4	1.50	4	57.50
5.50	4.50	4	4.50	70.00

Boiler Tubes

Carloads minimum wall seamless steel boiler tubes, cut-lengths 4 to 24 feet; f.o.b. Pittsburgh, base price per 100 feet subject to usual extras.

Lap Welded

Sizes	Gage	Steel	Charcoal Iron
1½"O.D.	13	$ 9,72	$23.71
1¾"O.D.	13	11.06	22.93
2" O.D.	13	12.38	19.35
2¼"O.D.	13	13.79	21.68
2½"O.D.	12	15.16	....
2¾"O.D.	12	16.58	26.57
3" O.D.	12	17.54	29.00
3½"O.D.	12	18.35	31.36
4" O.D.	11	23.15	39.81
5" O.D.	10	28.66	49.90
6" O.D.	9	44.25	73.93
	7	68.14	....

Seamless

Sizes	Gage	Hot Rolled	Cold Drawn
1" O.D.	13	$ 7.82	$ 9.01
1¼"O.D.	13	9.26	10.67
1½"O.D.	13	10.23	11.79
1¾"O.D.	13	11.64	13.42
2" O.D.	13	13.04	15.03
2¼"O.D.	13	14.54	16.76
2¼"O.D.	12	16.01	18.45
2½"O.D.	12	17.54	20.21
2¾"O.D.	12	18.59	21.42
3" O.D.	12	19.50	22.48
3½"O.D.	11	24.62	28.37
4" O.D.	10	30.54	35.20
4½"O.D.	10	37.35	43.04
5" O.D.	9	46.87	54.01
6" O.D.	7	71.96	82.93

Welded Iron, Steel, Pipe

Base discounts on steel pipe, Pitts., Lorain, O., to consumers in carloads. Gary, Ind., 2 points less on lap weld, 1 point less on butt weld. Chicago delivery 2½ and 1½ less, respectively. Wrought pipe, Pittsburgh base.

Butt Weld

Steel

In.	Blk.	Galv.
½	63½	51
¾	66½	55
1—3	68½	57½

Iron

¾	30	10
1—1¼	34	16
1½	38	18½
2	37½	18

Lap Weld

Steel

2	61	49½
2½—3	64	52½
3½—6	66	54½
7 and 8	65	52½

Iron

2	30½	12
2½—3½	31½	14½
4	33½	18
4½—8	32½	17
9—12	28½	12

Line Pipe, Plain Ends

Steel

1 to 3, butt weld..... 68½
2, lap weld 63
2½ to 3, lap weld 66
3½ to 6, lap weld 65
7 and 8, lap weld 64
Seamless, 3 pts. lower discount.

Cast Iron Pipe

Class B Pipe—Per Net Ton

6-in., & over, Birm..$45.00-46.00
4-in., Birmingham .. 48.00-49.00
4-in., Chicago 56.80-57.80
6-in. & over, Chicago 53.80-54.80
6-in. & over, east fdy. 49.00
Do., 4-in 52.00
Class A Pipe $3 over Class B
Stnd. fltgs., Birm., base $100.00.

Semifinished Steel

Rerolling Billets, Slabs

(Gross Tons)

Pittsburgh, Chicago, Gary, Cleve., Buffalo, Youngs., Birm., Sparrows Point..$34.00
Duluth (billets) 36.00
Detroit, delivered 36.00

Forging Quality Billets

Pitts., Chi., Gary, Cleve., Young., Buffalo, Birm.. 40.00
Duluth 42.00

Sheet Bars

Pitts., Cleveland, Young., Sparrows Point, Buffalo, Canton, Chicago. 34.00
Detroit, delivered 36.00

Wire Rods

Pitts., Cleveland, Chicago, Birmingham No. 5 to ⅝-inch incl. (per 100 lbs.) $2.00
Do., over ⅝ to 41/64-in. incl. 2.15
Worcester up $0.10, Galveston up $0.25 and Pacific Coast up $0.50 on water shipments.

Skelp

Pitts., Chi., Youngstown, Coatesville, Sparrows Pt. 1.90c

Shell Steel

Pittsburgh, Chicago, base, 1000 tons of one size, open hearth

3-12-inch $52.00
12-18-inch 54.00
18-inch and over 56.00

Coke

Price Per Net Ton

Beehive Ovens

Connellsville, fur... $6.00- 6.25
Connellsville, fdry.. 7.00- 7.50
Connell. prem. fdry. 7.25- 7.60
New River fdry. .. 8.00- 8.25
Wise county fdry. .. 7.50
Wise county fur. .. 6.50

By-Product Foundry

Newark, N. J., del... 12.60-13.05
Chicago, outside del. 11.50
Chicago, delivered .. 12.25
Terre Haute, del. .. 12.00
Milwaukee, ovens... 12.25
New England, del. .. 13.75
St. Louis, del. 12.02
Birmingham, ovens. 8.50
Indianapolis, del. .. 12.00
Cincinnati, del. 11.75
Cleveland, del. 12.30
Buffalo, del. 12.50
Detroit, del. 12.25
Philadelphia, del. .. 12.38

Coke By-Products

Spot, gal., freight allowed east of Omaha

Pure and 90% benzol.... 14.00c
Toluol, two degree 27.00c
Solvent naphtha 26.00c
Industrial xylol 26.00c

Per lb. f.o.b. Frankford and St. Louis

Phenol (less than 1000 lbs.) 14.75
Do. (1000 lbs. or over) 13.00

Eastern Plants, per lb.

Naphthalene flakes, balls, bbls. to jobbers 7.00c

Per ton, bulk, f.o.b. port

Sulphate of ammonia $29.00

Pig Iron

No. 2 foundry is 1.75-2.25 sil.; 50c diff. for each 0.25 sil. above 2.25 sil. Gross tons.

Basing Points:	No. 2 Fdry.	Malleable	Basic	Bessemer
Bethlehem, Pa.	$25.00	$25.50	$24.50	$26.00
Birmingham, Ala.§	20.38	.....	19.38	25.00
Birdsboro, Pa.	25.00	25.50	24.50	26.00
Buffalo	24.00	24.50	23.00	25.00
Chicago	24.00	24.00	23.50	24.50
Cleveland	24.00	24.00	23.50	24.50
Detroit	24.00	24.00	23.50	24.50
Duluth	24.50	24.50	.....	25.00
Erie, Pa.	24.00	24.50	23.50	25.00
Everett, Mass.	25.00	25.50	24.50	26.00
Granite City, Ill.	24.00	24.00	23.50	24.50
Hamilton, O.	24.00	24.00	23.50	.....
Neville Island, Pa.	24.00	24.00	23.50	24.50
Provo, Utah	22.00	.....	.....	.....
Sharpsville, Pa.	{24.00–24.50	24.00–24.50	23.50–24.50	24.50–25.00
Sparrow's Point, Md.	25.00	.....	24.50	.....
Swedeland, Pa.	25.00	25.50	24.50	26.00
Toledo, O.	24.00	24.00	23.50	24.50
Youngstown, O.	{24.00–24.50	24.00–24.50	23.50–24.50	24.50–25.00

§Subject to 38 cents deduction for 0.70 per cent phosphorus or higher.

Delivered from Basing Points:				
Akron, O., from Cleveland	25.39	25.39	24.89	25.89
Baltimore from Birmingham†	25.61	.....	25.11	.....
Boston from Birmingham†	25.12	.....	.....	.....
Boston from Everett, Mass.	25.50	26.00	25.00	26.50
Boston from Buffalo	25.50	26.00	25.00	26.50
Brooklyn, N. Y., from Bethlehem	27.50	28.00	.....	.....
Canton, O. from Cleveland	25.39	25.39	24.89	25.89
Chicago from Birmingham	†24.22	.....	.....	.....
Cincinnati from Hamilton, O.	24.44	25.11	24.61	.....
Cincinnati from Birmingham†	24.06	.....	23.06	.....
Cleveland from Birmingham†	24.12	.....	23.12	.....
Mansfield, O., from Toledo, O.	25.94	25.94	25.44	.....
Milwaukee from Chicago	25.10	25.10	24.60	25.60
Muskegon, Mich., from Chicago, Toledo or Detroit	27.19	27.19	.....	.....
Newark, N. J., from Birmingham†	26.15	.....	.....	.....
Newark, N. J., from Bethlehem	26.53	27.03	.....	.....
Philadelphia from Birmingham†	25.46	.....	24.96	.....
Philadelphia from Swedeland, Pa.	25.84	26.34	25.34	.....

Pittsburgh dist.: Add to Neville Island base, North and South Sides, 69c; McKees Rocks, 55c; Lawrenceville, Homestead, McKeesport, Ambridge, Monaca, Aliquippa, 84c; Monessen, Monongahela City, $1.07; Oakmont, Verona, $1.11; Brackenridge, $1.24.

	No. 2 Fdry.	Malleable	Basic	Bessemer
Saginaw, Mich., from Detroit	26.31	26.31	25.81	26.81
St. Louis, northern	24.50	24.50	24.00	.....
St. Louis from Birmingham	†24.50	.....	23.62	.....
St. Paul from Duluth	26.63	26.63	.....	27.13

†Over 0.70 phos.

Low Phos.

Basing Points: Birdsboro and Steelton, Pa., and Buffalo, N. Y., $29.50, base; $30.74 delivered Philadelphia.

Gray Forge		Charcoal	
Valley furnace	$23.50	Lake Superior fur.	$28.00
Pitts. dist. fur.	23.50	do., del. Chicago	31.34
		Lyles, Tenn., high phos.	28.50

Silvery

Jackson county, O., base, 6.00 to 6.50 per cent $29.50. Add 50 cents for each additional 0.25 per cent of silicon. Buffalo base $1.25 higher.

Bessemer Ferrosilicon†

Jackson county, O., base; Prices are the same as for silveries, plus $1 a ton.

Manganese differentials in silvery iron and ferrosilicon not to exceed 50 cents per 0.50 per cent manganese in excess of 1 per cent.

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

Second Quality

Pa., Ill., Ky., Md., Mo.	46.55
Georgia, Alabama	38.00
New Jersey	49.00

Ohio

First quality	43.00
Intermediate	36.10
Second quality	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, duty pd., tide, net ton	nominal
Washed gravel, f.o.b. Ill., Ky., net ton, carloads, all rail	$23.00
Do., barge	23.00
No. 2 lump	23.00

Ferroalloy Prices

Ferromanganese, 78-82%, Carlots, duty pd., seab'd $120.00; Carlots, del. Pittsburgh 125.33; Carlots, f.o.b. So. f'ces. 145.00. Add $10 for ton, $13.50 for less ton, $18 for less than 200-lb. lots.

Spiegeleisen, 19-21%, gross ton, Palmerton $36.00

Manganese Briquets, Contract carloads, bulk freight allowed, per lb. 5.50c; Packed 5.75c; Ton lots 6.00c; Less-ton lots 6.25c; Less 200-lb. lots 6.50c. Spot ¼c higher.

Manganese Electro, 99.9+%, less car lots 42.00c

Chromium Metal, per lb. contained chromium

	Contract	Spot
98% Cr. ton lots	80.00c	85.00c
88% Cr. ton lots	79.00c	84.00c

Ferrocolumbium, 50-60% f.o.b. Niagara Falls, per lb. contained Cb on contract $2.25; Less-ton lots 2.30 (Spot 10c higher)

Chromium Briquets, per lb., freight allowed

	Contract	Spot
Carlots	8.25c	8.50c
Packed	8.50c	8.75c
Ton lots	8.75c	9.00c
Less-ton lots	9.00c	9.25c
Less 200 lbs.	9.25c	9.50c

Ferrochrome, 66-70%, freight allowed, 4-6% carbon, per pound contained (chrome) Carloads 13.00c; Ton lots 13.75c; Less-ton lots 14.00c; Less than 200-lb. lots 14.25c

67-72%, low carbon, cts. per pound:

	Car loads	Ton lots	Less ton	Less 200 lbs.
2% C.	19.50	20.25	20.75	21.00
1% C.	20.50	21.25	21.75	22.00
0.20% C.	21.50	22.25	22.75	23.00
0.10% C.	22.50	23.25	23.75	24.00

Spot is ¼c higher.

Ferromolybdenum, 55-75%, per lb. contained molybdenum, f.o.b. furnace 95.00c

Calcium Molybdate (Molyte), 40-45% Mo., per lb. contracts, f.o.b. producers plant 80.00c

Molybdic Oxide Briquets, 48-52% Mo. per lb. contained, f.o.b. producers plant 30.00c

Molybdenum Oxide, (In 5 and 20 lb. mo. contained cans) 53-63 mo. per lb. contained f.o.b. producers' plants 80.00c

Molybdenum Powder, 99%, f.o.b. York, Pa., per lb. in 200-lb. kegs $2.60; Do., 100-200 lb. lots 2.75; Do., under 100-lb. lots 3.00

Ferrophosphorus, 17-19%, gross ton carloads, f.o.b. sellers' works, $3 unitage, freight equalized with Rockdale, Tenn. for 18% phos. Contract $58.50; Spot 62.25

23-26%, $3 unitage, freight equalized with Mt. Pleasant, Tenn., for 24% phos. Contract 75.00; Spot 80.00

Ferrosilicon, Gross tons, freight allowed, bulk

	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

(Above for contracts; spot ¼c higher)

Silicon Metal, Spot ¼-cent higher (Per Lb., Contracts):

	1% Iron	2% Iron
Carlots	14.50c	13.00c
Ton lots	15.00c	13.50c
Less-ton lots	15.25c	13.75c
Less 200 lbs.	15.50c	14.00c

Silicon Briquets, Contract 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 4.25c. Spot ¼c higher on less ton lots; $5 higher on ton lots and over.

Silicomanganese,

Carbon	1½%	2½%
Carloads (contract)	$128.00	$118.00
Ton Lots (contract)	140.50	130.50

Freight allowed spot $5 above contract

Ferrotungsten, (All prices nominal) Carlots, per lb. contained tungsten $1.90

Tungsten Metal Powder, (Prices Nominal) 98-99 per cent, per pound, depending upon quantity $2.60-$2.65

Ferrotitanium, 40-45%, f.o.b. Niagara Falls, per lb. contained in ton lots 1.25

Less ton lots 1.35

20-25%, C. 0.10 max., in ton lots per lb. contained Ti 1.40

Less-ton lots (Spot 5c higher)

Ferro-Carbon-Titanium, 15-20% Titanium.

	6-8% C	3-5% C
Carlots, contract, f.o.b. Niagara Falls, freight allowed to destinations east of Mississippi and north of Baltimore and St. Louis	$142.50	$157.50

Ferrovanadium, 35-40%, contract per pound contained vanadium $2.70-$2.80-$2.90 (Spot 10c higher)

Vanadium Pentoxide, Per lb. contained, contracts $1.10; Do., spot 1.15

Zirconium Alloy, 12-15%, carloads, contract, bulk $102.50; Packed 107.50; Ton lots 108.00; Less ton lots 112.50. Spot $5 a ton higher

35-40%, contract, carloads, bulk or package, per lb. alloy 14.00c; Do., ton lots 15.00c; Do., less-ton lots 16.00c. Spot is ¼-cent higher

Alsifer, Per lb., f.o.b. Niagara Falls.

	Contract	Spot
Carlots	7.50c	8.00c
Ton lots	8.00c	8.50c

Simanal, Per lb. of alloy, contracts, freight allowed (approx. 20% Si, 20% Mn, 20% Al)

Carlots	Ton Lots	Ton Lots
10.50c	11.00c	11.50c

WAREHOUSE STEEL PRICES

Base Prices in Cents Per Pound, Delivered Locally, Subject to Prevailing Differentials

	Soft Bars	Bands	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	4.48	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	5.26	3.31	4.06	8.56	7.10
Baltimore	3.85	4.00	4.35	3.70	3.70	5.25	3.50	....	5.05	....	4.05	....	....
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
Indianapolis	3.60	3.75	3.75	3.70	3.70	5.30	3.45	....	5.01	....	3.97	....	....
Cincinnati	3.60	3.67	3.67	3.65	3.68	5.28	3.42	4.00	4.92	3.47	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	3.30	3.75	8.40	6.75
Twin Cities	3.75	3.85	3.85	3.80	3.80	5.40	3.50	4.85	5.25	3.83	4.34	9.09	7.44
Milwaukee	3.63	3.53	3.53	3.68	3.68	5.28	3.18	4.23	4.73	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
Kansas City	4.05	4.15	4.15	4.00	4.00	5.60	3.90	....	5.00	....	4.30	....	....
Omaha	4.10	4.20	4.20	4.15	4.15	5.75	3.85	5.32	6.00	....	4.42	....	....
Memphis	4.15	4.35	4.35	4.20	4.20	5.96	4.35	....	6.00	....	4.56	....	....
Chattanooga	3.80	4.00	4.00	3.85	3.85	5.80	3.75	....	4.50	....	4.39	....	....
Tulsa, Okla.	4.44	4.34	4.34	4.49	4.49	6.09	4.19	....	5.79	....	4.69	....	....
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	....	4.80	5.00	4.60	....	....
Houston, Tex.	3.75	5.95	5.95	4.10	4.10	5.50	4.20	....	5.25	....	7.15	....	....
Seattle	4.00	4.00	5.20	4.75	4.75	6.50	4.75	7.25	6.00	....	5.75	....	....
Portland, Oreg.	4.25	4.50	6.10	4.00	4.00	5.75	3.95	6.50	5.00	....	5.75	....	....
Los Angeles	4.15	5.45	7.25	4.95	4.95	7.20	5.10	7.30	6.30	....	6.60	11.35	10.35
San Francisco	4.00	5.20	6.80	4.70	4.70	6.40	4.70	7.20	6.45	....	7.05	11.60	10.60

	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	7.87	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	6.45	....	8.75	8.60	9.40
Portland, Oreg.	5.70	8.85	8.00	7.85	8.65
Los Angeles	4.80	9.55	8.55	8.40	9.05
San Francisco	6.05	10.60	9.60	9.45	10.10

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 pounds and over, Portland, Seattle; 400-14,999 Twin Cities; 400-3999 Birmingham; 400 pounds and over in Memphis; Los Angeles, bars over 4-in. wide, 1-in. thick, 4.95c.

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; 300-1999 Los Angeles.

Galvanized Sheets: Base, 150-1499 pounds, New York; 150-1499 in Cleveland, Pittsburgh, Baltimore, Norfolk; 1 to 10 bun. in Los Angeles; 300 and over 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; any quantity 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, 1000 and over in Portland, Seattle, 1 to 99 pounds in Los Angeles; 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
	£ s d
Merchant bars, 3-inch and over	$56.50 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—

	£ 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.t. ovens	7.40 1 16 9
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
Mesabi nonbessemer	4.45
High phosphorus	4.35
Mesabi bessemer	4.60
Old range nonbessemer	4.60

Eastern Local Ore

Cents, unit, del. E. Pa.

Foundry and basic 56-63%, contract	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.
Chinese wolframite, net ton, duty pd.	$24.00
Brazil iron ore, 68-69%, ord.	7.50c
Low phos. (.02 max.)	8.00c

F.O.B. Rio Janeiro.

Scheelite, imp.	23.50-24.00
Chrome ore, Indian, 48% gross ton	.....

Manganese Ore

Including war risk but not duty, cents per unit cargo lots

Caucasian, 50-52%	.....
So. African, 50%	68.00-70.00
Indian, 50%	68.00-70.00
Brazilian, 46%	68.00-70.00
Chilean, 47%	68.00-70.00
Cuban, 50-51%, duty free	.....

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.

	Pittsburgh, *Wheeling, *Johnstown, Weirton, Steubenville	Youngstown, *Warren, Canton, Sharon	Chicago	Kokomo, Ind.	Bethlehem	*East. Pa.	Sparrows Pt.	Cleveland	Buffalo	Cincinnati, Ashland, Ky., Portsmouth, O. Middletown, O.	St. Louis	Detroit	Duluth	Alabama City, Atlanta, Birmingham	Los Angeles, San Francisco	Minnequa, Colo., Portland, Oreg.	Seattle, Wash.
OTHER THAN RAILROAD GRADES (a) (b)																	
No. 1 heavy melting	$20.00	$20.00	$18.75	$18.25	$18.25	$18.75	$18.75	$19.50	$19.25	$19.50	$17.50	$17.85	$18.00	$17.00	$17.00	$16.50(f)	$14.50
No. 1 hyd. comp. black sheets	20.00	20.00	18.75	18.25	18.25	18.75	18.75	19.50	19.25	19.50	17.50	17.85	18.00	17.00	17.00	16.50(f)	14.50
No. 2 heavy melting	19.00	19.00	17.75	17.25	17.25	17.75	17.75	18.50	18.25	18.50	16.50	16.85	17.00	16.00	16.00	15.50(f)	13.50
Dealer No. 1 bundles	19.00	19.00	17.75	17.25	17.25	17.75	17.75	18.50	18.25	18.50	16.50	16.85	17.00	16.00	16.00	15.50(f)	13.50
Dealer No. 2 bundles	18.00	18.00	16.75	16.25	16.25	16.75	16.75	17.50	17.25	17.50	15.50	15.85	16.00	15.00	15.00	14.50(f)	12.50
Mixed borings and turnings	15.25	15.25	14.00	14.25	13.50	14.00	14.00	14.75	14.50	14.75	12.75	13.10	. .	12.25(d)	12.25	11.75(f)	9.75
Machine shop turnings	15.50	15.50	14.25	14.50	13.75	14.25	14.25	15.00	14.75	15.00	13.00	13.35	15.50	15.00(d)	12.50	12.00(f)	10.00
Shovel turnings	16.50	16.50	15.25	15.50	14.75	15.25	15.25	16.00	15.75	16.00	14.00	14.35	16.50	16.00(d)	13.50	13.00(f)	11.00
No. 1 busheling	19.50	19.50	18.25	17.75	17.75	18.25	18.25	19.00	18.75	19.00	17.00	17.35	17.50	16.50(d)	16.50	16.00(f)	14.00
No. 2 busheling	15.50	15.50	14.25	13.75	13.75	14.25	14.25	15.00	14.75	15.00	13.00	13.35	13.50	12.50(d)	12.50	12.00(f)	10.00
Cast iron borings	15.75	15.75	14.50	14.00	14.00	14.50	14.50	15.25	15.00	†15.25	13.25	13.60	13.75	12.75(d)	12.75	12.25(f)	10.25
Uncut structurals and plate	19.00	19.00	17.75	17.25	17.25	17.75	17.75	18.50	18.25	18.50	18.50	16.85	17.00	16.00(d)	16.00	15.50(f)	13.50
No. 1 cupola	21.00	21.00	20.00	20.00	22.50	23.00	22.00	22.00	20.00	21.00	20.00	20.35	19.00	20.00(e)	19.50	18.00(g)	18.00
Heavy breakable cast	19.50	19.50	18.50	18.50	21.00	21.50	21.00	20.50	18.50	19.50	18.50	18.85	17.50	18.50(e)	18.00	16.50(g)	17.00
Stove plate	19.00	. .	17.00	16.00	18.00	18.50	18.00	18.00	19.00	17.50	17.00	14.10	16.00	17.00(e)	16.50	15.00(g)	14.00
Low phos. billet, bloom crops	25.00	25.00	23.75	23.75	23.25	23.75	23.75	24.50	24.25	24.50	22.50	22.85	23.00	22.00(e)	22.00	20.50(g)	19.50
Low phos. bar crops and smaller	23.00	23.00	21.75	21.75	21.25	21.75	21.75	22.50	22.25	22.50	20.50	20.85	21.00	20.00(e)	20.00	18.50(g)	19.50
Low phos. punch., plate scrap**	23.00(c)	23.00	21.75	21.75	21.25	21.75	21.75	22.50	22.25	22.50	20.50	20.85	21.00	20.00(e)	20.00	18.50(g)	17.50
Machinery cast cupola size***	22.00	22.00	21.00	21.00	23.50	24.00	23.50	23.00	21.00	22.00	21.00	21.35	20.00	21.00(e)	20.50	19.00(g)	19.00
No. 1 machine cast, drop broken, 150 pounds and under	22.50	22.50	21.50	21.50	24.00	24.50	24.00	23.50	21.50	22.50	21.50	21.85	20.50	21.50(e)	21.00	19.50(g)	19.50
Clean auto cast	22.50	22.50	21.50	21.50	24.00	24.50	24.00	23.50	21.50	22.50	21.50	21.85	20.50	21.50(e)	21.00	19.50(g)	19.50
Punchings and plate scrap††	22.00(c)	22.00	20.75	20.75	20.25	20.75	20.75	21.50	21.25	20.50	19.50	19.85	20.00	19.00(e)	19.00	17.50(g)	16.50
Punchings and plate scrap§§	21.00(c)	21.00	19.75	19.75	19.25	19.75	19.75	20.50	20.25	19.50	18.50	18.85	19.00	18.00(e)	18.00	16.50(g)	15.50
Heavy axle and forge turnings	19.50(c)	19.50	18.25	18.25	17.75	18.25	18.25	19.00	18.75	18.00	17.00	17.35	17.50	16.50(e)	16.50	15.00(g)	14.00
Medium heavy elec. furnace turnings	18.00(c)	18.00	16.75	16.75	16.25	16.75	16.75	17.50	17.25	16.50	15.50	15.85	16.00	15.00(e)	15.00	13.50(g)	12.50
GRADES ORIGINATING FROM RAILROADS																Kansas City	
No. 1 R.R. heavy melting steel	21.00	21.00	19.75	19.25	.....	19.75	19.75	20.50	20.25	20.50	18.50	18.85	19.00	18.00(e)	18.00	17.00	15.50
Scrap rails	22.00	22.00	20.75	20.25	.....	20.75	20.75	21.50	21.25	21.50	19.50	19.85	20.00	19.00(e)	19.00	18.00	16.50
Rerolling quality rails	23.50	23.50	22.25	21.75	.....	22.25	22.25	23.00	22.75	23.00	21.00	21.35	21.50	20.50(e)	20.50	19.50	18.00
Scrap rails 3 feet and under	24.00	24.00	22.75	22.25	.....	22.75	22.75	23.50	23.25	23.50	21.50	21.85	22.00	21.00(e)	21.00	20.00	18.50
Scrap rails 2 feet and under	24.25	24.25	23.00	22.50	.....	23.00	23.00	23.75	23.50	23.75	21.75	22.10	22.25	21.25(e)	21.25	20.25	18.75
Scrap rails 18 inches and under	24.50	24.50	23.25	22.75	.....	23.25	23.25	24.00	23.75	24.00	22.00	22.35	22.50	21.50(e)	21.50	20.50	19.00

*Johnstown, Pa., and Warren, O., not bases for railroad grades; Wheeling railroad only. Eastern Pa. includes Coatesville, Claymont, Conshohocken, Phoenixville and Harrisburg as bases only for "other than railroad grades"; Philadelphia and Wilmington are Eastern Pa. bases only for railroad grades. †Base price at Portsmouth and Ashland; Cincinnati, Middletown 25 cents less. **⅜-inch and heavier, cut 12 inches and under; ***may include clean agricultural cast; ††under ¾-inch to ¼-inch, cut 12 inches and under; §§under ¼-inch to No. 12 gage, cut 12 inches and under. (c) add $1.75 at Pittsburgh. (d) Bases at Alabama City and Birmingham only. (e) Bases at Birmingham only. (f) Minnequa only. (g) Portland only.

OTHER BASE PRICES: Machine shop turnings $17.60, Alloy, W. Va., $13.35 Toledo, O.; **Shoveling turnings,** $14.35 Toledo; **cast iron borings,** $13.60 Toledo; **No. 1 cupola cast,** $19 Minneapolis and St. Paul, $20.50 Chattanooga, $21 Radford, Va. and $22 Phillipsdale; Bridgeport and Worcester; Heavy **breakable cast,** $20.50 Phillipsdale, Bridgeport and Worcester, $17.50 Minneapolis and St. Paul; **Stove plate** $16 Minneapolis and St. Paul, $17.50 Chattanooga, $18 Radford, Va., $15.60 Toledo and $17.50 Phillipsdale, Bridgeport and Worcester; Machinery cast cupola size $21.50 Chattanooga, $22 Radford, Va. and $23 Phillipsdale, Bridgeport and Worcester; **No. 1 machinery cast, drop broken** $22 Chattanooga, $22.50 Radford, Va. and $23.50 Phillipsdale, Bridgeport and Worcester; **Clean auto cast** $22 Chattanooga, $22.50 Radford, Va. and $23.50 Phillipsdale, Bridgeport and Worcester.

(a) The grades specified are, except dealers' No. 1 and No. 2 bundles and uncut structural and plate scrap, as named and defined in the simplified recommendations R-58-36 of the Department of Commerce which shall be the governing specifications for iron and steel scrap hereunder (other than railroad grades). Dealers' No. 1 bundles shall consist of new, clean black sheet scrap, hydraulically compressed in the dealer's yard. Dealers' No. 2 bundles shall consist of old fender and body scrap, and shall in no case command a premium. (b) These grades (other than railroad grades) represent the major classifications of iron and steel scrap. The maximum prices of superior or inferior grades shall continue to bear the same comparable relationship to those major grade classifications as heretofore existed between the prices of such superior or inferior grades and the prices of the major grades.

Maximum price at shipping point: A shipping point is the point from which the scrap is to be shipped to a consumer. Maximum price at which a grade of scrap may be sold f.o.b. its point of shipment is the shipping point of such scrap. **For shipping points located within a basing point,** the shipping point price is determined by taking the basing point price and deducting actual transportation costs to the consumer's plant within the basing point. Exception: Shipping point price within the Cincinnati basing point, for all grades other than No. 1 cupola, heavy breakable, stove plate, machinery cast (cupola size), No. 1 machinery cast (drop-broken 150 lbs. and under) and clean auto cast, shall in no case exceed basing point prices minus 80 cents. **For shipping points outside a basing point,** the shipping point price is determined by taking the nearest basing point and subtracting the lowest transportation charge. (Example: No. 1 steel shipped from Toledo takes the Detroit base of $17.85 minus transportation of $1.52 or $16.33. This shipping point price is the same to all consumers wherever located.) **Exceptions:** Shipping point of any grade not listed as having a basing point in New England is the Johnstown base minus the all-rail freight from the shipping point to Johnstown. Shipping point prices for New York City, Brooklyn, New York and New Jersey must be computed on the basis of the Bethlehem base although nearer to Buffalo in terms of barge transportation.

Maximum prices to consumers: Maximum price at which any grade (other than railroad) may be delivered to a consumer wherever located is the shipping point price plus actual transportation charges. Where shipment is by water, not more than 75 cents per gross ton may be included for handling charges at dock. Maximum delivered price in no case shall exceed by $1 a ton the nearest maximum base price in terms of transportation charges. (Example: The $1 excess is the so-called "springboard" arrangement. Youngstown consumers can draw on the Cleveland area for No. 1 steel scrap by taking the Cleveland base of $19.50, subtracting the Cleveland switching charge of 65 cents and adding freight to Youngstown of $2.08. The resulting delivered figure of $20.93 is within the "springboard" limit of $1 over the Youngstown base of $20.)

Billet and bloom crops originating in the Pittsburgh district may be sold within or without the district at the Pittsburgh base price plus up to, but not more than $2.50 in transportation charges. Maximum prices for **unprepared scrap** shall be $2.50 a ton less than the maximums for corresponding grade or grades of prepared scrap. **Remote scrap** takes a maximum delivered price $5 above the nearest basing point price.

Railroad grades: Where a railroad operates in two or more basing points, the highest base applies to consumers anywhere on the line. (Example: New York Central Railroad uses the $21 Pittsburgh base on No. 1 steel since the P. & L. E. operates there). Exception: Switching charges of 84 cents a ton must be subtracted from prices on scrap originating from railroads operating in Chicago and sold for consumption outside Chicago. Where railroad scrap is shipped to an off-the-line consumer, the highest maximum on-the-line price or the nearest basing point price, whichever is higher, applies. For scrap rails and rerolling rails originating from mines, logging roads, etc., take the nearest basing point and subtract the lowest established transportation charge to determine shipping point price, which need not be less than $13.50 for scrap rails, $15 for rerollers.

Commissions: Brokers are allowed a commission up to 50 cents a ton above maximum prices to consumers, including export.

Export prices: Maximum on No. 1 heavy melting steel (other than railroad) is the domestic shipping point price plus lowest transportation charge to point of export. Maximum price to a domestic consumer on line of the originating railroad plus transportation to point of export applies on No. 1 railroad steel. Customary differentials apply on other railroad and non-railroad grades.

Sheets, Strip

Sheet & Strip Prices, Page 116

Sheet demand continues heavy in all grades, consumers pressing heavily for deliveries on existing contracts. Production restrictions on automobiles, refrigerators, washing machines and similar products has eased pressure to some extent and has made slightly more sheets available to warehouses, though the increase is far from sufficient to meet needs. Stovemakers expect some similar action will be taken in their case and preparations are being made by some producers to meet such a contingency.

An important Ohio sheetmaker announces its sheet equipment for defense were 63.25 per cent of production in November, against 58 per cent in October, which is a fair average for the industry. It is believed a larger proportion of sheet production is going into defense than of steel plates. Predictions are made that early next year defense will take 80 per cent of sheet tonnage.

Galvanized sheets are difficult to obtain, in some cases due more to shortage of sheets for galvanizing than to lack of zinc. Demand for rural areas for galvanized goods is strong.

Plates

Plate Prices, Page 116

General Allocations Order No. 1, to be issued soon by OPM covering steel plates and other material rolled on plate mills, will simplify the situation for plate sellers in some respects. With a large part of bookings in A classifications, much carrying A-1 priority, it has been difficult for each mill to determine which orders are most needed. With a broad view of the entire situation the allocations board is in better position to determine most pressing need and direct shipments to best advantage. Under the circumstances consumers with low A or B classifications have little chance of receiving material.

Operators of continuous strip mills are awaiting details of the order as it applies to their products. Many large producers have been rolling plates up to half-inch thickness, thus bringing them under the plate allocation. Effect of this situation on production of other flat-rolled products is awaited.

Available spot lots of plates are few, including scattered small tonnages of universal plates, but some material is filtering through to secondary distributors. In some instances substantial premiums have been asked and paid on this tonnage. As high as 7 cents per pound is reported to have been done on resale and an Eastern distributor has been asked by OPM to explain his prices.

Approximately 20,000 tons of plates has been reallocated from one mill to four, to fill needs of freight car builders. Most plates in the East go to shipyards and in November shipments were larger than in October.

Maritime Commission has awarded four oil barges to Lancaster Iron Works, Lancaster, Pa., requiring more than 2000 tons of plates and shapes, to be built at Perryville, Md. Duluth Shipbuilding Co., Duluth, was awarded eight of the same type, and Froeming Bros. Inc., Milwaukee, was awarded four oceangoing tugs.

PLATES CONTRACTS PLACED

100 tons, 100 16-ft. lengths, 18-in. i.d. steel shore pipe to Lancaster Iron Works, Lancaster, Pa., and 25 42-ft. lengths pontoon pipe, to American Rolling Mill Co., Middletown, O., serials 90 and 89, respectively, United States engineer, Washington; bids Nov. 14.

PLATES CONTRACTS PENDING

100,000 tons, plates, structurals, bars, castings and miscellaneous metal work, new Gatun Locks, Panama Canal, sch. 5700; bids Jan. 6, 1942, General Purchasing Officer, Panama Canal, Washington.

2500 tons, penstocks for Fort Peck, Montana, dam; bids in to United States engineer, Kansas City.

500 tons, United States engineer, Kansas City, Mo., inv. 199; bids Dec. 1.

Unstated, three water tanks, 100,000 to 200,000 gallons; bids to Defense Public Works, Dec. 2, Seattle; alternates for concrete.

Wire

Wire Prices, Page 117

Orders for merchant wire and its products booked by mills to No-

vember showed a decline and producers were not able to take all tonnage offered. Deliveries to distributors were limited by quotas. Spring wire bookings are heavy, with heat treating of high-grade material a definite choke point. Nailmaking equipment is operating at capacity, though raw material supply is short of requirements. Defense construction continues to require large quantities and requirements for crating war material are far above normal. A current government inquiry calls for 90 carloads.

Navy yards have placed contracts for several thousand tons of corrosion-resisting welding electrodes, thereby increasing backlogs of rod orders. Electrode consumption is at peak level, especially in shipyards. Demand for wire rope is heavy, with marine replacements requiring prompt shipment. Wire rope production is maintained at a high level.

Bars

Bar Prices, Page 117

Some steel bar producers are endeavoring to set up schedules on commercial tonnage for shipments after the beginning of the year. In some cases deliveries are promised only for January, rather than for first quarter. Even these are tentative, in view of uncertainty as to the volume of defense work that may come out in the meantime. This limited policy is necessary in view of probable steel allocations on a broader scale.

It is believed moderate tonnages of bars will be available for commercial users, many of whom have had orders on mill books for many months but have been unable to obtain deliveries.

Pipe

Pipe Prices, Page 117

Pipe demand for miscellaneous defense projects is brisk, including sprinkler systems, oil storage and distribution systems and construction. The Navy is placing orders for boiler tubes and additional large inquiries are out. Railroads are in need of boiler tubes and find difficulty in filling even normal replacements. Business in all types of tubing, notably alloys, is heavy for defense purposes.

Cast pipe buying has slackened but foundries as a rule are unable to build up normal stocks of standard sizes, due to limited pig iron and scrap supplies.

CAST PIPE PLACED

100 tons, mostly 6-inch, Westover Field, Chicopee, Mass., to Warren Pipe Co., Everett, Mass.; bids to United States engineer, Providence, R. I., Nov. 10.

CAST PIPE PENDING

800 tons, 6 to 16-inch, Kelso, Wash.; bids in; alternates for steel and transite.

Unstated, materials for Airport Way projects, Seattle, Dec. 4; alternates for fabricated steel pipe.

Rails, Cars

Track Material Prices, Page 117

Pennsylvania railroad is modernizing 100 additional passenger coaches at its Altoona, Pa., shops, bringing its fleet of completely modern passenger cars to 643, all with air conditioning and most recent types of seating equipment. It also has 498 other passenger cars equipped with air conditioning.

Terminal Railroad of St. Louis has placed five diesel-electric switching locomotives with three builders. This will bring its fleet of this type of switchers to 33 units, said to be the largest concentration by any railroad in a single metropolitan area.

Indications point to the early placing of the freight cars which have been on inquiry for more than a month by United States Steel Corp. subsidiaries. This and several miscellaneous inquiries from the government, some scheduled for export shipment, represent the bulk of active demand for cars at present.

Railroad equipment builders continue to book armament business. J. G. Brill Co. has closed a contract with the War Department for 360 75-millimeter pack howitzer carriages. This follows two previous orders, making a total of 554 carriages delivered and on order.

LOCOMOTIVES PLACED

Belt Railway of Chicago, one 1000-horsepower diesel-electric switch engine, to Baldwin Locomotive Works, Eddystone, Pa.

Bessemer & Lake Erie, four locomotives, two 2-10-4 type going to Baldwin Locomotive Works, Eddystone, Pa., and two 0-8-0 type to American Locomotive Co., New York.

Lone Star Defense Corp., Texarkana, Ark., two 65-ton diesel-electric locomotives, to General Electric Co., Schenectady, N. Y.

National Railways of Mexico, 33 steam locomotives, placed with Baldwin Locomotive Works, Eddystone, Pa., and American Locomotive Co., New York.

Ordnance plant, Weldon Springs, Mo., two 45-ton diesel-electric locomotives, to General Electric Co., Schenectady, N. Y.

Terminal Railroad of St. Louis, five diesel-electric switchers; two each to American Locomotive Co., New York, and Electro Motive Corp., La Grange, Ill., one to Baldwin Locomotive Works, Eddystone, Pa.

War department, forty 2-8-2 type steam locomotives, divided equally between Baldwin Locomotive Works, Eddystone, Pa., and Lima Locomotive Works, Lima, O.; these are in addition to ten of similar type noted in a recent issue as placed with the American Locomotive Co., New York; all 50 of these locomotives are for unnamed destinations.

LOCOMOTIVES PENDING

Navy, Bureau of Supplies and Accounts, delivery Burns City, Ind., one diesel-electric and spares, General Electric Co., Schenectady, N. Y., low, $38,970, sch. 9256.

Navy, one diesel-electric locomotive for delivery to South Boston, Mass.; bids asked.

Pennsylvania, one 4000-horsepower diesel-electric transfer locomotive; contemplated.

CAR ORDERS PLACED

Aluminum Co. of America, two 90-ton transfer cars, to American Car & Foundry Co., New York; in addition to one recently noted.

Chicago, Milwaukee, St. Paul & Pacific, five 70-ton gondolas, to Bethlehem Steel Co., Bethlehem, Pa.

Pittsburgh & West Virginia, five cabooses, to Bethlehem Steel Co., Bethlehem, Pa.

CAR ORDERS PENDING

Aluminum Co. of America, 100 to 200 seventy-ton hopper cars; bids asked.

Mexico Northwestern, 100 fifty-ton steel sheathed box cars; bids asked.

Navy, 15 fifty-ton steel flat cars and 10 fifty-ton steel sheathed box cars; bids asked; Schedule 9470, for delivery to Bayonne, N. J.

BUSES BOOKED

Twin Coach Co., Kent, O.: Twenty-six 40-passenger for New York City Transit System, Brooklyn, N. Y.; ten 40-passenger for Surface Transportation Corp., New York; ten 31-passenger for Northern Indiana Transit Co., South Bend, Ind.; eight 27-passenger and five 31-passenger for Grand Rapids Motor Coach Co., Grand Rapids, Mich.; seven 31-passenger for Central Illinois Electric & Gas Co., Rockford, Ill.; six 33-passenger for Bluebird Coach Lines Inc., Chicago; six 33-passenger for Lang Motor Bus Corp., Long Beach, Calif.; five 31-passenger for Duluth-Superior Transit Co., Duluth, Minn.; three 35-passenger for Bridge Transit Co., Louisville, Ky.; two 33-passenger for Schuylkill Valley Lines, Norristown, Pa.

Structural Shapes

Structural Shape Prices, Page 117

Approximately 100,000 tons of steel will be required for new Gatun locks, Panama Canal, closing Jan. 6, Washington, structurals and plates making up most of the tonnage. This is the largest single individual inquiry for steel to come out for an engineering project in years. Inquiry for fabricated structural steel is heavier in the East; also awards, although practically all tonnage is for high-rated defense construction.

Fabricated structural steel shipments in October were 210,639 net tons, largest for any month since October, 1930, the American Institute of Steel Constructionu reports. October shipments compared with monthly average of 188,527 tons for the first ten months this year. Bookings during October totaled 126,488 tons, smallest for any month this year and 13 per cent less than the monthly average of bookings in 1940. Backlog as of Nov. 1, scheduled for delivery in the next four months, has been reduced to 614,372 tons.

SHAPE CONTRACTS PLACED

18,000 tons, plant, Basic Magnesium Corp., Las Vegas, Nev., to Columbia Steel Co., San Francisco.

6750 tons, additional warehouses and engineering sheds, General Depot, Atlanta, Ga., to Bethlehem Steel Co., Bethlehem, Pa.; A. Farnell Blair, Decatur, Ga., contractor.

3800 tons, engine and welding shops, Fairbanks, Morse & Co., Beloit, Wis., to Bethlehem Steel Co., Bethlehem, Pa.; bids Nov. 12.

2730 tons, extension of pump and blower and sludge disposal building, West-Southwest sewage treatment works, division Q, Stickney, Ill., for Sanitary District of Chicago, to Bethlehem Steel Co., Bethlehem, Pa.; bids Nov. 6.

1045 tons, also 2855 tons of plates, five salvage tugs for Navy, to Basalt Rock Co., Napa, Calif.

1000 tons, state highway bridge, Warrior river, Tuscaloosa, Ala., to Virginia Bridge Co., Roanoke, Va.

730 tons, manufacturing plant, Grumman Aircraft Corp., Bethpage, Long Island, N. Y., to American Bridge Co., Pittsburgh.

700 tons, also 2100 tons of plates, 12 C-3 cargo vessels for Maritime Commission, to Richmond Shipbuilding Corp., Richmond, Calif.

600 tons, also 1400 tons of plates, for 13,000 to 17,000-barrel underground storage tanks, various Pacific coast locations, to Western Pipe & Steel Co., San Francisco.

500 tons, addition, hangar, navy, Bermuda, to U. S. Steel Export Co., New York; additional to 2300 tons for five hangars, contracts for which are pending.

430 tons, building 625 and extension to building 607, navy yard, Philadelphia, to Bethlehem Steel Co., Bethlehem, Pa., through Henry E. Baton Inc., Philadelphia.

300 tons or more, trash racks and other work, Bonneville power house, Oregon, to Bethlehem Steel Co.

300 tons, stop logs and trash racks, Bonneville power house, Oregon, to Pacific Car & Foundry Co., Seattle.

265 tons, oxidation buildings, Defense Ordnance Works, Tyner, Tenn., to Bristol Steel & Iron Works, Inc., Bristol, Va.; Stone & Webster Engineering Corp., Boston, contractor.

200 tons, service bridge, T.V.A. project, Farner, Tenn., to Worden-Allen Co., Milwaukee.

200 tons, addition, mechanical bottling division, Pepsi-Cola Louisville Bottlers Inc., Louisville, Ky., to Snead Architectural Iron Works Inc., Louisville; Leslie V. Abbott, Louisville, contractor; bars to American Builders Supply Co., Louisville.

135 tons, heat-treating buildings, shell plant, Gadsden, Ala., to Southern Steel Works Co., Birmingham; Rust Engineering Co., Birmingham, contractor; Truscon Steel Co., Youngstown, O., awarded 50 tons reinforcing bars.

133 tons, addition and alterations, Rice-Barton Corp., Worcester, Mass., to Stafford Iron Works, Worcester; E. J. Cross Co., Worcester, contractor.

Unstated tonnage, three 150-foot radio towers, Marine Barracks, Quantico, Va., to John Young Jr., Elmhurst, N. Y., second low bidder; design by International-Steacy Corp., low bidder, failed to comply with specifications, spec. 10605; bids Nov. 19.

SHAPE CONTRACTS PENDING

4775 tons, tank plant, for Defense Plant Corp., Grand Blanc, Mich.

2850 tons, airplane repair shop, unit field, Hill field, Utah, for War Department; postponed indefinitely.

2550 tons, flanged channel casings and cover, various locations, for U. S. Maritime Commission.

2200 tons, Hackensack river bridge, near Kearny, N. J., lift, span, Central Railroad of New Jersey; bids scheduled Nov. 28 postponed to later date.

2000 tons, addition to building GL and GF and new manufacturing building, Watervliet, N. Y., arsenal, Lehigh Structural Steel Co., Allentown, Pa., low; direct bids on fabricating and erecting, Constructing Quartermaster, Nov. 27.

1700 tons, superstructure, contract 2, main viaduct, Trafficway project, Kansas City, Mo., J. A. Tobin Construction Co., low on general contract; bids Nov. 18.

1516 tons, inert storehouses, Hawthorne, Nev., for Navy.

1177 tons, Beach Thorofare bridge and approaches, route 56 (Absecon boulevard), section 1, Atlantic City, N. J., also 116,000 pounds, machinery; 5650 square feet, steel grid flooring, and 4320 linear feet, precast concrete piles; bids Dec. 12, E. Donald Sterner, state highway commissioner, Trenton; A-3 rating.

910 tons, power plant addition, Cleve-

SHAPE AWARDS COMPARED

	Tons
Week ended Nov. 29	37,818
Week ended Nov. 22	11,748
Week ended Nov. 15	15,617
This week, 1940	33,970
Weekly average, 1941	28,643
Weekly average, 1940	28,414
Weekly average, Nov., 1941	20,935
Total to date, 1940	1,351,476
Total to date, 1941	1,346,305

Includes awards of 100 tons or more.

land Electric Illuminating Co., Avon, O.

900 tons, Lycoming Aircraft Engine Co., Williamsport, Pa.; Sodoni Construction Co., Wilkesbarre, Pa., general contractor, apparently low.

800 tons, additional facilities, Arsenal, Watertown, Mass.

760 tons, also 193 tons miscellaneous steel and 100 tons rails, Bluestone dam and appurtenant works, New River, near Hinton, W. Va.; bids Dec. 16, U. S. Engineer, Huntington, W. Va.; large tonnage of additional steel, including gates will be installed by contractor, to be furnished by government.

613 tons, building extension, United Engineering & Foundry Co., Youngstown, O.

600 tons, estimated, tank repair building, Watervliet, N. Y., Arsenal; bids Dec. 5, Constructing Quartermaster.

600 tons, one-section seaplane hangar, Naval Air Station, Quonset Point, R. I., with option on full double section; Merritt-Chapman & Scott and George A. Fuller Co., New York, joint contractors; bids to Officer in Charge of Construction, same station include: incinerator, spec. 10733, Dec. 9; addition, dispensary building, spec. 10729, Jan. 7; four-pump service station building, spec. 10657, Dec. 2.

500 tons, shop building, tank production program, Mack Truck Co., New Brunswick, N. J.

420 tons, state highway project RC-41-4, Felts Mills connection, Jefferson county, New York; Mohawk Paving Co., Buffalo, N. Y., contractor, $222,441; also 105 tons reinforcing steel.

234 tons, grade separation, Middlebelt road, Inkster, Mich., for state.

216 tons, fabricated structural steel parts for 24 mobile mooring masts, Naval Air Station, Lakehurst, N. J.; bids Dec. 1, supply officer.

188 tons, state bridge and underpass, De Beque, Colo.

175 tons, state bridge over Androscoggin river, Lewiston-Auburn, Me.

175 tons, scrap metal building, navy yard, Brooklyn, N. Y.

131 tons, plate treater, American Smelting & Refining Co., Newark, N. J.

122 tons, building, Tiffany Place Corp., Brooklyn, N. Y.

120 tons, shapes and bars, state highway bridge, Newtown creek, route 45, Haddon township, New Jersey; bids Dec. 5 to state highway commissioner, Trenton; also alternate on 3538 linear feet, steel shell concrete-filled piles, A-2 rating.

100 tons, 250-ton and 150-ton, electric traveling bridge cranes, Naval Proving Ground, Dahlgren, Va., spec. 10276.

Unstated, forging plant, Isaacson Iron Works, No. 2, Seattle; bids in to Army at Seattle, Nov. 22.

Unstated, towers for 99.5 mile, 230 kv. single circuit transmission line, Midway-Coulee section; bids to Bonneville project, Portland, Oreg.; Dec. 4; No. 2403.

Tin Plate

Tin Plate Prices, Page 116

Tin mills, dependent on strip mills for tin mill black plate, are interested in the extent to which allocations of plates will affect the proportion of strip to be rolled on strip mills which have been rolling plate material also. It is feared plate allocations may reduce the proportion of other flat-rolled steel. Tin plate has not been given a definite blanket rating, being tacitly acknowledged as vital because of its importance to the food supply. Supply of black plates has been adequate to sustain capacity tin mill operations up to this time.

Reinforcing Bars

Reinforcing Bar Prices, Page 117

Demand is heavy for reinforcing bars, largely with preference ratings and at the same time there are numerous inquiries for lots of 50 tons or less without preference. Production in highway mesh has slackened, demand being off seasonally and rods for fabrication are difficult to obtain. Most mesh tonnage now being placed will not be delivered until spring. New Jersey will close Dec. 5 on highway work taking several hundred tons and New York state is about to place 500 tons. Inquiry in the East and North is expected to be light for the next several months. Ratings as high as A-2 in some instances apply to active projects.

For most part only rated jobs are considered by suppliers and not all offered business brings bids.

REINFORCING STEEL AWARDS

1500 tons, approximate, partial requirements, concrete graving dock, navy yard, Boston, to Concrete Steel Co., Boston; J. F. Fitzgerald Construction Co., Boston, contractor; additional contracts for this project being figured, part 4 closing Dec. 3.

850 tons, additional warehouses and en-

gineering sheds, General Depot, Atlanta, Ga., to the Southern General Fireproof Co., Atlanta; A. Farnell Blair, Decatur, Ga., contractor.

700 tons, expansion, Granite City Steel Co., Granite City, Ill., to Laclede Steel Co., St. Louis.

700 tons, aluminum plant, Troutdale, Oreg., to Mercer Steel Co., Portland, (reported). Aluminum Co. of America, general contractor.

700 tons, aluminum plant, Spokane, Wash., to Northwest Steel Rolling Mills, Seattle; Aluminum Co. of America, general contractor.

690 tons, two additions, Worthington Pump & Machinery Co., Holyoke, Mass., 500 tons to Truscon Steel Co., Youngstown, O., and 190 tons to Berlin Construction Co., Berlin, Conn.; United Engineer & Construction Co., Philadelphia, contractor; Bethlehem Steel Co., Bethlehem, Pa., awarded 68 tons building mesh.

625 tons, Odair, Wash., for Bureau of Reclamation, to Inland Steel Co., Chicago; disposition of 3575 tons additional not known; bids to Denver, Oct. 28.

600 tons, ordnance machine shop, navy yard, Brooklyn, to Truscon Steel Co., Youngstown, O.; John Lowry, Inc., New York, contractor.

500 tons, state hospital workers' building, Philadelphia, to Republic Steel Corp., Cleveland, through Ceco Steel Products Corp.; Ralph Herzog, contractor.

400 tons, storehouse, navy yard, Boston, to Bethlehem Steel Co., Bethlehem, Pa.; Matthew J. Cummings Co., Boston, contractor.

400 tons, additional buildings (Supp. agreement 1) naval hospital, Portsmouth, Va., to Truscon Steel Co., Youngstown, O.; R. R. Richardson Co. & Associates, Norfolk, Va., contractors.

360 tons, photographic laboratory, Wright field, Ohio, to Pollak Steel Co., Cincinnati; James I. Barnes Co., contractor.

350 tons, army base, St. Lucia, British Guiana, to Joseph T. Ryerson & Son Inc., Chicago.

260 tons, mesh, state highway project RC-41-46, Guilderland-Duanesburg, Albany county, New York, to Truscon Steel Co., Youngstown, O.; Arute Bros. Inc., New Britain, Conn., $447,581, contractor.

200 tons, mesh, state highway project, Orange county, New York, to Wickwire Spencer Steel Co., New York; John Arborio Inc., Poughkeepsie, N. Y., contractor.

200 tons, army base, Georgetown, British Guiana, to Joseph T. Ryerson & Son Inc., Chicago.

200 tons, Philadelphia navy yard; 100 tons to Bethlehem Steel Co., Bethlehem, Pa., 100 tons to Capitol Steel Co., Brooklyn, N. Y.

170 tons, housing project, Rockford, Ill., to Bethlehem Steel Co., Bethlehem, Pa.; Steenberg Construction Co., contractor.

139 tons, two additions of 84 and 55 tons, respectively, Shuster Stores, Milwaukee, to Ceco Steel Products Corp., Milwaukee; bids Oct. 20.

120 tons, naval base dispensary, Norfolk, Va., to Truscon Steel Co., Youngstown, O.; Doyle & Russell, contractor.

105 tons, hydraulic building, General Electric Co., Schenectady, N. Y., to Albany Steel & Iron Co., Albany, N. Y.

100 tons, defense projects in Alaska, to Northwest Steel Rolling Mills, Seattle.

100 tons, hydraulic building, General Electric Co., Schenectady, N. Y., to Albany Steel & Iron Co.

100 tons or more, paving and miscellaneous facilities, General Depot, Atlanta, Ga., to Cosco Products Co., Atlanta; Hugh McMath, Columbus, Ga., contractor.

Unstated tonnage, sewage plant and gasoline storage system, air field, Houlton, Me., to Bethlehem Steel Co., Bethlehem, Pa.; steel pipe to National Tube Co., Boston; Ley Construction Co., Springfield, Mass., contractor.

REINFORCING STEEL PENDING

7800 tons, additional miscellaneous structures and facilities, dry docks, navy yard, Brooklyn; bids Dec. 8 to contractors for Dry Docks Inc., New York; deliveries to start in January and extending through to December, 1942.

5000 tons, plant, Hercules Powder Co., Merrimac, Wis.; Bechtel, McCone & Parsons, contractor.

4000 tons, incendiary bomb plant, Pine Bluff, Ark.

3400 tons, Bureau of Reclamation, invitation A-33457-A-1, Coram, Calif.; low bids as follows: 1050 tons, Youngstown Sheet & Tube Co., Youngstown, O.; 850 tons, Carnegie-Illinois Steel Corp., Pittsburgh; 750 tons, Columbia Steel Co., San Francisco; 750 tons, Inland Steel Co., Chicago; bids to Denver Nov. 25.

3200 tons, residential development, Alexandria, Va.; Starrett Bros. & Eken, contractor.

3080 tons, Bluestone dam and appurtenant works, New River, near Hinton, W. Va.; bids Dec. 16, U. S. Engineer, Huntington, W. Va.

2300 tons, Outhwaite homes, second unit, Cleveland; bids Dec. 9.

1500 tons, dry dock, Part 4, navy yard, Boston; bids Dec. 3.

850 tons, bridge No. 3, War Department building-road network, D. of C., Washington; bids Dec. 11, Federal Works Agency, Public Roads Adm.

717 tons, Mountain Home, Idaho, project, bids in to Reclamation Bureau.

700 tons, viaduct over Pere Marquette railroad, Erie, Mich.

700 tons, storage building, Phillip Morris Co., Richmond, Va.; John T. Wilson Co., contractor.

630 tons, Panama, sch. 5757; bids Dec. 10, Washington.

600 tons, plant, Aluminum Co. of America, Bauxite, Ark.

500 tons, additional facilities, Wright Aeronautical Corp., Paterson, N. J.

500 tons, building, navy yard, Boston; Thomas O'Connor & Co. Inc., Cambridge, contractor.

500 tons, two manufacturing buildings, Wright Aeronautical Corp., East Paterson, N. J.

404 tons, Beach Thorofare bridge and approaches, route 56 (Absecon boulevard), section 1, Atlantic City, N. J.; Dec. 12, E. Donald Sterner, state highway commissioner, Trenton, A-3 rating.

400 tons, building, War Department, Ridge Bridge, Arlington county, Virginia; bids Nov. 27.

400 tons, bridge No. 1, road network, Arlington county, Virginia; bids in, Nov. 27, to Federal Works Agency, Washington.

300 tons, wind tunnel, Navy, Carderock, Md.; bids Dec. 3.

300 tons, Chapman Valve Mfg. Co., Indian Orchard, Mass.; Stone & Webster, contractor.

255 tons, mesh, state highway project, route 28, section 22A, VanSyckle's Corner, Hunterdon county, New Jersey, also 66 tons, structural steel in bridge; bids Dec. 5 to state highway commissioner, Trenton; A-4 rating.

250 tons, navy yard, contract No. 4100, Norfolk, Va.; Dry Dock Associates, contractor.

225 tons, state highway project, Goshen-Fair Oaks, part 2, Orange county, New York; Lane Construction Corp., Meriden, Conn., $637,522.90, contractor; 900 tons, structural steel awarded American Bridge Co., Pittsburgh, previously reported.

205 tons, state highway project, Newburgh, N. Y.; John Arborio Inc., Poughkeepsie, N. Y., contractor, $403,935.

200 tons, factory building, Poughkeepsie, N. Y.

200 tons, tank parts plant, American Steel Foundries, East Chicago, Ind.

197 tons, bridge, SN-FAP-283E (1), Franconia, N. H.

185 tons, state highway project, route 28, sections 24A and 25A, Whitehouse relocation, Hunterdon county, New Jersey; bids Dec. 12, E. Donald Sterner, state highway commissioner, Trenton, A-4 rating.

160 tons, state bridge over Salt Creek, Lincoln, Ill.; Sangamo Construction Co., Springfield, Ill., low on general contract; bids Nov. 18.

150 tons, housing project, Chester, Pa.; bids Dec. 16.

130 tons, also 46 tons structural steel, state highway bridge, route 45 and 47, Big Timber Creek, Brooklawn, N. J.; bids Dec. 5 to state highway commissioner, Trenton; also 1884 linear feet steel shell piles; A-2 rating.

125 tons, mesh, state highway project, route 35, section 38-A, Middlesex county, New Jersey; Weldon Contracting Co., Westfield, N. J., low, $481,169, rating A-1-j, bids Nov. 21, Trenton.

120 tons, Berlin dam, U. S. Engineer, near Deerfield, C.; bids Dec. 18.

106 tons, superstructure, South District filtration plant, city of Chicago; Paschen Contractors Inc., Chicago, low on general contract; bids Nov. 21.

100 tons, office building, Illinois Bell Telephone Co., Rock Island, Ill.; bids Nov. 25.

Unstated, Spokane street viaduct, Seattle, estimated cost $1,000,000; bids to state highway department, Olympia, Dec. 16.

CONCRETE BARS COMPARED

	Tons
Week ended Nov. 29	10,069
Week ended Nov. 22	5,851
Week ended Nov. 15	10,814
This week, 1940	18,077
Weekly average, 1941	14,182
Weekly average, 1940	9,661
Weekly average, Nov., 1941	11,379
Total to date, 1940	473,539
Total to date, 1941	680,760

Includes awards of 100 tons or more.

Pig Iron

Pig Iron Prices, Page 118

OPM has notified pig iron producers that so-called free iron is not to be sold except under its specific direction. Producers frequently have had some tonnage left after all allocations for a given month were filled, due to inability of determining production accurately. This has been sold outside the allocations. In future this will be directed to melters most in need. A new form, PD-71-A, is understood to be in preparation to cover such situations.

As higher consumer inventories are leveled under mandatory distribution additional tonnage is going to melters who were curtailed earlier in the program. This tends to reduce tonnage available for less essential needs. This is expected to appear more markedly in January allocations, which will be based

more on actual requirements than on inventory.

Blast furnaces banked a week ago because of the coal strike have resumed production as coke supply became available, the only exception being two stacks in the Birmingham district where miners are still out. This strike was not part of the captive mine trouble. Negotiations are on for a settlement.

December allocations have been received and show little change from previous months, except a few shifts resulting from coal strike interruption.

Pig iron output in the Buffalo district has reached an all-time high by blowing in of Bethlehem Steel Co.'s sixth blast furnace stack at Lackawanna Works. All 16 stacks in that district are in blast.

Scrap

Scrap Prices, Page 120

OPA last week took direct steps to enable California steel mills to tap scrap supplies from every point in California and Oregon in an effort to increase supplies. Maximum basing point prices at San Francisco and Los Angeles are increased $2.50 per ton on all open-hearth grades and $1.50 on No. 1 cupola cast, St. Louis differentials on other cast grades to apply. A shipping point price of $12 per ton for No. 2 heavy melting steel may be paid at any shipping point in California where the present maximum is below that figure. Existing differentials will continue on steelmaking and foundry grades. With respect only to steelmaking grades Oregon is added to the nine other states previously defined as remote scrap areas, allowing payment of $12 per ton at shipping points in Oregon and absorption of freight charges up to $5 per ton. Pittsburg, Calif., is established as a basing point with the same prices as San Francisco. Portland, Oreg., is eliminated as a basing point for steelmaking grades, but continued as a base on cast grades.

OPA also has advanced low phosphorus scrap $1 at Cincinnati and Portsmouth, O., and Ashland, Ky.

Buffalo steelmakers have received about 10,000 tons additional scrap by boat from the head of the lakes, which will be a temporary help. Little more is likely to be received from this source this fall as navigation probably will close soon.

An important steel producer in the Chicago district will reduce operations 10 per cent, commencing the first week in December, to conserve scrap by gradual shortening. This will be the first curtailment in that district because of scrap shortage. Receipts are below consumption and reserves are being depleted. Some steelmaking grades are being diverted to other centers. A few allocations have been made to foundries in that district, to avoid shutdowns.

Much dissatisfaction is expressed over abrogation of the 50-cent per ton commission on yard scrap. Dealers claim they perform an essential service in preparing scrap purchased from collectors who do not have facilities and also that cost of preparation has increased materially.

While 150 tons of iron and steel scrap, half being steel pipe, were withdrawn from the sale to be disposed of by direct allocation, 1000 tons of nickel steel turnings were sold to Luria Bros. & Co. Inc., Philadelphia, at $16.86 per gross ton by the supply officer, Washington navy yard, under catalog 131-B, closing Nov. 18.

Expecting scrap supply to be relatively less in 1942 steelmakers are preparing to use a higher proportion of pig iron in open hearths. Industrial and home scrap will in-

Tool Steel Scrap

Cents per pound, to consumers f.o.b. shipping point

Tungsten Types

For each 1% tungsten contained
Solid scrap containing over 12%...1.80c
Solid scrap containing 5 to 12%....1.60
Turnings, millings containing over 12% 1.40
Turnings, millings, solids under 5% .1.25

Molybdenum Types

Solid scrap, not less than 7% molybdenum, 0.50 vanadium 12.50
Turnings, millings, same basis...10.50
Solid scrap, not less than 3% molybdenum, 4% tungsten, 0.50 vanadium 13.50
Turnings, millings, same basis....11.50

increase as steel output is enlarged but miscellaneous scrap is expected to diminish.

Warehouse

Warehouse Prices, Page 119

Proof of the restricted ability of warehouses to meet consumer demand is found in the increasing number of inquiries to mills for less than carloads in nearly all products. When rated sufficiently high these are being accepted and combined with other orders to form sufficient tonnage for a rolling.

Warehouse stocks of wire and wire products are unbalanced and orders are difficult to fill, manufacturers' stocks are on a hand-to-mouth basis, necessitating frequent attempts to obtain more material. Nails continue among the most difficult products to obtain.

Pacific Coast

Seattle—Work has begun on the proposed aluminum reduction plants at Troutdale, Oreg. and Spokane, Wash. Unstated tonnages of shapes have been placed with interests at Pittsburgh. Northwest Steel Rolling Mills will furnish 700 tons of reinforcing bars for the Spokane project and Mercer Steel Co., Portland, is reported to have a similar tonnage for Troutdale. Announcement by Defense Plant Corporation states that a $22.000.000 contract has been placed with United Engineering & Foundry Co., Pittsburgh, for construction of proposed 300,000 ton annual capacity aluminum fabricating plant at Fairview, Oreg., to be operated by Alcoa, adjacent to the reduction plant at Troutdale.

Washington state highway department has called bids Dec. 16 for the long delayed Sookane street viaduct, Seattle, a $1,000,000 project, involving about 1000 tons of steel. Alternates will be received for creosoted timber approaches in view of the scarcity of prompt steel.

Bids were opened by navy officials at Seattle Nov. 22 for construction of No. 2 plant for Isaccson Iron Works, Seattle, designed for heavy forging.

Stop logs and trash racks for Bonneville power house, totaling more than 600 tons, have been placed with Bethlehem Steel Co. and Pacific Car & Foundry Co., Seattle, by U. S. engineer. Unstated tonnages are involved in the 99.5 mile single circuit steel tower transmission line, from Midway to Coulee, bids to Bonneville Project, Portland, Dec. 4.

Cast iron pipe continues in better demand than agencies are prepared to serve, priorities delaying many proposed municipal improvements.

Receipts of steel scrap are increasing with freight adjustments following the survey recently made on this coast by OPM officials. Rolling mills report sufficient stocks for the present but view the future with uncertainty. Dealers state that some of the confusion previously prevailing has been removed but they are still far from happy with existing conditions. Cast iron scrap continues scarce and foundries are unable to obtain as much as they can use.

There is no change in the warehouse situation, stocks are low and replacements slow, many months behind. Sheets are in extremely strong demand with plates and bars also strong.

Rolling mills are working on imposing backlogs and meantime refusing new business except that required by defense agencies.

Canada

Toronto, Ont.—Further drastic reduction in iron, steel and nonferrous metals for civilian manufacture is under consideration by the steel controller and the metals controller. The country is faced by severe shortage of raw materials and as new plants come into production even greater difficulties will be experienced in supplying steel and other metals for war supplies. Canadian steel mills are maintaining capacity production and have about reached their limit with present facilities. While additional rolling mill capacity will be available early next year, no enlargements are underway for pig iron, and additional raw materials must come from scrap.

Plate producers are flooded with orders and backlogs assure capacity production to the end of the war. There has been some increase in output of armor plate recently and shipments to tank builders are increasing. Shipbuilding requirements are absorbing all available supplies and efforts are being made to extend and speed deliveries from the United States. Rolling stock builders are receiving some plates but not sufficient to assure capacity production.

Local mill representatives have no sheets to sell, and most orders are going direct to mills from government sources. The automotive industry has been placing contracts recently and it is stated a large part of this buying has been done in the United States. Warehouse operators report only small stocks of sheets.

Inquiries for merchant bars are gaining and mills are turning down many orders. Civilian users obtain supplies only when mills have a surplus over war needs. Most bookings now are directly associated with the war effort, and no assurance can be given as to delivery even on this business.

Structural lettings are falling off steadily, due to restrictions on use of steel in construction unless directly associated with the war. However, fabricators are running full time to take care of backlogs and have enough business to maintain this rate almost to the end of next year.

Merchant pig iron sales continue to absorb all foundry and malleable grades, and supply falls far short of meeting requirements. Under government control, deliveries of pig iron are going almost ex-

clusively to melters making castings for the war program. Civilian foundries are receiving barely sufficient iron to take care of their more pressing needs and only after war contractors are supplied. Pig iron production is at capacity although one old stack has not been blown in.

While the government has not taken over control of deliveries of iron and steel scrap the steel controller has made a number of special appeals to all holders of scrap to assist in meeting the expanding demand. Imports of scrap from the United States dropped sharply during the week with the close of Great Lakes navigation in this area.

Metallurgical Coke

Coke Prices, Page 117

About 4000 beehive coke ovens in the Connellsville district, made idle by the coal strike, have resumed but a few independent ovens dependent on truck deliveries have been unable to obtain sufficient coal. Clairton coke works of Carnegie-Illinois Steel Corp. has resumed at full capacity after a 30 per cent reduction. Coke stocks at this company's blast furnaces are negligible and cannot be replenished rapidly under present consuming conditions.

Some foundries were able to run through the strike period without interruption but foundry deliveries have been cut into by demand from blast furnace operations.

Steel in Europe

Foreign Steel Prices, Page 119

London — (*By Cable*) — Little change has taken place in the steel and iron position in Great Britain except a slight increase in hematite iron output, although deliveries continue severely restricted. Semifinished steel stocks are plentiful. Railroad and colliery maintenance requirements are being met, including steel colliery arches. Domestic trade in tin plate is good, within present restrictions. The sheet market is relatively quiet.

Jewelry Shops To Make Badges for Government

With prospects of closing or sharply curtailing operations by the end of the year because of inability to secure brass and copper, costume jewelry shops in some instances are partially filling gaps with government contracts, priority ratings for which will enable them to maintain employment for part of shop forces.

The Robbins Co., Attleboro, Mass., will fabricate 112,500 badges for the government at $19,800; Cohn & Rosenberger Co., Providence, R. I., 295,000 silver bars, $13,563.45, and Uncas Mfg. Co., Providence, 68,000 badges, $12,456.

Equipment

Boston—Sub-contracting is an increasing factor in the machine tool industry of New England, notably by a group of Rhode Island shops well equipped to meet close tolerance and heat-treating requirements. Several of these also have moderate prime contracts for defense, but tend to take on subcontracts to a greater extent. This applies mostly to the better equipped shops, some of which are considering expansions and additional purchases of tools. There is only slight decline in new business being placed with builders and prospective orders are heavy. Demands on roller and ball bearing plants loom large and most are adding to equipment. Machine tools required for the supplemental torpedo production program will not be delivered before 1943, according to current outlook. Engineers from Newport, R. I., will lay out the tool program in co-operation with a leading can manufacturer and many precision tools will be required. Deliveries of boring mills appear to be the most extended, shops producing that type of equipment being heavily booked.

New York—Supplemental programs for aircraft engine, combat tank and miscellaneous armament production continues to add to machine tool orders without interruption and the volume of tooling required indicates no early slackening. Deliveries are being deferred although some tools are subject to diversion as to deliveries; when this is done attempts are being made to minimize confusion and hardship. Supplies of materials for machine tool building are well maintained as a rule. There are scattered complaints, but the high rating given machine tool shops from the start of the emergency has worked well and smoothly. Builders of heat-treating equipment are sold months ahead and demand still tends upward. Ratio of de-

fense needs requiring heat-treatment is notably high. New specifications have made necessary changes in heat-treating equipment, replacement of furnaces and controls with supplemental training of employes to prevent spoilage.

Seattle—Stocks of equipment are lowest in years and dealers unable to obtain replacements are turning down new business. Used items are also scarce. Defense projects under priorities are obtaining requirements but counties face difficulties in getting automotive equipment for which there is a strong demand. Bonneville Project opened bids Nov. 24 for 10,500 feet of conductor and accessories for North Bonneville line. U. S. engineer, Portland, has called bids Dec. 2 for 210,500 feet of conductor wire for Bonneville power house.

Nonferrous Metals

New York—Special Senate committee investigating the national defense program will open hearing on copper Dec. 8. Complaints from several directions will be aired on the way SPAB and OPM have handled copper production and priorities, although, so far as the latter know, copper production is as high as possible and the shortages which have forced conservation of the limited supply are legitimate defense shortages.

Copper—Among producers, fabricators and consumers there is little sympathy for REA to secure 4500 tons of metal per month since available supplies have been inadequate for all defense and essential civilian requirements.

Lead—Leon Henderson, OPA administrator, has agreed to confer with representatives of the industrmy Jan. 5 to determine whether price of lead should be increased. A congressman says that a 7.50c refined lead price would bring out an additional 10,000 tons of lead per month from domestic mines, or an increase of about 25 per cent. OPM estimates November lead supply at 73,000 tons while requests received for allocations totaled about 106,000 tons.

Zinc—Delay in announcing the December pool rate has strengthened belief that OPM may take a larger portion of production for the emergency pool, possibly as much as 100 per cent, which would be in line with the SPAB's direct allocation program. OPA issued a schedule establishing maximum prices for rolled zinc sheet, strip and plates.

Tin—Offerings continued light due to the relatively high price level in the Far Eastern market, the primary source of domestic supplies.

Hahn Engineering Co., 30 Church street, New York, manufacturer of pipe line ash conveyors, coal bunkers, hoppers, and mechanical soot blowers, has become a division of the Luria Steel & Trading Corp., Woolworth building. Eugene Hahn will direct activities of the new division.

Nonferrous Metal Prices

Nov.	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	5.85	5.70	8.25	15.00	14.00	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	9.10
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

No. 1 Composition Red Brass

New York	10.12½-10.25
Cleveland	10.25-10.50
Chicago	10.25-10.50
St. Louis	10.50

Heavy Copper and Wire

New York, No. 1	10.00
Cleveland, No. 1	10.00
Chicago, No. 1	10.00
St. Louis	10.00

Composition Brass Turnings

New York	9.37½-9.75

Light Copper

New York	8.00
Cleveland	8.00
Chicago	8.00
St. Louis	8.00

Light Brass

Cleveland	6.00-6.25
Chicago	6.00-6.25
St. Louis	6.25

Lead

New York	5.25-5.50
Cleveland	5.00-5.25
Chicago	4.75-5.00
St. Louis	4.75-5.00

Old Zinc

New York	5.00-5.25
Cleveland	4.00-4.12½
St. Louis	4.50-5.00

Aluminum

Mis., cast	11.00
Borings, No. 12	9.50
Other than No. 12	10.00
Clips, pure	13.00

SECONDARY METALS

Brass ingot, 85-5-5-5, l. c. l.	13.25
Standard No. 12 aluminum	14.50

DIED:

■ **Matthew J. Esser,** 66, secretary-treasurer, Fuller & Johnson Co., Madison, Wis., from 1926 until his retirement in 1931, Nov. 16, in that city. He had been associated with the company 38 years.

♦

Eugene L. Le Baron, 72, head of the E. L. Le Baron Foundry Co., Brockton, Mass., Nov. 20.

♦

Stuart Judson Marble, 51, manager, industrial department, Revere Copper & Brass Inc., New York, in that city, Nov. 24.

♦

Albert Quincy Dufour, 67, Wisconsin district manager, Jeffrey Mfg. Co., Columbus, O., Nov. 17, at his home in Whitefish Bay, Wis.

♦

Herbert A. McCord, 82, retired president of McCord & Co., Detroit, subsidiary of McCord Radiator & Mfg. Co., maker of automobile parts, at his home in Winnetka, Ill., Nov. 21.

Report on Metalworking Machine Builders' Sales

■ Combined sales reported by 18 companies manufacturing metalworking machinery totaled $144,000,000 in 1940, compared with $82,000,000 in 1939, according to a survey by the Securities & Exchange Corp. The report was based on studies of industry groups whose companies have securities listed under the SEC act.

Net profit of the 18 companies after all charges totaled $22,000,000 in 1940, against $11,000,000 in 1939, and was respectively equal to 15.1 per cent and 13.8 per cent of sales. Dividends paid out by these companies totaled $12,000,000 last year, compared with $6,700,000 in 1939.

Their combined assets at the end of 1940 totaled $119,000,000, compared with $94,000,000 a year earlier. Surplus increased from $47,000,000 to $56,000,000, for the entire group, at the close of 1940.

Hobart Honors Veterans

■ Banquet honoring 22 employes who have qualified this year for its Quarter Century Club was held recently by Hobart Mfg. Co., Troy, O. Induction into the organization of the new members brings to 120 the total of Hobart employes who have been with the company in the factory, office or selling field 25 or more years. Each of the new members was presented an engraved certificate and silver pin and granted the annual privilege of an extra week's vacation with pay.

Construction and Enterprise

New York

BROOKLYN, N. Y.—H. M. Sushan, engineer, 367 Fulton street, will soon let contract for one-story 76 x 96-foot machine shop for Cameron Machine Co., 61 Poplar street. Cost estimated at $40,000.

BUFFALO—Farnham Mfg. Co., 1646 Seneca street, has awarded contract to H. F. Stimm Inc., Ellicott Square building, for factory to cost $40,000, with equipment.

CHERRY CREEK, N. Y.—Chautauqua-Cattaraugus Electric Association, Raymond O. Colburn, president, has received REA allotment of $176,000 to finance construction of 177 miles of rural lines.

CLINTON, N. Y.—REA has allotted $170,000 to Oneida County Electric Association, Ray A. Todd, president, to finance construction of 160 miles of rural transmission lines.

NORTH TONAWANDA, N. Y.—Durez Plastics & Chemicals Inc., Walsh street, has let contract to George W. Morris Construction Co., Jackson building, Buffalo, for factory, to cost over $40,000.

ROCHESTER, N. Y.—Haloid Co. plans 40 x 250-foot factory, for which contract has been let to Luther & Sons Co. Cost $40,000.

Ohio

CLEVELAND—Weldon Tool Co., 3000 Woodhill road, has been allotted $18,654 for purchase of machinery and equipment, by Defense Plant Corp.

CLEVELAND—Colonial Iron Works, L. M. Stern, president, 17643 St. Clair avenue, will build one-story 75 x 120-foot factory extension, costing $40,000. (Noted Oct. 20).

CLEVELAND—Steel Improvement & Forge Co., East Sixty-fifth and Addison road, has let contract to J. L. Hunting Co., Ninth-Chester building, for one-story 60 x 175-foot steel factory addition. Estimated cost $50,000.

CLEVELAND—Reliance Electric & Engineering Co., 1088 Ivanhoe road, has purchased present plant of Cleveland Hobbing Machine Co. at 1170 East 152nd street, and will remodel the 75,000 square foot building when the latter company moves to its new plant now under construction on Chardon road.

JEFFERSON, O.—General Electric Co., Schenectady, N. Y., will erect a 50 x 60-foot addition to its plant here, to increase welding facilities. Cost $50,000.

KENT, O.—Davey Compressor Co., S. V. Saginor, general manager, 266 North Water street, is installing machinery and equipment for air compressor assembly in the Williams Bros. Co. building.

SANDUSKY, O.—S. E. Hyman Co. is considering erection of factory addition costing approximately $40,000.

Additional Construction and Enterprise leads may be found in the list of Shapes Pending on page 124 and Reinforcing Bars Pending on page 126 in this issue.

Massachusetts

WEST NEWTON, MASS.—Zenith Products Inc., 58 Chestnut street, maker of pumping machinery and allied specialties, will install motors and controls, switchgear, regulators, conveyors, electric hoists and other equipment in one-story plant in Allston Park district, Nonantum, Mass. Cost over $500,000.

Pennsylvania

ERIE, PA.—Erie Enameling Co., 1400 West Twentieth street, has purchased from American Rolling Mill Co., Middletown, O., former Erie Steel Barrel Co. plant at Nineteenth and Raspberry street, containing 20,000 square feet of floor space.

POTTSTOWN, PA.—Jacobs Aircraft Engine Co. has started construction of an aircraft engine plant here costing approximately $13,000,000, which is being financed through loans from Defense Plant Corp.

WILLIAMSPORT, PA.—Hygrade Sylvania Corp., H. Ward Zimmer, general manager, will take bids late in December for two-story radio products manufacturing plant. Estimated cost $500,000, including equipment.

Michigan

ADRIAN, MICH.—Bohn Aluminum & Brass Corp., 1400 Lafayette building, Detroit, is considering erection of a $1,415,000 plant here.

DETROIT—Austin Co. will erect a shop and office building on Lyndon avenue for Bassler-Carter Co., 3500 Grandy.

DETROIT—Michigan Wire Cloth Co., 2100 Howard, is modernizing and expanding its plant and equipment to meet defense demand.

DETROIT—Glern & Anholt Tool Co., 1312 Mt. Elliott, has awarded contract to Robert Tillotson, Bloomfield Hills, Mich., for an addition to its factory.

FAIR HAVEN, MICH.—Ira township plans waterworks filtration plant costing about $60,000 with equipment. Ayers, Lewis, Norris & May, Ann Arbor, Mich., engineers.

MONTAGUE, MICH.—Michigan Public Service Co., Whitehall, Mich., will soon start construction of a $200,000 diesel power plant near here.

MUSKEGON, MICH.—Campbell, Wyant & Cannon Foundry Co. will erect a one-story foundry building, 120 x 350 feet. Jensen & Keough, Detroit, architects.

MUSKEGON, MICH.—Continental Aviation & Engineering Corp. has awarded contract to Strom & Strom, Muskegon, for an addition to its factory. (Noted Sept. 1.)

Illinois

CHICAGO—Charles Bruning Co., 4700 Montrose avenue, will erect an addition to its plant, containing 9000 square feet, and costing $30,000. Equipment will cost $15,000.

CHICAGO—Industrial Screw Machine Products Co., 1650 West Seventy-fifth place, will soon start work on a one-story, 60 x 70-foot addition. Luther & Christensen, 9453 South Ashland avenue, architects.

EAST ST. LOUIS, ILL.—Defense Plant Corp. has authorized expenditure of $4,000,000 to expand facilities of American Zinc Co. at its plants in Fairmont City and Monsanto, Ill.

New Jersey

HILLSIDE, N. J.—D. O. Evans, 1445 North Broad street, has plans by J. Wind Jr., same address, for one-story, 65 x 185-foot steel machine and assembly shop.

NEWARK, N. J.—American Steel Castings Co., Edwards street and L avenue, has awarded contract to Walter Kidde Construction Co., 140 Cedar street, New York, for one-story pattern shop, machine shop and foundry addition to cost $200,000. Defense Plant Corp. will finance.

Alabama

ANNISTON, ALA. — Defense Plant Corp. has authorized execution of a lease agreement with Kilby Steel Co. to provide for purchase of machinery costing $40,000 for installation in plant to be used in manufacture of ordnance equipment.

Georgia

COLUMBUS, GA.—City will soon call bids for construction of $370,000 improvements, extensions and additions to

waterworks system, for which it has grant of $111,204.

DUDLEY, GA.—Oconee Electric Membership Corp., E. B. Dominey, president, has REA allotment of $181,000 for building 218 miles of rural lines.

LOUISVILLE, GA.—Jefferson County Electric Membership Corp., James B. Polhill Jr., superintendent, received REA allotment of $185,000 for construction of 232 miles of lines to serve 887 customers.

Maryland

FAIRFIELD, MD.—Maryland Dry Dock Co. will soon let contract for 70 x 120-foot machine shop, and 180 x 200-foot electric shop. J. E. Greiner Co., 1201 St. Paul street, Baltimore, engineer.

Mississippi

BILOXI, MISS.—City, Louis Braun, mayor, and government have signed agreement that PWA will install sewage disposal plant to cost $1,056,000.

North Carolina

STEDMAN, N. C.—South River Electric Membership Corp., R. R. Edwards, superintendent, has REA allotment of $448,000 for construction of 451 miles of rural lines to serve 1750 customers.

WAYNESVILLE, N. C.—Cruso Electric Membership Corp. has received REA allotment of $279,000 for construction of 247 miles of lines to serve 1117 members.

WILMINGTON, N. C.—City, J. R. Benson, city clerk, will vote Dec. 2 on issuance of $485,000 bonds for city's share of $1,000,000 waterworks project.

Tennessee

FAYETTEVILLE, TENN. — Lincoln County Electric Membership Corp. has REA allotment of $164,000 for rural lines.

ONEIDA, TENN.—Plateau Electric Cooperative has received REA allotment of $230,000 for rural transmission lines.

Louisiana

NEW ORLEANS—Pendleton Shipyard Co. Inc., Pendleton E. Lehde, president, plans construction of shipbuilding plant, including four 200-foot shipways, outfitting dock, assembly shops, warehouses, office building, etc. Approximate cost $50,000. Barnard-Godat & Heft, Terminal Station building, consulting engineers.

Virginia

DUBLIN, VA. — Town, George C. Moomaw, mayor, plans $66,000 waterworks system. Demott & Ryan, Law building, Lynchburg, Va., engineers.

RADFORD, VA.—City, H. T. Roberts, city manager, plans $231,100 waterworks system, for which it has grant of $81,000. Wiley & Wilson, Peoples National Bank building, Lynchburg, Va., engineers.

Arkansas

MALVERN, ARK.—An aluminum plant will be constructed on Lake Catherine, near here, by the government, to have annual capacity of 128,000,000 pounds of aluminum, and costing $33,000,000. The plant will be built and operated by Aluminum Co. of America, Gulf building, Pittsburgh.

Oklahoma

CHOTEAU, OKLA.—DPW has approved project here for construction of water and sewage system to cost $500,000. H. V. Grant is mayor and T. P. Clonts, Choteau, consulting engineer.

TULSA, OKLA.—City, C. H. Veale, mayor, will hold a $3,833,000 bond issue election to finance among other projects construction of sewage disposal plant at estimated cost of $1,037,000. Victor H. Cochrane, Wright building, Tulsa, consulting engineer.

Missouri

INDEPENDENCE, MO.—War Department, owner, and Remington Arms Co. Inc., Bridgeport, Conn., lessee and operator, have awarded contract for erection of two 100 x 300-foot buildings in connection with $10,000,000 Lake City ordnance plant. Walbridge-Aldinger Co., 409 Griswold street, Detroit, and Foley Bros. Inc., New York Life building, St. Paul, Minn., contractors. Smith, Hinchman & Grylls Inc., 800 Marquette building, Detroit, architects.

NORTH KANSAS CITY, MO.—Standard Steel Works, Sixteenth and Howell streets, is building a plant addition to cost over $40,000. John H. Thompson

Construction Co., 114 West Tenth street, Kansas City, Mo., general contractor.

ST. LOUIS—Emerson Electric Mfg. Co., W. S. Symington, president, 1824 Washington avenue, has leased building at 2109 Locust street for manufacture of power-operated airplane gun turrets.

Minnesota

BAUDETTE, MINN.—Village, R. J. Flynn, clerk, is preparing plans for construction of sewage disposal plant. J. C. Taylor, 902 Minnesota street, Hibbing, Minn., architect.

VIRGINIA, MINN.—Allotment of $249,000 has been granted by REA to Northern Electric Co-operative, Fritz E. Anderson, superintendent, for construction of 296 miles of rural transmission lines to serve 939 customers.

Texas

AUSTIN, TEX.—Union Potash Co., subsidiary of International Agricultural Co., New York, has let contract to Austin Co., Freeport, Tex., for design and construction of magnesium plant near here, to be financed by Defense Plant Corp.

FORT WORTH, TEX.—Brazos River Transmission Electric Co-operative Inc. plans construction of rural lines, for which it has REA allotment of $1,000,000.

LEVELLAND, TEX.—City has approved issuance of $275,000 bonds for construction of municipal light plant.

RUSK, TEX.—Judge B. Perkins and associates, Rusk, plan to build an iron ore plant here, including unit for charcoal distilling acetic acid and wood alcohol by-products. RFC loan of $2,500,000 is being negotiated.

Kansas

KANSAS CITY, KANS.—Board of public utilities, Charles A. Lowder, secretary, is taking bids to Dec. 10 on construction of addition to Quindaro power plant estimated to cost $300,000. Burns & McDonnell Engineering Co., 107 West Linwood boulevard, Kansas City, Mo., consulting engineer.

LEAVENWORTH, KANS.—REA has alloted $265,000 to Leavenworth Jefferson Electric Co., Herbert D. Harrod, president, to finance construction of 281 miles of rural electric lines to serve 682 customers.

MOUND CITY, KANS.—REA has allotted $160,000 to Sugar Valley Electric Co-operative, J. A. Martin, president, to construct 177 miles of lines, serving 410 customers.

PRATT, KANS.—REA has allotted $183,000 to Ninnescah Rural Electric Co-operative, Lewis Trimpe, president, to construct 228 miles of lines to serve 358 customers.

Nebraska

BATTLE CREEK, NEBR.—REA has allotted $317,000 to Madison County Rural Public Power district, Alfred H. Lewis, superintendent, to finance construction of 363 miles of transmission lines serving 804 members.

Montana

TWIN BRIDGES, MONT.—Vigilante Electric Co-operative, Howard Babcock, superintendent, will take bids to close about Dec. 1 on 216 miles of lines to serve 638 customers. J. M. Garrison, State Water Conservation Board, Helena, Mont., consulting engineer.

North Dakota

BOTTINEAU, N. DAK.—REA has allotted $200,000 to North Central Electric Co-operative, Clifford Lund, co-ordinator, to finance construction of 248 miles of transmission lines.

MILNOR, N. DAK.—REA has allotted $167,000 to R. S. R. Electric Co-operative, R. G. Harens, co-ordinator, to finance construction of 249 miles of rural transmission lines.

South Dakota

CLEAR LAKE, S. DAK.—Hamlin Electric Association, Gordon Gunderson, manager, has completed plans for construction of 194 miles of rural transmission lines to serve 358 customers. Banister Engineering Co., 1586 University avenue, St. Paul, Minn., consulting engineer.

Iowa

AGENCY, IOWA—City, Harry L. Cramer, clerk is preparing plans for construction of waterworks system, including elevated water tank; will take bids about Jan. 1. Estimated cost $40,000. Ralph W. Gearhart, Cedar Rapids, Iowa, consulting engineer.

BROOKLYN, IOWA—REA has allotted $206,000 to T. I. P. Rural Electric Co-operative, Irvin L. Nervig, manager, to finance construction of 274 miles of transmission lines, serving 719 customers.

EARLVILLE, IOWA—City, Elmer J. Primus, clerk, is preparing plans for construction of sewer system and sewage disposal plant. Currie Engineering Co., Webster City, Iowa, consulting engineer.

California

LOS ANGELES—Aircraft Tools, 750 Gage avenue, will build a machine shop, 95 x 105 feet at 6425 McKinley avenue.

MARE ISLAND, CALIF.—Public works

officer, Mare Island navy yard, is making surveys for five 290-foot double ship ways, machine and electric shops. Project to cost about $7,000,000.

OAKLAND, CALIF. — Todd-California Shipbuilding Corp. has been granted RFC loan of $12,000,000 for construction of three plants to manufacture and fabricate magnesium metals.

SAN JOSE, CALIF.—Permanente Corp. has obtained $11,000,000 RFC loan for expansion of its magnesium plant at Los Altos, Calif.

VENICE, CALIF.—Aviation Products, 518 Washington street, will erect a one-story aircraft parts manufacturing plant, 70 x 100 feet, at Maxilla and Levelon streets.

Oregon

FAIRVIEW, OREG.—Negotiations are under way for purchase of a site near here for construction of a $20,000,000 aluminum fabricating plant, to be owned by Defense Plant Corp. and leased to Bohn Aluminum & Brass Co., 1400 Lafayette building, Detroit.

Canada

WINNIPEG, MAN.—MacDonald Bros. Aircraft Ltd., 50 Robinson street, will erect engine and propeller overhaul plant to cost, with equipment, about $100,000 for which bids are being received by Department of Munitions and Supply, Ottawa, Ont., H. H. Turnbull, secretary.

BRANTFORD, ONT.—Cockshutt Plow Co. Ltd., Mohawk street, W. J. Phillips, manager, will build plant addition 60 x 144 feet, to cost with equipment about $40,000. General contract let to Cromar Construction Co. Ltd., 448 Colborne street.

HAMILTON, ONT.—Hamilton Bridge Co. Ltd., Bay street North, has started preliminary work in connection with plant addition to cost about $135,000. Frid Construction Co. Ltd., 128 King Street East, has general contract.

HAMILTON, ONT.—Dominion Foundries & Steel Ltd., Depew street, C. W. Sherman, president, has called bids through Prack & Prack, architects, Pigott building, for construction of armor plate mill, 90 x 242 feet, to cost $300,000, including equipment. A 60-foot span crane will be installed.

OTTAWA, ONT.—Department of Munitions and Supply will award contracts soon in connection with construction of engine repair shop and test house at Laurentian Air Services.

OWEN SOUND, ONT—.Russell Bros. Ltd., 2202 Third avenue East, Colin Russell, manager, will build plant addition to cost about $100,000 with equipment. General contract given to Woolrich & Clark, First avenue East.

TORONTO, ONT.—Canadian National Carbon Co. Ltd., 805 Davenport road, will call bids soon for erection of plant addition to cost about $10,000, equipment extra.

TORONTO, ONT.—John Inglis Co. Ltd., 24 Strachan avenue, will build ordnance plant to cost with equipment about $300,000, and has given general contract to A. W. Robertson Ltd., 57 Bloor street West.

WINDSOR, ONT.—Truscon Steel Co. of Canada Ltd., Walker road, has completed plans and will call bids for plant addition to cost, with equipment, about $30,000.

WINDSOR, ONT.—Long Mfg. Co. Ltd., 2744 Edna street, has let contract to Allan Construction Co. Ltd., 44 Wyandotte street East, for erection of plant addition, 60 x 174 feet, to cost about $40,000.

WINDSOR, ONT.—Kelsey Wheel Co. Ltd., 308 Ellis avenue, will build second plant addition, 23 x 136 feet, costing about $25,000, including equipment. Allan Construction Co. Ltd., 44 Wyandotte street East, has general contract.

SHELBOURNE, N. S.—Department of public works, Ottawa, J. M. Somerville, secretary, has let contract to M. A. Condon, Aberdeen street, Kentville, N. S., for construction of naval base here to cost $260,867, equipment extra.

DORVAL, QUE.—Construction Equipment Co., 180 Valee street, Montreal, will build addition to machine shop and boiler room here to cost about $50,000, and has given general contract to Foundation Co. of Canada Ltd., 1538 Sherbrooke street West, Montreal.

GRANBY, QUE. — Electrical Trading Co., Sun Life building, Montreal, is considering plans for erection of factory here to cost about $60,000.

MONTREAL, QUE.—Aluminum Foundry & Pattern Works, 4 St. Phillipe street, St. Laurent, is completing plans for erection of foundry, to cost about $40,000, with equipment.

MOUNT ROYAL, QUE. — Canadian Marconi Co. Ltd., 2440 Trenton road, is considering plans for another addition to its plant here to cost about $50,000.

SHAWINIGAN FALLS, QUE.—Canadian Industries Ltd., 1135 Beaver Hall Hill, Montreal, will build addition to trichlorethylene plant on Summit street, here, to cost about $200,000 with equipment, and has let contract to Fraser Brace Engineering Co. Ltd., 107 Craig street West, Montreal.

WHERE-TO-BUY

A classified list of advertisers according to products. ¶Index to advertisements gives page number of any advertiser.

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.

ABRASIVES (Polishing)
Carborundum Co., The, Niagara Falls, N. Y.
Norton Co., Worcester, Mass.

ABRASIVES (Wheels)
Bay State Abrasive Products Co., Westboro, Mass.

ACCUMULATORS
Elmes, Chas. F., Engineering Wks., 243 N. Morgan St., Chicago, Ill.
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.

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-1241, 3830 W. Burnham St., Milwaukee, Wis.
Pennsylvania Salt Mfg. Co., Dept. S, Pennsalt Cleaner Div., Philadelphia, Pa.

AIR COMPRESSORS—See COMPRESSORS (Air)

AIR CONDITIONING EQUIPMENT
Peabody Engineering Corp., 580 Fifth Ave., New York City.
Kirk & Blum Mfg. Co., The, 2838 Spring Grove Ave., Cincinnati, O.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.

AIRLESS BLAST CLEANING EQUIPMENT
American Foundry Equipment Co., The, 509 So. Byrkit St., Mishawaka, Ind.
Pangborn Corp., Hagerstown, Md.

ALKALI CLEANING COMPOUNDS
Pennsylvania Salt Mfg. Co., Dept. S, Pennsalt Cleaner Div., Philadelphia, Pa.

ALLOYS (Hard Surfacing)
Stoody Co., Whittier, Calif.

ALLOYS—See FERROALLOYS

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.

ANODES (All Types)
Udylite Corp., The, 1651 E. Grand Blvd., Detroit, Mich.

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
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., 1842 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., 1842 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., 1226 Tacony, Philadelphia, Pa.

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.

BARRELS (Plating)
Udylite Corp., The, 1651 E. Grand Blvd., Detroit, Mich.

BARRELS (Steel)
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.

BARS (Alloy)
Ampco Metal, Inc., Dept. S-1241, 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.
Sumet Corporation, 1553 Fillmore Ave., Buffalo, N. Y.

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.
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. T-125, Oliver Bldg., Pittsburgh, Pa.
*Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
*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.
*Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
*Rustless Iron & Steel Corp., 3400 E. Chase St., Baltimore, Md.
*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.

BATTERY CHARGING APPARATUS
Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.

BEAMS, CHANNELS, ANGLES, ETC.
(*Also Stainless)
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.
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-1241, 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.
Lawrence Copper & Bronze, Bessemer Bldg., Pittsburgh, Pa.
Moraine Products Division, General Motors Corporation, Dayton, Ohio.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Shenango-Penn Mold Co., Dover, O.
Sumet Corporation, 1553 Fillmore Ave., Buffalo, N. Y.

BEARINGS (Journal)
Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
Bantam Bearings Corp., South Bend, Ind.
Bower Roller Bearing Co., 3040 Hart St., Detroit, Mich.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Division, General Motors Sales Corp., Harrison, N. J.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
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., Metalline Co., P. O. Box 1, 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.
Bower Roller Bearing Co., 3040 Hart St., Detroit, Mich.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Div., General Motors Sales Corp., Harrison, N. J.
Link-Belt Co., 519 No. Holmes Ave., Indianapolis, Ind.
New Departure Div., General Motors Corp., Bristol, Conn.
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 Sales Corp., Harrison, N. J.
Morgan Construction Co., Worcester, Mass.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
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.
Bower Roller Bearing Co., 3040 Hart St., Detroit, Mich.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Div., General Motors Sales Corp., Harrison, N. J.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis, Ind.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS (Rolling Mill)
American Roller Bearing Co., 416 Melwood St., Pittsburgh, Pa.
Bantam Bearings Corp., South Bend, Ind.
Hyatt Bearings Div., General Motors Sales 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 (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.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Timken Roller Bearing Co., The, Canton, O.

BELTING (Chain and Link)
Link-Belt Co., 220 So. Belmont Ave., Indianapolis, Ind.

BELTING (Metal, Conveyor, High and Low Temperature)
Cyclone Fence Co., Waukegan, Ill.

BENCH PLATES
Challenge Machinery Co., Grand Haven, Mich.

BENCHES
Challenge Machinery Co., Grand Haven, Mich.
Lyon Metal Products, Inc., 7211 Madison Ave., Aurora, Ill.

BENDING AND STRAIGHTENING MACHINES
Alliance Machine Co., The, Alliance, O.
Buffalo Forge Co., 446 Broadway, Buffalo, N. Y.
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, 243 N. Morgan St., Chicago, Ill.
Hanniffin 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.
Thomas Machine Mfg. Co., Etna Branch P. O., Pittsburgh, Pa.

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.
Keystone Steel & Wire Co., Peoria, Ill.
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.
Heppenstall Co., 47th & Hatfield Sts., 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.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, 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.
*Copperweld Steel Co., Warren, O.
*Firth-Sterling Steel Co., McKeesport, 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.
*Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
*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)
Buffalo Wire Works Co., 437 Terrace, Buffalo, N. Y.
Lyon Metal Products, Inc., 7211 Madison Ave., Aurora, Ill.

BLAST CLEANING EQUIPMENT (Sand)
American Foundry Equipment Co., The, 509 So. Byrkit St., Mishawaka, Ind.
Pangborn Corp., Hagerstown, Md.

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.
Brassert, H. A., & Co., First National Bk. Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.
McKee, Arthur G., & Co., 2300 Chester Ave., Cleveland, 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. 312, Reading, Pa.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

BLOWERS
General Electric Co., Schenectady, N. Y.
Kirk & Blum Mfg. Co., The, 2838 Spring Grove Ave., Cincinnati, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., Dept. 112, 5600 Roosevelt Rd., Chicago, Ill.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.

BLOWPIPES (Oxy-Acetylene)
Linde Air Products Co., The, 30 E. 42nd St., New York City.

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., 2930 E. 79th St., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
*Erie Bolt & Nut Co., Liberty Ave., at W. 12th St., Erie, Pa.
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.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

BOLTS (Carriage and Machine)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2930 E. 79th St., Cleveland, O.
Erie Bolt & Nut Co., Liberty Ave. at W. 12th St., Erie, Pa.
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.

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., 2930 E. 79th St., Cleveland, O.
Erie Bolt & Nut Co., Liberty Ave. at W. 12th St., Erie, Pa.
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., 2934 E. 79th St., Cleveland, O.
Erie Bolt & Nut Co., Liberty Ave. at W. 12th St., Erie, Pa.
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.

WHERE-TO-BUY

BOLTS (Stove, Recessed Head)
American Screw Co., Providence, R. I.
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

BOOKS
International Correspondence Schools, Box 9379-B, Scranton, Pa.

BORING MACHINES (Precision)
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
Heald Machine Co., Worcester, Mass.

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.
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., 1370 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.

BRAKE LININGS
Johns-Manville Corp., 22 E. 40th St., New York City.

BRAKES (Electric)
Clark Controller Co., The, 1146 E. 152nd St., Cleveland, O.
Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.
Electric Controller & Mfg. Co., The, 2670 E. 79th St., Cleveland, O.

BRAKES (Press)
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, 243 N. Morgan St., Chicago, Ill.

BRICK—(Insulating)—See INSULATING BRICK

BRICK (Refractory)—See REFRACTORIES, CEMENT, ETC.

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.

BROACHING CUTTERS
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.

BROACHING MACHINES
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 (Industrial)
Fuller Brush Co., The, Hartford, Conn.

BRUSHES (Steelcript)
Fuller Brush Co., The, Hartford, Conn.

BUCKETS (Clam Shell, Dragline Grab, Single Line)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
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.
Osgood Co., The, Marion, O.
Wellman Engineering Co., The, 7016 Central Ave., Cleveland, O.

BUCKETS (Single Hook, Automatic Dump, Automatic Single Line)
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.
Wellman Engineering Co., The, 7016 Central Ave., Cleveland, O.

BUILDINGS (Steel)—See BRIDGES, BUILDINGS, ETC.

BULLDOZERS
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.
Peabody Engineering Corp., 580 Fifth Ave., New York City.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Bloom Engineering Co., 916 Behan St., Pittsburgh, Pa.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wean Engineering Co., Warren, O.
Wilson, Lee, Engineering Co., 1370 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.
Peabody Engineering Corp., 580 Fifth Ave., New York City.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Stewart Furnace Div., Chicago Flexible Shaft Co., Dept. 112, 5600 Roosevelt Rd., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wean Engineering Co., Warren, O.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

BUSHINGS (Bronze)
Ampco Metal, Inc., Dept. S-1241, 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.
Lawrence Copper & Bronze, Bessemer Bldg., Pittsburgh, Pa.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Shenango-Penn Mold Co., Dover, O.
Sumet Corporation, 1553 Fillmore Ave., Buffalo, N. Y.

BUSHINGS (Jig)
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.

BUSHINGS (Oilless)
Rhoades, R. W., Metaline Co., P. O. Box 1, Long Island City, N. Y.

BY-PRODUCT PLANTS
Koppers Co., Engineering and Construction Div., 901 Koppers Bldg., Pittsburgh, Pa.

CADMIUM
Udylite Corp., The, 1651 E. Grand Blvd., Detroit, Mich.

CADMIUM PLATING PROCESS
Udylite Corp., The, 1651 E. Grand Blvd., Detroit, Mich.

» » » WHERE-TO-BUY « « «

CAISSONS (Pneumatic)
Dravo Corp., (Contracting Div.), Neville Island, Pittsburgh, Pa.

CALCIUM METAL AND ALLOYS
Electro Metallurgical Co., 30 E. 42nd St., New York City.

CAP SCREWS—See SCREWS (Cap, Set, Safety-Set)

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.

CARS (Charging)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Morgan Engineering Co., The, Alliance, O.

CARS (Cinder Pot)
Pressed Steel Car Co., (Koppel Div.) Koppers Bldg., Pittsburgh, Pa.

CARS (Dump)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Easton Car & Construction Co., Easton, Pa.
Pressed Steel Car Co., (Koppel Div.) Koppers Bldg., Pittsburgh, Pa.

CARS (Industrial and Mining)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Easton Car & Construction Co., Easton, Pa.
Pressed Steel Car Co., (Koppel Div.) Koppers Bldg., Pittsburgh, Pa.

CARS (Scale)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.

CASTING WASHER EQUIPMENT
Pangborn Corp., Hagerstown, Md.

CASTINGS (Acid Resisting)
Ampco Metal, Inc., Dept. S-1241, 3830 W. Burnham St., Milwaukee, Wis.
Cadman, A. W., Mfg. Co., 2816 Smallman St., Pittsburgh, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
322 Vulcan St., Buffalo, N. Y.
International Nickel Co., Inc., The, 67 Wall St., New York City.
National Alloy Steel Div. of Blaw-Knox Co., Blawnox, Pa.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Shenango-Penn Mold Co., Dover, O.

CASTINGS (Alloy Iron)
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.
Damascus Steel Casting Co., New Brighton, Pa.
Electro Alloys Co., The, Elyria, O.
National Alloy Steel Div. of Blaw-Knox Co., Blawnox, Pa.
National-Erie Corp., Erie, Pa.
Ohio Steel Foundry Co., Lima, O.-Springfield, O.

CASTINGS (Steel) (*Also Stainless)
*Allegheny Ludlum Steel Corp., Dept. T-125, Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Stel Fdry. & Mach. Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
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 (Brass, Bronze, Copper, Aluminum)
Ampco Metal, Inc., Dept. S-1241, 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.
Lawrence Copper & Bronze, Bessemer Bldg., Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Shenango-Penn Mold Co., Dover, O
Sumet Corporation, 1553 Fillmore Ave., Buffalo, N. Y.

CASTINGS (Corrosion Resisting)
National Alloy Steel Div. of Blaw-Knox Co., Blawnox, Pa.

CASTINGS (Die)—See DIE CASTINGS

CASTINGS (Electric Steel)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Damascus Steel Casting Co., New Brighton, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
322 Vulcan St., Buffalo, N. Y.
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.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
322 Vulcan St., Buffalo, N. Y.
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., Dover, O.
Western Gas Div., Koppers Co., Fort Wayne, Ind.

CASTINGS (Heat Resisting)
Electro Alloys Co., The, Elyria, O.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
322 Vulcan St., Buffalo, N. Y.
International Nickel Co. Inc., The, 67 Wall Street, New York City.
National Alloy Steel Div. of Blaw-Knox Co., Blawnox, Pa.
Shenango-Penn Mold Co., 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.
Damascus Steel Casting Co., New Brighton, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
322 Vulcan St., Buffalo, N. Y.
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 (Wear Resisting)
Shenango-Penn Mold Co., Dover, O.

CASTINGS (Worm and Gear Bronze)
Ampco Metal, Inc., Dept. S-1241, 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)
Pennsylvania Salt Mfg. Co., Dept. S. Pennsalt Cleaner Div., Philadelphia, Pa.

CEMENT (High Temperature)
Bay State Abrasive Products Co., Westboro, Mass.
Carborundum Co., The, Perth Amboy, N. J.
Eagle-Picher Lead Co., The, Cincinnati, O.
Johns-Manville Corp., 22 E. 40th St., New York City.
Norton Company, Worcester, Mass.
Quigley Company, 56 W. 45th St., New York City.

CEMENT (High Temperature Hydraulic)
Atlas Lumnite Cement Co., Dept. S-20, Chrysler Bldg., New York City.

CENTRAL STATION EQUIPMENT
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.

CHAIN (Conveyor and Elevator)
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)
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, 1140 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)
Broslus, Edgar E., Inc., 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.

CHEMICALS (Industrial)
American Solder & Flux Co., 2153 E. Norris St., Philadelphia, Pa.
Titanium Alloy Mfg. Co., The, Niagara Falls, N. Y.

CHISELS (Chipping)
Steel Conversion & Supply Co., P. O. Box 537 (Castle Shannon), Pittsburgh, Pa.

CHROME ORE
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

CHROMIUM METAL AND ALLOYS
Electro Metallurgical Co., 30 E. 42nd St., New York City.

CHROMIUM PLATING PROCESS
United Chromium, Inc., 51 E. 42nd St., New York City.

CHUCK OPERATING CYLINDERS
Airgrip Chuck Div., Anker-Holth Mfg. Co., Port Huron, Mich.

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)
Airgrip Chuck Div., Anker-Holth Mfg. Co., Port Huron, Mich.
Tomkins-Johnson Co., The, 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.
MacDermid, Inc., Waterbury, Conn.
Pennsylvania Salt Mfg. Co., Dept. S, Pennsalt Cleaner Div., Philadelphia, Pa.

CLUTCHES (Friction)
Jones, W. A. Fdry. & Mach. Co., 4437 Roosevelt Rd., Chicago, Ill.

CLUTCHES (Magnetic)
Cutler-Hammer, Inc., 1211 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.

WHERE-TO-BUY

COAL OR COKE—Con.
Koppers Coal Co., 300 Koppers Bldg., Pittsburgh, Pa.
New England Coal & Coke Co., Boston, Mass.
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.
Wieman & Ward Co., The, Oliver Bldg., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., The, Youngstown, O.

COAL, COKE, ORE AND ASH HANDLING MACHINERY
Atlas Car & Mfg. Co., The, 1140 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, 1140 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, 2670 E. 79th St., Cleveland, O.

COMPRESSORS (Air)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Curtis Pneumatic Machinery Div. of Curtis Mfg. Co., 1996 Kienlen Ave., St. Louis, Mo.
General Electric Co., Schenectady, N. Y.

CONCRETE (Heat Resistant)
Atlas Lumnite Cement Co., Dept. S-20, 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.

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., 47th & Hatfield Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, 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.
Clark Controller Co., The, 1146 E. 152nd St., Cleveland, O.
Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.
Electric Controller & Mfg. Co., The, 2670 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.

CONVEYOR BELTS (High and Low Temperature)
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

CONVEYOR BELTS (Wire)
Cyclone Fence Co., Waukegan, Ill.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

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. 312, Reading, Pa.

CONVEYORS (Roller—Power and Gravity)
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

CONVEYORS (Vibratory)
Ajax Flexible Coupling Co., 4 English St., Westfield, N. Y.

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.

CORRESPONDENCE COURSES
International Correspondence Schools, Box 9379-B, Scranton, Pa.

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.

COUPLINGS (Flexible)
Ajax Flexible Coupling Co., 4 English St., Westfield, N. Y.
American Flexible Coupling Co., 18th & Pittsburgh Aves., Erie, Pa.
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Clark Controller Co., The, 1146 E. 152nd St., Cleveland, O.

COUPLINGS (Flexible)—Con.
Electric Controller & Mfg. Co., The, 2670 E. 79th St., Cleveland, O.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
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.
Nicholson, W. H., & Co., 177 Oregon St., Wilkes-Barre, 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)
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.
Osgood Co., The, Marion, 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.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Morgan Engineering Co., The, Alliance, O.
Reading Chain & Block Corp., Dept. 312, 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.
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. 312, 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.
Industrial Brownhoist Corp., Bay City, Mich.
Reading Chain & Block Corp., Dept. 312, 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.
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. 312, 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.
Osgood Co., The, Marion, 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.
Reading Chain & Block Corp., Dept. 312, Reading, Pa.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.

CRANES (Traveling)
Reading Chain & Block Corp., Dept. 312, 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.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Union Drawn Steel Div. Republic Steel Corp., Massillon, O.

CRUSHERS
American Pulverizer Co., 1539 Macklind Ave., St. Louis, Mo.

CUSHIONS (Pneumatic)
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.

CUT-OFF MACHINES (Abrasive)
Challenge Machinery Co., Grand Haven, Mich.

CUTTERS (Die Sinking & End Milling)
Brown & Sharpe Mfg. Co., Providence, R. I.
Tomkins-Johnson Co., The, 611 N. Mechanic St., Jackson, Mich.

CUTTERS (Gang Slitter)
Cowles Tool Co., 2086 W. 110th St., Cleveland, O.

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., 15 Thomson Ave., McKees Rocks, Pa.

CYLINDERS (Air or Hydraulic)
Airgrip Chuck Div., Anker-Holth Mfg. Co., Port Huron, Mich.
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.
Tomkins-Johnson Co., The, 611 N. Mechanic St., Jackson, Mich.

CYLINDERS (Hydraulic)
American Hollow Boring Co., 1054 W. 20th St., Buffalo, N. Y.

CYLINDERS (Pressure)
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.

DEGREASERS
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.

DESIGNERS (Industrial)
Designers for Industry, Inc. Terminal Tower, Cleveland, O.

DIAMONDS (Wheel Dressing)
Diamond Tool Co., 938 E. 41st St., Chicago, Ill.

DIE BLOCKS
American Shear Knife Co., 3rd & Ann Sts., Homestead, Pa.
Ampco Metal, Inc., Dept. S-1241, 3830 W. Burnham St., Milwaukee, Wis.
Bissett Steel Co., The, 900 E. 67th St., Cleveland, O.
Heppenstall Co., 47th and Hatfield Sts., Pittsburgh, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.

DIE CENTERS
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

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, 243 N. Morgan St., Chicago, Ill.

DIES (Cast)
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.

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.
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.

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., 938 E. 41st St., Chicago, Ill.

DRILL HEADS (Multiple)
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.

DRILL RODS—See RODS (Drill)

DRILLING MACHINERY
Buffalo Forge Co., 446 Broadway, Buffalo, N. Y.

DRILLING MACHINES (Radial)
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.

DRILLING MACHINES (Vertical)
Bryant Machinery & Engineering Co., 400 W. Madison St., Chicago, Ill.
Cleereman Machine Tool Co., Green Bay, Wis.

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)
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
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.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

DRIVES (Multi-V-Belt)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

DRIVES (Reciprocating)
Ajax Flexible Coupling Co., 4 English St., Westfield, N. Y.

DRUMS (Steel)
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.

DRYERS (Compressed Air)
Ruemelin Mfg. Co., 3860 N. Palmer St., Milwaukee, Wis.

DRYERS (Rotary)
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

DUST ARRESTING EQUIPMENT
Kirk & Blum Mfg. Co., The, 2838 Spring Grove Ave., Cincinnati, O.
Pangborn Corp., Hagerstown, Md.
Peabody Engineering Corp., 580 Fifth Ave., New York City.
Ruemelin Mfg. Co., 3860 N. Palmer 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, 2670 E. 79th St., Cleveland, O.
Fairbanks, Morse & Co., Dept. K75, 600 S. Michigan Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.

ELECTRODES (Carbon and Graphite)
National Carbon Co., W. 117th St. at Madison Ave., Cleveland, O.

ELECTRODES (Hard Surfacing Welding)
Stoody Co., Whittier, Calif.

ELEVATING AND CONVEYING MACHINERY—See CONVEYORS

ENGINEERS AND CONTRACTORS
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Brassert, H. A., & Co., First National Bank Bldg., Pittsburgh, Pa.
McKee, Arthur G., & Co., 2300 Chester Ave., Cleveland, O.
Morgan Engineering Co., The, Alliance, O.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Wean Engineering Co., Warren, O.

ENGINEERS (Consulting)
Brassert, H. A., & Co., First National Bank Bldg., Pittsburgh, Pa.
Easton Car & Construction Co., Easton, 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.

ENGINEERS (Lubricating Equipment)
Lincoln Engineering Co., 5700 Natural Bridge Ave., St. Louis, Mo.

ENGINES (Diesel)
Cooper-Bessemer Corp., The, Mt. Vernon, O.
Fairbanks, Morse & Co., Dept. K75, 600 So. Michigan Ave., Chicago, Ill.

ENGINES (Gas, Oil)
Fairbanks, Morse & Co., Dept. K75, 600 So. Michigan Ave., Chicago, Ill.

ENGINES (Kerosene)
Fairbanks, Morse & Co., Dept. K75, 600 S. Michigan Ave., Chicago, Ill.

ENGINES (Steam)
Oil Well Supply Co., Dallas, Texas.

EXCAVATORS
Northwest Engineering Co., 28 E. Jackson Blvd., Chicago, Ill
Osgood Co., The, Marion, O.

FANS (Crane Cab)
Perkins, B. F. & Son, Inc., Holyoke, Mass.

FANS (Exhaust Ventilating)
Kirk & Blum Mfg. Co., The, 2838 Spring Grove Ave., Cincinnati, O.
Sturtevant, B. F., Co.,

FANS (Portable)
Perkins, B. F., & Son, Inc., Holyoke, Mass.

FANS (Wall)
Perkins, B. F. & Son, Inc., Holyoke, Mass.

FENCE (Chain Link)
Cyclone Fence Co., Waukegan, Ill.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, 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.
Pittsburgh Steel Co., 1653 Grant 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.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
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.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
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.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
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.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
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
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
Disston, Henry, & Sons, Inc., 1226 Tacony, Philadelphia, Pa.
Simonds Saw & Steel Co., Fitchburg, Mass.

FILTER CLOTH (Asbestos)
Johns-Manville Corp., 22 E. 40th St., New York City.

FIRE EXTINGUISHERS
C-O-Two Fire Equipment Co., 10 Empire St., Newark, N. J.
Kidde & Co., Inc., Walter 1132 West St., Bloomfield, N. J.

FIRE CLAY—See REFRACTORIES

FIRE DOORS & SHUTTERS—See DOORS & SHUTTERS

FITTINGS (Electric Steel)
Reading-Pratt & Cady Div. of American Chain & Cable Co., Inc., Bridgeport, Conn.

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)
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.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill
Scully Steel Products Co., Tri-Lok Co., 5515 Butler St., Pittsburgh, Pa.

FLUE DUST CONDITIONERS
Brosius, Edgar E., Inc., 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.
American Solder & Flux Co., 2153 E. Norris St., Philadelphia, 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 (Brass, Bronze, Copper)
American Brass Co., The, Waterbury, Conn.
Ampco Metal, Inc., Dept. S-1241, 3830 W. Burnham St., Milwaukee, Wis.
Bridgeport Brass Co., Bridgeport, Conn.

FORGINGS (Drop) (*Also Stainless)
*Atlas Drop Forge Co., Lansing, Mich.
*Bethlehem Steel Co., Bethlehem, Pa.
Oil Well Supply Co., Dallas, Texas.
Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

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.
National Forge & Ordnance Co., Irvine, Warren Co., 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.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
*Midvale Co., The, Nicetown, Philadelphia, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., 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 (Upset)
Atlas Drop Forge Co., Lansing, Mich.
Bethlehem Steel Co., Bethlehem, Pa.

FROGS AND SWITCHES
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.

FURNACE INSULATION—See INSULATION

FURNACES (Blast)
Brassert, H. A., & Co., First National Bank Bldg., Pittsburgh, Pa.
McKee, Arthur G., & Co., 2300 Chester Ave., Cleveland, O.

FURNACES (Brazing)
Hevi Duty Electric Co., 4100 W. Highland Blvd., Milwaukee, Wis.
Upton Electric Salt Bath Furnace Div. Commerce Pattern Fdry. & Mach. Co., 7452 Melville Ave., at Green, Detroit, Mich.

FURNACES (Electric Heating)
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.
Hevi Duty Electric Co., 4100 W. Highland Blvd., Milwaukee, Wis.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1257, Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.

FURNACES (Electric Melting)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
General Electric Co., Schenectady, N. Y.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1257, Pittsburgh, Pa.

FURNACES (Forging)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Amsler-Morton Co., The, Fulton Bldg., Pittsburgh, Pa.
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.
Stewart Furnace Div., Chicago Flexible Shaft Co., Dept. 112, 5600 Roosevelt Rd., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wilson, Lee, Sales Corp., 1370 Blount St., Cleveland, O.

FURNACES (Galvanizing)
Salem Engineering Co., 714 So. Broadway, Salem, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., Dept. 112, 5600 Roosevelt Rd., Chicago, Ill.
Wilson, Lee, Sales Corp., 1370 Blount St., Cleveland, O.

FURNACES (Gas or Oil)
Electric Furnace Co., The, Salem, O.

FURNACES (Gas or Oil)—Con.
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.
Stewart Furnace Div., Chicago Flexible Shaft Co., Dept. 112, 5600 Roosevelt Rd., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wilson, Lee, Sales Corp., 1368 Blount St., Cleveland, O.

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.
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.
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.
Stewart Furnace Div., Chicago Flexible Shaft Co., Dept. 112, 5600 Roosevelt Rd., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Upton Electric Salt Bath Furnace Div. Commerce Pattern Fdry. & Mach. Co., 7452 Melville Ave., at Green, Detroit, Mich.
Wean Engineering Co., Warren, O.
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.
Wilson, Lee, Sales Corp., 1370 Blount St., Cleveland, O.

FURNACES (Laboratory)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Hevi Duty Electric Co., 4100 W. Highland Blvd., Milwaukee, Wis.

FURNACES (Non-Ferrous Melting)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Wilson, Lee, Sales Corp., 1370 Blount St., Cleveland, O.

FURNACES (Open Hearth)
Amsler-Morton Co., The, Fulton Bldg., Pittsburgh, Pa.
Brassert, H. A., & Co., First National Bank Bldg., Pittsburgh, Pa.
McKee, Arthur G., & Co., 2300 Chester Ave., Cleveland, O.

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 Corp., 2375 Dorr St., Toledo, O.

FURNACES (Rivet Heating)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Surface Combustion Corp., 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 Corp., 2375 Dorr St., Toledo, O.
Wean Engineering Co., Warren, O.
Wilson, Lee, Engineering Co., 1370 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 Corp., 2375 Dorr St., Toledo, O.
Wellman Engineering Co., The, 7016 Central Ave., Cleveland, O.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

GAGE BLOCKS
Dearborn Gage Co., 22036 Beech St., Dearborn, Mich.

GAGES
Brown & Sharpe Mfg. Co., 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., 2507 E. Cumberland St., Philadelphia, Pa.
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.
Standard Galvanizing Co., Chicago, Ill.
Wilcox, Crittenden & Co., Inc., Middletown, Conn.
Witt Cornice Co., The, Cincinnati, O.

GALVANIZING COMPOUNDS
American Solder & Flux Co., 2153 E. Norris St., Philadelphia, Pa.

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.
Brassert, H. A., & Co., First National Bank Bldg., Pittsburgh, Pa.
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-1241, 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.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.
Waldron, John, Corp., New Brunswick, N. J.

GEAR MACHINERY (Generating)
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
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.
Pittsburgh Gear & Machine Co., 2680-2700 Smallman St., Pittsburgh, Pa.
Simonds Gear & Mfg. Co., The, 25th St., Pittsburgh, Pa.

GEARS AND GEAR CUTTING
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
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 1466, Pittsburgh, Pa.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.
National-Erie Corp., Erie, 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
Fairbanks, Morse & Co., Dept. K75, 600 So. Michigan Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Reliance Electric & Eng. Co., 1081 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.
Fairbanks, Morse & Co., Dept. K-75, 600 S. Michigan Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O.
Reliance Electric & Eng. Co., 1081 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., 1743 Orange St., New Haven, Conn.

GRATING
Blaw-Knox Co., Blawnox, Pa.
Dravo Corp., (Machinery Div.), 300 Penn Ave., Pittsburgh, Pa.
Tri-Lok Co., 5515 Butler St., Pittsburgh, Pa.

GREASE FITTINGS
Lincoln Engineering Co., 5700 Natural Bridge Ave., St. Louis, Mo.

GREASE GUNS
Lincoln Engineering Co., 5700 Natural Bridge Ave., St. Louis, Mo.

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.

GRINDERS (Circular Saw)
Motch & Merryweather Machinery Co., Penton Bldg., Cleveland, O.

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
Sun Oil Co., Dept. 1, 1608 Walnut St., Philadelphia, Pa.
Wayne Chemical Products Co., 9502 Copeland St., Detroit, Mich.

GRINDING MACHINES (Automotive Reconditioning)
Heald Machine Co., Worcester, Mass.

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.
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 (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.
Norton Co., Worcester, Mass.

GRINDING MACHINES (Roll)
Cincinnati Milling Machine and Cincinnati Grinders, Inc., Oakley Sta., Cincinnati, O.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
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 (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.
Kearney & Trecker Corp., 5926 National Ave., Milwaukee, Wis.
Norton Co., Worcester, Mass.
Oster Mfg. Co., The, 2037 E. 61st St., Cleveland, O.

GRINDING WHEELS
Bay State Abrasive Products Co. Westboro, Mass.
Blanchard Machine Co., The, 64 State St., Cambridge, Mass.

WHERE-TO-BUY

GRINDING WHEELS (Segmental)—Con.
Carborundum Co., The, Niagara Falls, N. Y.
Macklin Co., The, Jackson, Mich.
Norton Co., Worcester, Mass.

GRINDING WHEELS (Segmental)
Blanchard Machine Co., The, 64 State St., Cambridge, Mass.
Carborundum Co., The, Niagara Falls, N. Y.
Norton Company, Worcester, Mass.

GUARDS (Belt, Machine & Window)
Buffalo Wire Works Co., 437 Terrace, Buffalo, N. Y.

GUIDE SHOES
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

GUIDES (Mill)
Ampco Metal, Inc., Dept. S-1241, 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.
Broslus, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

GUNS (Steam, Hydraulic, Electric)
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Broslus, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

HAMMER BUSHINGS
Steel Conversion & Supply Co., P. O. Box 537 (Castle Shannon), Pittsburgh, Pa.

HAMMERS (Drop)
Alliance Machine Co., The, Alliance, Ohio.
Chambersburg Engineering Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
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 Sales 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.

HEATERS (Air)
Airtherm Manufacturing Co., 726 S. Spring Ave., St. Louis, Mo.
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.

HEATERS (Electric Space)
Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.

HEATERS (Unit)
Airtherm Manufacturing Co., 726 S. Spring Ave., St. Louis, Mo.
Buffalo Forge Co., 446 Broadway, Buffalo, N. Y.
Dravo Corp. (Machinery Div.), 300 Penn Ave., Pittsburgh, Pa.
Grinnell Co., Inc., Providence, R. I.

HEAT TREATING MATERIALS
Houghton, E. F., & Co., 3rd, American & Somerset Sts., Philadelphia, Pa.

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. 312, 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.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Reading Chain & Block Corp., Dept. 312, 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 (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.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Reading Chain & Block Corp., Dept. 312, 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.

HOOPS (Welded Wire)
Keystone Steel & Wire Co., Peoria, Ill.

HOSE (Flexible Metal)
American Metal Hose Branch of The American Brass Co., Waterbury, Conn.

HUMIDIFIERS (Industrial)
Grinnell Co., Inc., Providence, R. I.

HYDRAULIC MACHINERY
Alliance Machine Co., The, Alliance, Ohio.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Bethlehem Steel Co., Bethlehem, Pa.
Chambersburg Engineering Co., Chambersburg, Pa.

HYDRAULIC MACHINERY—Con.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Morgan Engineering Co., The, Alliance, O.
National-Erie Corp., Erie, Pa.
Schloemann Engineering Corp., Empire Bldg., 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.

INDICATORS (Blast Furnace Stock Line)
Brosius, Edgar E., Inc., 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.

INDUSTRIAL DESIGNERS
Designers for Industry, Inc., Terminal Tower, Cleveland, O.

INGOT MOLDS
Bethlehem Steel Co., Bethlehem, Pa.
Shenango-Penn Mold Co., Oliver Bldg., Pittsburgh, Pa.
Superior Mold & Iron Co., Penn, Pa.
Valley Mould & Iron Corp., Hubbard, O.

INHIBITORS
American Chemical Paint Co., Dept. 310, Ambler, 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.
Brush Development Co., 3311 Perkins Ave., Cleveland, O.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
General Electric Co., Schenectady, N. Y.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.

INSULATING BLOCK
Armstrong Cork Co., 985 Concord St., Lancaster, Pa.
Illinois Clay Products Co., 214 Barber Bldg., Joliet, Ill.
Johns-Manville Corp., 22 E. 40th St., New York City.

INSULATING BRICK
Armstrong Cork Co., 985 Concord St., Lancaster, Pa.
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 CONCRETE
Atlas Lumnite Cement Co., Dept. S-20, Chrysler Bldg., New York City.
Illinois Clay Products Co., 214 Barber Bldg., Joliet, Ill.
Johns-Manville Corp., 22 E. 40th St., New York City.

INSULATING POWDER AND CEMENT
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Armstrong Cork Co., 985 Concord St., Lancaster, Pa.
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.
Illinois Clay Products Co., 214 Barber Bldg., Joliet, Ill.
Johns-Manville Corp., 23 E. 40th St., New York City.

INSULATION (Building)
Johns-Manville Corp., 22 E. 40th St., New York City.

INSULATION (Furnace, Boiler Settings, Ovens, Steam Pipe, Etc.)
Armstrong Cork Co., 985 Concord St., Lancaster, Pa.
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.
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.

KEYS (Machine or Woodruff)
Moltrup Steel Products Co., Beaver Falls, Pa.

KNIVES
American Shear Knife Co., 3rd and Ann Sts., Homestead, Pa.
Cowles Tool Co., 2086 W. 110th St., Cleveland, O.
Disston, Henry, & Sons, Inc., 1226 Tacony, Philadelphia, Pa.
Ohio Knife Co., Dreman Ave. & B. & O. R.R., Cincinnati, O.

LABORATORY WARE
Bay State Abrasive Products Co., Westboro, Mass.
Norton Company, Worcester, Mass.

LAMPS (Industrial)
General Electric Co., Dept. 166-S-G, Nela Park, Cleveland, 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.

LAPPING PLATES
Challenge Machinery Co., Grand Haven, Mich.

LARRIES (Coal)
Atlas Car & Mfg. Co., The, 1140 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
Axelson Manufacturing Co., 6160 So. Boyle Ave., Los Angeles, Cal.
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.
Simmons Machine Tool Corp., 1850 N. Broadway, Albany, N. Y.
South Bend Lathe Works, 897 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 (Chucking)
Gisholt Machine Co., 1217 E. Washington Ave., Madison, Wis.
Oster Mfg. Co., The, 2037 E. 61st St., Cleveland, O.

LATHES (Engine)
Monarch Machine Tool Co., Sidney, O.
Simmons Machine Tool Corp., 1850 N. Broadway, Albany, N. Y.
South Bend Lathe Works, 897 E. Madison St., South Bend, Ind.

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.
Simmons Machine Tool Corp., 1850 N. Broadway, Albany, N. Y.
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.
Oster Mfg. Co., The, 2037 E. 61st St., Cleveland, O.
Simmons Machine Tool Corp., 1850 N. Broadway, Albany, N. Y.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland, O.

LAYOUT SURFACE PLATES
Challenge Machinery Co., Grand Haven, Mich.

LEAD (Tellurium)
National Lead Co., 111 Broadway, New York City.

LEVELING MACHINES
Erie Foundry Co., Erie, Pa.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
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.

LIFT TRUCKS—See TRUCKS (Lift)

LIFTING MAGNETS—See MAGNETS (Lifting)

LIGHTING (Industrial)
General Electric Co., Dept. 166-S-G, Nela Park, Cleveland, O.

LINERS (Pump and Cylinder)
Shenango-Penn Mold Co., Dover, O.

LOCOMOTIVE CRANES—See CRANES (Locomotive)

LOCOMOTIVES (Diesel-Electric)
Atlas Car & Mfg. Co., The, 1140 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, 1140 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, 1140 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, 1140 Ivanhoe Rd., Cleveland, O.

LOCOMOTIVES (Steam)
Porter, H. K., Co., Inc., 49th & Harrison Sts., Pittsburgh, Pa.

LOCOMOTIVES (Storage Battery)
Atlas Car & Mfg. Co., The, 1140 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.

LUBRICANTS (Industrial)
Acheson Colloids Corp., Port Huron, Mich.
American Lanolin Corp., Railroad St., Lawrence, Mass.
Gulf Oil Corp. of Penna., Gulf Refining Co., 3800 Gulf Bldg., Pittsburgh, Pa.
Houghton, E. F., & Co., 3rd, American & Somerset Sts., Philadelphia, Pa.
New York & New Jersey Lubricant Co., 292 Madison Ave., New York City.
Penola, Inc., 34th & Smallman Sts., Pittsburgh, Pa.
Shell Oil Co., Inc., 50 W. 50th St., New York City.
Socony-Vacuum Oil Co., Inc., 26 Broadway, New York City.
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.
Lincoln Engineering Co., 5700 Natural Bridge Ave., St. Louis, Mo.

MACHINE WORK
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Federal Shipbuilding & Dry Dock Co., Kearney, N. J.
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.

MACHINERY (Special)
Alliance Machine Co., The, Alliance, Ohio.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.
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, 243 N. Morgan St., Chicago, Ill.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
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.
Shuster, F. B., Co., The, New Haven, Conn.
Simmons Machine Tool Corp., 1850 N. Broadway, Albany, N. Y.
Thomas Machine Mfg. Co., Etna Branch P. O., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, 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.
Simmons Machine Tool Corp., 1850 N. Broadway, Albany, N. Y.
West Penn Machinery Co., 1208 House Bldg., Pittsburgh, Pa.

MAGNESIA (Electrically Fused)
Norton Co., Worcester, Mass.

MAGNETIC SEPARATORS—See SEPARATORS (Magnetic)

MAGNETS (Lifting)
Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.
Electric Controller & Mfg. Co., 2670 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.

MANDRELS (Expanding)
Nicholson, W. H., & Co., 177 Oregon St., Wilkes-Barre, Pa.

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.

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

METAL CLEANERS
American Chemical Paint Co., Dept. 310, Ambler, Pa.
Houghton, E. F., & Co., 3rd, 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.

METAL FINISHES
American Nickeloid Co., 1310 N. Second St., Peru, Ill.

METAL SPECIALTIES AND PARTS—See STAMPINGS

METAL STAMPINGS—See STAMPINGS

METALS (Hard Surfacing)
Stoody Co., Whittier, Calif.

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.

MILLING CUTTERS
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.
Simmons Machine Tool Corp., 1850 N. Broadway, Albany, N. Y.

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

MOLDS (Ingot)—See INGOT MOLDS

MOLYBDENUM
Climax Molybdenum Co., 500 Fifth Ave., New York City.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

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. 312, 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.
Fairbanks, Morse & Co., Dept. K75, 600 So. Michigan Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O.
Reliance Electric & Eng. Co., 1081 Ivanhoe Rd., Cleveland, O.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.
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.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
*Pittsburgh Steel Co., 1653 Grant 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.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
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)
Pangborn Corporation, Hagerstown, Md.

NUTS (*Also Stainless)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2930 E. 79th St., Cleveland, O.
Elastic Stop Nut Corp., 2367 Vauxhall Rd., Union, N. J.
Erie Bolt & Nut Co., Liberty Ave., at W. 12th St., Erie, Pa.
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
Tinnerman Products, Inc., 2039 Fulton Rd., Cleveland, O.

NUTS (Castellated)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2930 E. 79th St., Cleveland, O.
Erie Bolt & Nut Co., Liberty Ave., at W. 12th St., Erie, Pa.
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., 2930 E. 79th St., Cleveland, O.
Erie Bolt & Nut Co., Liberty Ave. at W. 12th St., Erie, Pa.
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)
Gulf Oil Corp. of Penna., Gulf Refining Co., 3800 Gulf Bldg., Pittsburgh, Pa.
Oster Mfg. Co., The, 2037 E. 61st St., Cleveland, O.
Penola, Inc., 34th & Smallman Sts., Pittsburgh, Pa.
Shell Oil Co., Inc., 50 W. 50th St., New York City.
Socony-Vacuum Oil Co., Inc., 26 Broadway, New York City.
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 (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.
Kirk & Blum Mfg. Co., The, 2838 Spring Grove Ave., Cincinnati, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., Dept. 112, 5600 Roosevelt Rd., Chicago, Ill.

OVENS (Coke, By-Product Recovery)
Koppers Co., Engineering and Construction Div., 901 Koppers Bldg., Pittsburgh, Pa.

OVENS (Core and Mold)
Kirk & Blum Mfg. Co., The, 2838 Spring Grove Ave., Cincinnati, O.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.

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

PACKING (Asbestos or Rubber)
Johns-Manville Corp., 22 E. 40th St., 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.

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.

PARALLELS
Challenge Machinery Co., Grand Haven, Mich.

PARTS (Precision)
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.

PATTERN EQUIPMENT (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., 5684 Fillmore St., Chicago, Ill.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

PHENOL RECOVERY PLANTS
Koppers Co., Engineering and Construction Div., 901 Koppers Bldg., Pittsburgh, Pa.

PICKLING COMPOUNDS
American Chemical Paint Co., Dept. 310, Ambler, Pa.
Houghton, E. F., & Co., 3rd, American & Somerset Sts., Philadelphia, Pa.
Pennsylvania Salt Mfg. Co., Dept. S, Pennsalt Cleaner Div., Philadelphia, Pa.

PICKLING CRATES
Kirk & Blum Mfg. Co., The, 2838 Spring Grove Ave., Cincinnati, O.

PICKLING EQUIPMENT
Buffalo Wire Works Co., 437 Terrace, Buffalo, N. Y.
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
Cellcote Co., 750 Rockefeller Bldg., Cleveland, 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.
Republic Steel Corp., Dept. ST, Cleveland, O.
Samuel, Frank & Co., Inc., Harrison Bldg., Philadelphia, Pa.

PIG IRON—Con.
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.
Wieman & Ward Co., The, Oliver Bldg., Pittsburgh, Pa.

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.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
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 (Case Hardened or Heat Treated)
Erie Bolt & Nut Co., Liberty Ave. at W. 12th St., Erie, 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.
Shenango-Penn Mold Co., Dover, O.

PIPE (Square and Rectangular)
Youngstown Sheet & Tube Co., The, Youngstown, O.

PIPE (Steel)
Allegheny Ludlum Steel Corp., Dept. T-125, Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, 3091 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.
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.

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.

PIPE LINES (Riveted and Welded)
Bethlehem Steel Co., Bethlehem, Pa.

PIPE MILL MACHINERY
Taylor-Wilson Mfg. Co., 15 Thompson 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, 243 N. Morgan St., Chicago, Ill.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Sutton Engineering Co., Park Bldg., Pittsburgh, Pa.
Taylor-Wilson Mfg. Co., 15 Thompson 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., 47th and Hatfield Sts., Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., 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 AND SHAPERS
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.

PLANT DISMANTLERS
Hetz Construction Co., Warren, O.

PLATE CASTORS
Hyatt Bearings Div., General Motors Sales Corp., Harrison, N. J.

PLATE LIFTING GRIPS
Downs Crane & Hoist Co., 3989 S. Normandie Ave., Los Angeles, Cal.

PLATES (Sheared or Universal) (*Also Stainless)
*Alan Wood Steel Co., Conshohocken, Pa.
*Allegheny Ludlum Steel Corp., Dept. T-125, Oliver Bldg., Pittsburgh, Pa.
*American Rolling Mill Co., The, 3091 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.

POLES (Tubular Steel)
National Tube Co., Frick Bldg., Pittsburgh, Pa.

POLISHING MACHINERY (Tube and Bar)
Medart Co., The, 3520 de Kalb St., St. Louis, Mo.

POTENTIOMETERS
Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.

POTS (Case Hardening)
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.

POTS (Melting)
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.

POWER UNITS (Gasoline, Electric for Industrial Trucks)
Ready-Power Co., The, 3828 Grand River Ave., Detroit, Mich.

PREHEATERS
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.

PRESSED METAL PARTS
Stanley Works, The, Pressed Metal Div., New Britain, Conn.

PRESSES
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Erie Foundry Co., Erie, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.
Tomkins-Johnson Co., The, 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 (Extrusion)
Elmes, Chas. F., Engineering Works, 243 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.
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.
Watson-Stillman Co., Roselle, N. J.
Zeh & Hahnemann Co., 56 Avenue A, Newark, N. J.

PRESSES (Hydraulic)
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Chambersburg Engineering Co., Chambersburg, Pa.
Denison Engineering Co., The, 113 W. Chestnut St., Columbus, O.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Erie Foundry Co., Erie, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
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.
Progressive Welder Co., 3050 E. Outer Drive, Detroit, Mich.
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.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.
Progressive Welder Co., 3050 E. Outer Drive, Detroit, Mich.
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)
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.

PRODUCER GAS SYSTEMS—See GAS PRODUCER PLANTS

PUG MILLS (For Blast Furnaces and Sintering Plants)
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.

PULLEYS (Magnetic)
Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.

PULVERIZERS
American Pulverizer Co., 1539 Macklind Ave., St. Louis, Mo.

PUMP HOUSES
Dravo Corp. (Contracting Div.), Neville Island, Pittsburgh, Pa.

PUMPS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Buffalo Forge Co., 446 Broadway, Buffalo, N. Y.
Fairbanks, Morse & Co., Dept. K75, 600 S. Michigan Ave., Chicago, Ill.
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. K75, 600 S. Michigan Ave., Chicago, Ill.
Weinman Pump & Supply Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.

PUMPS (Centrifugal)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Brown & Sharpe Mfg. Co., Providence, R. I.
Fairbanks, Morse & Co., Dept. K75, 600 So. Michigan Ave., Chicago, Ill.
Tomkins-Johnson Co., The, 611 N. Mechanic St., Jackson, Mich.
Weinman Pump & Supply Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.

WHERE-TO-BUY

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, 243 N. Morgan St., Chicago, Ill.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
National-Erie Corp., Erie, Pa.
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.

PUMPS (Reciprocating)
Fairbanks, Morse & Co., Dept. K75, 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. K75, 600 S. Michigan Ave., Chicago, Ill.
Roper, The Geo. D., Corp., Rockford, Ill.
Weinman Pump & Supply Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.

PUMPS (Vacuum)
Fairbanks, Morse & Co., Dept. K75, 600 S. Michigan Ave., Chicago, Ill.

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
Buffalo Forge Co., 446 Broadway, Buffalo, N. Y.
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.

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.
Simmons Machine Tool Corp., 1850 N. Broadway, Albany, N. Y.
West Penn Machinery Co., 1208 House Bldg., Pittsburgh, Pa.

RECEIVERS
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.

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.

REDUCERS (Speed)—See SPEED REDUCERS

REDUCTION GEARS
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
322 Vulcan St., Buffalo, N. Y.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
National-Erie Corp., Erie, 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 Co., 1100 B. F. Jones Law Bldg., Pittsburgh, Pa.
Illinois Clay Products Co., 214 Barber Bldg., Joliet, 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-20, Chrysler Bldg., New York City.
Johns-Manville Corp., 22 E. 40th St., New York City.

REGULATORS (Pressure)
Electric Controller & Mfg. Co., The, 2670 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.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

RESISTORS (Edgewound)
Clark Controller Co., The, 1146 E. 152nd St., Cleveland, O.

RESISTORS (Graphite Disc)
Allen-Bradley Co., 1320 So. 2nd St., Milwaukee, Wis.

RHEOSTATS (Plating)
Electric Controller & Mfg. Co., The, 2670 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., 47th & Hatfield Sts., Pittsburgh, Pa.
King Fifth Wheel Co., 2915 No. Second St., Philadelphia, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., 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
Buffalo Forge Co., 446 Broadway, Buffalo, N. Y.
Chambersburg Engineering Co., Chambersburg, Pa.
Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill.
Shuster, F. B., Co., The, New Haven, Conn.
Tomkins-Johnson Co., 611 N. Mechanic St., Jackson, Mich.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

RIVETS (*Also Stainless)
Bethlehem Steel Co., Bethlehem, Pa.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
*Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
*Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

RIVETS (Non-Ferrous and Stainless)
Harper, H. M., Co., The, 2646 Fletcher St., Chicago, Ill.

RODS (Alloy)
Ampco Metal, Inc., Dept. S-1241, 3830 W. Burnham St., Milwaukee, Wis.
Bliss & Laughlin, Inc., Harvey, Ill.
Copperweld Steel Co., Warren, O.
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.

RODS (Drill)
Allegheny Ludlum Steel Corp., Dept. T-125, 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.

RODS (Rounds, Flats and Shapes) (*Also Stainless)
*Allegheny Ludlum Steel Corp., Dept. T-125, 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.
*Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, 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.
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.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Roebling's, John A., Sons Co., Trenton, N. J.

RODS (Welding)—See WELDING RODS

RODS (Wire)—See WIRE PRODUCTS

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.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
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.
Morgan Construction Co., Worcester, Mass.
Morgan Engineering Co., The, Alliance, O.
National Roll & Foundry Co., The, Avonmore, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Wean Engineering Co., Warren, O.
Yoder Co., The, W. 55th St. & Walworth Ave., Cleveland, O.

ROLLING MILLS (Consulting, Contracting Engineers)
Schloemann Engineering Corp., Empire Bldg., Pittsburgh, Pa.

ROLLING MILL TABLES
Schloemann Engineering Corp., Empire Bldg., Pittsburgh, Pa.

ROLLS (Bending and Straightening)
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

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.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
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.
Pittsburgh Steel Foundry Corp., Glassport, Pa.
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, 3091 Curtis St., Middletown, O.
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.
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.
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)
Koppers Co., Tar & Chemical Div., 300 Koppers Bldg., Pittsburgh, Pa.

RUST PREVENTIVES
Alrose 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.
Parker Rust Proof Co., 2158 E. Milwaukee Ave., Detroit, Mich.
Smith Oil & Refining Co., Rockford, Ill.
Wayne Chemical Products Co., 9502 Copeland St., Detroit, Mich.

RUST PROOFING COMPOUNDS
Parker Rust Proof Co., 2158 E. Milwaukee Ave., Detroit, Mich.

RUST PROOFING PROCESS
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
Koppers Co., Tar & Chemical Div., 300 Koppers Bldg., Pittsburgh, Pa.
Parker Rust Proof Co., 2158 E. Milwaukee Ave., Detroit, Mich.
Udylite Corp., The, 1651 E. Grand Blvd., Detroit, Mich.

SAFE ENDS (Boiler Tube)
National Tube Co., Frick Bldg., Pittsburgh, Pa.

SAFETY DEVICES (Electric)
Electric Controller & Mfg. Co., The, 2670 E. 79th St., Cleveland, O.

SALT TABLETS
Fairway Laboratories, Div. The G. S. Suppiger Co., 1530 Hadley St., St. Louis, Mo.
Morton Salt Co., 310 So. Michigan Ave., Chicago, Ill.

SAND-BLASTING NOZZLES (Boriun)
Stoody Co., 1134 W. Slauson Ave., Whittier, Calif.

SAND CONDITIONING AND PREPARING MACHINERY
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

SAWING MACHINES (Hot and Cold)
Armstrong-Blum Mfg. Co., 5700 Bloomingdale Ave., Chicago, Ill.
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.
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)
Disston, Henry, & Sons, Inc., 1226 Tacony, Philadelphia, Pa.
Huther Bros. Saw & Mfg. Co., 1190 University Ave., Rochester, N. Y.
Simonds Saw & Steel Co., Fitchburg, Mass.

SAWS (Hack)
Armstrong-Blum Mfg. Co., 5700 Bloomingdale Ave., Chicago, Ill.
Disston, Henry & Sons, Inc., 1226 Tacony, Philadelphia, Pa.
Simonds Saw & Steel Co., Fitchburg, Mass.

SAWS (Hot and Cold)
Huther Bros. Saw & Mfg. Co., 1190 University Ave., Rochester, N. Y.
Motch & Merryweather Machinery Co., Penton Bldg., Cleveland, O.

SAWS (Inserted Tooth, Cold)
Disston, Henry, & Sons, Inc., 1226 Tacony, Philadelphia, Pa.
Huther Bros. Saw & Mfg. Co., 1190 University Ave., Rochester, N. Y.
Pittsburgh Saw & Tool Co., 78-80 Sycamore St., Etna P. O., Pittsburgh, Pa.
Simonds Saw & Steel Co., Fitchburg, Mass.

SAWS (Metal Cutting)
Brown & Sharpe Mfg. Co., Providence, R. I.
Disston, Henry, & Sons, Inc., 1226 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., Fitchburg, Mass.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SAWS (Segmental)
Disston, Henry, & Sons, Inc., 1226 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, 1140 Ivanhoe Rd., Cleveland, O.
Fairbanks, Morse & Co., Dept. K75, 600 So. Michigan Ave., Chicago, Ill.
Kron Co., The, Bridgeport, Conn.

SCALES (Dial & Recording)
Fairbanks, Morse & Co., Dept. K75, 600 S. Michigan Ave., Chicago, Ill.

SCALES (Laboratory)
Fairbanks, Morse & Co., Dept. K75, 600 S. 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. K75, 600 So. Michigan Ave., Chicago, Ill.
Kron Co., The, Bridgeport, Conn.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.

SCHOOLS
International Correspondence Schools, Box 9379-B, Scranton, Pa.

SCRAP BALING PRESSES—See BALING PRESSES

SCREENS AND SIEVES
Ajax Flexible Coupling Co., 4 English St., Westfield, N. Y.
Buffalo Wire Works Co., 437 Terrace, Buffalo, N. Y.
Chicago Perforating Co., 2443 W. 24th Pl., Chicago, Ill.

SCREENS AND SIEVES—Con.
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.
Ludlow-Saylor Wire Co., The, Newstead Ave. & Wabash R. R., St. Louis, Mo.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

SCREENS (Vibrating)
Ajax Flexible Coupling Co., 4 English St., Westfield, N. Y.

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.

SCREW MACHINES (Automatic, Single and Multiple Spindle)
Brown & Sharpe Mfg. Co., Providence, R. I.
Cone Automatic Machine Co., Inc., Windsor, Vt.
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., 2930 E. 79th St., Cleveland, O.
Continental Screw Corp., New Bedford, Mass.
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., 2930 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

SCREWS (Cold Headed)
Central Screw Company, 3517 Shields Ave., Chicago, Ill.
Cleveland Cap Screw Co., 2930 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.

SCREWS (Machine, Recessed Head)
American Screw Co., Providence, R. I.
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 (Self Locking)
Shakeproof Inc., 2525 N. Keeler Ave., Chicago, Ill.

SCREWS (Sheet Metal, Recessed Head)
American Screw Co., Providence, R. I.
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
Shakeproof Inc., 2525 N. Keeler Ave., Chicago, Ill.

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.
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., 1211 St. Paul Ave., Milwaukee, Wis.
Electric Controller & Mfg. Co., The, 2670 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.

SHAKERS
Ajax Flexible Coupling Co., 4 English St., Westfield, N. Y.

SHAPERS
Cincinnati Shaper Co., Garrard and Elam Sts., Cincinnati, O.

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.
Harrison Sheet Steel Co., 4718 W. 5th Ave., Chicago, Ill.
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., 1226 Tacony, Philadelphia, Pa.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
Ohio Knife Co., Dreman Ave. & B. & O. R.R., Cincinnati, O.
Wapakoneta Machine Co., The, Wapakoneta, O.

SHEARS
Buffalo Forge Co., 446 Broadway, Buffalo, 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.
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)
Yoder Co., The, W. 55th St. & Walworth Ave., Cleveland, O.

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-Friestedt Co., 1308 S. Kilbourn Ave., Chicago, Ill.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
J-B Engineering Sales Co., 1743 Orange St., New Haven, Conn.

SHEET METAL PRODUCTS—See STAMPINGS

SHEET METAL WORKERS MACHINES
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.
Yoder Co., The, W. 55th St. & 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-1241, 3830 W. Burnham St., Milwaukee, Wis.
Bridgeport Brass Co., Bridgeport, Conn.

SHEETS (Corrugated)
American Rolling Mill Co., The, 3091 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, 3091 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. T-125, Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, 3091 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, 3091 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, 3091 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., 1226 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)
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.
Weirton Steel Co., Weirton, W. Va.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHEETS (Perforated)
Harrington & King Perforating Co., 5634 Fillmore St., Chicago, Ill.

SHEETS (Reinforced)
Erdle Perforating Co., 171 York St., Rochester, N. Y.

SHEETS (Roofing)—See ROOFING AND SIDING

SHEETS (Stainless)
Allegheny Ludlum Steel Corp., Dept. T-125, Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, 3091 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, 3091 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.

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

SILICO-MANGANESE
Electro Metallurgical Co., 30 E. 42nd St., New York City.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

SILICON METAL AND ALLOYS
Electro Metallurgical Co., 30 E. 42nd St., New York City.
Revere Copper & Brass, Inc., 230 Park 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., Inc., 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 Corp., 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., 1211 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.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
322 Vulcan St., Buffalo, 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.
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.

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.

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.
Wickwire Spencer Steel Co., 500 Fifth Ave., 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.

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.
Davis Brake Beam Co., Laurel Ave., & P. R. R., Johnstown, Pa.
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.
Kirk & Blum Mfg. Co., The, 2838 Spring Grove Ave., Cincinnati, O.

WHERE-TO-BUY

STAMPINGS—Con.
Lyon Metal Products, Inc., 7211 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.
Shakeproof Inc., 2525 N. Keeler Ave., Chicago, Ill.
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.

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, 2670 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., 139 W. Bern St., Reading, Pa.
Columbia Steel Co., San Francisco, Calif.
Copperweld Steel Co., Warren, O.
Disston, Henry, & Sons, Inc., 1226 Tacony, Philadelphia, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Frasse, Peter A., & Co., Inc. 17 Grand St., New York City
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
Jessop Steel Co., 584 Green St., Washington, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., 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., 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.
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., 139 W. Bern St., Reading, Pa.
*Copperweld Steel Co., Warren, O.
*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.
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.
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.
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. T-125, Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, 3091 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, 900 E. 67th St., Cleveland, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Carpenter Steel Co., 139 W. Bern St., 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 Forge & Ordnance Co., Irvine, Warren Co., Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
Rustless Iron & Steel Corp., 3400 E. Chase St., Baltimore, Md.
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., 1226 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., 1226 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.
National Forge & Ordnance Co., Irvine, Warren Co., 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. T-125, Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., 139 W. Bern St., Reading, Pa.
Disston, Henry, & Sons, Inc., 1226 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. T-125, 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.
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 (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. T-125, Oliver Bldg., Pittsburgh, Pa.
*American Rolling Mill Co., The, 3091 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.
Harrison Sheet Steel Co., 4718 W. 5th Ave., Chicago, 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.
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.
Seneca Wire & Mfg. Co., Fostoria, O.
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.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

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.
Columbia Steel Co., San Francisco, Calif.
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.
*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.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

STEEL (Tool)
Allegheny Ludlum Steel Corp., Dept. T-125, Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Bissett Steel Co., The, 900 E. 67th St., Cleveland, O.
Carpenter Steel Co., 139 W. Bern St., Reading, Pa.
Copperweld Steel Co., Warren, O.
Darwin & Milner, Inc., 1260 W. 4th St., Cleveland, O.
Disston, Henry, & Sons, Inc., 1226 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.
Federal Shipbuilding & Dry Dock Co., Kearney, N. J.
General American Transportation Corp., 135 So. LaSalle St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Western Gas Div., Koppers Co., Fort Wayne, Ind.

STELLITE
Haynes Stellite Co., Harrison and Lindsay Sts., Kokomo, Ind.

STOKERS
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.

STONES (Honing)
Bay State Abrasive Products Co., Westboro, Mass.

STOOLS
Superior Mold & Iron Co., Penn., Pa.

STOPPERS (Cinder Notch)
Bailey, Wm. M. Co., 702 Magee Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

STOPPERS (Rubber)
Rhoades, R. W., Metaline Co., P. O. Box 1, Long Island City, N. Y.

STORAGE EQUIPMENT
Lyon Metal Products, Inc., 7211 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, 243 N. Morgan St., Chicago, Ill.
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.
Medart Co., The, 3520 de Kalb St., St. Louis, Mo.
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.

SWITCHES (Electric)
Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.
Electric Controller & Mfg. Co., The, 2670 E. 79th St., Cleveland, O.
General Electric Co., Dept. 166-S-G, Nela Park, 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.
Goodyear Tire & Rubber Co., 1144 E. Market St., Akron, O.
National Carbon Co., W. 117th St. and Madison Ave., Cleveland, O.

TANKS (Pickling)
Goodyear Tire & Rubber Co., 1144 E. Market St., Akron, O.
National Carbon Co., W. 117th St. and Madison Ave., Cleveland, O.

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.
Kirk & Blum Mfg. Co., The, 2838 Spring Grove Ave., Cincinnati, O.
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.
Western Gas Div., Koppers Co., Fort Wayne, Ind.

TANKS (Wood or Steel, Rubber or Lead Lined)
Goodyear Tire & Rubber Co., 1144 E. Market St., Akron, O.
Kirk & Blum Mfg. Co., The, 2838 Spring Grove Ave., Cincinnati, O.

TANTALUM-TUNGSTEN CARBIDE
Vascoloy-Ramet Corp., No. Chicago, Ill.

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)
Shakeproof Inc.,
2525 N. Keeler Ave.,
Chicago, Ill.
Thompson-Bremer & Co.,
1638 W. Hubbard St.,
Chicago, Ill.

TERNE PLATE—See TIN PLATE

TESTING MACHINERY (Materials)
National Broach & Machine Co.,
5600 St. Jean, Detroit, Mich.

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. T-125,
Oliver Bldg., Pittsburgh, Pa.
Disston, Henry, & Sons, Inc.,
1226 Tacony, Philadelphia, Pa.
Firth-Sterling Steel Co.,
McKeesport, Pa.
Haynes Stellite Co., Harrison and Lindsay Sts., Kokomo, Ind.
Jessop Steel Co.,
384 Green St., Washington, Pa.
Michigan Tool Co.,
7171 E. McNichols Rd.,
Detroit, Mich.

TOOL BITS (Tantalum Carbide)
Vascoloy-Ramet Corp.,
N. Chicago, Ill.

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.
Vascoloy-Ramet Corp.,
N. Chicago, Ill.

TOOLS (Tantalum Carbide)
Vascoloy-Ramet Corp.,
N. Chicago, Ill.

TOOLS (Tipped, Carbide)
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
McKenna Metals Co.,
200 Lloyd Ave., Latrobe, Pa.

TORCHES AND 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.

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.
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
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.

TRAPS (Compressed Air)
Nicholson, W. H., & Co.,
177 Oregon St., Wilkes-Barre, Pa.

TRAPS (High Pressure Steam)
Nicholson, W. H., & Co.,
177 Oregon St., Wilkes-Barre, Pa.

TRAPS (Steam)
Nicholson, W. H., & Co.,
177 Oregon St., Wilkes-Barre, 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. 312, 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,
1140 Ivanhoe Rd., Cleveland, O.
Baker-Raulang Co., The,
2167 W. 25th St., Cleveland, O.
Easton Car & Construction Co.,
Easton, Pa.
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., 127 Springfield Pl., Battle Creek, Mich.

TRUCKS (Dump-Industrial)
Atlas Car & Mfg. Co., The,
1140 Ivanhoe Rd., Cleveland, O.
Easton Car & Construction Co.,
Easton, Pa.

TRUCKS (Hydraulic Lift)
Atlas Car & Mfg. Co., The,
1140 Ivanhoe Rd., Cleveland, O.

TRUCKS (Industrial)
Easton Car & Construction Co.,
Easton, Pa.
Ohio Galvanizing & Mfg. Co.,
Penn St., Niles, O.

TRUCKS (Lift)
Atlas Car & Mfg. Co., The,
1140 Ivanhoe Rd., Cleveland, O.
Baker-Raulang Co., The,
2167 W. 25th St., Cleveland, O.
Clark Tructractor Div., Clark Equipment Co., 127 Springfield Pl., Battle Creek, Mich.
Easton Car & Construction Co.,
Easton, Pa.
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.,
15 Thompson Ave.,
McKees Rocks, Pa.

TUBES (Boiler)
Allegheny Ludlum Steel Corp.,
Dept. T-125,
Oliver Bldg., Pittsburgh, Pa.
Babcock & Wilcox Tube Co., The,
Beaver Falls, Pa.
Bethlehem Steel Co.,
Bethlehem, Pa.
Bissett Steel Co., The,
900 E. 67th St., Cleveland, O.
Columbia Steel Co.,
San Francisco, Calif.
Jones & Laughlin Steel Corp.,
Jones & Laughlin Bldg.,
Pittsburgh, Pa.
Michigan Steel Tube Products Co.,
9450 Buffalo St., Detroit, Mich.
National Tube Co., Frick Bldg.,
Pittsburgh, Pa.
Ohio Seamless Tube Co., Shelby, O.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
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.
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.

TUBING (Alloy Steel) (*Also Stainless)
*Babcock & Wilcox Tube Co., The,
Beaver Falls, Pa.
Bissett Steel Co., The,
900 E. 67th St., Cleveland, O.
Columbia Steel Co.,
San Francisco, Calif.
Michigan Steel Tube Products Co.,
9450 Buffalo St., Detroit, Mich.
*National Tube Co., Frick Bldg.,
Pittsburgh, Pa.
Ohio Seamless Tube Co., Shelby, O.
*Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Steel and Tubes Division, Republic Steel Corp., 226 E. 131st St.,
Cleveland, O.
Timken Roller Bearing Co., The,
Steel & Tube Div., Canton, O.

TUBING (Copper, Brass, Aluminum)
American Brass Co., The,
Waterbury, Conn.
Revere Copper & Brass, Inc.,
230 Park Ave., New York City.
Shenango-Penn Mold Co., Dover, O.

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.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
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.
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.

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.
Michigan Steel Tube Products Co.,
9450 Buffalo St., Detroit, Mich.
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.
Youngstown Sheet & Tube Co., The,
Youngstown, O.

TUBULAR PRODUCTS
Bundy Tubing Co.,
10951 Hern Ave., Detroit, Mich.
Michigan Steel Tube Products Co.,
9450 Buffalo St., Detroit, Mich.
Ohio Seamless Tube Co., Shelby, O.
Pittsburgh Steel Co.,
1653 Grant Bldg., Pittsburgh, Pa.
Steel and Tubes Division, Republic Steel Corp., 226 E. 131st St.,
Cleveland, O.

TUMBLING BARRELS (Coke Testing)
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

TUNGSTEN CARBIDE
Bissett Steel Co., The, 900 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.
Vanadium Corp. of America, 420 Lexington Ave., 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, 1140 Ivanhoe Rd., Cleveland, O.

TURRET LATHES—See LATHES (Turret)

TWIST DRILLS
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, O.
Greenfield Tap & Die Corp., Greenfield, Mass.

VACUUM CLEANERS
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.

VALVE CONTROL (Motor Operated Units)
Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.

VALVES (Blast Furnace)
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Inc., 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)
Airgrip Chuck Div., Anker-Holth Mfg. Co., Port Huron, Mich.
Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
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.
Homestead Valve Mfg. Co., P. O. Box 22, Coraopolis, Pa.
Nicholson, W. H., & Co., 177 Oregon St., Wilkes-Barre, Pa.

VALVES (Electrically Operated)
Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Nicholson, W. H., & Co., 177 Oregon St., Wilkes-Barre, Pa.

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)
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Homestead Valve Mfg. Co., P. O. Box 20, Coraopolis, Pa.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

VALVES (Iron & Steel)
Galland-Henning Mfg. Co., 2747 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 (Open Hearth Control—Oil, Tar, Steam & Air)
Nicholson, W. H., & Co., 177 Oregon St., Wilkes-Barre, Pa.

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.
Thompson-Bremer & Co., 1638 W. Hubbard St., Chicago, Ill.

WASHERS (Lock)
Garrett, George K., Co., 1421 Chestnut St., Philadelphia, Pa.
Shakeproof Inc., 2525 N. Keeler Ave., Chicago, Ill.
Thompson-Bremer & Co., 1638 W. Hubbard St., Chicago, Ill.

WASHERS (Non-ferrous and Stainless)
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.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 So. Centre St., Corry, Pa.
Shakeproof Inc., 2525 N. Keeler Ave., Chicago, Ill.
Thompson-Bremer & Co., 1638 W. Hubbard St., Chicago, Ill.

WELDERS (Electric—Arc)
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Hobart Bros., Box ST81, Troy, O.
Lincoln Electric Co., The, Cleveland, O.
Progressive Welder Co., 3050 E. Outer Drive, Detroit, Mich.

WELDERS (Electric-Resistance)
Federal Machine & Welder Co., Dana St., Warren, O.

WELDING
Bartlett-Hayward Div. Koppers Co., Baltimore, Md.
Lincoln Electric Co., The, Cleveland, O.
Western Gas Div., Koppers Co., Ft. Wayne, Ind.

WELDING (Welded Machine Steel Bases)
Kirk & Blum Mfg. Co., The, 2838 Spring Grove Ave., Cincinnati, O.

WELDING AND CUTTING APPARATUS AND SUPPLIES (Electric)
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Hobart Bros., Box ST81, Troy, O.
Lincoln Electric Co., The, Cleveland, O.
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.

WELDING RODS (Alloys)
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.
Maurath, Inc., 7311 Union Ave., Cleveland, O.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.

WELDING RODS (Bronze)
American Brass Co., The, Waterbury, Conn.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.

WELDING RODS (Hard Surfacing)
Stoody Co., Whittier, Calif.

WELDING RODS OR WIRE
Air Reduction, 60 E. 42nd St., New York City.
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 ST81, Troy, O.
Lincoln Electric Co., The, Cleveland, O.
Linde Air Products Co., The, 30 E. 42nd St., New York City.
Maurath, Inc., 7311 Union Ave., Cleveland, O.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Seneca Wire & Mfg. Co., Fostoria, O.
Washburn Wire Co., Phillipsdale, R. I.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
Wilson Welder & Metals Co., 60 East 42nd St., New York City.
Youngstown Sheet & Tube Co., The, Youngstown, O.

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.
Seneca Wire & Mfg. Co., Fostoria, O.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

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.
Keystone Steel & Wire Co., Peoria, Ill.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wheeling Steel Corp., Wheeling, W. Va.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
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.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

WIRE (Cold Drawn)
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, 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.
Seneca Wire & Mfg. Co., Fostoria, O.
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
Roebling's, John A., Sons Co., Trenton, N. J.
Washburn Wire Co., 118th St. and Harlem River, New York City.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

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.
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.

WHERE-TO-BUY

WIRE (Round, Flat, Square, Special Shapes)—Con.
Seneca Wire & Mfg. Co., Fostoria, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Washburn Wire Co., 118th St. and Harlem River, New York City.
Wickwire Spencer Steel Co., 500 Fifth Ave., 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.
Keystone Steel & Wire Co., Peoria, Ill.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, 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 (Stainless)
Allegheny Ludlum Steel Corp., Dept. T-125, Oliver Bldg., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.

WIRE (Stapling)
Keystone Steel & Wire Co., Peoria, Ill.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.
Rustless Iron & Steel Corp., 3400 E. Chase St., Baltimore, Md.

WIRE (Welding)—See WELDING RODS OR WIRE

WIRE AND CABLE (Electric)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
General Electric Co., Sec. CDW-1907, Appliance & Merchandise Dept., Bridgeport, Conn.
Roebling's, John A., Sons Co., Trenton, N. J.

WIRE CLOTH
Cyclone Fence Co., Waukegan, Ill.
Buffalo Wire Works Co., 437 Terrace, Buffalo, N. Y.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, O.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

WIRE DIES
Vascoloy-Ramet Corp., N. Chicago, Ill.

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.
Ludlow-Saylor Wire Co., The, Newstead Ave. & Wabash R. R., St. Louis, Mo.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 So. Centre St., Corry, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, O.

WIRE FORMING MACHINERY
Nilson, A. H., Machine Co., The, Bridgeport, Conn.

WIRE MILL EQUIPMENT
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.
Buffalo Wire Works Co., 437 Terrace, Buffalo, N. Y.
Continental Steel Corp., Kokomo, Ind.
Hubbard, M. D., Spring Co., 444 Central Ave., Pontiac, Mich.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Leschen, A., & Sons Rope Co., 5909 Kennerly Ave., St. Louis, Mo.
Ludlow-Saylor Wire Co., The, Newstead Ave. & Wabash R. R., St. Louis, Mo.
*Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa
Republic Steel Corp., Dept. ST, Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, O.
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.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
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.
Broderick & Bascom Rope Co., 4203 N. Union St., St. Louis, Mo.
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.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

WIRE ROPE SLINGS
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Broderick & Bascom Rope Co., 4203 N. Union St., St. Louis, Mo.
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 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.

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

THE MORECO BARGAIN CORNER

125 KW, G.E. 125 v. D.C. M.G. Set with 3 phase 60 cycle 1200 RPM, squirrel cage G.E. M.D.

75 KW Gen. Elec. 125 volt D.C. 3 bearing M.G. Set driven by a 2200 volt, 3 phase, 60 cycle, 1200 RPM motor.

35 KW Westinghouse M.G. Set 125 volt D.C. generator driven by 54 H.P. 220/440 volt 3 phase, 60 cycle, 1200 RPM CS motor

300 amp. 40/0 volt Lincoln Welder with 10 HP 220 volt, DC motor.

75/50/37½/5¼ H.P. Gen. Elec. multi-speed motor 3-60-440 volt 900/600/450/300 RPM.

THE MOTOR REPAIR & MFG. CO.
1558 Hamilton Ave. Cleveland, Ohio

FOR SALE

30 Ton—Watson—Stillman Broaching Press Hydraulic cylinder, constant pressure pullbacks suitable for 2000 lbs. per square inch.

35 HP Watson—Stillman pump delivery 5700 cubic inches at 2000 lbs. per square inch.

32" x 10" x 48" Hydro pneumatic accumulator for high pressure service. Capacity 16 1/3 gallons at 2000 lbs. per square inch per stroke.

The above equipment has been used only on experimental work and will be sold from location.

Address Box 599
STEEL, Penton Building, Cleveland

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

We Pay **BEST PRICES** *for...*

IRON AND STEEL EQUIPMENT
INDUSTRIAL PLANTS
MILLS—RAILROADS
TRACKAGE, ETC.

For HIGHEST offers, get in touch with
SONKEN-GALAMBA CORP.
108 N. 2nd St. Kansas City, Kans.
We buy and sell. *Get our quotations.*

Write or Phone

FOR SALE—BLANKS, STRIPS, CIRCLES

We offer a large tonnage of Hot Rolled and Hot Rolled Pickled Sheared Blanks, Strips, and Circles, in thicknesses from 3/16 to ½". Our Shearing and Circling Equipment is modern and our deliveries are good. Samples furnished immediately. *We solicit your inquiries.*

EASTERN STEEL PLATE CO., Atlantic 6710—Oliver Bldg., PITTSBURGH, PA.

FOR SALE

3-ton Link Belt Electric Hoist D.C. Motor—Good condition.

3-ton Detroit Hoist & Machine Co. No. M12 D.C. Motor—Good condition.

UNITED STEEL SALES, INC.
4-114 General Motors Bldg. Detroit, Mich.

FOR SALE

Bar Shear—Capacity 1" x 6"
Equipped with 11" blade.

UNITED STEEL SALES, INC.
4-114 General Motors Bldg. Detroit Mich.

More for Your Dollar!

IRON & STEEL PRODUCTS, INC.
36 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.

MILL MOTOR

300 HP . . . . 230V-DC . . . . 500 RPM
G. E., Type MPC, form A Comp. wound, interpole, pedestal brgs., with magnetic reversing control panel, master controller and spare armature, condition equals new.

JOHN D. CRAWBUCK CO., PITTSBURGH, PA.
Phone Atlantic 6345

JACQUES L. ABRAVANEL,
8, KASR EL NIL STR.,
CAIRO (EGYPT)

INTERESTED IN IMPORTING MACHINE TOOLS, INDUSTRIAL SUPPLIES AND RAW MATERIALS, ASKING CATALOGS AND PRICE LISTS.

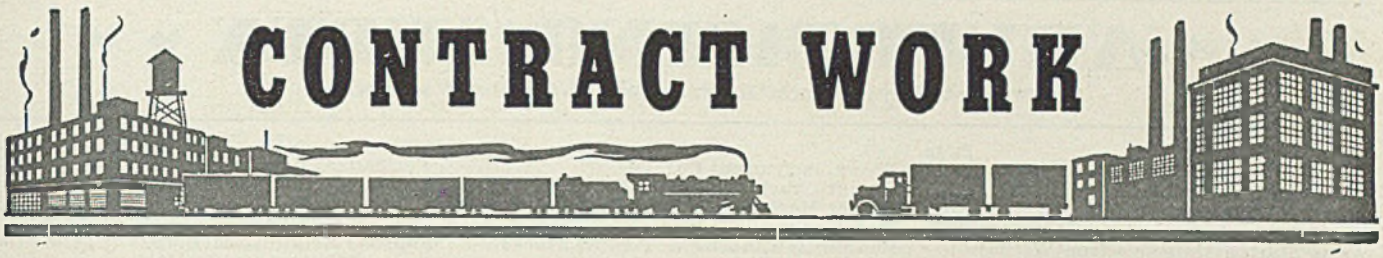
GEAR CUTTERS, Spur 30", 40" & 84", M.D.
GEAR PLANERS, Bevel 36" & 54" Gleason, M.D.
LATHES, 48"x22½' & 48"x26½' Johnson.
PLANERS, 30"x30"x8', 36"x36"x10' & 36"x36"x11'
PUNCH, Multiple "E" L & A, cap. 340 tons
SHEARS, Plate, 96"x1" Mesta, 72"x1¼" United, 54"x3/16" Hyde Park, 36"x1/8" United.

LANG MACHINERY COMPANY
28th Street & A.V. R.R. Pittsburgh, Pa.

LOOKING FOR USED OR SURplus machinery? STEEL readers may have the equipment you want. Place an advertisement in this section. Rates are moderate. Write today.

EQUIPMENT WANTED

. . . by a great many concerns in the defense industries. If you have surplus machinery in your plant, an advertisement in this section will help you dispose of it quickly. . . . Write STEEL, Penton Building, Cleveland.



Send your inquiries for
SPECIAL ENGINEERING WORK
to the
A. H. NILSON MACHINE COMPANY, BRIDGEPORT, CONN.
designers and builders of wire and ribbon stock forming machines.
We also solicit your bids for cam milling

SUB-CONTRACT WORK
is being given out daily. Put yourself in line to receive your share of this business by listing your services in this section. Write STEEL, Penton Bldg., Cleveland.

DEFENSE ORDERS WANTED

Specialists in *quantity production* for forty years.

Excellent facilities for assembling large quantities of small stampings or larger sheet metal items.

Set up to handle *in quantity* blanking, forming, bending and rolling of small metal tubing from 3/16" to 1" in diameter, and U.S.S. gauges No. 31 to No. 28 in thickness. Also stampings, parts, etc., from .013 to .070 in thickness. Well equipped for brass and nickel plating in quantity.

Send sample specifying quantity desired and deliveries required. Also state where you stand as to orders, priorities, etc., for the necessary raw materials and special tools.

If item O.K. will furnish best of references. Address: Box 583—c/o STEEL, Penton Bldg., Cleveland, Ohio.

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

Help Wanted

MANUFACTURERS REPRESENTATIVE. To represent well-known line of rust preventive coatings. Exclusive territories open for Cleveland, New York and Pittsburgh. Write full details of past experience and type of accounts you are now contacting. Reply Box 585, STEEL, Penton Bldg., Cleveland.

SALES REPRESENTATIVE, FAMILIAR with Ohio and adjacent district, wanted by well-known Tool Steel firm. Knowledge of heat treatment preferable. Splendid chance for somebody with knowledge of the trade and selling capabilities. Good references indispensable. Address Box 596, STEEL, Penton Bldg., Cleveland.

COMPETENT, TO INSTALL AND HANDLE complete cost system for an iron, steel and alloy roll foundry and finishing department located in the Pittsburgh district. This is a good opportunity for one with experience. Send full details in first letter and interview can be arranged. Address Box 595, STEEL, Penton Bldg., Cleveland.

DRAFTSMAN EXPERIENCED IN DESIGN and detailing of steel plate work. Permanent position offered with good prospects for advancement. Give full particulars regarding age, experience, and salary desired. Tippett & Wood, Phillipsburg, N. J.

MAN WITH METALLURGICAL TRAINING and experience in modern automatic heat treating, including ordnance shell. State age and experience. Location-Central New York. Address Box 600, STEEL, Penton Bldg., Cleveland.

WANTED—FOR JANUARY 1, 1942, AN experienced field erection superintendent, over 20 to 50 crews, on tanks, bins, stand pipes, pipe, etc., of both riveted and welded construction. Write fully giving age, experience, references, salary to start. Address Box 591, STEEL, Penton Bldg., Cleveland.

SCRAP YARD FOR SALE

LOCATED BETWEEN YOUNGSTOWN AND PITTSBURGH

- Real Estate comprises three acres, taxes moderate.
- Yard enclosed with a corrugated sheet fence.
- Two railroad tracks.
- Two large frame buildings and office building.
- One Morgan 10-ton overhead crane with runway. Crane 96' long.
- Runway 325 feet long.
- Long and Allstatter Co. No. R 18 shear.
- One No. 38 shear.
- One Aetna Foundry Sheet iron shear.
- One very large shear.
- One MG set using DC current.
- One 54" magnet.
- Two drop balls.

Will either sell real estate and equipment in its entirety, or will consider proposition to buy complete equipment and lease real estate. Address Box 597, STEEL, Penton Bldg., Cleveland.

Castings

OHIO

THE WEST STEEL CASTING CO., Cleveland. Fully equipped for any production problem. Two 1½ ton Elec. Furnaces. Makers of high grade light steel castings, also alloy castings subject to wear or high heat.

PENNSYLVANIA

NORTH WALES MACHINE CO., INC., North Wales. Grey Iron, Nickel, Chrome, Molybdenum Alloys, Semi-steel. Superior quality machine and hand molded sand blast and tumbled

Employment Service

SALARIED POSITIONS
$2,500 to $25,000

This thoroughly organized advertising service of 31 years' recognized standing and reputation, carries on preliminary negotiations for positions of the caliber indicated above, through a procedure individualized to each client's personal requirements. Several weeks are required to negotiate and each individual must finance the moderate cost of his own campaign. Retaining fee protected by refund provision as stipulated in our agreement. Identity is covered and, if employed, present position protected. If your salary has been $2,500 or more, send only name and address for details. R. W. Bixby, Inc., 110 Delward Bldg., Buffalo, N. Y.

OLD ESTABLISHED BUSINESS FOR SALE

Southern Ohio location. Fully equipped machine shop with heavy tools—structural and welding shop. Now running double shift with backlog of Defense and priority orders. Reasonable price—owner wants to retire. Address Box 598, STEEL, Penton Bldg., Cleveland.

Positions Wanted

BLAST FURNACE OR COKE OVEN SUperintendent, over 20 years' experience in merchant iron and by-product coke production, with sales service ability. Address Box 570, STEEL, Penton Bldg., Cleveland.

PRODUCTION MAN—TECHNICAL GRADuate desires position of responsibility. Six years' experience in large steel plant; metallurgical and production control. Married; now employed. Address Box 589, STEEL, Penton Bldg., Cleveland.

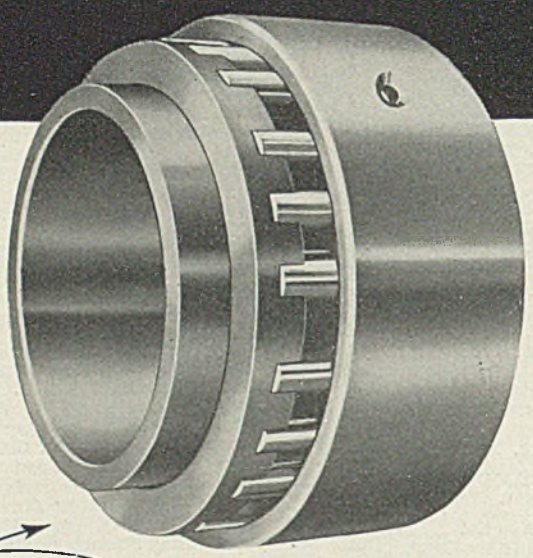
ADVERTISING INDEX

Where-to-Buy Products Index carried in first issue of month.

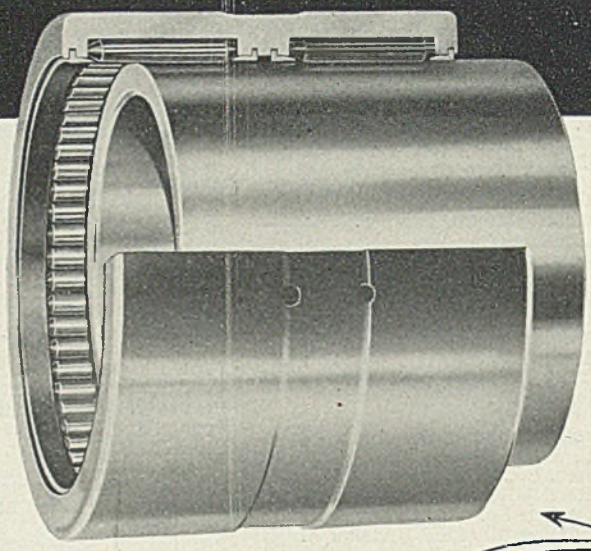
ADVERTISING INDEX

Where-to-Buy Products Index carried in first issue of month.

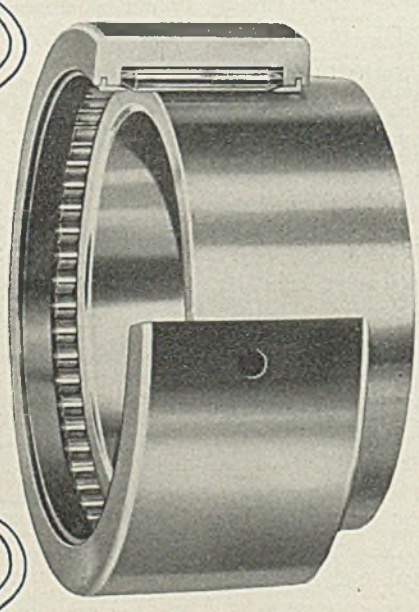
A FAMOUS AMERICAN FAMILY!



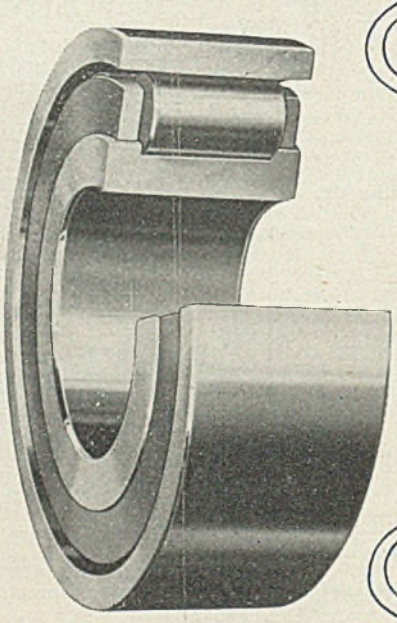
HEAVY, MEDIUM OR SUPER-HEAVY DUTY TYPE



DOUBLE GROOVED FULL ROLLER TYPE



SINGLE GROOVED FULL ROLLER TYPE



RADIAL TYPE WITH GROOVED INNER RACE

A COMPLETE LINE FOR EVERY HEAVY-DUTY ROLLER BEARING NEED

The success of AMERICAN Roller Bearings in heavy-duty applications results from the uncompromising policy of relating *engineering design* to *requirements of service.* The type, the style, the size . . . all these, and other engineering considerations, vitally affect the performance of roller bearings under the terrific strains and impacts of today's 24-hour-a-day operation. To select just the *right* bearing for the *right* purpose is as important as the selection of the *right* manufacturer. When you specify AMERICANS you accomplish both objectives! AMERICAN engineers will advise you well; in the *complete* AMERICAN line are heavy-duty bearings *exactly* suited to your needs. Send your blueprints for analysis and recommendations.

AMERICAN ROLLER BEARING CO.

PITTSBURGH, PENNSYLVANIA

Pacific Coast Office:

1718 S. Flower Street, Los Angeles, Calif.

AMERICAN HEAVY DUTY ROLLER BEARINGS