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STEEL

ESTABLISHED 1882

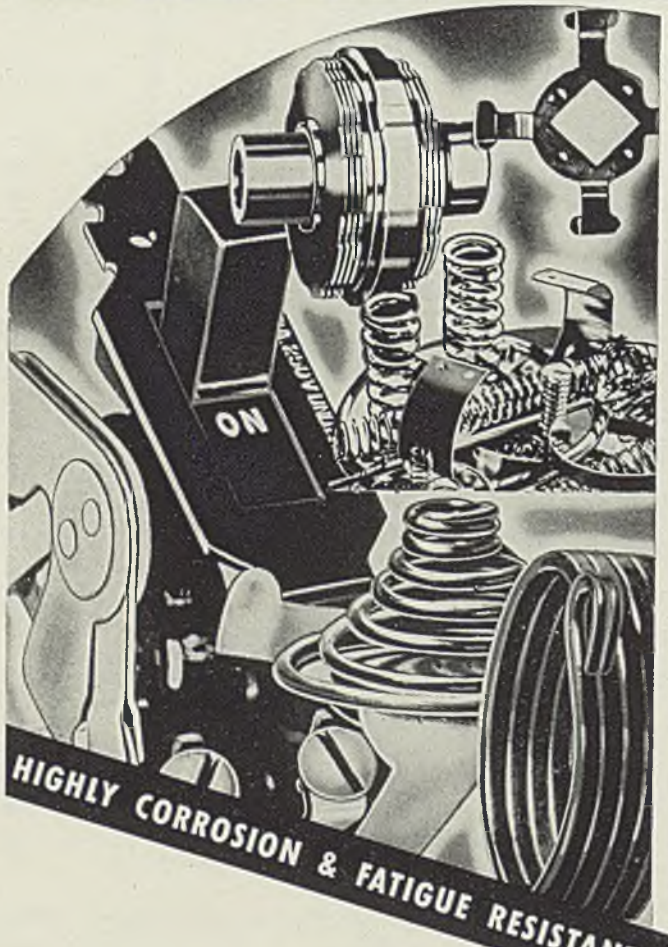
Contents

Volume 108—No. 25 **June 23, 1941**

PRODUCTION • PROCESSING • DISTRIBUTION • USE

SEYMOUR Phosphor Bronze

A SCIENTIFIC ALLOY OF COPPER, TIN AND PHOSPHORUS THAT TAKES THE OUT OF MECHANICAL PERFORMANCE



DOES your product "bog down" too often in the user's hands, due to the failure of some vital spring, cam or slide? Make the offending member of Seymour Phosphor Bronze and you may eliminate this "bottle neck" in performance! The principal characteristics of this alloy are non-corrodibility, toughness, and extreme fatigue and abrasion resistance. It takes any hardness from dead soft to a lively spring temper. It is practically indifferent to thermal change and develops no appreciable "arc" or spark. May also be had leaded for free cutting.

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HIGHLY CORROSION & FATIGUE RESISTANT • DEAD SOFT • SPRING HARD • FREE CUTTING

SHEET
WIRE
ROD

TIME-TESTED
WELDING ROD

IN GRADES A, C, D, E

Your Jobber Can Supply It

HIGHLIGHTING THIS ISSUE OF STEEL

■ THIS WEEK may bring the answer to the vital question as to the extent to which the country's steelmaking capacity **(p. 21)** should be expanded. In general, the steel industry sees a large expansion program as unsound but will carry out any orders it receives from Washington. The law of "first things first" should settle the steel expansion issue, declares **(p. 46)** E. L. Shaner, STEEL's editor-in-chief. In the meantime the industry, as heretofore, is further **(p. 22)** rounding out capacity. . . . Straws that show which way the wind is blowing are warnings that priorities soon may be supplanted by an allocation system **(p. 44)** and that only companies working on defense can be sure of staying in business.

• • •

Preference Ratings High

More than 40 per cent of current inquiries for steel now carry preference ratings and **(p. 91)** sales of some steel companies are restricted 100 per cent to preference requirements. . . . Blanket preference ratings have been extended **(p. 33)** to 24 shipbuilders who may pass them along to suppliers. . . . Freight car builders have been granted a limited blanket priority rating **(p. 44)** which they may pass on to suppliers. . . . To clear away mistaken fears among consumers: All will continue to get zinc in the same general way in which they have obtained it since April; producers **(p. 36)** continue free to ship directly for defense and nondefense all zinc not required by OPM to provide for defense "hot spots."

• • •

Some Predict Output Loss

Tightening scrap supply, together with the shortage of pig iron, leads some steelmakers to predict early crippling of open-hearth furnace operation **(p. 91)** to at least some extent . . . Republic **(p. 23)** will further increase its electric steel capacity . . . Allocation of 1,000,000 tons of steel for Great Britain **(p. 26)** has been launched . . . Idle tank cars, if placed in service, could more than offset **(p. 30)** the loss in oil transporting capacity caused by diversion of tankships to the British war effort, says, J. J. Pelley . . . Allegheny Ludlum **(p. 29)** offers royalty-free licenses on high-speed steels with low tungsten content . . . A monograph **(p. 27)** reviews substitutes for nickel constructional steels.

• • •

Protecting Surfaces

Certain sacrifices in physical characteristics and serviceability of steel might have to be made if steelmakers should become obliged to depend entirely **(p. 56)** on domestic alloying elements, says W. G. Bischoff. C. H. Herty Jr. tells how ferromanganese consumption can be reduced without seriously affecting the quality of steel. . . . Paul J. McKimm **(p. 62)** discusses factors that enter into the manufacture of high-quality, low-cost steel; in particular, he dwells upon iron from the blast furnace. . . . In laying out its new plating department, Bridgeport Brass Co. **(p. 69)** paid special attention to facilities that prevent damage to the surfaces of work being processed.

• • •

Battleship Versus Bomber

In his article this week **(p. 50)** Prof. Macconochie analyzes what transpires when a projectile is in flight. He explains why the battleship is superior to the bomber in attack against heavily armored vessels. Prof. E. A. Arnold continues his revelation **(p. 72)** of the vital role played by metal catalysts in the armament program. . . . Bethlehem Steel Co. has reorganized its bar heat-treating department **(p. 82)** to permit straightline operation. . . . W. D. Wilkinson Jr. **(p. 76)** describes best procedure in welding stainless steel for aircraft construction. . . . Gamma rays now are used **(p. 65)** to detect flaws in steel structure. . . . Heat flow through solid materials is measured **(p. 70)** by an electric "brain."

INLAND

The President of the United States has declared the existence of an "unlimited" National Emergency —Inland has been helping America re-arm from the very beginning, and is ready now to help in the new emergency with steelmaking capacity of 3,300,000 tons, many thousands of loyal American workers, and steelmaking skill keyed to the task of "all out" defense.

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Western Companies Propose $100,000,000 Steel Expansion To Aid Defense

Plan would add 1,556,000 tons to present capacity in that area, a 70 per cent increase . . . Additions scheduled at existing plants, following recommendations of OPM expert . . . American Steel & Wire Co. improving Illinois facilities

■ EXTENT of steel capacity expansion to meet national defense requirements and increased civilian demand will be decided this week when reports are received from individual companies, Office of Production Management officials announced.

Total expansion to be ordered may be less than the 10,000,000 tons proposed by OPM several weeks ago, according to William S. Knudsen, Director General of the defense agency. The 10,000,000-ton expansion proposal has been sharply criticized by some steel experts who believe the diversion of men, materials and equipment to the project would seriously retard the immediate production of much needed defense implements.

A considerable portion of the new capacity will be constructed on the Pacific coast. Four western companies last week submitted to OPM plans for expanding their facilities by a total of 1,556,000 tons at a cost of $100,000,000.

This would more than double present plant capacity on the coast and would increase that of all far-western states by about 70 per cent.

Largest expansion was proposed by Columbia Steel Co., United States Steel Corp. subsidiary, which is planning to add 930,000 tons at a cost of $63,200,000. Company informed OPM it is prepared to finance 10 per cent of the cost and will ask government aid for the remainder. Proposal includes additional coke ovens, blast furnaces, open-hearth plant, plate mill and steel foundry at Provo, Utah; additional furnace and rolling mills at Torrence, Calif.; and furnaces, blooming mill, billet and merchant mill at Pittsburg, Calif.

Company capacity was listed as 494,480 net tons by the American Iron and Steel Institute in 1938. Early in 1941 a $5,000,000 expansion of steelmaking and finishing facilities was announced. The expansion now proposed would nearly treble the company's capacity.

Bethlehem To Add 276,000 Tons

Bethlehem Steel Co., which operates plants at Los Angeles, South San Francisco and Seattle having capacity in 1938 of 425,600 net tons, offered to expand western plants by 276,000 tons, costing $12,000,000, to be provided by the government. Plan covers additional furnaces and mills at Los Angeles; furnaces and new shipping facilities at South San Francisco and Seattle.

Pacific Car & Foundry Co. filed a $650,000 expansion program for a new steel foundry to meet navy and Maritime Commission requirements.

Colorado Fuel & Iron Corp., Denver, proposed a 250,000-ton increase to cost $15,000,000. Company's capacity at the end of last year was 1,131,210 net tons, according to Gano Dunn, former OPM steel consultant.

In addition to the steelmaking additions, negotiations are under way for more heavy forging facilities at plants of Isaacson Iron Works, Seattle, American Forge Co., Berkeley, Calif., Moore Dry Dock Co., San Francisco, and National Supply Co.

Pacific States Steel Corp., Niles, Calif., is increasing its alloy ingot capacity by about 100,000 tons under a navy contract of approximately $700,000.

OPM officials said the western companies' plans were formulated before the Steel institute was asked to study the feasibility of adding 10,000,000 tons to present capacity. The plans are in line with recommendations by W. A. Hauck, who surveyed conditions in the West after the proposal by Henry J. Kaiser, West coast construction engineer, to build a new plant had been rejected by OPM. Mr. Kaiser planned to organize a new company, and build facilities with capacity for producing 1,250,000 tons of steel annually.

OPM steel experts believed West coast expansion could be effected more rapidly and efficiently by adding increments to existing plants than by building wholly new facilities manned by new organizations.

Mr. Hauck recommended construction of a minimum expansion of 1,115,200 tons of ingot capacity on the coast, accompanied by pig iron, coke and ore facilities to balance. His survey showed the Pacific coast

industry's ore supplies would come from Utah and Wyoming, without making additional demands on the already heavily loaded Great Lakes transportation systems.

The expansion in the West has been made necessary by the strategic importance of being independent of eastern supplies during an emergency on account of the vulnerability of the Panama Canal, and possible congestion of transcontinental railroads. West coast shipyards hold orders for large numbers of merchant and naval ships, requiring considerable tonnages of steel.

The proposed expansion when completed will raise steelmaking capacity from the Rocky Mountains west to about 3,800,000 tons annually. Columbia, Bethlehem and Colorado Fuel & Iron will operate the great bulk of the facilities. Judson Steel Corp., Oakland, Calif., and Pacific States Steel Corp. will be among the leading small producers. In addition there are a number of small mills, most of which have electric furnaces.

Wire Company Expanding, Improving Joliet and Waukegon, Ill., Plants

American Steel & Wire Co. last week announced plans for "rehabilitation, consolidation and expansion" of its facilities for manufacturing rods, wire and wire products in plants at Joliet and Waukegan, Ill.

The project includes a new coarse rod mill and a new mill for manufacturing merchant products at the Collins street plant in Joliet, which, upon completion, will replace the present facilities at the Rockdale and Scott street plants in the same city.

The new rod mill at Joliet will be adjacent to the present rod mills and eventually will replace the existing Waukegan rod mills. Present billet storage and shipping facilities will be enlarged to accommodate the new mill. Rod production thus will be increased somewhat by the installation.

While the wire drawing capacity of the Joliet plant will not be greatly enlarged, the new facilities will permit increased production and an improved product. Heat treating equipment for both rods and wire is included in the new mill.

The new buildings at Joliet will include a structure with a total length of 480 feet, a width of 150 feet on one end and 80 feet on the other, to house the rod mill, together with a new conveyor building 30 x 730 feet. The wire mill will have approximate dimensions of 960 x 1500 feet. Total new floor space involved in the Joliet project will amount to over 1,100,000 square feet.

At Waukegan replacements, rearrangement and improvements will be made "to make it one of the most efficient units for the production of manufacturers' wire in the country."

The Waukegan program includes provision for rod storage, replacement and relocation of rod patenting equipment, replacement of heat treating equipment, replacement and relocation of straightening and cutting and tinning equipment, additional continuous wire drawing and finishing equipment, improvements and replacements in the spring mill to afford better arrangement and versatility in manufacture, replacement of cleaning house and of iron sulphate facilities, extension to warehouse space, and an addition to the present office building.

New buildings will include an electro galvanizing building 37 x 525 feet, a straight and cut building 70 x 355 feet, and a sulphate of iron building 60 x 250 feet.

Also to be constructed are two additions to present rod storage facilities, 60 x 420 feet and 210 x 340 feet. Expansion of warehouse facilities also will be provided through

New Armor Plate Plant Opened

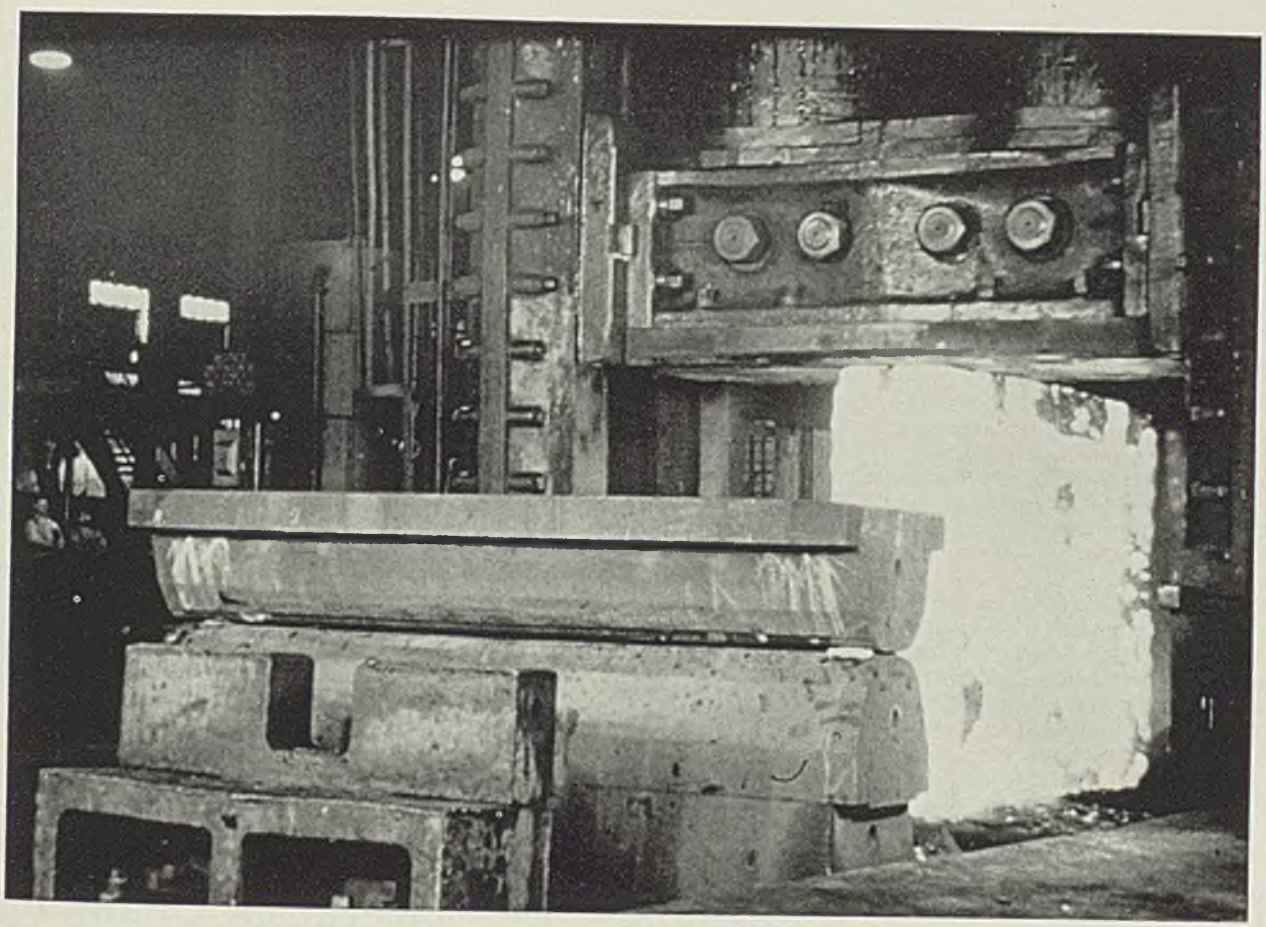
■ Completion of a new $1,250,000 armor plate plant at the Henry Disston & Sons factory in the Tacony area of Philadelphia and dedicated last week, will enable the company to triple its output of that product, it was reported. The new unit will produce armor plate for ordnance gun shields for 37 to 155-millimeter howitzers, scout and combat cars, light and medium tanks, small naval craft and aircraft. S. Horace Disston, president, lighted fires under the boilers (see photo).

Industry was urged by C. Jared Ingersoll, civilian head of the Philadelphia ordnance district, and speaker at the ceremonies to forget holidays in a drive to overtake Germany's production of war materials.

"In France," he said, "labor celebrated eighteen national holidays shortly before France fell. Let's work here and not make the same mistake."

Ranged about the speaker's stand in the concrete and steel plant, as he spoke, were one of the new 3-ton tanks which made the trip under its own power from the Baldwin Locomotive Works at Eddystone; a new M-2 half-trac caterpillar tread scout car, produced by the Autocar Co. at Ardmore, and a 37-millimeter gun manufactured by the York Safe & Lock Co.

Wide World photo



$7,000,000 Armor-Plate Forging Press Working 200 Tons of Steel

■ It was this press to which Irvin S. Olds, chairman, United States Steel Corp., referred in an illustrated talk to stockholders recently. With auxiliary equipment such a press costs $7,000,000, according to Mr. Olds. It requires 15 to 18 months to install.

The press is operated by Carnegie-Illinois Steel Corp., at Homestead, Pa. Its capacity is 12,000 tons; that is, it is capable of exerting a total pressure of 12,000 tons on the ingot or armor-plate slab. The press is one of the three largest owned by commercial companies in the United States, and when present expansion of armor plate capacity is completed five of such presses will be in operation.

In smaller units pressure is exerted by a single plunger, centrally located between guides, but as may be seen in the above illustration the 12,000-ton press is built with twin plungers. The large steel shapes in the foreground are spare parts. An even larger press, of 14,000 tons capacity, is now being built in this country.

the construction of four additions to present buildings. The addition to the office building will be two stories, 39 x 100 feet. The total amount of new floor space thus to be provided at Waukegan will add up to over 183,000 square feet.

Strip Mill Rearranged To Roll Light Plates

Details of the program by which Great Lakes Steel Corp., Detroit, will rearrange a hot strip mill to permit rolling of light plates (STEEL, June 9, p. 22), to be used for defense material manufacture, were announced last week. Capacity will be 300,000 tons annually, and production is expected to start in six months.

Program will involve changes and additions to the finishing department of the 96-inch hot strip mill as follows:

The present 96 x ½-inch parting shear is to be replaced by a 96 x 1-inch parting shear. The piler at the end of the runout table will be increased to permit the piling of plates up to 30 feet in length. Runout tables, kickoff and cradles for piling plate are to be installed at the end of one of the existing shearing lines.

A new shearing line, consisting of a charging car, lift table, trimmer, leveller, shear, plate kickoff, and piler, with the necessary roller tables between the units, will also be installed. To provide room for the new shearing line, the hot strip mill finishing building will be extended.

New facilities will permit the rolling of plates up to 90 inches wide, ⅜-inch thick and 30 feet long. Actual rolling will be done on the 96-inch hot strip mill, which, although primarily designed for the rolling of strip sheets, will require no alteration. Maximum plate production will utilize approximately one-third of the normal capacity of the mill.

The new source of supply for light plates will reduce pressure on existing plate capacity for light material and allow plate mills to concentrate to a greater degree on the more efficient production of heavier plates which also are in urgent demand for defense purposes. Location of the plant in the Midwest will also make possible a saving in time, material and labor now consumed in transportation of material to plate fabricators in that area.

Republic Orders Two New 50-Ton Electric Furnaces

Two new electric furnaces, with capacity of 122,000 tons of alloy steel annually, were ordered last week by Republic Steel Corp., Cleveland. The furnaces will be installed at the company's Canton plant and are expected to be in operation by Nov. 1.

Already the largest producer of electric furnace steel in the country, Republic's capacity will be increased

from 605,000 tons to 727,000 tons annually by the new 50-ton units. At the beginning of 1940 the company's capacity was 146,000 tons.

During 1940, Republic installed six 50-ton furnaces. Electric furnace steel is necessary in the manufacture of aircraft motors and light armor plate and the output of the new units will be used substantially for these purposes.

Company May Double Its Cold-Rolled Strip Capacity

Cold Metal Process Co., Youngstown, O., is tentatively planning to double its present capacity for producing cold-rolled strip. Production now is at the rate of approximately 5000 to 6000 tons of light-gage strip monthly including spring-steel grades.

The company recently purchased the former Youngstown plant of the Sharon Steel Corp., which it occupied on a rental basis since 1936. Four buildings are being improved with new roofs and sides and several smaller buildings have been razed. Equipment will be installed later this year.

Ask U. S. Steel To Expand

Shenango Valley business leaders have asked United States Steel Corp. executives to enlarge its steel and armor plate mills at Farrell, Pa. The corporation owns several sites adjacent to the armor plate plant now under construction.

Extends Wire Rope Facilities

Jones & Laughlin Steel Corp., Brackenridge, Pa., has authorized an extension to its new wire rope plant at Muncy, Pa., which was completed in 1938. Work is expected to start this week on the addition which will provide more warehouse space and also house a new closing machine to fabricate wire into rope. An office building will also be included in the new work.

Timken Adds Electric Furnace

Timken Steel & Tube Division, Timken Roller Bearing Co., Canton, O., installed a 25-ton electric furnace last week, replacing a 10-ton unit and bringing annual electric steel capacity up to 360,000 tons. Equipment now includes one 25-ton, two 35-ton, two 60-ton and one 85-ton furnaces. Timken also has three 100-ton open hearths.

■ Alloy Steel Division of the Copperweld Steel Co., Warren, O., now is operating five electric furnaces with annual capacity of 150,000 tons. Operations are at 122 per cent of capacity. May shipments were largest for any month since the alloy division started operations about nine months ago.

"Steel Expansion Would Retard Defense Effort"

■ If defense production and aid to Great Britain require less than 25 per cent of present steel capacity, the 10,000,000 tons additional capacity asked by the government would be used primarily for civilian needs. These needs can be restricted for the present and their fulfillment after the war would cushion the post-war shock.

This point was made by J. Leonard Replogle, in charge of steel on the War Industries Board during the first World war, in explaining why he believes the 10,000,000-ton expansion is impractical at this time (STEEL, June 16, p. 25).

Even if the plants were built now—it is estimated the expansion would require two and one half years—they could not long be operated at capacity on account of the shortage of scrap, manganese, ore and other materials. Four million workers would be required to supply the ore, coal, limestone and other raw materials.

Mr. Replogle suggested further curtailment of automobile production and the use of auto plants and workers for the production of defense materials. Large stocks of used cars indicate the public would not be materially affected by a lack of new cars for the present.

Aircraft and ship production in 1941 will require less than 3,000,000 tons of steel. Ship plate construction, according to Mr. Replogle, can be increased by 2,500,000 tons by conversion of sheet and strip mills.

Construction of the proposed facilities would take 4,250,000 tons of steel, cost $1,250,000,000 and divert the efforts of workers and management from the immediate production of defense materials, so urgently required now, the authority declared.

■ Priority controls on ferrotungsten, tungsten metal powder and tungsten compounds, sheduled to expire June 30, were extended last week to Aug. 31. Edward R. Stettinius Jr., priorities director, emphasized conservation measures must be continued because of uncertainties surrounding shipment of the metal from the Far East.

Continuous Mill Operators Changing From Sheet to Plate Production

PITTSBURGH

■ REQUEST by the Office of Production Management that sheet and strip steel producers curtail production of these items for nondefense purposes and use rolling mill capacity thus released for rolling plates has posed new problems to the producers.

The changeover now is in process. Some mills already are rolling plates; some have not yet started. Practically all the large mills can roll plates to a certain extent, although there is a considerable variance in the thicknesses of plate that can be rolled. Several mills are being altered to increase ability to roll plates to necessary specification.

The actual dividing line between plate and sheet, as well as strip and certain bar sizes, all of which can be rolled on the same mill, is a purely arbitrary standard and is shown in the attached table:

Thickness, inch	3½ and under	over 3½ to 6 inc.
.2500 and over	bar	bar
.2499 to .1875	strip	strip
.1874 to .0568	strip	strip
.0567 to .0344	strip	strip
.0343 to .0255	strip	sheet
.0254 to .0142	sheet	sheet
.0141 and under	sheet	sheet

Any continuous strip mill can roll all these sizes, as well as heavier gage plates; some mills at present roll material up to ⅝-inch thick.

Chief demand for plate from sheet mills comes from the railroads. This material is 3/16 to ¼-inch thick of carbon steel, and well within the capacity of sheet mills. Where high-tensile steels are used, gage thicknesses decline proportionately. These sizes, furthermore, can be handled on normal shear lines.

Railroad car builders here are confident they will not be handicapped with priorities, but their needs will be allocated directly by the government to sheet producers. How much such a program might cut into sheet production is not known, because most of the major continuous mills have not been tested extensively on plate production and capacities are indefinite. It is apparent, however, that few if any sheet orders will take precedence over the railroad plate requirements.

Width, inches			
over 6 to 12 inc.	over 12 to 32 inc.	over 32 to 48 inc.	over 48
plate	plate	plate	plate
strip	sheet	sheet	plate
strip	sheet	sheet	sheet
sheet	sheet	sheet	sheet
sheet	sheet	sheet	sheet
sheet	sheet	sheet	sheet
sheet	black plate	sheet	

$60,800,000 Machine Tool Shipments in May

■ Machine tool shipments in May totaled about $60,800,000, according to the National Machine Tool Builders' Association, Cleveland. This compared with deliveries aggregating $60,300,000 in April and $57,400,000 in March.

In May, 1940, total of shipments was estimated at $32,800,000.

Electric Truck Bookings Decline 25 Per Cent

■ Unit domestic bookings of electric industrial trucks and tractors in May were almost 25 per cent lower than in March and April, according to the Industrial Truck Statistical Association, 208 South LaSalle street, Chicago. Totaling 320 units, bookings in May were about 210 per cent greater than in the month in 1940.

Total net value of chassis only booked in the month was $1,234,936, against $1,557,592 in March, $1,472,226 in April, and $387,503 in May of 1940. Bookings included 19 nonelevating platform trucks with aggregate net value of $46,534; 273 cantilever trucks, total value, $1,048,778; eight light and heavy duty tractors, total value, $12,860; and 20 crane trucks, valued at $126,764.

Further details may be obtained from the association.

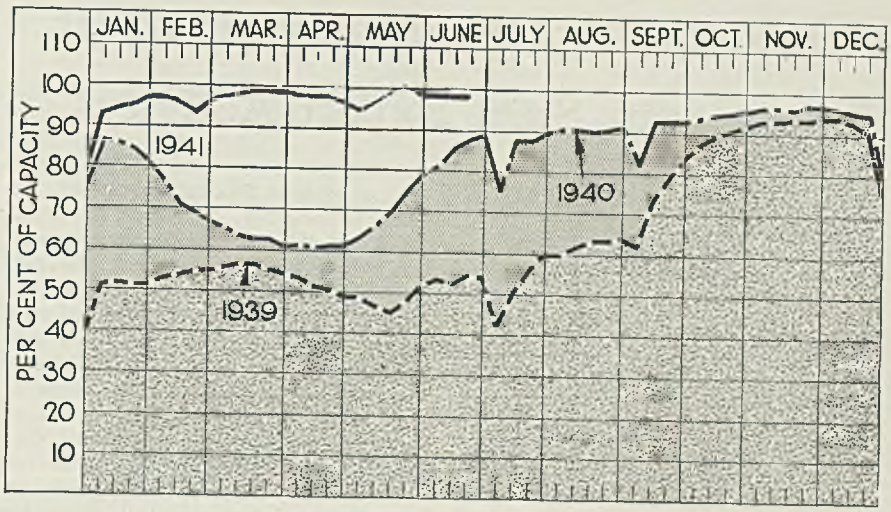
Pontiac Starts Work On Scrap Salvage Plant

■ Preliminary work on an 8000 square-foot addition to the salvage plant of Pontiac Motor Division, Pontiac, Mich., has started. The new space will facilitate handling of more than 5000 tons of scrap iron and steel a month.

Steel and brick addition to the present salvage building will enclose a railroad spur which will eliminate the current method of trucking scrap, and will release trucks and drivers for other purposes.

Scrap from all Pontiac plants now is gathered in the salvage building and sorted for sale or re-use in the foundry. Salvage cost will be cut by the new system which will eliminate double handling before the scrap is rerouted to the foundry or shipped. Cars will be spotted on the spur track and loaded as scrap is sorted.

■ Wider spacing of oil wells and elimination of some offset drilling as a means of economizing in steel was suggested last week by the Office of Production Management, according to F. R. Frye, conservation department petroleum engineer.



PRODUCTION . . . . Steady

■ STEELWORKS operations remained steady at 99 per cent last week. Three districts reported higher rates, one declined and eight were unchanged. A year ago the rate was 88 per cent; two years ago it was 54½ per cent.

Detroit — Advanced 2 points to 94 per cent. One producer operated all 16 furnaces and the other eight furnaces out of ten part of the week and nine the remainder.

Chicago — Unchanged at 102 per cent, with five of the district's six plants at 100 per cent or higher.

Cincinnati—With all open hearths but one in production the rate rose 6 points to 95 per cent.

St. Louis — Steady at 98 per cent for the eleventh successive week.

Central eastern seaboard—Held at 97 per cent for the third week.

Birmingham, Ala. — Maintained 95 per cent for the sixth week, relining of a blast furnace limiting pig iron supply, preventing capacity steelmaking.

New England — With two steelworks operating at 100 per cent the district rate remains at 94 per cent.

Buffalo — Production continued at 90½ per cent. Relighting of the only idle blast furnace in this district puts pig iron production at 100 per cent.

Wheeling — Slight shifts in production held rate at 88 per cent.

Pittsburgh — Off 1½ points to 99 per cent. Carnegie-Illinois Steel Corp. has blown in a blast furnace at its Clairton works.

Cleveland — Increase of 3 points to 95 per cent resulted from addition of open hearths late in the week by one interest. A further slight increase is indicated for this week.

Youngstown, O. — With 76 open hearths and three bessemers in production the district rate remained at 98 per cent. Republic Steel Corp. has relighted a blast furnace after relining. For the first time in at least 16 years all blast furnaces in this district are producing. Carnegie-Illinois Steel Corp. has resumed operation of 20 hot mills at Shenango Works, New Castle, Pa., after being closed 18 months.

District Steel Rates

Percentage of Ingot Capacity Engaged In Leading Districts

	Week ended June 21	Change	Same week 1940	Same week 1939
Pittsburgh	99	— 1.5	81	47
Chicago	102	None	93	49.5
Eastern Pa. ...	97	None	83	38
Youngstown ..	98	None	78	54
Wheeling	88	None	90	79
Cleveland	93	+ 3	84.5	55.5
Buffalo	90.5	None	90.5	39.5
Birmingham ..	95	None	88	71
New England ..	94	None	70	32
Cincinnati	95	+ 6	85.5	60
St. Louis	98	None	68	42
Detroit	94	+ 2	89	57
Average	99	None	88	54.5

Forecast 21% Gain in Lakes Area Car Loadings

■ Freight car requirements in the Great Lakes area for the third quarter will be 21.1 per cent greater than in the corresponding period last year, according to Regional Advisory Board's estimates. In 1940, third quarter carloadings were 525,822.

Iron and steel products will take 33.8 per cent more cars, and iron ore concentrates 19.8 per cent more. Other increases include: Machinery and boilers, 37.4 per cent; automobiles and trucks, 49 per cent; farm implements and vehicles, other than automobiles, 41.1 per cent.

Lease-Lend Act Purchases for Great Britain Spur Steel Export Activity

NEW YORK

■ ACTIVITY in the steel export market is accelerating as the Treasury's procurement division prepares to formally place 460,000 tons of finished and semifinished steel for Great Britain under the lease-lend act. The tonnage is part of the 1,000,000 tons for which bids were asked last month; it will be delivered over the next four months and many mills will share in the allocation. The remaining 540,000 tons will come up for consideration later.

Substantial tonnages of steel and pig iron have been moving to Great Britain against old contracts. When Great Britain asked suspension of shipments on carbon steels at the beginning of this quarter about 500,000 tons of steel was in storage along the Eastern seaboard for shipment to England. Much of this has been moved over the past two and one-half months. By June 1, such stocks had been reduced to around 250,000 tons and further reductions have undoubtedly been made since.

A substantial portion of the plain carbon steels, including some semifinished, on mill books has been canceled since the suspension on April 1 and some of this tonnage was later identified in the 1,000,000-ton inquiry put out by the Treasury Department.

In addition to the British accumulation along the Atlantic seaboard, which has been moving more freely in recent weeks, there has been a loosening up in the movement of tonnage which long has been held in this country for the account of European countries which have since been invaded by Germany. Some of this has moved into domestic consumption, but apparently the bulk has been moving abroad.

French Have Large Stocks Here

There still is a relatively large amount of this tonnage here. The French are understood to have approximately 100,000 tons in storage in the New York metropolitan area and Holland, Norway and one or two other European countries still have some stocks available. An accumulation of steel for Greece is estimated at 75,000 tons.

Within the past few days one lot of 54 cars of sheets, involving approximately 2000 tons, has been sold abroad, and also another lot of 1000 tons of wire. Six thousand tons of plates and shapes for shipbuilding, aboard one of the sabotaged Italian ships recently taken under custody by the United States government, is being offered by Italian agents for sale in one lot. However, the attitude of the American government on this transaction has not yet been defined.

Some relief for certain of the South American countries, which have been clamoring for steel here, is promised by the recent action of the state department in granting general licenses for export of certain iron and steel products to Argentina and Brazil. Under such arrangements, individual licenses for shipment of any of the products specified will be required no longer. General licenses should expedite business, although demand for steel in this country and shortage of ship bottoms still represent potential bottlenecks. General licenses on various products have also been granted to Cuba and the Philippines, and similar action is expected soon for another South American country.

General Licenses Issued

In the case of Argentina, general licenses have been issued for the exportation of iron and steel products, other than alloy, as follows: Bars, sheets, strip, tin plate, structural shapes, rails, pipe and tubing, wire and wire rods. In the case of Brazil, the same items are affected, along with chromium, molybdenum, vanadium and antimony.

General licenses for Cuba apply to the same steel products and the same metal and alloys mentioned above in the instance of Brazil. However, general licenses for Cuba which were announced March 26 have been revoked, because of national defense requirements, on the following items: Ingots, plates, piling, wheels, axles and spikes. Application for individual licenses for these products may still be submitted to the Department of State.

Blanket licenses continue for England, Scotland, Northern Ireland, Canada, Newfoundland, Palestine, Australia, New Zealand, Egypt, Bahamas, Barbados, Bermuda, Union of South Africa and British Southwest Africa. For certain British colonies, however, prior certificates must be obtained through the British Iron and Steel Corp. Apparently these certificates apply to destinations where there is question as to the importance of needs and as to whether some of the steel might fall into alien hands. Hong Kong is cited as a case in point.

Exports of steel continue more and more for the account of Great Britain and her colonies. Export figures no longer are available but the trend during the first three months emphasizes this. Of the total of 945,135 gross tons shipped to Europe during the quarter, 920,883 tons were for the United Kingdom. Incidentally, last year United Kingdom took 3,487,781 gross tons out of a total of 3,941,997 tons shipped to Europe and in 1939, 163,665 tons out of a total of 597,154 tons.

Shipments to North and Central America and the West Indies in the first three months of this year amounted to 305,299 tons, of which the great bulk was for Canadian account. South America, in the first three months, took 165,267 tons, or at the rate of approximately 661,000 tons, against 1,048,314 in all of last year, and 503,318 tons in 1939. There appears to be little doubt, however, that the trend in the current quarter has been further downward and that the annual rate of shipments to date to South America is consequently lower than indicated by the first quarter. Brazil, with 59,436 tons, was the largest importer during the first three months, with Argentina, second, with 39,015 tons. Last year Brazil took 254,799 tons and Argentina 362,059 tons.

Asia and Oceania took 170,064 tons during the first quarter with the Dutch East Indies the largest importer, with 47,564 tons. Shipments to Japan, normally our largest Asiatic buyer, amounted to only 5779 tons, with none in March. Last year Japan took 388,134 tons and the year before, 203,034 tons. Dutch East Indies took 164,306 tons in 1940 and 53,599 in 1939. Interestingly, China received only 4668 tons during the first three months of this year, against 142,745 tons in all of 1940 and 57,422 tons in the preceding year. The Philippines during the first three months took 17,691 tons, compared with 121,078 tons in all of last year, and 146,102 in 1939.

Resellers Offered Premiums

As for Africa, shipments during the first three months amounted to 106,739 tons, of which 80,329 tons were for the Union of South Africa and 13,176 tons for Egypt, leaving only approximately 13,000 tons for the remainder of that continent. Last year shipments to Africa amounted to 349,911 tons and the year before, 93,388 tons.

Total shipments to all points in the first quarter amounted to 1,692,504 tons, or at the annual rate of 6,770,016 tons, against 7,785,540 tons in 1940, and 2,499,002 tons in 1939.

Producers are still quoting prices on levels comparable to those at the end of last quarter. However, resellers who have iron and steel available are said to be taking advantage of handsome premiums which are being offered by most foreign buyers.

Reviews Substitutes For Nickel Steels

■ Number one of a series of monographs dealing with contributions to the metallurgy of steel and titled "Possible Substitutes for Nickel Steels" has been issued by the American Iron and Steel Institute, New York.

Devoted principally to 55 charts showing comparative physical properties, the 80-page booklet also contains seven tables and is divided into five parts as follows: Introduction; carburizing steels; thorough-hardening steels; low-carbon alloy steels, and standard methods for sampling for check analysis and standard variations from specified chemical limits.

The report deals only with constructional steels containing not more than 1.50 per cent chromium, 5.25 nickel, 0.75 molybdenum, 2.0 manganese, 2.0 silicon and 0.20 vanadium. It is pointed out significantly that because of the difficulties inherent in any program of substitution it must be understood clearly that substitution frequently involves sacrifice. Steels having identical tensile properties may exhibit widely varying impact and distortion characteristics; others having almost identical hardenability characteristics exhibit widely varying other physical properties. In some cases a compromise with the optimum is all that is possible; in other cases the substitute steel will be found to be as satisfactory in every respect as the steel which has been replaced.

The report summarizes possible substitutes for nickel steels as follows:

Nickel Steel In Use	Possible Substitute Standard Steel Series No.				
2300	4600	3100	4000	4100	6100
2500	3300	4300	4800	*4300	
3000	4000	4100	5100	6100	
3100	4000	4100	5100	6100	3000
3200	3100	4000	4100	*4100	6100
3300	*4300				
3400	*4300				
4300	No substitute suggested				
4600	3100	4000	4100	*4100	6100
4800	4300	*4300			

*These steels contain a higher molybdenum content than the regular 4300 and 4100 series. They are still in the development stage, but research work is being done to study further their possible application.

Westinghouse Wages Averaged $42 Per Week

■ Employes of Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., received an average weekly wage of $42 in 1940, highest ever paid by the company, it was reported last week. Average annual wage was $2156, representing $1947 in base wage or salary and $209 in adjusted compensation under the Westinghouse wage and salary plan.

Greatest business expansion in its 55-year history was experienced by Westinghouse last year, and 1941 business to date is far ahead of 1940, a company report to employes declared. New records in volume of incoming orders, sales billed, value of unfilled orders, total payroll and number of employes at the year's end were established in 1940.

Total of employes increased 10,000 in the year to 58,503, largely under the stimulus of national defense demands. More than 65,000 are now employed.

Farm Implement Exports Lower Than in 1940

■ Farm implement and machinery exports in April were valued at $8,345,145, a drop of 17 per cent from $10,013,391 in April, 1940, as reported by the Bureau of Foreign and Domestic Commerce. Practically all classes shared in the decline, wheel tractors registering the largest drop, 44 per cent. Exports for the first four months, 1941, were valued at $26,186,518, compared with $26,713,268 for the same period in 1940.

Tillage implements exported in April were valued at $723,554, a drop of 24 per cent from $978,516 in April, 1940. Tractors, parts and accessories exported in April were valued at $6,561,683, a decline of more than 16 per cent from $7,861,117, the figure for April, 1940. Harvesting machinery exports were $486,398, compared with $500,438 a year ago. Miscellaneous types of farm implements and machinery were shipped abroad in April to the value of $553,510, compared with $673,320 in April, 1940.

Committee for Copper Service May Be Formed

NEW YORK

■ Formation of a war service committee for the copper industry, to act in behalf of copper producers and to advise government officials in charge of copper is a possibility. Such war service committees were formed to advise the War Industries Board in World War 1, and the legal questions involved in recreating such committees in each industry to advise the OPM now are being explored. Already OPM is consulting with informal committees from other industries.

B. M. Baruch, chairman of War Industries Board, has made these comments on these industry committees:

"The various units composing a particular industry would join in appointing one of these committees to act as spokesman in negotiating with the government. The strongest men in the industry usually served on these committees."

Baruch further stated: "The war service committees were constant sources of information regarding the sentiment of the trades, their complaints, and their suggestions."

Because of antitrust laws and the subsequent experiences of oil producers in post-NRA days, there is a reluctance to form a copper industry committee until there is adequate assurance it could not be charged with illegal activities.

Selling prices for old copper and brass will be considered by OPACS this week at a conference with trade representatives in Washington. Prices will be fixed on fabricated articles made from these metals rather than scrap obtained from machine shops.

Asked To Withdraw Protest Against Scrap Exports to Britain

OPM was asked last week to withdraw its objections to export of 280,000 tons of scrap iron and steel to Great Britain. Cliffton Mock and A. A. Walsh, Treasury Procurement Division officials, conferred with R. C. Allen, OPM Production Division, to present the Treasury's views, reported in favor of unlimited co-operation with the British. OPM steel executives are said to believe protest of United States steel mills against future curtailing of scrap supplies are justified.

Housing Authority Is Conserving Steel

■ United States Housing Authority will replace iron, steel and bronze on its projects with concrete and wood, Administrator Nathan Straus said last week. This "will save from half-ton to one ton of metal for each USHA home built." Architects are instructed to eliminate metal gutters and downspouts, galvanized iron, bronze placques and decorations, aluminum trimmings of every description, metal stairs in buildings up to two stories high, and link fences.

Scrap Institute Will Meet in Detroit July 14

Midyear convention of the Institute of Scrap Iron and Steel will be held in Hotel Statler, Detroit, July 14. Committees will meet in the morning, the board of directors at noon, and a general business meeting on defense problems is scheduled for the afternoon.

The national golf tournament and other activities will be held at Franklin Hills Country Club, near Detroit, July 15. In the evening there will be a banquet at the club house.

Structural Mill Operations "Limited Only by Semifinished Steel Supplies"

NEW YORK

■ STRUCTURAL steel mills, with an estimated annual capacity of 5,038,200 tons, are rolling plain material at 85 to 90 per cent of capacity. If ingots and semifinished were available, structural mills would be producing shapes at capacity. Should supplies of semifinished shrink even slightly, some less essential construction may be curtailed in view of the expanding supplemental defense program.

Recently, the spread between bookings and shipments of the fabricating industry has been narrowing. Final tonnage figures for May show a slight excess of deliveries over new orders. Assumption this trend will continue, however, is fraught with uncertainty. How much additional construction will be authorized by the government is a matter of conjecture, but appropriations have been made under the lend-lease law, amendments to the Reconstruction Finance Corp. and defense highway and bridges act for the Defense Plant Corp., in excess of two and one-half billion dollars. Potential requirements for fabricated structural steel still are great.

Structural mill rollings the first quarter this year totaled 1,065,260 tons; during April 384,500 tons was produced. Mills rolled 3,149,036 tons in 1940, while shipments of fabricated structural steel last year totaled 1,515,543 tons. Analysis of rollings of plain material and shipments of fabricated steel during the last two decades indicates a steady decline in the share of heavy structural material going to fabricating shops. In the 1930s practically all the tonnage of heavy plain material went to the fabricating industry. During 1940 and so far this year, the industry took 67.3 per cent of the heavy structural tonnage rolled. This situation developed despite the fact the fabricating industry was heavily engaged in defense construction from mid-1939 on.

Backlog of structural shapes and piling held by the rolling mills at this time is not far from 1,500,000 tons. For comparison, backlogs of other products are estimated at: Sheets and piling, 5,000,000 tons; bars, 3,500,000 tons; and plates, 2,500,000 tons. As of May 1, tonnage for direct defense requirements by seven of the largest producers of plain structural material, accounting for the bulk of production, involved 116,597 tons for delivery in May; 77,590 tons, June; 70,195 tons, July; and 168,451 tons, delivery after July. Since then additional contracts for fabricated structural steel have been placed, but backlogs of both plain material and fabricated work are still largely concentrated in relatively early deliveries.

Compare United States and Germany In War Expenditures and Research

■ A DEFENSE program costing more than $100,000,000,000 instead of the $44,000,000,000 now contemplated may be necessary to overtake Germany's war machine, said Joseph L. Trecker, Defense Contract Service.

Estimating that Germany spent more than $100,000,000,000 in preparing for conquest, Mr. Trecker pointed to this country's commitments in industrial production for defense which he said total about $19,000,000,000.

"No matter how good Americans are, they are not five times as good as anybody else," he declared.

"Including the $19,000,000,000 now on the dotted line, the program we now have in the mill totals about $44,000,000,000. That is merely a drop in the bucket."

■ UNITED STATES must speed up its own research and make it more effective to compete with Germany's huge and efficient industrial research system, Maurice Holland, director of the division of engineering and research of the National Research Council, declared last week. Commenting on a report of industrial research laboratories issued by the council, Mr. Holland said the number of laboratories and research workers has increased sharply since 1920. The number of laboratories rose from 300 to 2264 and workers from 9000 to 70,063.

Mr. Holland pointed out that industrial research in the United States now is entering the substitute or *ersatz* phase in which Germany has been working for 20 years. The war has shown, he said, that Germany's substitute materials are generally good. He termed the German research setup as the most highly integrated in the world.

The defense program has exercised far-reaching influences on industrial research. Fundamental or pure science research, with a few exceptions, has been laid aside and attention turned to the immediate problem of developing substitute materials to be used in defense armament.

Military requirements have given researchers a wider field, however, in that they now can undertake investigations which in normal times would not be economical. Expense today is no hindrance, he said.

"Nazi Europe Would Lack Raw Materials and Food"

■ A Nazi-controlled European continent would be far from economically self-sufficient, according to a study of trade movements made by the Brookings Institution, Washington. The area as a whole is similar to old Germany in respect to foreign trade, being a net importer of food and raw materials and a net exporter of manufactured goods.

"Unless industrial materials were imported, the area's manufacturing, mining, transportation, communications and even agriculture would be severely handicapped. Of outstanding importance would be the reduction in output and deterioration in quality of modern machines and machine tools. The area is deficient in most of the important alloy metals, notwithstanding its adequate supply of iron ore and its excess steel capacity.

"There would be a shortage of bearing metals. The automotive industry would lack asbestos for brake linings and mica for spark plugs, and to a considerable extent they would be dependent on motor fuels from synthetic sources.

"The electrical industries and those dependent on them would be hampered by a shortage of copper and of many other minerals that are used in smaller amounts. And, while aluminum might replace copper, this would require a considerable increase in the manufacture of aluminum."

The analysis shows Europe's net imports of food and raw materials have exceeded considerably its net exports of manufactures. In the past the difference has been made up from tourist trade, emigrant remittances, shipping earnings, insurance and commissions. A Nazi regime might involve a considerable decline in these international receipts and make difficult importation of the necessary raw materials.

Power Supply Held Ample for All Needs

■ United States power supply, as augmented by new construction scheduled to be completed in the next two years, should prove ample for all demands, William P. Witherow, president, Blaw-Knox Co., Pittsburgh, and chairman of the National Association of Manufacturers' defense committee, told members of the Edison Electric Institute in Buffalo recently.

Mr. Witherow said in a few areas there is some danger of a shortage. These situations are being corrected in most cases, but there are local utilities where some strain is likely to be placed on reserves.

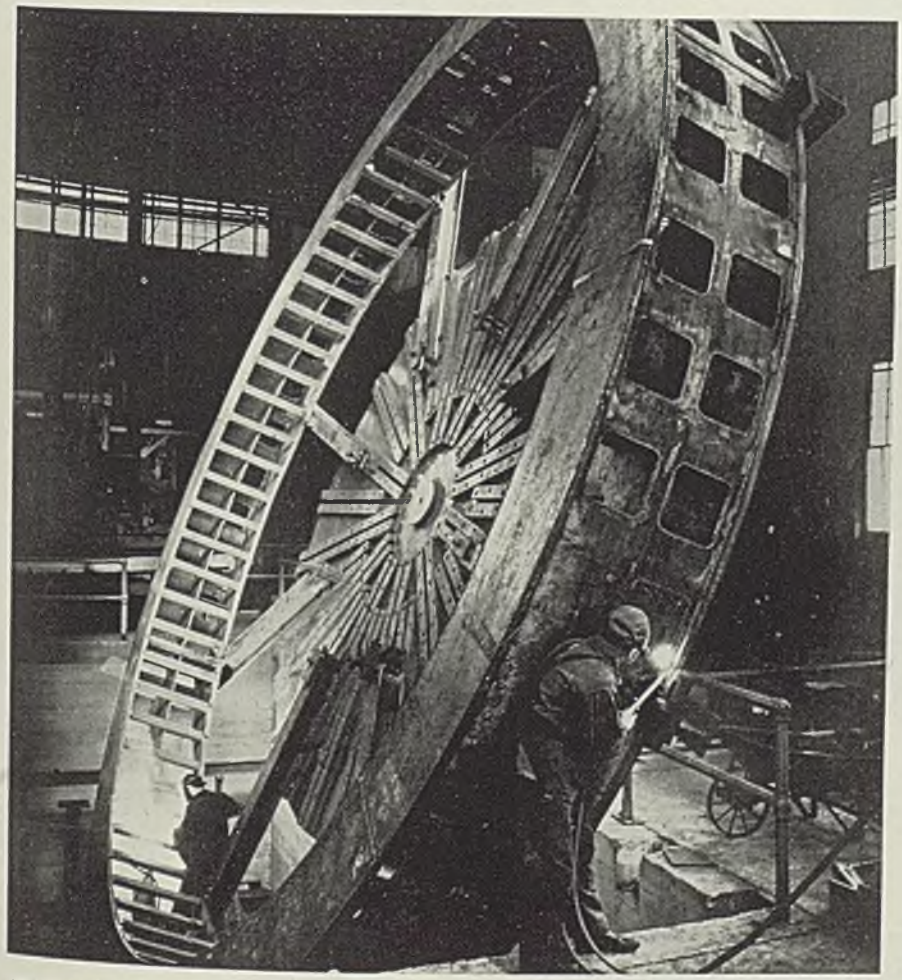
"The factor of obsolescence and inadequate excess capacity of factory-owned power plants will bring increasing dependence of industry on power purchased from central stations as industrial activity advances.

"There is need for further progress in the interconnection of system and the closing of the four principal gaps in the high voltage transmission system.

"There are two potential limiting factors from outside the utility industry: (1) Limited facilities for the manufacture of heavy electrical equipment and (2) limited facilities for the transportation of fuel. It is only fair to say that as yet there is no indication of difficulty from either source caused by the demands of the defense program."

■ Cleveland Electric Illuminating Co., Cleveland, reported last week that it has ordered an additional 50,000-kilowatt turbogenerator for its power plant in Avon Lake, O. With necessary equipment and construction of an extension to the power plant building, the generator will cost approximately $3,500,000.

Welding Operator's Helper



■ Size is no obstacle where this huge new welding positioner is concerned. Here it is shown at the Allis-Chalmers plant, Milwaukee, tilting a huge 50,000-pound water wheel generator yoke to an angle suitable for the welders. The positioner not only can be tilted to any angle from horizontal to vertical, but also can be rotated. It can be used for either hand or automatic welding since it can be made to move at the correct predetermined welding speed needed for any diameter. All motions are controlled by means of a portable push-button station

High-Speed Steel Patent Offered Royalty-Free

■ Endorsing the action by E. R. Stettinius Jr., Priorities Director, to conserve tungsten supplies, the Allegheny Ludlum Steel Corp., Brackenridge, Pa., last week offered royalty-free licenses to the government and users for its patented high-speed steels in which other alloying elements are substituted in part for tungsten.

Company's metallurgists several years ago began an intensive study aimed at substitution of less strategic metals to replace the high tungsten content of high-speed steel. A year ago the company placed on the market a steel containing 6 per cent tungsten instead of the orthodox 18 per cent; molybdenum replaced the remainder of the tungsten. Tests indicate this steel is equal in performance in 85 to 90 per cent of the applications for which high-speed steel is commonly used, including the machining of armor plate.

Holders of U. S. Steel Common Stock Increase

■ United States Steel Corp. common stockholders of record May 20 numbered 164,873, an increase of 1734 since Feb. 20. Preferred stockholders of record May 2 totaled 68,539, an increase of 85 since Feb. 3, when there were 68,454. This was a decrease of 193 from Nov. 1, 1940.

Observes 40th Anniversary

■ United Engineering & Foundry Co., Pittsburgh, in celebrating its fortieth anniversary, has issued a special edition of "United Effort," the company's monthly magazine. The issue lists all employes with service records of 40 years and more, shows photographs of the various plants in 1901 and 1941, and contains special messages from its directors who were also associated with the company at its founding.

Build Submarine Inland

■ Construction of the center section of the first submarine to be built in inland waters was begun last week at the Manitowoc Shipbuilding yards, Manitowoc, Wis., according to the naval public relations office, Chicago. Lieut. Commander G. C. Weaver represented the navy at the ceremonies.

Windows of WASHINGTON

By L. M. LAMM
Washington Editor, STEEL

ALCOA affirms willingness to expand capacity whenever government desires . . . OPM studies proposal to produce aluminum by the Alunite process . . . Stettinius orders decrease in primary metal used in stainless steel to conserve nickel . . . Pelley says oil tank cars could replace water transportation to East Coast

WASHINGTON

■ ANSWERING charges made by Interior Secretary Ickes and other administration figures, I. W. Wilson, vice president in charge of operations, Aluminum Co. of America, said last week the organization has not attempted to curtail production of aluminum to strengthen its competitive position.

Wilson testified before the Senate committee investigating the progress of the defense program. Expressing ALCOA's willingness to expand whenever told to do so by the government, he said:

"Most of the things that have been said before this committee concerning aluminum seem to be based on the assumption it is the function of a private industrial corporation to estimate not only what it will produce to meet the defense needs of the United States but also to set itself up as an authority for what those needs are.

"We have not presumed to tell Congress, the Army or the Navy how many planes are needed for defense. Our function as to forecasts is, and can only be, to tell what we will produce and how far we can expand under the instructions and requests of the government and then to produce such aluminum."

Plan 600,000,000-Pound Aluminum Capacity Increase

OPM consultants are studying a proposal by the Alunite Corp., affiliate of the Winchester Repeating Arms Co., to produce aluminum by the Alunite process, officials disclosed last week. Director General Knudsen said no decision on the proposal would be made until the process is demonstrated as practical.

He named Bohn Aluminum & Brass Corp., Detroit, Aluminum Co. of America, Pittsburgh, and Reynolds Metals Co., Richmond, Va., as the companies "in the picture as probable participants in the War Department's plan to raise aluminum capacity by 600,000,000 pounds annually.

A nation-wide campaign intended to salvage 20,000,000 pounds of aluminum from kitchen pots and pans and other household equipment will be launched July 19 by the OPM. A test campaign conducted recently in Virginia and Wisconsin counties produced 80,000 pounds, or three to four times the amount expected, according to Frank Bane, director of the division of state and local cooperation of the Office of Civilian Defense.

Twenty million pounds of aluminum would be enough to build 650 long-range four-motor bombers.

More Nickel-bearing Scrap To Be Used in Stainless Steel

An order designed to conserve nickel by reducing the amount of primary metal used in production of nickel-bearing stainless steel was issued last week by E. R. Stettinius Jr.

The order says that in the production of nickel-bearing stainless steel products, the amount of primary nickel to be used may not exceed 40 per cent of the total nickel content in such steel.

The rest of the nickel content must be made up of nickel-bearing scrap.

Net effect of the order is to require that, for every 100 pounds of nickel going into the production of stainless steel, only 40 pounds can be primary metal and the other 60 must come from scrap.

Henderson Asks Companies To Stabilize Oil Prices

Price advances on petroleum products were banned last week by OPACS Director Leon Henderson who asked refiners and markets to avoid increasing quotations in any section of the country. Changes in the prices of basic raw materials which might affect prices of finished products also were ruled out by Mr. Henderson.

"We request your company not to make any further advances in prices except when this office has been given reasonable advance notice and opportunity to study the proposed increase," he stated in a letter to oil companies.

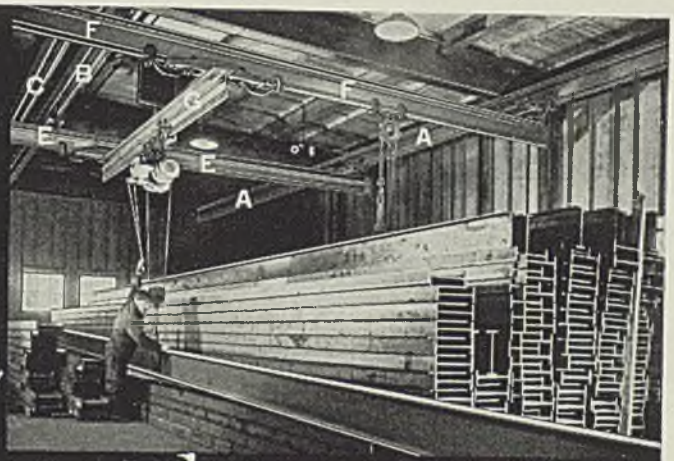
19,000 Tank Cars Could Supply Atlantic Coast Oil Needs

Nineteen thousand rail tank cars, most of which are standing idle on sidings, could if placed in service more than offset the loss in oil transporting capacity caused by diversion of tankships to the British war effort. This was the answer of J. J. Pelley, president, Association of American Railroads, to proposals by Harold Ickes, petroleum co-ordinator, for gasless Sundays and other petroleum conservation measures.

Mr. Pelley said the tank cars are idle because the rail rate is higher than the water rate. Railroads seldom haul oil from the Gulf coast to Atlantic coast ports for other than their own uses.

Mr. Pelley estimates the tank cars could deliver twice the capacity of the tankships which have been diverted from coastwise to foreign service. The cars he said, are ready for immediate service and no construction program is necessary to provide the motive power with

New AMERICAN MONORAIL Criss-Cross System AIDS PRODUCTION



Criss-cross or 3-level American MonoRail System stores steel taken direct from gondolas. (Letters on equipment correspond with those on layout below.)

Overhead MonoRail serves the punch (and all units) efficiently . . . fully covers the area . . . permits passing of loads . . . moves them easily.

THIS newly developed MonoRail System of rails, cross rails and bridges is a most efficient and economical means of overhead handling in small plants.

With this system you can place the load exactly where you want it—in storage, fabrication or shipment.

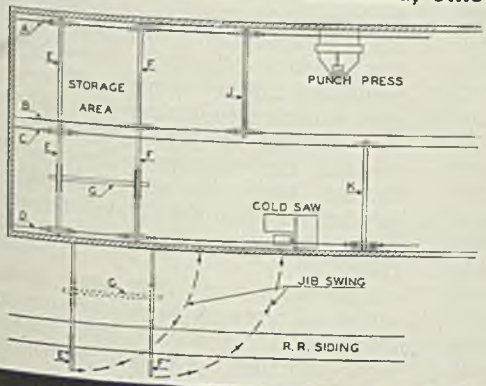
By eliminating floor congestion American MonoRail increases plant capacity. By providing superior mechanized methods for lifting and carrying, it increases the productivity of labor. Skilled labor is not required in its use. Operation and maintenance, a minimum. In many plants this low cost, flexible handling system has soon repaid its cost.

Just what saving you can realize can be soon determined by an American MonoRail engineer. Write us about your problem.

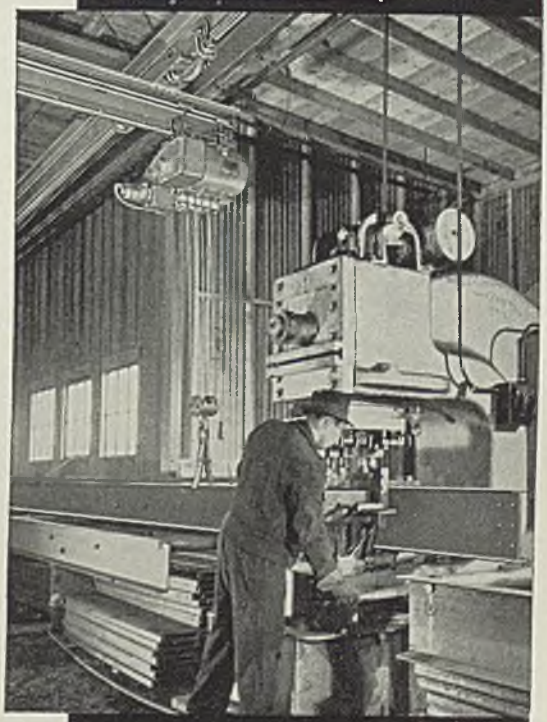
Ask for free copy of "Blue Book" illustrating numerous installations.

THE AMERICAN MONORAIL CO.

13102 Athens Avenue Cleveland, Ohio



Layout of shop showing 3-level MonoRail System.



In unloading or loading parallel jibs (E' and F' on layout) are swung out from building interlocking with tracks (inside) carrying MonoRail bridge equipped with electric hoist . . . unloads and stores without rehandling.

which to get them where they are wanted.

The railroad spokesman said the largest tankers carry 145,000 barrels and many have a smaller capacity. Assuming that 50 of the largest were diverted to Britain the loss in trip capacity would be 7,250,000 barrels. The idle tank cars would have a capacity of 3,578,400 barrels. However, because rail shipment is approximately twice as fast, the tank cars could haul as much petroleum as 50 of the largest tankers.

De Chazeau Will Head Iron and Steel Section

Melvin de Chazeau, former metals consultant on OPM's materials branch and a writer on the iron and steel industry, will head the iron and steel section in the Office of Price Administration and Civilian Supply.

Jesse L. Maury has been appointed head of the nonferrous metals section. A mining engineer, he has been connected with Lehman Corp., New York, for the past four years.

V. Lewis Bassie, formerly with the Department of Commerce, has been named head of the Division of Standards and Research. Edward L. McCormack, former priorities advisor to Harriett Elliott, consumer representative on the old National Defense Advisory Committee, will head the fuel division.

50 Per Cent Auto Output Reduction Not Ordered

OPM has not ordered automobile builders to reduce production for the next model year by 50 per cent, as has been widely reported, Director General Knudsen said last week. Nor have either the War Department or the Navy Department requested that such a drastic reduction be made, he added.

OPM will take an inventory of the industry's raw materials as of Aug. 1 to guide it in future curtailment, Mr. Knudsen said.

Widespread reduction which would close the auto plants and throw men out of work before defense industries are ready to absorb them would be unwise, he indicated.

Co-ordinated Industry Defense Committees To Be Organized

Industry committees now working with various defense agencies soon will be co-ordinated in a single group for each industry and OPM divisions, OPACS, the Army and Navy, and the Labor Department will be represented on each.

OPM heads believe this plan, already established in the iron and steel industry, will cut down delays caused when separate committees exist for each agency.

Bernard Baruch is said to have advocated this form of industrial co-operation, which is similar to the Commodities Sections of the old War Industries Board.

Small Companies Get Share of Defense Loans, DCS Reports

Sixty-seven per cent of the defense loans made by 321 banks in 101 cities went to companies with assets of less than $1,000,000 each and 26 per cent to companies with assets of less than $100,000, Defense Contract Service, OPM, reported last week.

To April 30, defense loans and commitments made by the 321 banks aggregated $1,093,000,000. On that date defense loans outstanding were equivalent to about 8 per cent of the total commercial loans of the same banks.

Of the defense loans, 56.5 per cent were for less than $50,000 each.

Appointed to Commerce Department's Field Offices

Appointment of 12 research, financial and trade specialists who will serve business men in the regional offices of the Department of Commerce was announced by Secretary Jesse Jones.

Their selection, he said, "is part of the general plan to streamline the activities of the Department bringing them more nearly in line with 1941 developments, thus providing more timely and complete information to government, industry and business."

Those appointed are: Roscoe B. Arant of the University of Mississippi; Virgil D. Cover, university teacher and transportation expert; W. Cornell Dechert, former statistical worker with the San Francisco Federal Research Bank; C. H. Henrikson Jr., former research director of the National Association of Credit Men; Wesson S. Hetrais, former credit manager and banker; Robert H. Leding, former director of research of Lord & Thomas Advertising Agency; Eldon C. Shoup, former merchandising and sales manager for New England companies; Arnold L. Skinner and James D. Studley of the Bureau of Foreign and Domestic Commerce; William A. Spurr, business analyst; Joseph H. Taggart, former university professor; Bervard Nichols, former editor of monthly business reviews at Universities of Texas and Pittsburgh.

War Department Now Has Plastics Branch

The War department has a new plastics branch to work out substitutions of plastics for metals in articles purchased by the quartermaster corps. F. H. Tupper, plastics industry expert, heads the unit which is part of the quartermaster corps standardization branch.

Cuban Manganese Ore Production Stepping Up

Spurred largely by demand from United States, development of Cuban manganese ore deposits is moving rapidly to the estimated annual production mark of $7,000,000 which local authorities believe can be reached.

Reports received by the Department of Commerce say the El Cristo manganese ore concentration plant, operated by the Cuban Mining Co., is the world's largest. About 360 tons of 50 per cent manganese are produced daily.

Industrial Machinery Exports $40,963,265

Industrial machinery exports in April were valued at $40,963,265, practically equal to the March figure, $40,418,406, according to the Bureau of Foreign and Domestic Commerce. Most of the major groups were fairly steady, except textile, sewing and shoe machinery, which increased 38 per cent over March.

Machine tool exports in April were valued at $19,021,589, slightly greater than March shipments valued at $17,947,336. This gain was due mainly to increased exports of milling machines, $5,285,184, compared with $3,917,001 in March. Lathe exports dropped to $3,503,755 in April from $3,738,621 in March.

Metalworking machinery other than machine tools was exported in April to the value of $3,359,743, compared with $3,991,579 in March. Rolling mill equipment exports in April were valued at $208,001, against $345,825 in March.

Endorse Labor Standards For Atlantic Ship Yards

Shipyard managers and labor leaders represented in the shipbuilding stabilization conference of the OPM Labor Division last Friday endorsed proposed standards providing for uniform wages, hours and working conditions for all Atlantic coast yards. They recommended the standards become effective June 23, after necessary ratification by the Navy Department, Maritime Commission and OPM.

Standards were developed in an effort to prevent any stoppage in shipbuilding and to avoid labor dissatisfaction. Gerard Swope is chairman of the Atlantic coast conference.

705 Merchant Ships by Dec. 31, 1943; OPM Acts To Insure Materials, Labor

■ TO SPEED construction of merchant ships needed for United States' and Great Britain's defense, national defense agencies last week moved to insure adequate supplies of materials and an uninterrupted supply of labor.

Blanket preference ratings, similar to those awarded the airframe builders, were granted to 24 shipbuilding companies working on Maritime Commission hulls. A total of 601 ships is involved. For ships to be completed this year, the rating will be A-1-a; for 1942 ships, A-1-b; for 1943 ships, A-1-c. The high ratings will assure prompt delivery of critical materials, including steel plates.

Thirteen producers of sheet and strip were advised by the Office of Production Management to curtail production of these materials for nondefense purposes and use the strip mill capacity thus released to turn out more plates for shipbuilding, car building and other urgent defense needs. OPM has asked the 13 producers for data on May production and to whom it was sold; orders on hand May 31; present capacity of mills and current production of plates, sheets and strip; a statement as to whether more plates could be rolled with present facilities; plans for expanding finishing and loading facilities to increase plate production still further; types of products best suited for each of the mills, together with their limitations.

East Coast Pact Formulated

To avoid work stoppages at the shipyards on the Atlantic coast, shipbuilders and labor unions were offered a proposed set of zone standards to be incorporated in a two-year agreement. The proposal provides for a ban on strikes and lockouts; uniform wages and working conditions, including a basic rate of $1.12 for first class skilled mechanics and an adjustment of wages after one year on the basis of living cost changes; time and one half for work over 40 hours a week and double time for Sundays and holidays; 7 per cent premiums for the second and third shifts.

Proposal was submitted by the government to the managements of 55 shipyards. It is similar to that recently signed for the Pacific coast; soon after the West coast agreement was signed, machinists in the San Francisco bay area struck for a further wage increase, from $1.12 to $1.15, in a strike condemned by national union officers who ordered the strikers to return to their jobs.

Blanket preference ratings, the Priorities Division pointed out, should save shipbuilders considerable paper work and will eliminate the necessity for using individual preference rating certificates on the various contracts for material flowing into the ships.

Under the arrangement, the shipbuilders who use the plan will apply it to their contractors by executing a copy of the order and serving it on their suppliers. The suppliers in turn may extend the rating to their own subcontractors by going through the same procedure. Once a shipbuilder has served such an order on his suppliers, the rating will apply for all future orders flowing into the same ships.

Covers Critical List Materials

The blanket orders cover all materials on the critical list and to portable or stock tools, whether or not on the list. Machine tools and similar machinery are not included and ratings for these must be obtained in the usual manner through the use of individual preference rating certificates.

W. A. Hauck, OPM steel consultant, in questioning the 13 sheet and strip producers as to potential plate-producing capacity, advised them an official order for curtailing sheet and strip production may be forthcoming. His questionnaire was addressed to the following producers:

American Rolling Mill Co., Middletown, O.; Bethlehem Steel Co., Bethlehem, Pa.; Carnegie-Illinois Steel Corp., Pittsburgh; Ford Motor Co., Dearborn, Mich.; Granite City Steel Co., Granite City, Ill.; Great Lakes Steel Corp., Ecorse, Mich.; Inland Steel Co., Chicago; Jones & Laughlin Steel Corp., Pittsburgh; Otis Steel Co., Cleveland; Republic Steel Corp., Cleveland; Weirton Steel Co., Weirton, W. Va.; Wheeling Steel Corp., Wheeling, W. Va.; Youngstown Sheet & Tube Co., Youngstown, O.

The Maritime Commission is administering a merchant shipbuilding program costing approximately $1,715,000,000 and has as its goal the delivery by Dec. 31, 1943, of 705 merchant vessels of all types.

Program has three major divisions: Re-establishment of a stable and efficient merchant marine by building 500 new ships over a 10-year period. This is the commission's long-range program, inaugurated in 1938.

Emergency national defense construction program to build 200 standardized cargo carriers, as authorized by the President in January.

Construction of 222 merchant ships as part of our defense program, authorized by the President in April.

In addition, there are building in this country 60 emergency-type cargo ships ordered by the British government and 86 vessels of various types for private account without the commission's participation.

This brings the grand total of all merchant ships included in the immediate construction effort up to 851.

Up to May 20, 86 of the commission's long-range naval-auxiliary type vessels had been delivered; thus there remain 765 merchant vessels building or under order in the United States today.

To produce these ships the commission is establishing emergency facilities for existing shipbuilding companies at seven new sites with 51 ways; and has arranged for 42 new ways at existing yards, as well as the construction of ten additional ways to build ships for British account. The 103 new ways represent an investment of approximately $86,000,000.

Based on present estimates, the merchant ship construction program will produce 1,250,000 deadweight tons in 1941, about 3,500,000 tons in 1942 and 5,000,000 tons in 1943.

1941 Farm Cash Income May Reach Ten Billions

■ Farm cash income probably will reach $10,000,000,000 in 1941, compared with the Department of Agriculture's estimate of $9,120,000,000 for 1940. January-April income was $2,776,000,000, or 6.1 per cent above last year. Normally the first four months' income represents about 28 per cent of the total for the year, according to *The Agricultural Outlook*, Chicago.

Increased consumer buying, government support of prices, actual and prospective purchases under the lend-lease act, curtailment of imports of competitive agricultural products, provision of loans on certain products at 85 per cent of parity and the increment in prices of holdover supplies have enhanced farm income prospects.

April index of farm prices, based on August, 1909-July, 1914, as 100, was 110, an increase of 12 per cent over last year and 25 per cent over August, 1939, last month before the war's outbreak. Prices of goods farmers buy have increased less sharply and the ratio between the two, or the value of farm products in exchange for other goods, was 89 in April, compared with 80 a year earlier.

Mirrors of MOTORDOM

By A. H. ALLEN
Detroit Editor, STEEL

Higher income groups buying property, defense bonds and setting aside funds for next year's tax bill . . . Boom or bust ahead in postwar period, with likelihood of rampant industrial capacity waiting on new distribution techniques, probably supported by government spending . . . Motor industry the goat on prices and production . . . Auto plant methods give birth to new ideas for ordnance machining equipment

DETROIT

■ WHERE is the smart money going these days? What do those in the upper 2.6 per cent of the nation's population, earning $5000 a year or more, and capable of better than average foresight, discern in the future postwar years? These are persistent questions that are being asked every day not alone in Detroit but throughout the country.

A sort of Gallup poll, or microscopic cross section, of some of the smart money reveals plenty of confusion but also a few definitely discernible trends. In the first place these people are buying property, chiefly farms and suburban areas, in the belief that if worst comes to worst they can always retire to the land and eke out enough to keep alive and healthy. The rush to buy such property here has been and still is tremendous. A lot of it goes for cash on the line and the new owners move in with elaborate modernization plans and blueprints of new buildings, aiming toward completion of country estates and the possible creation of a new class of landed gentry of better than average means.

The lure of the farm to city folks is age-old, but the automobile and good roads have done more than anything else to bring true the dream of living in the country and working in a city 25 to 50 miles distant.

Accompanying this move is a similar spreading out of families with only the most moderate of incomes—perhaps $1500 to $3000 a year—onto suburban property called little farms, ranging from one to five acres in size. Here again the automobile provides the link between the calm of chickens and a vegetable garden and the hum of machines in industrial plants.

Today's profits and high wages also are being dumped into defense bonds. Many well-fixed business men are buying up to the annual limit of such bonds. They reason, no doubt correctly, that if anything is to endure the government certainly will be the last to go under and while the earning rate is only 2.9 per cent, still the security is there.

Saving for Income Tax

Another plan which business people are adopting generally is to set aside regular sums of money each month to deposit in savings accounts so that when their quadrupled income tax bill is calculated next March they will have the funds to pay it. This is a precaution which is being urged on workmen in plants, too, many of whom are earning top wages today for the first time in 12 years and are inclined to go on spending orgies with little thought of the waiting tax collector.

One executive who is following this practice was asked by a friend, "Why put your money in the savings account? Don't you know the government is planning to require a high percentage of all such accounts be turned over to defense bonds?" He replied that in this event the government would be told his money was earmarked for income tax payments, and if it preferred defense bonds to cash as tax payment, they would have to suffice.

Certainly there is no wholesale move to invest in stocks and securities. Apparently the present generation has learned its lesson in this field, since there has been no active support of the stock market for a good many years. It is even being discarded as the barometer of business conditions and future events.

Opinion is unanimous that the country is headed for the greatest boom of all time, such as to make even the once-popular Major Angus gasp, or else for the greatest collapse ever known. Which it will be seems now to rest largely on the solvency of the federal government. The 20-billion dollar pump priming of 1933-1940 was not enough to correct the many national economic ills. The 100-billion dollar war effort of 1941-194? is working wonders already, but old-line economists and capitalists shudder when they think of the day of reckoning.

It is most unfortunate that it took the shock of an imperiled security to let loose the flood of dollars into the nation's economy. What great things might have been accomplished by such an expenditure in peacetime for the national welfare, that is, assuming it had been properly directed into productive channels and not into leaf-raking.

In any event, the postwar period will find industry geared to produce as it has never been geared before. Eight hundred million dollars' worth of the latest and best machine tools pouring into industry every year; the steel industry pouring out a hundred million tons of steel annually; the automotive in-

dustry able to wrap up six million new cars a year and still have a vast reservoir of productive capacity in the new plants now beginning to turn out armament.

This giant productive capacity is going to demand a commensurate market if it is not to rust and collapse. The federal government and its hundreds of advisers and consultants are determined to forestall a collapse. The only answer appears to be government subsidization of consumers who have not the wherewithal to buy the things industry can produce, and the regulation of industry to produce the maximum amount of material at the lowest possible cost with very little, *if any* profit.

This would sound the knell of the American way of things as far as the old concept is concerned, but if the old way will not work, a new way must be found.

"Study" Henderson's Request To Withdraw Advances

Request of Mr. Leon Henderson, head of the OPACS and arch-baiter of the automobile industry since NRA days, for five automobile companies to withdraw announced price increases on 1941 models was being given the silent treatment, at least up to Wednesday of last week. No statements, beyond the fact they were studying the demands, were available from the companies involved. The manufacturers found themselves in the pretty pickle of either having to withdraw the increases and concede they were unjustified or of sticking by their guns and refusing to admit that the government is running their business.

If Mr. Henderson is to have power of price control over everything sold in this country, whether it be steel, automobiles or spinach, he has a real job cut out for himself. The hopelessness of enforcement of universal price regulation and policing already must be apparent to Henderson, convincing him that the only way to proceed is to single out some violators and go after them full tilt, hoping that the attendant publicity will keep other price boosters in line.

Thus the motor industry again becomes the national whipping boy, for the edification of the public. And not only on retail prices. Other government officials exhibit the peculiar trait of first grimacing at the auto industry as the culprit responsible for any of their troubles. One of the latest charges is hogging steel supply at the expense of defense production.

Navy department officials became ruffled over the fact that they could get no immediate bids on 150 tons of cold-rolled bars for the Hudson naval ordnance plant which is months away from start of production with only one of 15 buildings completed and no equipment installed.

It is suggested that curtailment of production of auto steel will at once guarantee supplies of defense steel—another *non sequitur*. Even a steel mill sample chaser knows that you cannot press a button on a continuous strip-sheet mill and start rolling ship plates instead of automobile body stock.

The 20 per cent reduction in the 1942 model output, already ordered by OPM and the 50 per cent suggested by the War Department to conserve all sorts of raw materials, will automatically reduce the auto industry's demand for zinc.

The OPM and OPACS priority order for zinc, effective July 1, raised many groundless fears of who is to get zinc and how much. The OPM order is "mandatory," which suggests something drastic. This is not true, for all the OPM and OPACS control actually does is to put on a legal basis the informal co-operation of zinc producers and the OPM begun last April.

All consumers will continue to get their zinc in the same general way in which they have obtained zinc since April. Producers themselves have been and will continue to be free to ship directly to both defense and nondefense consumers all the zinc not required by the OPM to provide zinc for defense "hot spots."

In June the OPM is taking 22 per cent, or some 15,000 tons, but producers have the other 78 per cent to distribute themselves to consumers with both defense and nondefense work. Regular customers are taken care of out of this 78 per cent. Incidentally during the greatest demand in history, all production of virgin slab zinc continues to be sold on the unchanged price basis of 7.25c in effect since Sept. 23, 1940.

Automobile Production

Passenger Cars and Trucks—United States and Canada

By Department of Commerce

	1939	1940	1941
Jan.	356,962	449,492	524,126
Feb.	317,520	422,225	509,233
March	389,499	440,232	533,912
April	354,266	452,433	489,841
4 mos.	1,418,247	1,764,382	2,057,112
May	313,248	412,492	.....
June	324,253	362,566	.....
July	218,600	246,171	.....
Aug.	103,343	89,866	.....
Sept.	192,679	284,583	.....
Oct.	324,689	514,374	.....
Nov.	368,541	510,973	.....
Dec.	469,118	506,931	.....
Year	3,732,718	4,692,338	.....

Estimated by Ward's Reports

Week ended:	1941	1940†
May 24	133,560	99,810
May 31	106,395	61,255
June 7	133,645	95,560
June 14	134,682	93,635
June 21	133,565	90,060

†Comparable week.

Go All Out on Streamlining

J. C. Zeder, chief engineer in charge of the Chrysler engineering laboratories, told S.A.E. at its recent meeting in White Sulphur Springs, W. Va., that the corporation now has "in the mill" a radically streamlined coupe model, with engine, transmission and gear ratio specially designed to fit its particular needs. He emphasized the futility of streamlining for reduction in air resistance if it is not accompanied by a transmission and rear axle redesign which maintains engine efficiency at a satisfactory level in the high speed range and yet does not reduce car performance at lower speeds.

Co-operation of tool designers and engineers, machine tool representatives and production experts is giving birth to some important new ideas in machining of ordnance components, such as shells, machine guns, antiaircraft guns and the like. A half dozen or more plants in this area are benefiting from development of new equipment embodying such ideas, while the time-ripened arsenals and arms producers in the East throw up their hands in horror at any disturbance of their traditional production methods.

Two examples are: Equipment for broaching of gun barrels instead of the slower rifling methods with single-point tools; and a vertical-spindle completely automatic chambering machine which greatly reduces time required for chambering on horizontal hand-indexed machines.

These ideas are typical of many others which are conceived in the brains of engineers who have been trained in the mass production methods of the motor industry.

Recent address by D. U. Bathrick, sales manager of Pontiac, opened with these words, which undoubtedly echo the sentiments of many another sales manager standing before his customers: "You see before you a fugitive from the economic law of supply and demand—a sales manager with nothing to sell. Nothing to sell, that is, except a deep and abiding faith in this America of ours and in the automobile—the greatest single contributor to the American standard of living that we are so concerned about defending today."

MEN of INDUSTRY

■ **JOHN F. BYRNE,** of Pittsburgh, has been appointed general manager of Koppers United Co.'s newly created Blast Furnace Division, which includes the two blast furnaces purchased from the Granite City Pig Iron Co., Granite City, Ill. Mr. Byrne joined Koppers in 1925 as a research chemist at Chicago. For several years he has been an assistant to the vice president in charge of finance.

♦

H. H. Rothrock, formerly head of the industrial engineering department, University of Pittsburgh, has assumed his new duties as assistant to the chief industrial engineer, Carnegie-Illinois Steel Corp., Pittsburgh.

♦

Samuel T. Nicholson has retired as chairman of the board, Vulcan Iron Works, Wilkes-Barre, Pa., after 55 years of service with the company.

Robert T. Dunlap has been appointed general manager of the Vulcan company.

♦

Robert S. Furst has been appointed personnel director, Adel Precision Products Corp., Burbank, Calif. Mr. Furst joined the company in March this year and before that was associated with Republic Steel Corp. at Massillon, O.

♦

Samuel Reid has joined Cochrane Steam Specialty Co., Boston, and will be engaged in sales engineering work, handling the products of the Cochrane Co., Hayes Corp., Northern Equipment Co., Reliance Gauge Column Co., and Vulcan Soot Blower Corp.

♦

C. W. Christensen, assistant general manager of sales, rubber service department, Monsanto Chemical Co., Akron, O., has been promoted to general manager of sales, while **James F. Hand** has been made assistant general manager of sales, succeeding Mr. Christensen.

♦

David C. Prince, manager, Commercial Engineering department, General Electric Co., Schenectady, N. Y., was elected president, American Institute of Electrical Engineers, New York, at the summer convention in Toronto, Ont., June 16-20. Other officers elected were: Vice presidents, **N. S. Hibshman,** Bethlehem, Pa.;

Ellsworth T. Candee

Who has been elected president, American Electroplaters Society, as reported in STEEL, June 16, p. 31. Mr. Candee is technical supervisor, American Metal Hose Branch of American Brass Co., Waterbury, Conn.

J. Elmer Houseley, Alcoa, Tenn.; **Arthur L. Jones,** Denver; **Walter C. Smith,** San Francisco; **C. A. Price,** Hamilton, Ont.; directors, **Lester R. Gamble,** Spokane, Wash.; **T. G. LeClair,** Chicago; **Fred R. Maxwell Jr.,** Pensacola, Fla.; national treasurer, **W. I. Slichter,** New York, (re-elected).

♦

W. E. Griffiths has been named manager of the newly established development engineering department of Allegheny Ludlum Steel Corp., Pittsburgh, with **W. F. Detwiler Jr.** as assistant manager. The past eight years Mr. Griffiths has handled engineering and sales promotion of stainless and other alloys for Carnegie-Illinois Steel Corp. in the midwestern states. Associated with Allegheny Ludlum since 1936, Mr. Detwiler spent the first half of 1939 in Sheffield, England, as a European representative, and since his return has been engaged in warehouse control at the Pittsburgh offices.

H. M. Givens Jr. has been appointed manager of tool steel sales, as reported in STEEL, June 16, p. 29.

♦

Arthur G. Chase, vice president, treasurer and a director, Precision Castings Co., Syracuse, N. Y., and Cleveland, has been elected a director of Continental Can Co. Inc., New York. Mr. Chase was formerly associated with Continental Can as an official and a director.

♦

A. J. Grindle has returned to the pulverizer department of Whiting Corp., Harvey, Ill. Mr. Grindle pioneered successful application of pulverized coal in firing malleable iron melting furnaces, annealing ovens and other metallurgical furnaces. The past several years he has been engaged in consulting practice.

♦

E. T. Slackford, advertising manager, Harnischfeger Corp., Milwaukee, has been elected president, Milwaukee Association of Industrial Advertisers. **Forrest J. Nelson,** advertising manager, Macwhyte Co., Kenosha, Wis., has been elected vice president; and **M. E. Engebret-**

H. M. Givens Jr.

W. F. Detwiler Jr.

W. E. Griffiths

son, Oilgear Co., Milwaukee, secretary-treasurer.

♦

Guy R. Growl has been named manager of the Minneapolis manufacturing and repair department, Westinghouse Electric & Mfg. Co. He succeeds **J. D. Whitaker,** who has become manager of the southeastern district manufacturing and repair department, with headquarters in Atlanta, Ga.

♦

Alexander W. Strachan has been named superintendent of rod mills at the Donora, Pa., Steel & Wire works of American Steel & Wire Co., Cleveland. Associated with the company 24 years, Mr. Strachan has been foreman of the No. 2 rod mill, Cuyahoga works, since November, 1938.

♦

William L. Batt, deputy director, Production Division, Office of Production Management, and president, SKF Industries Inc., Philadelphia, recently was re-elected chairman of the board, American Management Association, New York. **Alvin E. Dodd** will continue as president of the association.

♦

Clyde A. Crowley and **Harry Bennett** have organized Crowley & Bennett, and will engage in technical consulting practice, with headquarters at 6803 North Clark street, Chicago. An eastern branch has been established at 228 King street, Brooklyn, N. Y.

♦

C. O. Wanvig, president, Globe-Union Inc., Milwaukee, has been appointed chairman of the newly created defense industries council for Milwaukee county. He also has been elected chairman of the council's executive committee and has as his assistant in both groups, **C. W. Pendock,** Le Roi Co., former president of the Association of Commerce.

♦

Alden F. Erikson, the past seven years district sales manager in the Boston and New England territory for Wyckoff Drawn Steel Co., Pittsburgh, has been called to active duty with the 68th Coast Artillery Anti-Aircraft Regiment. He holds the rank of major, having been a member of the coast artillery reserve since 1922.

Theodore C. Cederholm succeeds Major Erikson as district sales manager. He has been affiliated with Hawkridge Bros. Co., Boston steel distributor, seven years.

♦

C. M. Maratta, since 1921 maintenance engineer, Timken Roller Bearing Co., Canton, O., has been appointed chief works engineer, succeeding the late W. C. Makley. **Walter F. Green,** associated with Timken's engineering department since 1935, becomes assistant works engineer, and **Putney L. Wright,** with Timken since 1938, will be plant engineer.

Harry McCool Jr. has been appointed southwestern sales representative for the Steel and Tube Division of Timken. His territory includes Kansas, Louisiana, Oklahoma, Arkansas and Texas, with headquarters at Dallas, Tex. Mr. McCool joined the company in 1928, and from 1935 until March, 1941, when he joined the sales department of the Steel and Tube Division, he was superintendent of the tube mill at Wooster, O.

♦

Charles B. Getsinger has been named supervisor of fuel and power, Carnegie-Illinois Steel Corp., Pittsburgh. A graduate of Carnegie Institute of Technology, Mr. Getsinger joined the former Carnegie Steel Co. as an inspector at the Homestead works in 1909.

Charles D. Mills has become manager, raw materials, fuel and power division, succeeding Mr. Getsinger. Graduating from Carnegie Institute of Technology in 1919 he joined the engineering department of the former Carnegie Steel Co. at New Castle, Pa., and after serving in various engineering capacities, was named special engineer in the raw materials, fuel and power division, in 1936.

Training for Production Stressed at Conference

■ Highlighting the third annual industrial relations training conference of Carnegie-Illinois Steel Corp. at Gary, Ind., June 17-18, was an evening session the first day in Gary Memorial auditorium, attended by 5000 of the company's executives, supervisors, foremen and invited guests. Program was geared to the subject of "Education and Training in an Industrial Democracy," with J. L. Perry, president of the corporation, Pittsburgh, as principal speaker.

Other speakers were E. E. Moore, vice president in charge of industrial relations, Pittsburgh; G. P. Wardley, assistant vice president, Chicago; J. E. Lose, vice president in charge of operations, Pittsburgh; and R. J. Greenly, chief of training, Pittsburgh. W. E. Hadley, manager of operations, Chicago district, was chairman of the meeting.

In discussing "Training for the Future," Mr. Perry reviewed the progress which the company has made in employe training and relations with its employes in recent years and pledged co-operation of the corporation in producing steel, in quantity as well as quality for the national defense program. In every month this year, the corporation has shipped more than 1,300,000 tons of steel. Less than 1,000,000 tons was shipped in the best month of 1937.

Mr. Greenly emphasized that production is the goal sought and personnel training, properly directed, is merely a tool for attaining that goal.

During the program, 25-year service employes and pensioners, a group which easily totaled 1000, was presented to the audience.

Carnegie-Illinois is currently training 4000 employes in keeping step with national defense requirements and purpose of the two-day conference of industrial relations representatives was to review general aspects of training technique. The meeting brought together 40 training directors from the Pittsburgh and Chicago districts for discussion of mutual problems.

Technical sessions were held in the Gary mills.

DIED:

■ **William W. Wilcox,** 79, chairman of the board, Wilcox, Crittenden & Co., Middletown, Conn., June 12, in that city. He became a shipping clerk for the company, founded by members of his family in 1847, and worked in all departments before being elected president in 1917. He became chairman when he retired from the presidency in November, 1940.

♦

Arthur Anderson, 44, assistant treasurer, National Carbide Corp., New York, June 12, in Louisville, Ky., where he was directing construction of a plant the company is building there. Mr. Anderson also was assistant treasurer, Wilson Welder & Metals Co., and treasurer, Air Reduction Corp., Carbide subsidiaries.

♦

Victor A. Harder, 72, associated with Central Foundry Co., New York, many years, recently, at his home in that city.

♦

Arthur Chester Smith, superintendent of the foundry of Hardie-Tynes Mfg. Co., Birmingham, Ala., in Birmingham, June 16.

♦

R. J. Williams, 58, master mechanic at the Ensley, Ala., blast furnaces of Tennessee Coal, Iron & Railroad Co., in Ensley, recently.

♦

Karl D. Smith, 57, formerly executive secretary, Union Steam Pump Co., Battle Creek, Mich., and more recently engineer for American-Marsh Pumps Inc., June 17, in Battle Creek.

♦

Gus Nelson, an employe of Tennessee Coal, Iron & Railroad Co., Birmingham, Ala., over 30 years, and superintendent of its pipe shop, recently, in Birmingham.

Activities of Steel Users, Makers

■ FALK CORP., Milwaukee, will build a $900,000 factory addition for the manufacture of reduction gears for the United States Navy and the Maritime Commission. Addition will contain about 100,000 square feet.

♦

Timken Roller Bearing Co., Canton, O., has enlarged its expansion program to a total of $6,000,000 to handle an increased volume of defense work. Improvements will be made at company's various Ohio plants where several million dollars already are being spent.

♦

Trumbull Electric Mfg. Co. has moved from Ludlow, Ky., to 4817 Section avenue, Norwood, O.

♦

Gering Products Inc. has moved from Rahway, N. J., to North Seventh street and Monroe avenue, Kenilworth, N. J.

♦

Jackson Machine Tool Co., Jackson, Mich., has appointed J. Guy Griffith Co., Pittsburgh, sales representative in Pennsylvania, eastern Ohio and West Virginia.

♦

Masonite Corp., Chicago, will spend $1,500,000 for expansion and improvements at its Laurel, Miss., plant to speed up fiber board production. Largest item is $800,000 for a steam turbine plant.

♦

Diamond T Motor Car Co., Chicago, is now occupying its new $200,000 plant in the Fifty-first street section, Clearing Industrial District. The new building, erected in 43 working days and leased for a term of years, will be used to supplement activities in the company's main plant at 4517 West Twenty-sixth street. It affords 72,000 quare feet.

♦

Standard Truck Equipment Co., Jackson, Miss., has been appointed distributor for the Hoist and Body Division of Gar Wood Industries Inc., Detroit.

♦

Roth Mfg. Co., Chicago, is erecting a one-story top addition, 60 x 118 feet, to be used for office purposes. Another addition, completed about a year ago, was used to increase manufacturing space.

♦

Kent-Owens Machine Co., Toledo, O., has appointed A. C. Haberkorn Machine Co., Detroit, exclusive agent for its milling machines in Detroit and eastern Michigan.

♦

Delta-Star Electric Co., Chicago, has appointed Wise Equipment Co., General Motors building, Detroit, representative in that territory.

♦

Buda Co., Harvey, Ill., celebrated a double anniversary the week of May 26, one the sixtieth year of its existence and the other the golden jubilee of moving to its present site from Buda, Ill. Starting with only 20 workers, the company now employs 1700.

♦

Production Machine Co., Greenfield, Mass., has taken over the manufacture of the line of plain and universal tool and cutter grinders formerly made by the Greenfield Tap & Die Corp., Greenfield.

♦

Lord Mfg. Co., Erie, Pa., has opened a district office at 4937 Laclede avenue, St. Louis, with George Harrington in charge. Territory to be covered will include southern Illinois, Indiana, Missouri, Kansas, and the Southwest.

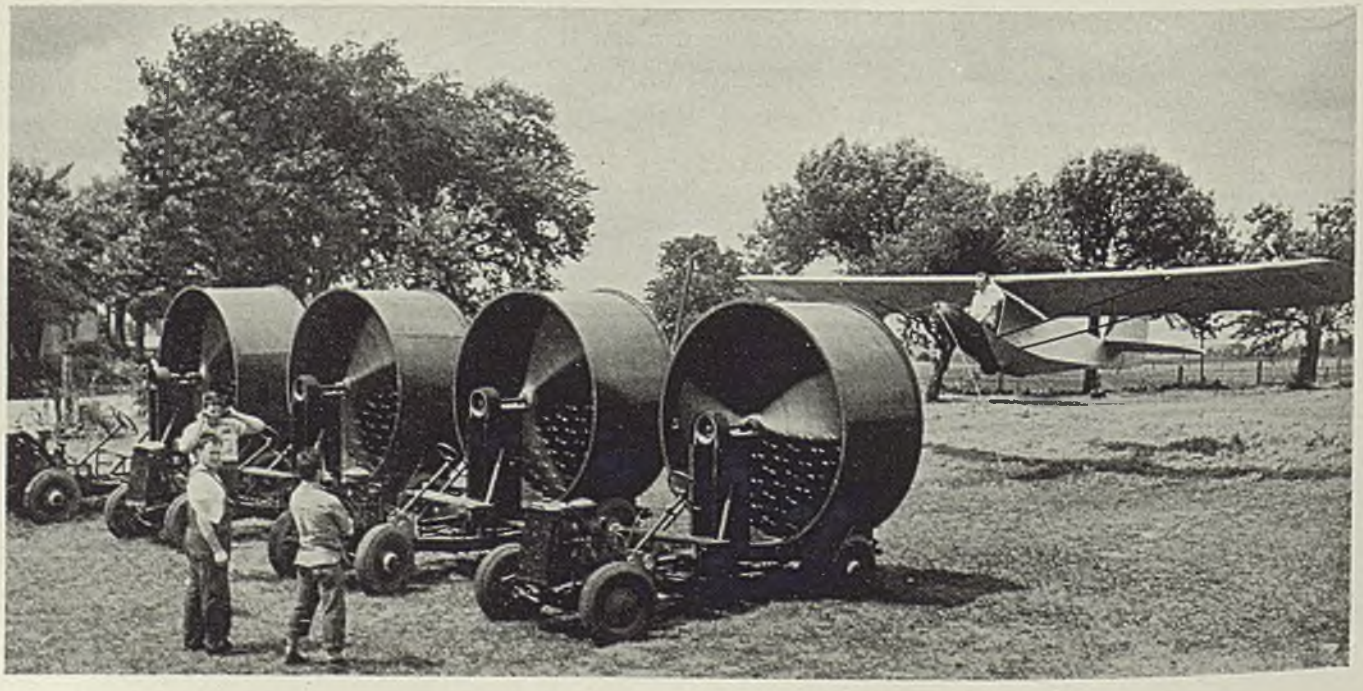
♦

Each of the Sinclair Refining Co.'s six new tankers being built by the Bethlehem Steel Co. will be equipped with a de-aerator of atomizing design, manufactured by the Cochrane Corp., Philadelphia. Four of the units will have maximum de-aerating capacity of 60,000 pounds per hour; other two are of 80,000 pounds per hour capacity.

Foundry Equipment Sales Index Lower in May

■ Foundry Equipment Manufacturers' Association, Cleveland, reports index of net orders closed for new equipment in May was 291.2, compared with 405.3 in April. Index for repairs was 321.0 in May and 292.5 in April. Total sales index was 298.7 in May and 377.2 in April.

Indexes are per cent of monthly averages of sales to metalworking industries, 1937-39. Practical comparison of figures on the old base, 1922-24, can be determined by multiplying by 1.328.



■ **Propellers mounted in steel drums and driven by Ford 85-horsepower engines create a 45-mile wind that enables glider students to obtain practical instruction without risk at the Lewis School of Aeronautics, Lockport, Ill. Photo shows a glider, anchored with steel cables, "flying" 6 feet above the ground. NEA photo**

$15,597,421,028 in National Defense Contracts Awarded to June 1

■ DEFENSE awards placed by various government agencies in the period from July 1, 1940, to June 1, 1941, totaled $15,597,421,028. In the latter half of May, contracts placed aggregated $770,322,106, according to the Office of Government Reports, New York.

California's total as of June 1 was greater than that of any other state or political subdivision sharing in rearmament business. New York, which formerly led in aggregate of defense awards, dropped to second place, New Jersey was third and Pennsylvania fourth.

Detailed figures for the 11 states whose individual total is more than $500,000,000, their awards in the latter half of May and total of all their defense contracts, are given in the following table:

	May 16 to May 31, 1941	July 1, '40, to May 31, 1941
California	$79,743,266	$1,735,691,632
New York	33,078,564	1,631,356,259
New Jersey....	17,513,136	1,445,122,879
Pennsylvania .	23,181,234	1,320,750,268
Massachusetts.	2,816,928	886,805,899
Virginia	6,002,809	868,675,833
Michigan	74,780,662	845,083,109
Connecticut ...	15,294,757	596,005,916
Washington ...	2,650,358	591,657,055
Ohio	17,629,781	560,559,230
Texas	170,529,548	507,199,524

Aircraft and shipbuilding industries in California were largely responsible for the state's huge total. Shipbuilding and its associated industries comprised a major share of the aggregate in New Jersey, Virginia and Washington also.

Contracts reported in the past week by the War Department:

Bell Aircraft Corp., Buffalo, airplanes and spare parts, $7,407,540.

Douglas Aircraft Co. Inc., Santa Monica, Calif., airplanes and spare parts, $3,119,436.

Doyle & Russell, and Wise Contracting Co. Inc., Richmond, Va., quartermaster storage depot in Chesterfield county, Va., at estimated cost of $2,781,292. It is anticipated that at a future date the scope of work covered by these contracts will be increased by approximately $3,000,000.

Martin, Glenn L., Co., Baltimore, airplanes and spare parts, $81,741,953.

Sanderson & Porter, New York, estimated $5,774,075 for expansion of the Elwood arsenal loading plant at Joliet, Ill., to accommodate bomb, detonator and primer loading.

Wright Aeronautical Corp., Paterson, N. J., aircraft engines and spare parts, $7,977,503.

Ordnance Department Awards

Abel, Robert, Inc., Boston, electric hoist and track system, $1622.

American Can Co., Brooklyn, N. Y., containers, $7037.20.

American Manganese Bronze Co., Holmesburg, Philadelphia, manganese bronze, $2904.75.

Armstrong, G. R., Co., Boston, hacksaw blades, $2131.20.

Bendix Aviation Corp., Bendix, N. J., tools, parts for tanks, $102,807.58.

Blanchard, Fred K., Inc., Troy, N. Y., reamers, twist drills, and counterbores, $3253.02.

Breeze Corp. Inc., Newark, N. J., starter assemblies, $41,480.

Chase Brass & Copper Co. Inc., Waterbury, Conn., brass bars, $1208.08.

Clapp, E. D., Mfg. Co., Auburn, N. Y., drop forgings, $1618.

Cleveland Twist Drill Co., Cleveland, reamers, $1505.

Continental Motors Corp., Muskegon, Mich., parts for tanks, $1592.90.

Crescent Electric Supply Co., Davenport, Iowa, capacitors, conduit, $6592.95.

Disston, Henry, & Sons Inc., Tacony, Philadelphia, parts for tanks, $2623.20.

Division Lead Co., Chicago, pig lead, $9345.

Federal Products Corp., Chicago, gages, $1953.

Fox Munitions Corp., Philadelphia, gages, $29,477.

Fuller Mfg. Co., Drop Forge Division, West Allis, Wis., forgings, $9985.60.

General Motors Corp., Detroit, pieces for machine and punch presses, $7698.92.

Gold Seal Electric Supply Co., Hatfield Wire & Cable Co., Hillside, N. J., cable and copper wire, $1954.20.

Goodyear Tire & Rubber Co. Inc., St. Mary's, O., bushing assemblies, $1236.44.

Great Lakes Steel Corp., Ecorse, Detroit, steel, $8526.69.

Illinois Central Railroad, Chicago, railroad cars, $28,125.

Interstate Mechanical Laboratories Inc., New York, gages, $2068.

Iron & Steel Products Inc., Chicago, railroad cars, $32,625.

Jeffrey Mfg. Co., New York, barrel packers, $1790.

Lamson Corp., Syracuse, N. Y., assemblies, $3800.

Latrobe Electric Steel Co., New York, steel bar, $1921.51.

Lyman Gun Sight Corp., Middlefield, Conn., gun parts, $2375.

Mattison Machine Works, Rockford, Ill., sanders, $1598.

McEvoy Co., Houston, Tex., assemblies, $3447.06.

McQuay-Norris Mfg. Co., St. Louis, parts for tanks, $4225.50.

New England Foundation Co. Inc., Boston, crane and runway, $22,890.

Niles-Bement-Pond Co., Pratt & Whitney Division, Chicago, arbors, $1821.60.

Norton Co., Worcester, Mass., grinding wheels, $1846.97.

Ohio Rubber Co., Willoughby, O., tools and parts, $1275.

Ohio Seamless Tube Co., Shelby, O., steel tubing, $4360.

Precise Tool & Mfg. Co., Farmington, Mich., gages, $3915.

Precision Mfg. Co., Philadelphia, gages, $28,010.

Phoenix Mfg. Co., Catasauqua, Pa., forgings, $6195.30.

Roessler Machine Co., Elkins Park, Pa., dies, $3282.

Rudolph & West Co., Washington, taps, $1503.60.

Sager Spuck Supply Co. Inc., Athol, Mass., reamers, twist drills, saws and tools, $1972.30.

Schlosser Mfg. Co. Inc., Philadelphia, gages, $2660.

Sinko Tool & Mfg. Co., Chicago, gages, $1080.

Thurston Mfg. Co., Providence, R. I., end mills, $1025.

Timken-Detroit Axle Co., Wisconsin Axle Division, Oshkosh, Wis., parts for tanks, $110,078.47.

Tomkins-Johnson Co., Jackson, Mich., cutters, $2376.50.

Ulmer, J. C., Co., Cleveland, gages, $1072.

Union Spring & Mfg. Co., New Kensington, Pa., springs, $7280.

United States Fire Protection Co., Hoboken, N. J., producing unit, $22,592.

Vinco Corp., Detroit, gages, $1026.90.

Wilson-Brown Co., Barnes Drill Co., Rockford, Ill., honing machines, $24,413.60.

Wire Novelty Mfg. Co., Shelton, Conn., containers, $9124.36.

York Ice Machinery Co., Philadelphia, extension to air conditioning equipment, $5600.

Quartermaster Corps Awards

Harrington, Russell, Cutlery Co., Southbridge, Mass., butchers' steels, $302.57.

Savory Inc., Newark, N. J., tin measures and flour scoops, $1516.68.

Corps of Engineers Awards

American Machine & Metals Inc., Troy Laundry Machinery Division, New York, laundry equipment, $20,647.45.

Concrete Conduit Co. Ltd., Colton, Calif., reinforced concrete pipe, Phoenix military airport, Litchfield Park, Ariz., $12,337.03.

Goulter, K. L., Seattle, airport runways and appurtenant works, Kitsap County airport (Bremerton), Washington, $239,857.

Jones & King, Hayward, Calif., airport improvements, Klamath Falls municipal airport, Oregon, $279,356.50.

White, H. D., & Co., Chicago, dwellings and appurtenant works, Loyalhanna dam on Loyalhanna creek, Saltsburg, Pa., $24,434.

Chemical Warfare Service Awards

Continental Can Co., New York, canister tops, bodies, and inlet valve seats, $62,550.

Doehler Die Casting Co., Pottstown, Pa., perforated discs, $581.60.

Maclane Hardware Co., New York, shears and pliers, $4885.97.

Stanley Works, New Britain, Conn., clasps, slides and loops, $23,093.25.

Willson Products Co., Reading, Pa., dust respirators, $65,444.28.

Medical Corps Awards

Globe-Wernicke Co., Norwood, O., steel filing cabinets, $3599.05.

Onan, D. W., & Sons, Minneapolis, generators, $77,748.

Air Corps Awards

Arion Steel Co., Elizabeth, N. J., files, $9019.80.

Bendix Aviation Corp., Pioneer Instrument Division, Bendix, N. J., regulator assemblies, $216,936.

Caterpillar Tractor Co., Peoria, Ill., graders, $229,725.

Champion Spark Plug Co., Toledo, O., spark plugs, $150,729.60.

Cleveland Pneumatic Tool Co., Cleveland, forceps, $42,360.

Continental Motors Corp., Detroit, parts for engines, $308,414.69.

Crescent Tool Co., Jamestown, N. Y., pliers, $82,951.18.

Dixon, William, Inc., Newark, N. J., files, $8381.04.

Heller Bros. Co., Newark, N. J., files, $1870.08.

Holtzer-Cabot Electric Co., Boston, inverters, $48,000.

Independent Engineering Co., O'Fallon, Ill., recharger assemblies, $84,770.

Ingersoll-Rand Co., Cincinnati, air compressors, $50,532.

International Harvester Co., Chicago, trucks, $130,410.

Kraeuter & Co. Inc., Newark, N. J., pliers, $13,566.

Leroy Automotive Distributors, New York, pliers, $3724.50.

Lufkin Rule Co., Saginaw, Mich., gages, calipers, $152,212.28.

Machinery & Specialties Inc., Dayton, O., reamers, $78,396.23.

Manning, Maxwell & Moore Inc., Bridgeport, Conn., gage assemblies, $102,588.

Nicholson File Co., Providence, R. I., files, $124,509.02.

Stevens, L. E., Co., Cincinnati, piping systems, $54,469.72.

Square D Co., Kollsman Instrument Divi-

sion, Elmhurst, N. Y., indicator and tube assemblies, parts for altimeters, $124,776.

United Aircraft Products Inc., Dayton, O., regulator assemblies, $32,063.75.

Utica Drop Forge & Tool Corp., Utica, N. Y., pliers, $7759.20.

More Munitions Plant Expansions Authorized

War Department last week reported authorization of funds for expansion of ordnance units as follows:

Kingsbury plant, La Porte, Ind., $8,997,000; Morgantown works, Morgantown, W. Va., $18,500,000; St. Louis plant, St. Louis, $58,850,000; Plum Brook works, Sandusky, O., $20,297,000; Weldon Spring works, Weldon Spring, Mo., $20,000,000; Elwood plant, Joliet, Ill., $3,575,000; Wolf Creek plant, Milan, Tenn., $5,395,000; Ogden depot, Ogden, Utah, $4,900,000; Ravenna plant, Ravenna, O., $6,100,000; and Iowa plant, Burlington, Iowa, $7,200,000.

Sites for additional munitions plants for the War Department, recently selected and announced last week, and sum authorized for each unit:

Jacksonville, Ark., $33,500,000 for a minor ammunition loading plant in which fuzes, boosters, primers and detonators will be loaded. Site comprises approximately 8000 acres. About 2950 will be employed in loading operations.

St. Paul, $30,000,000 for purchase of land, construction of necessary buildings, and equipment of plant for manufacture of small ammunition. Approximately 8500 will be employed; site to comprise 3000 acres.

Salt Lake City, Utah, $30,000,000 for purchase of land, construction of necessary buildings and equipment of plant for manufacture of small ammunition. Eighty-five hundred will be employed on site covering 3000 acres.

Des Moines, Iowa, $30,000,000 for purchase of land, construction of necessary buildings and equipment of the plant for fabrication of small ammunition. Site includes 3000 acres; 8500 will be employed in operation of the plant.

Defense Corp. Assumes $17,772,500 Boeing Contracts

Defense Plant Corp., it was reported last week, has assumed a prior Emergency Plant Facility contract negotiated by the War Department with Boeing Aircraft Co., Seattle, for expansion of the Boeing and Stearman Division plant facilities at Wichita, Kans. Terms of the Defense Plant Corp. agreements of lease, totaling $17,500,000 for the Boeing plant and $272,500 for the Stearman plant, provide facilities will be expanded further than contemplated in the original agreement.

Boeing expansion covers construction of necessary buildings and the acquisition and installation of machinery and equipment. Agreement with Stearman Division is a paper conversion of the original Emergency Plant Facility contract pertaining to acquisition and installation of machinery and equipment.

This Defense Plant Corp. lease agreement will expand the Boeing plant by approximately $4,000,000 beyond that contemplated in the original plan. Both plants will manufacture aircraft and aircraft parts.

Letters of Intent for War Materials Issued

Letters of intent last week reported issued by the War Department and accepted by industrial firms for additional equipment and supplies for defense included:

Emerson Electric Mfg. Co., St. Louis, reimbursement to $1,000,000 guaranteed, pending negotiation of formal contract for procurement of standardized aircraft machine gun turrets which the War Department intends to purchase in connection with augmenting the industry's productive capacity to permit output of 500 heavy bombardment planes per month.

War Supplies Ltd., Washington, informal contract totaling $1,737,554 for various items of antigas clothing and equipment for the chemical warfare service.

United Pressed Products Co., Chicago, for gas mask face forms totaling $33,625 for the chemical warfare service.

Michigan United Division, Central Paper Co. Inc., Muskegon, Mich., antigas pathway materials, $1840.

Make Tools Work Harder, C. J. Stilwell Urges

■ More specific planning of new machine tool requirements for national defense and more efficient operation of present machine tools are urged by Charles J. Stilwell, president, Warner & Swasey Co., Cleveland. Mr. Stilwell's plea is contained in an article in *The Clevelander*, business magazine of the Cleveland Chamber of Commerce, of which Mr. Swasey is president.

"If tomorrow's increased machine tool production is to be properly allocated to defense needs and unnecessary expansion avoided, machine tool builders must be given more facts than have thus far been furnished them as to types and sizes of machine tools required, the amounts required and the dates upon which deliveries are desired.

"Certainly it would seem possible that the government might be able to give machine tool builders, with some degree of probability, a summary of what they would be expected to produce in 1942."

Mr. Stilwell expressed the opinion that operators are not getting out of tools all of the productivity which has been built into them.

"How to develop the sense of urgency, the feeling of emergency, among the machine tool operators is a problem which remains to be solved.

"How important it is may be summed up in the simple statement that if every machine tool operator in this country would step up his output by 10 per cent the result in increased performance would be the equivalent of a whole year's production of new machine tools."

Continued imposition of price ceilings without wage ceilings, Mr. Stilwell warned, may in time eliminate all profits in defense industries and in effect bring about state socialism and the regimentation that is the groundwork of the fascist state.

"It would be a sorry outcome indeed, if in the process of arming against the destruction of democracy, we should lapse into the very philosophy and practice against which we were endeavoring to defend ourselves."

Canadian Steel Output, Foreign Trade Increased

■ Canadian production of steel ingots and castings, pig iron and ferroalloys in April exceeded that of March and was materially larger than in April, 1940. Total for four months this year also exceeded that for the corresponding period last year. At the end of April nine blast furnaces were in blast, 92.8 per cent of capacity. Production comparisons follow, in gross tons:

	Steel ingots, castings	Pig iron	Ferro-alloys
April, 1941	200,680	103,362	16,161
March, 1941 ...	195,481	102,038	15,201
April, 1940	153,451	84,210	13,989
4 mos., 1941 ...	755,162	399,614	58,064
4 mos., 1940 ...	617,616	367,717	37,844

Canadian steel and iron imports in April totaled $37,914,000, compared with $24,349,000 in April, 1940. Machinery imports, except agricultural, were valued at $12,174,000, compared with $6,056,000. Other April imports were: Vehicles, $7,544,000; rolling mill products, $5,288,000; farm implements, $3,196,000; engines and boilers, $2,806,000; pipe and tubes, $800,000; tools, $712,000; pig iron, ingots, blooms and billets, $640,000.

April exports gained more than 300 per cent over April, 1940, with value of $15,165,000, compared with $4,165,000. Principal exports were automobiles and parts, $8,766,000; pig iron, ingots, etc., $1,554,000; machinery, except agricultural, $1,542,000; farm implements, $1,347,000.

Canada May Ration Copper and Brass; Progress in Dominion's War Effort

TORONTO, ONT.

■ CANADA is the largest nonferrous metal exporting country in the world, and at the same time must curtail consumption of those metals for civil requirements because of a shortage, C. D. Howe, minister of munitions and supply, declared recently. Summarizing highlights of Canada's progress in development of a war industry at the seventieth annual meeting of the Canadian Manufacturers' Association, Mr. Howe warned brass and copper may soon be rationed, as are aluminum, zinc and nickel.

"Manufacturers must face the possibility of further restrictions of civil consumption and manufacturing operations should be adjusted to this possibility," he said. Every effort must be made to conserve supplies of manganese, chromium, tungsten or tin for essential purposes, "and if we are unable to meet demands for both war and civil uses, then civil use must be sacrificed." All four metals are imported.

In recapitulation, Mr. Howe pointed out that more than $400,000,000 has been spent in construction of Crown properties for manufacture of shell, guns, tanks, automotive equipment, bombs and machine tools. Total war orders placed to date in Canada exceed $1,700,000,000.

Great quantities of Bren machine guns are being manufactured, a plant in Quebec is producing trench mortars, two types of antiaircraft gun barrels are in substantial production and both types of complete guns will be turned out by August.

Aerial bombs are being manufactured and filled, naval antiaircraft gun mountings involving more than 2000 separate parts are being fabricated and assembled, 25-pound artillery guns will be produced in considerable number before the month is out, said Mr. Howe. Production of depth bombs and charges, as well as 2-pounder guns (see illustration) has begun.

Tank Model for Britain

Canada's first infantry tank was completed recently, and production is being stepped up to "considerable" volume. First Canadian-made cruiser tank has been completed also, and its design adopted by Great Britain as a model. United States, reported Mr. Howe, has also asked for a sample of this tank, may adopt the version. Antisubmarine nets and equipment and minesweeping gear are being manufactured.

More than 120,000 vehicles have been delivered by the automotive industry, with additional 80,000 on order. Universal carriers are likewise being delivered in large numbers.

The entire armament program, concluded Mr. Howe, has been dependent upon a rapid enlargement of sources of supply of basic raw materials. To this end Canada's system of control and priorities has functioned effectively.

War contracts placed in the week ended June 6 by the Department of Munitions and Supply totaled 2062, with aggregate value of $14,325,314. The orders:

Shipbuilding: Halifax Shipyards Ltd., N. S., $88,528; Port Arthur Shipbuilding Co. Ltd., Port Arthur, Ont., $80,000; National Steel Car Corp. Ltd., Hamilton, Ont., $12,935.

Land transport: International Harvester Co. of Canada Ltd., Ottawa, Ont., $21,548; Metallic Rooling Co. of Canada Ltd., Ottawa, $7734; Firestone Tire & Rubber Co. of Canada Ltd., Hamilton, Ont., $5503; Bickle-Seagrave Ltd., Woodstock, Ont., $6064; Ford Motor Co. of Canada Ltd., Windsor, Ont., $78,379.

Aircraft: Air Ministry, England, $75,000; Canadian Vickers Ltd., Montreal, Que., $2,099,520; Macdonald Bros. Aircraft Ltd., Ottawa, $5446; National Steel Car Corp. Ltd., Malton, Ont., $18,886.

Electrical equipment: Canadian Marconi Co., Montreal, $48,815; Terry Machinery Co. Ltd., Montreal, $103,404; Northern Electric Co. Ltd., Ottawa, $65,145; Stewart-Warner-Alemite Corp. of Canada Ltd., Belleville, Ont., $6604; Canadian Telephones & Supplies Ltd., Toronto, $23,750; Exide Batteries of Canada Ltd., Toronto, $8580.

Machinery: General Supply Co. of Canada Ltd., Ottawa, $7204; Preston Woodworking Machinery Co. Ltd., Preston, Ont., $6221; Waterloo Mfg. Co. Ltd., Waterloo, Ont., $13,639.

Ordnance: Research Enterprises Ltd., Toronto, $1,290,000; War Office, England, $7000.

Miscellaneous: T. W. Hand Fireworks Co. Ltd., Cooksville, Ont., $7344; James Davidson's Sons, Ottawa, $12,204; Enterprise Foundry Co. Ltd., Sackville, N. B., $5737; Instruments Ltd., Ottawa, $7283; Eastern Canada Steel & Iron Works Ltd., Quebec, $5099; Canadian Warren-Pink Ltd., St. Catharines, Ont., $5244; Outboard Marine & Mfg. Co. of Canada Ltd., Peterborough, Ont., $5907; Quebec Power Co., Quebec, $29,000; Keystone Contractors Ltd., Windsor, $12,000; Anthes Foundry Ltd., Winnipeg, Man., $7000; Clark Ruse Aircraft Co., Montreal, $7000; Howard Furnace Co., Toronto, $5000; Canadian Comstock Co., Toronto, $8000; L. E. Moulton & Co. Ltd., Montreal, $18,000; James W. Ross, Montreal, $60,000.

War construction projects: Deacon & Stewart Ltd., Montreal, addition to Fairchild Aircraft Co., Longueuil, Que., $25,000; Thomas O'Connell Ltd., Montreal, plumbing and heating system for addition to Noorduyn Aviation Co. Ltd., St. Laurent, Que., $98,000; Canadian Comstock Co. Ltd., Montreal, electrical equipment for Noorduyn Aviation Co. Ltd., $60,000; A. Deslauriers et Fils, Quebec, addition to Dominion Arsenal, Valcartier, Que., $126,000; Canadian Dredge & Dock Co. Ltd., Toronto, addition to shipyards at Saint John, N. B., $300,000; Bird Construction Co. Ltd., Winnipeg, Man., airplane repair depot at Winnipeg, $190,000; Stewart Construction Co. Ltd., Sherbrooke, Que., Royal Canadian Air Force station, Shelbourne, N. S., $210,000; Bremner, Norris & Co. Ltd., Montreal, flying training school, St. Hubert, Que., $80,000; Russell Construction Co. Ltd., Toronto, $400,306; Tomlinson Construction Co. Ltd., Toronto, $191,300; W. C. Brennan Contracting Co., Hamilton, $356,536.

■ More than 1000 operations are required in the manufacture of a new 2-pounder antitank gun now in production in Canada. This photo shows a line of the 2-pounder gun barrels being inspected. Craftsman at right is a veteran armament worker from England. First consignment of these guns already has been shipped to United Kingdom. NEA photo, passed by censor

60 Freight Car Builders Granted Limited Blanket Preference Rating

WASHINGTON

■ FREIGHT car builders last week were given a limited blanket priorities rating of A-3. Rating was extended to 60 builders and covers critical materials, cutting and other perishable tools and equipment. Machine tools are not included and will continue to be obtained by preference rating certificates.

"Car builders who use the rating, including railroads which build their own cars, can extend it to their suppliers by executing copies of the order and serving it to their subcontractors, who in turn can extend the rating to their own suppliers by going through with the same procedure," explained E. R. Stettinius Jr., Priorities Director.

Mr. Stettinius urged substitution of other materials for metals wherever possible, citing wood as a possible material for superstructures. Builders were advised to specify standard sizes and thicknesses of steel sheets and plates to minimize production difficulties.

Builders receiving the order included: American Car & Foundry Co., Bethlehem Steel Co., Bettendorf Co., Buda Co., Carnegie-Illinois Steel Corp., Easton Car & Construction Co., Kanawha Mfg. Co., Magor Car Corp., Mount Vernon Car Mfg. Co., Pacific Car & Foundry Co., Pressed Steel Car Co. Inc., General American Transportation Co., Georgia Car & Locomotive Co., Gifford Wood Co., Greenville Steel Car Co., Hyman-Michaels Co., Interstate Car & Foundry Co., Pullman-Standard Car Mfg. Co., Ralston Steel Car Co., Rodger Ballast Car Co., Virginia Bridge Co., Warren Tank Car Co., and Youngstown Steel Car Corp. Thirty-seven railroads which build their own cars also received the rating.

Division Opens Regional Offices

A priorities field organization, designed to aid businessmen and manufacturers who have difficulty with priorities questions is being established, Mr. Stettinius said. Four regional offices already have been set up, in New York, Boston, Philadelphia and Chicago.

Field offices will be staffed by representatives of the priorities division, trained in Washington, and will be supervised by L. Edward Scriven and E. C. Laird Jr., assistant deputy directors.

District managers for the four new offices and office locations: William P. Homans, 30 Pearl street, Boston; Phillip M. McCullough, 33 Liberty street, New York; Frederick W. Slack, 925 Chestnut street, Philadelphia; Warren G. Bailey, 230 South LaSalle street, Chicago.

Other offices will be opened in various cities.

Priorities Soon May Be Supplanted By Allocation System, Says Nelson

■ PRIORITIES may soon become a thing of the past, Donald M. Nelson, Director of Purchases, Office of Production Management, said last week in an interview at Pittsburgh. Effectiveness of priorities is dropping in an increasing number of cases and on all metals from aluminum to zinc. In many cases recently, Mr. Nelson stated, holders of orders carrying top priority ratings have been unable to find a supplier willing to take the order.

Only alternative to priorities is allocation, he said.

Later in an address before the National Association of Manufacturers at the Duquesne Club, Mr. Nelson reiterated that defense production must be speeded up and that small plants, some of which are being forced to close because they have no defense work and are unable to obtain materials for civilian production, must be drawn into the armament program as subcontractors.

To accomplish this, he suggested several steps that must be taken at once.

"First, we must increase the all-over size of this program. We must make the backlog of unfilled orders so big that there will be an irresistible pressure to put every plant to work on defense orders the moment that plant is known to be available.

"Next, we must increase the tempo of the program. I am very glad indeed to be able to tell you that the army and navy right now are renegotiating contracts so as to advance delivery dates. As delivery rates are advanced, more and more prime contractors will be compelled by force of circumstances to subcontract their work . . .

"Next, we must do everything we can to increase our national capacity to produce the essential metals and other materials of which we are short."

Mr. Nelson declared new ways of getting defense goods from facilities still producing consumer goods must be found. One way, he suggested, is through widespread simplification of lines, styles and models offered to the commercial trade. Such simplification, he said, would increase present productive capacity by "a fourth or perhaps even by a third."

Two-Group Industry Setup Suggested

■ Conversion of civilian industries into prime contractor and subcontractor groups will be necessary if they are to escape obliteration when the nation goes on a full wartime economy, OPM subcontracting officials were told at a conference in Washington last week. The plan was suggested by Peter R. Nehemkis, of the Defense Contract Service.

More unemployment and more idle machines can be expected as priorities are tightened in response to needs of a "guns before butter" economy, he said. Unless civilian goods industries are reorganized they may be wiped out and the national democratic foundations weakened.

"The task of converting industries cannot be undertaken through a piecemeal process," Mr. Nehemkis declared. "The problem has to be dealt with in terms of an entire industry, rather than through individual units in that industry.

"Certain units which have better managerial, technical and financial resources than other units in an industry will have to become prime contractors for the entire industry. These selected concerns will then organize a satellite group of subcontractors composed of the less strongly entrenched units to whom they then will farm out whatever defense work may be available."

■ Mississippi river freight traffic is setting new records, according to statistics of the Mississippi Valley Association. In 1940 freight carried on the river totaled 32,372,232 tons, a gain of 2,865,962 tons over the 1939 volume. Port of Memphis, Tenn., reported 1,841,068 tons and port of St. Louis 1,302,614 tons in 1940.

Mesta Speeding Up on Guns and Heavy Equipment

■ ADDITIONAL facilities for manufacturing heavy machinery and armament are being completed by Mesta Machine Co., Pittsburgh, and will materially increase the company's production.

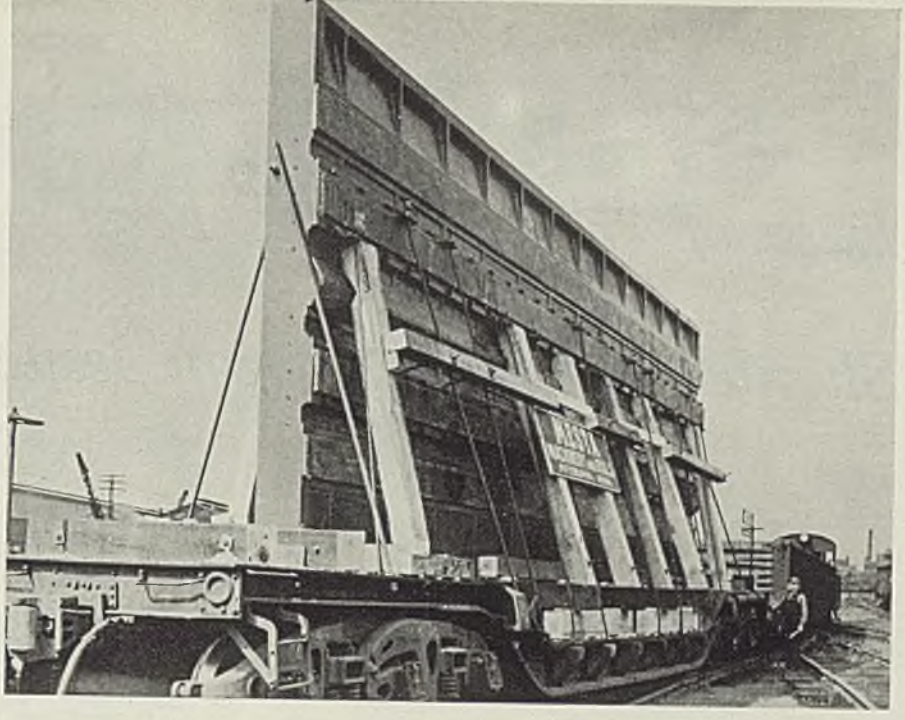
In anticipation of increased demand for large forgings, a new forge shop, consisting of a 6000-ton forging press and all necessary heating and heat-treating equipment was started early in 1940. New open-hearth capacity and foundry equipment for the production of large ingots were added. This department now is in operation and is producing high-pressure steel bottles, ship shafting, guns and miscellaneous large forgings, carbon and alloy ingots weighing up to 200 tons.

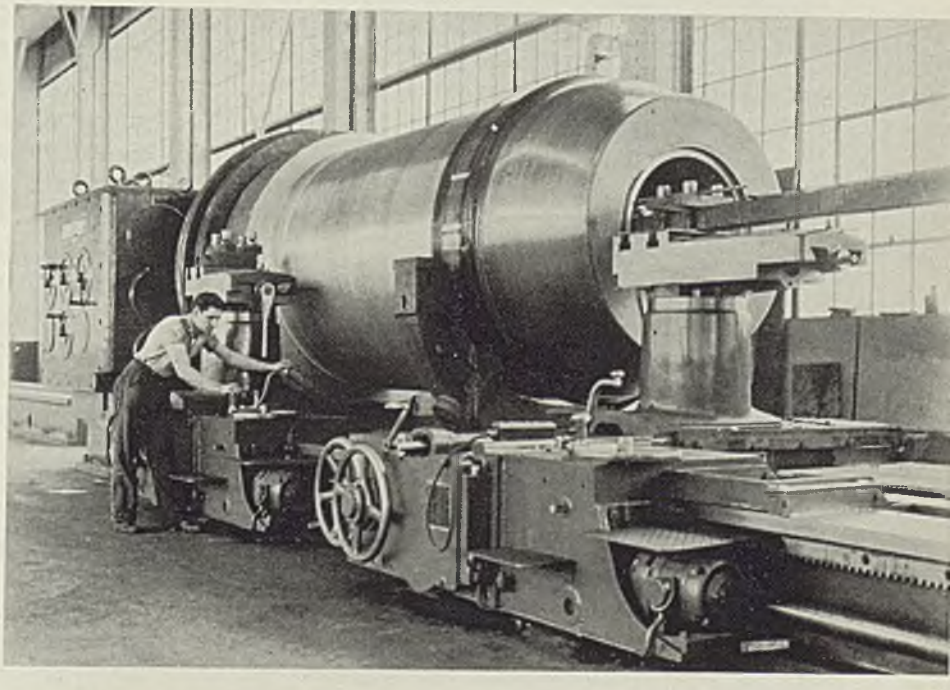
Building Large Guns

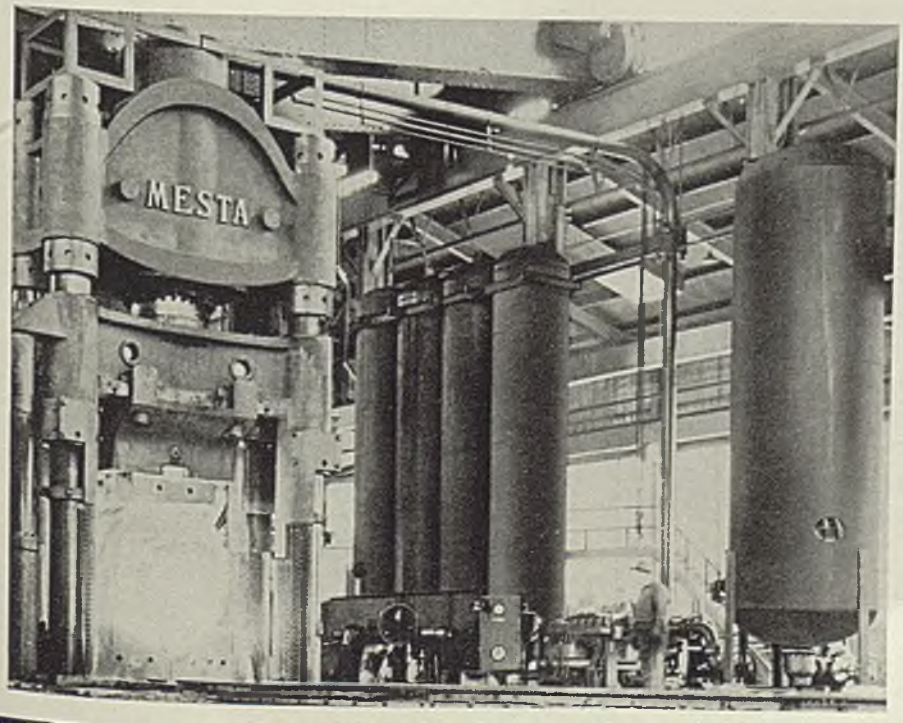
Last summer Mesta was awarded a contract for 155-millimeter guns by the United States Army. Buildings in which these will be made now are completed and some machine tools in operation. First of the guns are well under way and will be finished within a few weeks.

Barbette carriages upon which 16-inch coastal defense guns are trained and mounted also will be built by Mesta and buildings and equipment to handle this contract are being erected. Buildings will be large so that the guns can be maneuvered for a 360-degree swing on the emplacements. Recently the company was awarded an order for 8-inch howitzer forgings.

In addition to these direct defense contracts, Mesta is building heavy machinery and equipment for other defense manufacturers, including steel, iron and nonferrous metal companies. One of these units is a 14,000-ton forging press, to be completed next fall.







■ Fourteen-foot planer table, blocked and ready for shipment, top of page, indicates size of equipment manufactured by Mesta.

Center photo, an 84-inch boring and turning lathe, working on a hollow forged steel pressure cylinder to be used as an air accumulator on a 12,000-ton press for forging armor plate. Some of these vessels are built to withstand pressures of 6½ tons per square inch.

At left, 6000-ton forging press in operation.

Law of "First Things First"

Should Settle Expansion Issue

■ ONE of the primary instincts of man in an emergency is to do first things first. It should be a good rule for a nation when it is confronted by an "unlimited" emergency.

Apparently the leaders of our government recognized the validity of this rule. If President Roosevelt has been clear-cut and positive on any one point, it has been in his emphasis upon the need for the greatest possible production for defense and for aid to Britain at the earliest possible moment.

♦ ♦ ♦

His repeated stressing of the time element has been echoed and re-echoed by practically every key man identified with the defense program. Speed is one of the few things upon which there has been absolute unanimity of opinion.

In view of this agreement as to objective, it is difficult to understand why there is so much dissension as to the proper ways and means of achieving it.

For instance, consider the problem of production of materials for defense items. It is well known that the volume of certain ferrous and nonferrous metals required for the emergency and for ordinary civilian needs exceeds the present capacity of American industry.

♦ ♦ ♦

When this fact first became evident some months ago, the initial impulse among government administration officials was to think of spending money for expansion. Among most industrialists the first impulse was to explore the possibilities of making better use of existing facilities, and then, if necessary, to look into expansion.

In the meantime the urgency for greater immediate production has become more acute and the likelihood of a prolonged war has crystallized into conviction.

As a result, a clear-cut problem of policy has been put before the nation. It is to what extent we can devote the utmost of our resources to immediate needs and yet be assured of adequate resources for a long drawn out conflict.

American industry, in harmony with the judgment of many responsible and experienced officials in the Army and Navy departments and in OPM, is trying conscientiously to meet both conditions of the problem. It is performing near-miracles in getting outputs of 100 per cent or more of the capacity of existing facilities and at the same time is steadily increasing capacity through greater efficiency, rehabilitation, expansion and other expedients.

♦ ♦ ♦

Opposed to industry's policy is a group of governmental officials who not only favor unlimited expansion regardless of any expert appraisal of reasonably anticipated needs but who publicly accuse industry of selfish motives.

Their policy of excessive and unwarranted expansion is dangerous. It would cut into immediate production critically at a most inopportune time. It clearly violates the axiom of first things first.

Here again is a case in which experienced and responsible judgment should take precedence over the whims of persons whose chief qualification to date has been a faculty for spending and lending other people's money freely.

E. L. Shaner

EDITOR-IN-CHIEF

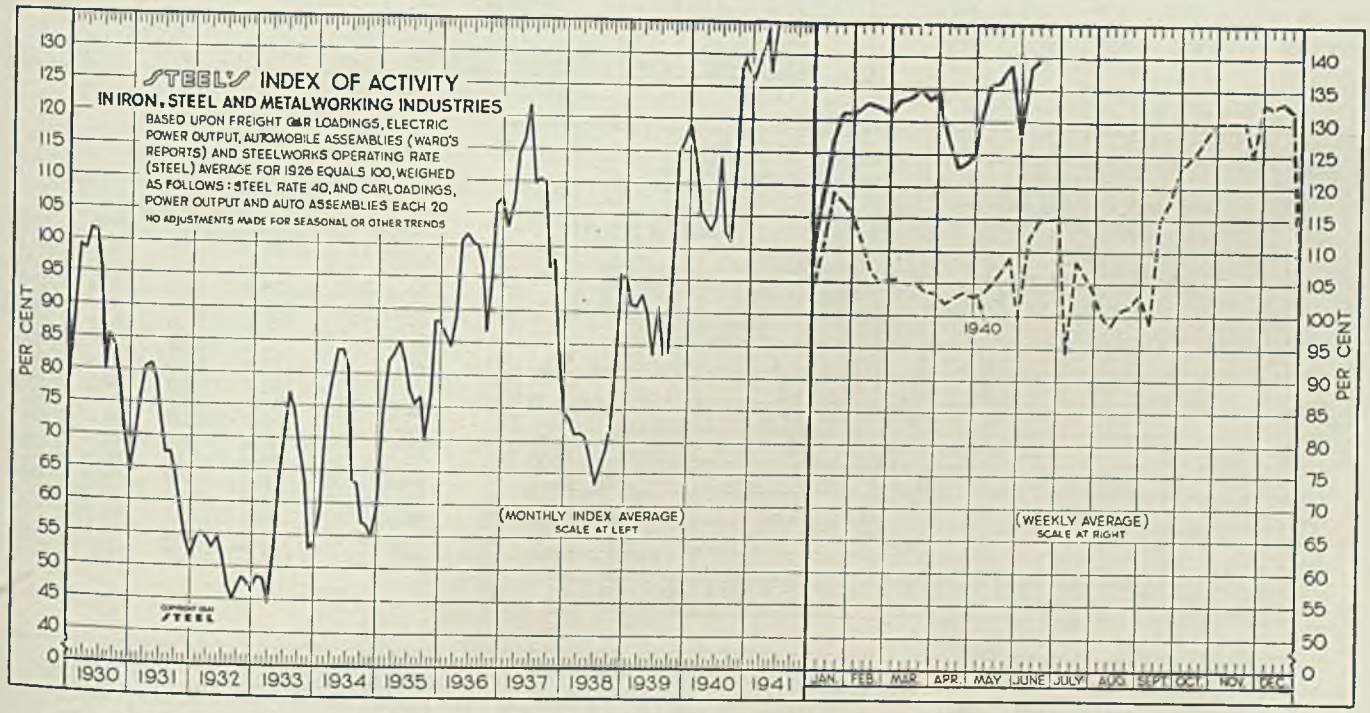
The *BUSINESS TREND*

Pace of Business Activity Continues Upward Trend

■ UPWARD trend of industrial activity continues unabated despite adverse seasonal influences normally in effect at this time. During the week ended June 14 electric power output, revenue freight carloadings and automobile production reached the highest levels recorded this year. In many lines, further advances in production schedules are hampered by difficulty in obtaining supplies.

To an increasing extent activity in defense industries has shown the most marked gains in recent weeks. Priorities are governing a growing proportion of total output. Reflecting the extensive buying movement of the past few months and sold up condition in most industries, new bookings have eased moderately lately. Inventories have expanded in some lines, although in almost every instance stocks are below normal in relation to capacity operations and prospects of further expansion in production over the remainder of the year.

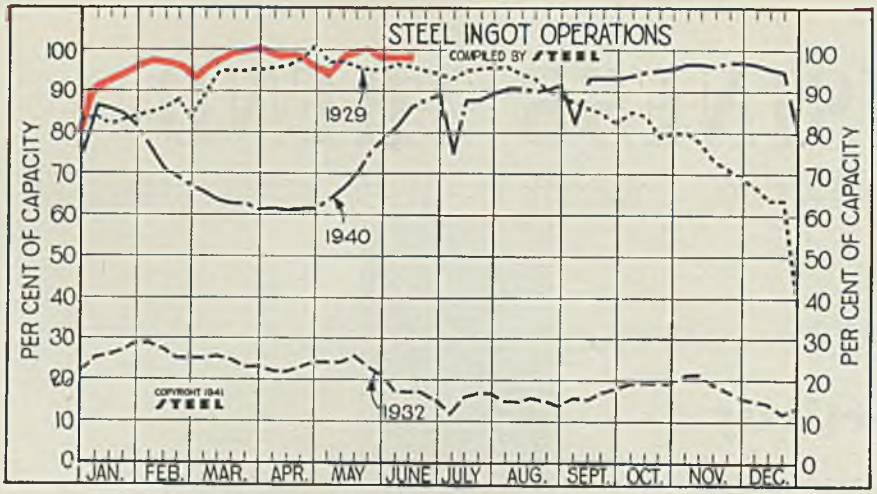
In the week ended June 14, STEEL's index of activity attained a new all time peak of 139.0, a gain of 0.6 point over the preceding week. At this time a year ago the index stood at 114.6, while in 1937 and 1929 it was 111.4 and 120.1 respectively.



STEEL'S index of activity gained 0.6 point to 139 in the week ended June 14:

Week Ended	1941	1940
March 29	133.9	103.2
April 5	128.9	101.8
April 12	123.8	102.7
April 19	124.2	103.4
April 26	126.5	102.8
May 3	132.6	103.3
May 10	135.9	104.8
May 17	136.1	106.8
May 24	138.6	109.1
May 31	128.4	99.2
June 7	138.4	111.9
June 14	139.0	114.6

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	101.8	81.8	83.7	63.5	54.8	78.6	101 2
June	.....	114.1	90.9	63.4	109.9	100.3	77.4	80.6	70.3	51.4	72.1	95 8
July	.....	102.4	83.5	66.2	110.4	100.1	75.3	63.7	77.1	47.1	67.3	79.9
Aug.	.....	101.1	83.9	68.7	110.0	97.1	76.7	63.0	74.1	45.0	67.4	83 4
Sept.	.....	113.5	98.0	72.5	96.8	86.7	69.7	56.9	68.0	46.5	64.3	83.7
Oct.	.....	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	71.0
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

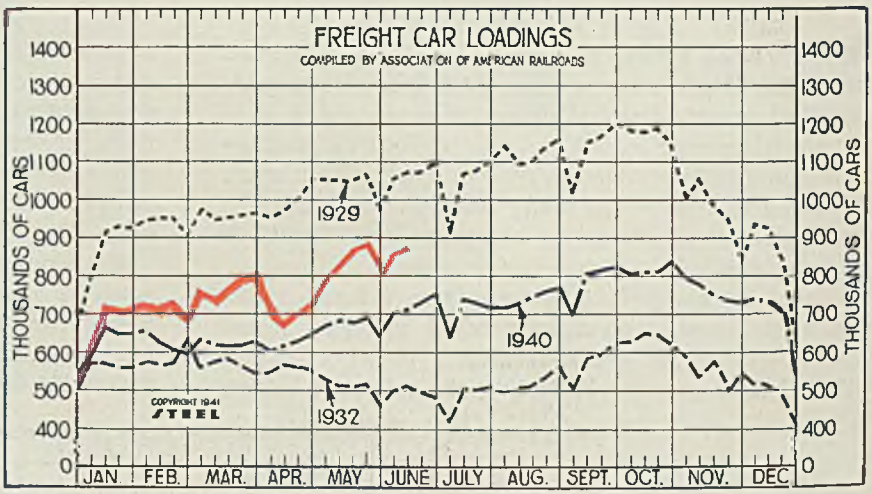
(Per Cent)

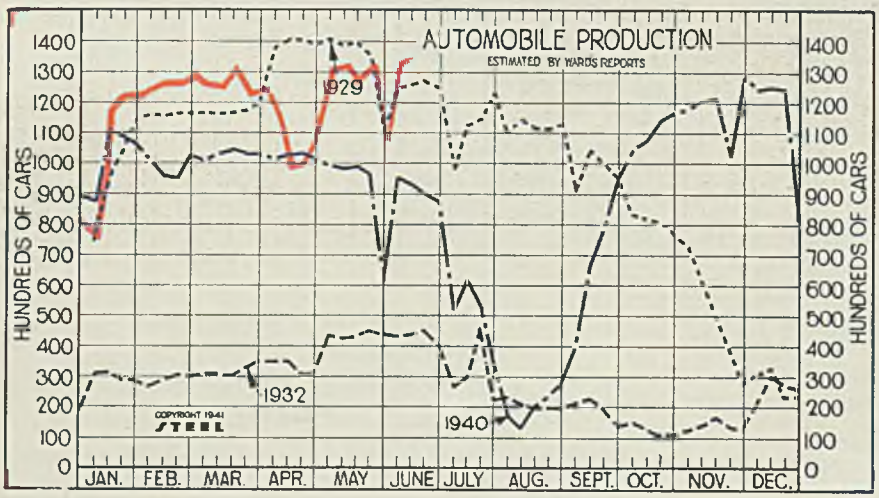
Week ended	1941	1940	1939	1938
June 14....	99.0	86.0	52.5	27.0
June 7....	99.0	81.5	53.5	25.5
May 31....	99.0	78.5	52.0	25.5
May 24....	100.0	75.0	48.0	28.5
May 17....	99.5	70.0	45.5	30.0
May 10....	97.5	66.5	47.0	30.0
May 3....	95.0	63.5	49.0	31.0
April 26...	96.0	61.5	49.0	32.0
April 19...	98.0	61.5	50.5	32.5
April 12...	98.0	61.0	51.5	32.0
April 5...	98.0	61.5	53.5	32.0
March 29..	99.5	61.0	54.5	36.0
March 22..	99.5	62.5	55.5	35.0
March 15..	98.5	62.5	56.5	32.0
March 8...	97.5	63.5	56.5	30.0
March 1...	96.5	65.5	56.0	29.5
Feb. 22....	94.5	67.0	55.0	30.5

Freight Car Loadings

(1000 Cars)

Week ended	1941	1940	1939	1938
June 14.....	863	712	638	556
June 7.....	853	703	635	554
May 31.....	802	639	568	503
May 24.....	886	687	628	562
May 17.....	864	679	616	546
May 10.....	837	681	555	542
May 3.....	794	666	573	536
April 26.....	722	645	586	543
April 19.....	698	628	559	524
April 12.....	680	619	548	538
April 5.....	682	603	535	522
March 29....	792	628	604	523
March 22....	769	619	605	573
March 15....	759	619	595	540
March 8.....	742	620	592	557
March 1.....	757	634	599	553
Feb. 22.....	678	595	561	512





Auto Production

(1000 Units)

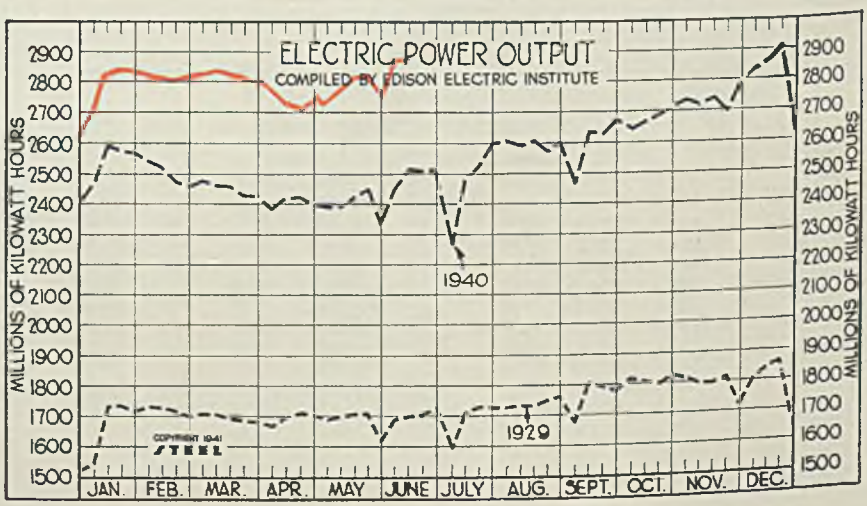
Week ended	1941	1940	1939	1938
June 14....	134.7	93.6	78.3	41.8
June 7....	133.6	95.6	65.3	40.2
May 31....	106.4	61.3	32.4	27.0
May 24....	133.6	96.8	67.7	45.1
May 17....	127.3	99.0	80.1	46.8
May 10....	132.6	98.5	72.4	47.4
May 3....	130.6	99.3	71.4	53.4
April 26...	108.2	101.4	86.6	50.8
April 19...	99.9	103.7	90.3	60.6
April 12...	99.3	101.9	88.1	62.0
April 5....	116.3	101.7	87.0	61.0
March 29..	124.2	103.4	86.0	57.5
March 22..	123.8	103.4	89.4	56.8
March 15..	131.6	105.7	86.7	57.6
March 8...	125.9	103.6	84.1	57.4
March 1...	126.6	100.9	78.7	54.4
Feb. 22....	129.2	102.7	75.7	57.0

Electric Power Output

(Million KWH)

Week ended	1941	1940	1939	1938
June 14...	2,882†	2,516	2,265	1,991
June 7...	2,877	2,453	2,257	1,992
May 31...	2,730	2,332	2,114	1,879
May 24...	2,838	2,449	2,205	1,973
May 17...	2,800	2,422	2,170	1,968
May 10...	2,792	2,388	2,171	1,968
May 3...	2,734	2,386	2,164	1,939
April 26..	2,750	2,398	2,183	1,939
April 19..	2,702	2,422	2,199	1,951
April 12..	2,721	2,418	2,171	1,958
April 5...	2,779	2,381	2,174	1,990
March 29.	2,802	2,422	2,210	1,979
March 22.	2,809	2,424	2,199	1,975
March 15.	2,818	2,460	2,225	2,018
March 8..	2,835	2,464	2,238	2,015
March 1..	2,826	2,479	2,244	2,036
Feb. 22...	2,820	2,455	2,226	2,031

†Estimated.

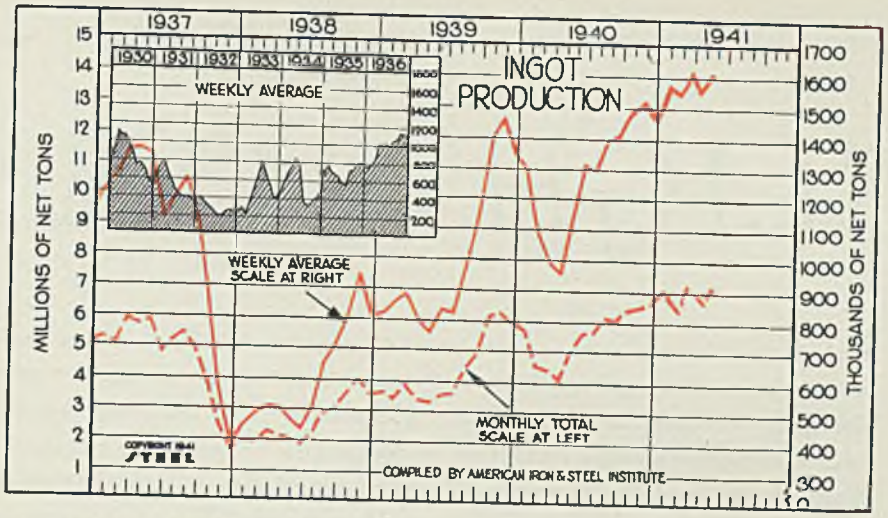


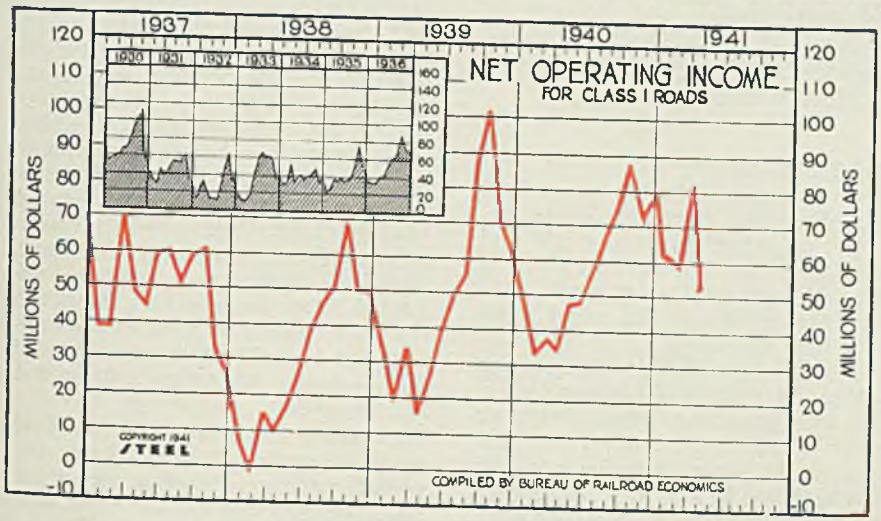
Steel Ingot Production

(Unit 100 Net Tons)

	Monthly Total 1941	Monthly Total 1939	Weekly Average 1941	Weekly Average 1940
Jan.	6,928.8	5,764.7	1,564.1	1,301.3
Feb.	6,237.9	4,525.8	1,559.5	1,093.2
Mar.	7,131.6	4,389.2	1,609.9	990.8
Apr.	6,757.7	4,100.5	1,575.2	955.8
May	7,101.8	4,967.8	1,603.1	1,121.4
June	.....	5,657.4	.....	1,318.8
July	.....	5,724.6	.....	1,295.2
Aug.	.....	6,186.4	.....	1,396.5
Sept.	.....	6,056.2	.....	1,415.0
Oct.	.....	6,644.5	.....	1,499.9
Nov.	.....	6,469.1	.....	1,507.9
Dec.	.....	6,495.4	.....	1,469.5
Total	.....	66,981.7	.....	1,281.2†

†Weekly average.





Class I Railroads
Net Operating Income

(Unit: $1,000,000)

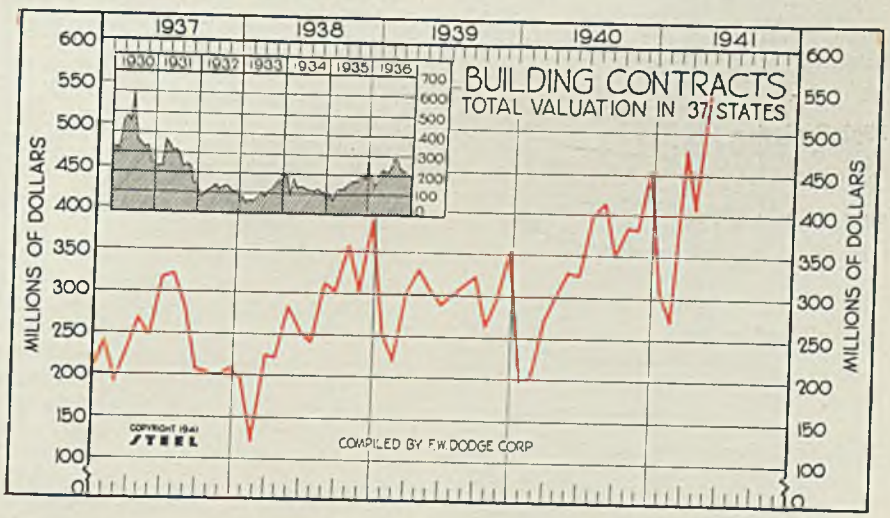
	1941	1940	1939	1938
Jan.	$62.36	$45.57	$32.89	$7.14
Feb.	58.49	32.86	18.59	1.91*
Mar.	80.63	36.73	34.32	14.73
April	52.57	33.82	15.32	9.40
May	.....	47.08	25.10	16.67
June	.....	47.42	39.10	25.16
July	.....	57.08	49.01	38.43
Aug.	.....	66.01	54.59	45.42
Sept.	.....	74.19	86.43	50.36
Oct.	.....	86.99	101.62	68.57
Nov.	.....	71.10	70.35	49.67
Dec.	.....	78.79	60.95	49.37
Average	.....	$56.84	$49.02	$31.02

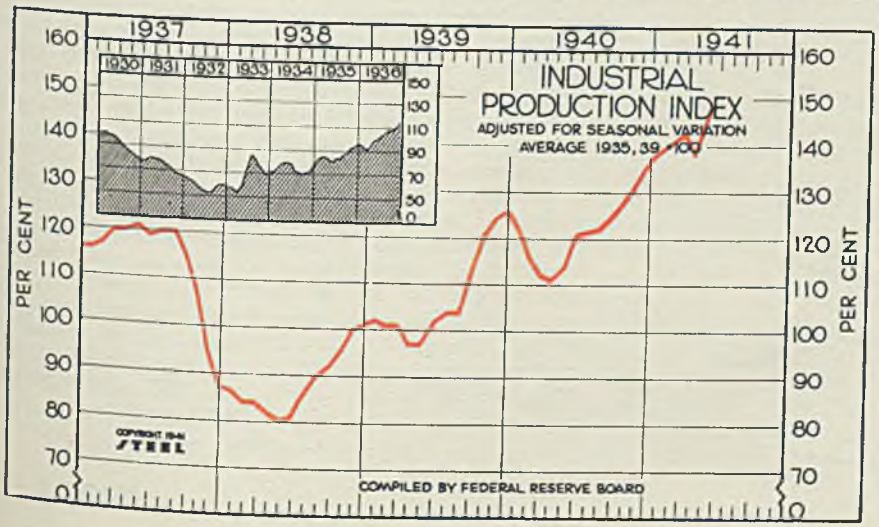
*Indicates deficit.

Construction Total Valuation In 37 States

(Unit: $1,000,000)

	1941	1940	1939	1938	1937
Jan.	$305.2	$196.2	$251.7	$192.2	$242.7
Feb.	270.4	200.6	220.2	118.9	188.3
Mar.	479.9	272.2	300.7	226.6	231.2
April	406.7	300.5	330.0	222.0	269.5
May	548.7	328.9	308.5	283.2	243.7
June	.....	324.7	288.3	251.0	317.7
July	.....	398.7	299.9	239.8	321.6
Aug.	.....	414.9	312.3	313.1	281.2
Sept.	.....	347.7	323.2	300.9	207.1
Oct.	.....	383.1	261.8	357.7	202.1
Nov.	.....	380.3	299.8	301.7	198.4
Dec.	.....	456.2	354.1	389.4	209.5
Ave.	.....	$333.7	$295.9	$266.4	$242.8





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	148	115	97	80	121
June	...	121	102	81	119
July	...	121	104	86	120
Aug.	...	121	104	90	120
Sept.	...	125	113	92	115
Oct.	...	129	121	95	107
Nov.	...	133	124	100	95
Dec.	...	138	126	101	87
Year Ave.	...	122	108	88	113

FLIGHT OF THE PR

Read about: Difference between explosion and detonation; forces acting on a shell in flight; precession, yaw and drift; the Magnus effect; "rolling" on air; how spin velocity is determined; ballistic calculations; superiority of the battleship over the bomber from armor-piercing standpoint; how armor-piercing capacity is calculated; effects of wind, variation in muzzle velocity, weight of projectile and rotation of the earth; types of United States shell

This Is Number 20 in a Series on Ordnance and Its Production, Prepared for STEEL *by Professor Macconochie*

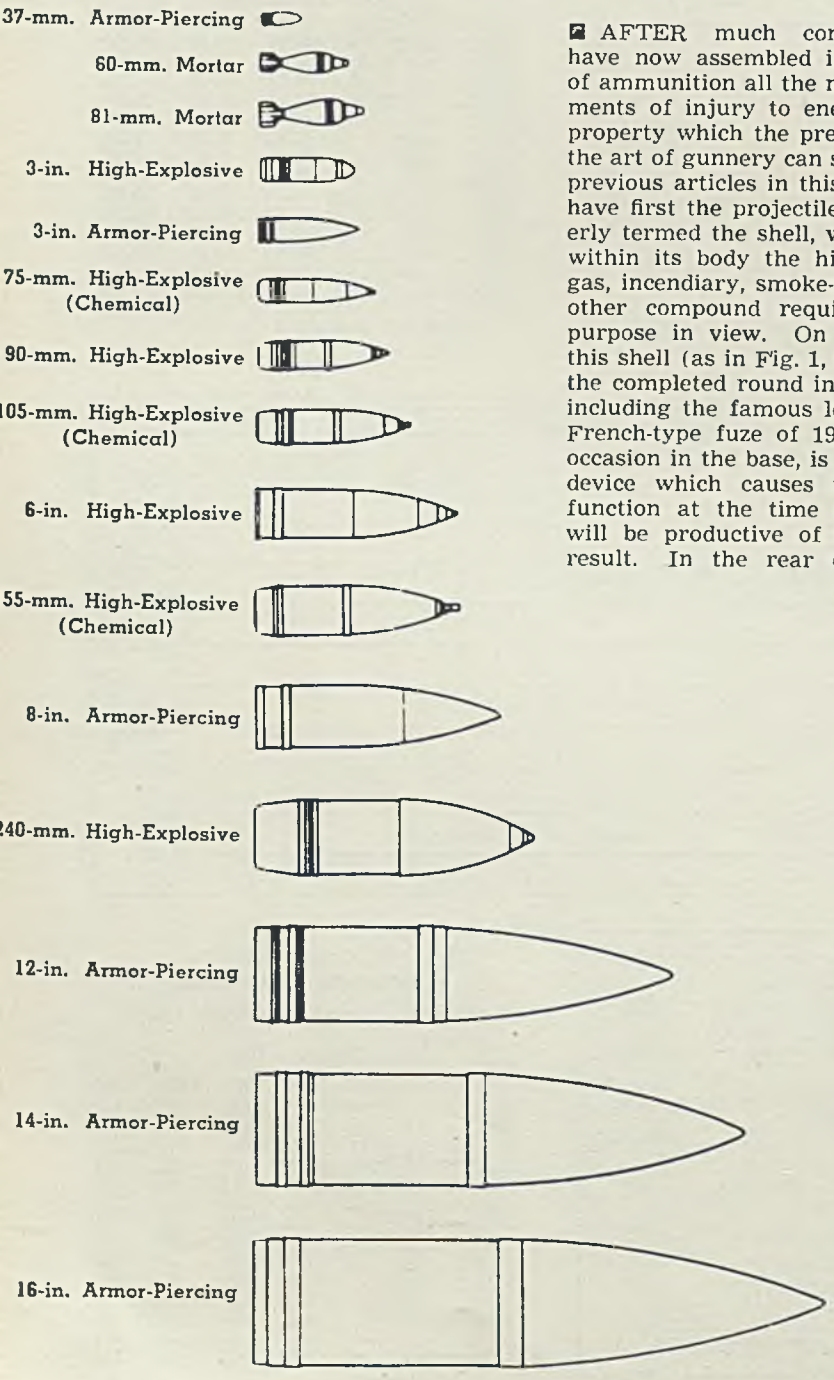


Fig. 3—Various sizes and types of shell commonly used in the United States service. The 37-millimeter armor piercer is a solid shell, does not explode, is merely overgrown bullet, can penetrate 1½ inches of armor plate. Mortar shell has tail vanes to keep it nose first in flight since mortars have no rifling, so do not "spin" the projectile, thus there is no gyroscopic action to keep shell nose first. Rear end of mortar is permanently closed. Mortar shell are loaded by dropping into open end of mortar, fire themselves automatically as they strike fixed firing pin at bottom of gun cavity. High-explosive shell fragment completely when fuze sets them off, scattering steel pieces over wide area; usually have fuze in nose, or in nose and tail. Large armor piercers have pointed windshield on front end which crumpies on impact, allowing blunt-nosed hardened shell body to penetrate armor; followed by a tail fuze setting off a bursting charge to do damage after shell has penetrated armor plate. All shell without tail vanes are given rapid spin by rifling grooves of gun during firing as soft copper band of shell engages these grooves; effect of spin is described in accompanying text. All shell have fuzes which can not be set off until after shell is fired from gun. Chemical shell produce either smoke or poison gas. In addition there are incendiary shell and also illuminating shell which discharge a flare and parachute through shell nose

■ AFTER much contriving, we have now assembled in one round of ammunition all the necessary elements of injury to enemy life and property which the present state of the art of gunnery can suggest. (See previous articles in this series.) We have first the projectile itself, properly termed the shell, which carries within its body the high-explosive, gas, incendiary, smoke-producing or other compound required for the purpose in view. On the nose of this shell (as in Fig. 1, which shows the completed round in half-section, including the famous long-stemmed French-type fuze of 1914-18) or on occasion in the base, is mounted the device which causes the shell to function at the time when action will be productive of the greatest result. In the rear of the shell and enclosed within the cartridge case is the propellant which drives the projectile through the bore of the gun, starting the shell on its flight.

The explosives carried by the shell and contained in the cartridge case differ in that the first has a rate of decomposition so high as, in general, to merit the term "detonation"; while in the latter the action proceeds more slowly and is in the nature of a very rapid combustion. Thus the speed of the detonating wave is commonly measured in *miles* per second, while the rate of propellant explosion can be computed in *feet* per second. For most practical purposes it may be assumed that the rearrangement of the molecules characteristic of *detonation* is instantaneous, compared with a much slower rearrangement in *combustion*.

Finally we have the primer, whose function it is to ignite the propellant charge and so speed the shell on its way. This may take one of several forms depending on whether firing is the result of percussion, friction or the heat generated by the momentary passage of an electric current. In any case, an "igniter" of black powder is caused to burn in the midst of the

OJECTILE

By ARTHUR F. MACCONOCHIE
Head, Department of Mechanical Engineering
University of Virginia
University Station, Va.

propellant which burns or "explodes" in its turn, thus generating the high-pressure gases which act on the base of the shell and produce the very high accelerations of the flight through the barrel of the gun.

Range Tables: The goal of all investigations into the behavior of a projectile in flight is, of course, to so direct the fire from a battery either ashore or afloat that the results will be most effective. From a practical standpoint, these investigations resolve themselves into three parts. First, there is the necessity for solving the "trajectory" in air, a task which has taxed the best mathematical brains for over 400 years. Next, there is the problem of preparing a "range table" in which all the data required for the control of a particular gun are tabulated in convenient form. And finally, we are faced with the necessity of applying these range tables to the determination of the firing data and of utilizing the laws of error in the analyses of the results.

In the heat of battle, it is not, of course, necessary to think of the numerous and involved considerations which entered into the preparation of the range table. We are too deeply concerned with its efficient application. But the naval or artillery officer is likely to make more intelligent use of the facilities at his disposal if acquainted with the manner of their construction from fundamental principles. Further, there is always the possibility that the guns — especially those of a ship—may not be employed in the manner anticipated when the range tables were prepared.

If we lived in a vacuum instead of at the bottom of a shoreless ocean of air, the task of laying a gun so that missile and target eventually coincided would be relatively easy. All we would have to do would be to apply the comparatively simple equations of dynamics which relate to the problem of a body projected in space at a given angle to the horizontal and with a

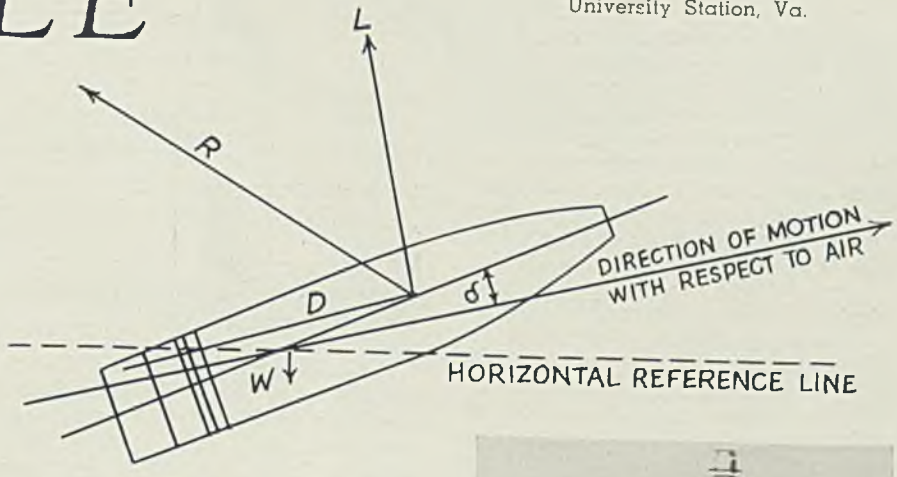


Fig. 2—Forces, above, acting on the projectile while in flight; R is total wind resistance; D is component of R parallel to the direction of motion of the shell and is known as the head resistance or "drag"; L is the component of R at right angles to the drag and is called the cross wind force; W represents weight of the projectile acting vertically down; S is the "angle of yaw"

given velocity, and subjected throughout the action to the constant acceleration of gravity.

Shell Rises 27 Miles: Perhaps the closest any actual computation of the trajectory of a shell ever came to this limiting case occurred during the last war when "big Bertha" was turned on Paris. Due to the great height (some 27 miles) such a shell rises in the atmosphere, the greater portion of the path lies in the rarefied region of the stratosphere. But even in this case, the departure of the actual path from that "in vacuo" was very large, the principal object of increasing the maximum height being, of course, not to simplify calculations relating to the laying of the gun, but to increase the range.

Incidentally, while the presence of the atmosphere introduces serious complications, it at least insures that the shell will arrive point first—something that would not happen in a perfect vacuum. The spinning shell, it will be remembered, is a gyroscope which tends to preserve its orientation in space. Thus, were all forces which tend to alter this situation absent, the shell would arrive at the target with

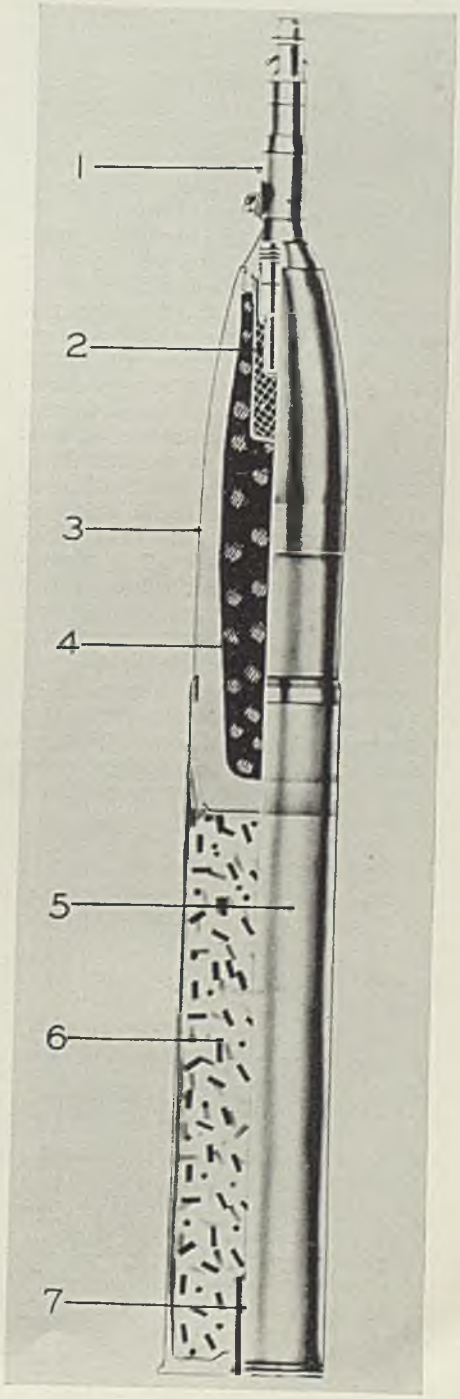


Fig. 1—An assembled round of 75-millimeter ammunition, reproduced from Hayes' **Elements of Ordnance**, published by John Wiley & Sons, New York. Here elements are: 1—point detonating fuze, Mark III, originally a French type that served well in the last war (note its length); 2—adapter and booster, Mark III-b; 3—high-explosive shell, Mark IV; 4—bursting charge, TNT; 5—cartridge case; 6—propelling charge; 7—49-grain primer, Mark I, used to set off propelling charge

its axis inclined at the same angle as that of the gun, and so would arrive broadside on in the case of plunging fire.

This tendency of the shell to maintain its direction in space results in a small inclination of the axis of the shell to the tangent to its downward curving path. This angle is known as the "yaw". Hence the wind resistance encountered by the shell is not "head-on" but may be regarded as consisting of two components, one directly opposed to the direction of motion and the other at right angles to this and acting in such a manner as to cause the shell to "float". This latter is called the "cross wind force". See Fig. 2. If the relation of weight distribution and surface exposed to the blast of air past the shell be considered, it will be found that the pressure of the air acts along a line which intersects the axis of the shell *above* the center of gravity, thus tending to overturn it.

Shell Acts As a Gyroscope: However, the spinning shell is a gyroscope and behaves as such. If, for example, a disk be mounted with its axis vertical and be given a clockwise spin when viewed from above, any attempt to rotate the disk about a diametral axis pointing toward the observer will result in a rotation about a second diametral axis at right angles to the first. Further, the sense of this rotation will depend on the direction of the precessional rotation about the first diametral axis. If the rotation about the first diametral axis be clockwise, then the rotation about the second diametral axis resulting from the gyroscopic torque will be counterclockwise when viewed from the right.

Suppose the shell has a clockwise spin when viewed from the gun. Neglecting for the moment the irregularities of flight arising from clearance between shell and gun and the effects of the blast of explosive gas upon it as it leaves the muzzle, the curve of the trajectory will eventually result in a lifting of the nose of the shell above the tangent to the path, thus permitting the dynamic pressure of the air, acting on the underside of the shell, to initiate a counterclockwise or overturning movement as viewed from the right of an observer stationed at the gun.

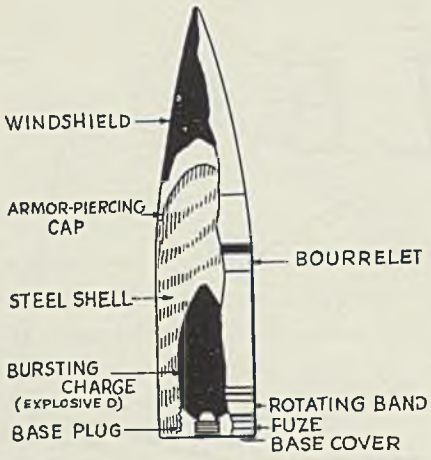


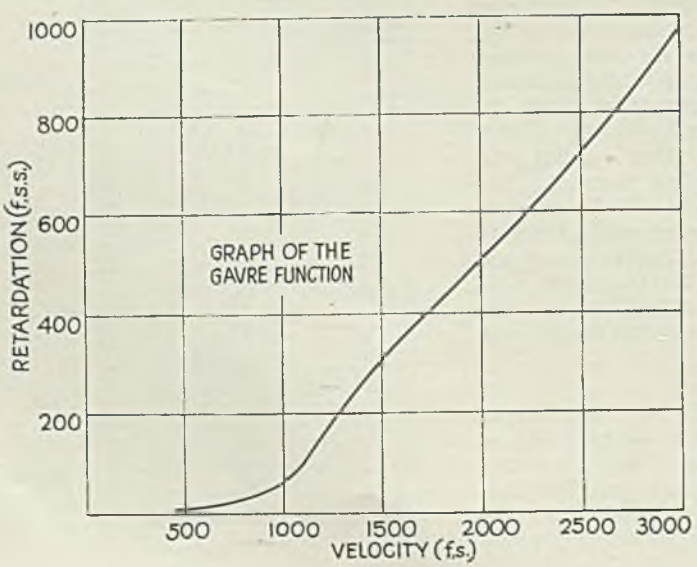
Fig. 5—Diagrammatic sketch of 16-inch armor-piercing shell. Body is chromium-nickel alloy steel with an exceedingly hard nose, upon which is fitted the softer "cap". On impact, the windshield collapses and the cap spreads out around the nose preventing fracture against the hardened armor plate of the enemy ship. Fuze in shell base detonates the charge a short while after impact, allowing time for shell to reach inside of ship and so to be most effective. One such shell, especially if it penetrates the magazine, is sufficient to destroy the largest battleship afloat, as was demonstrated in the case of the ill-fated HOOD. The "bourrelet" is the forward bearing ring of the shell which contacts the inside of the gun as the shell slides through the barrel

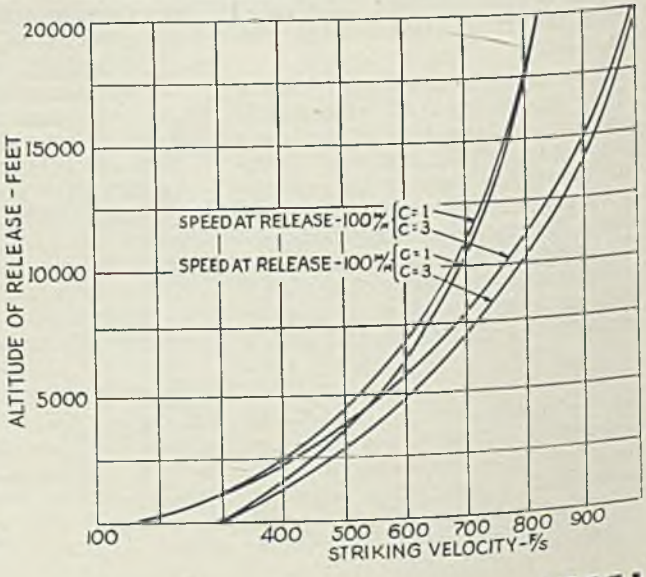
What Happens In Flight: If, now, the rules laid down above be applied in this case, it will be agreed that if the shell have a clockwise rotation as viewed from the rear, the effect of the overturning moment will be to produce a rotation about a second axis at right angles to the first and of such sense that the nose of the shell deviates to the right of the line of flight. This precession in its turn initiates a downward dip of the nose, the net result of the combination of forces acting on the rapidly revolving shell being a slow movement of the point about the path of flight. Without delving too deeply into the gyrodynamics of this action, it may be stated that the balance of probability favors a cycloidal oscillation of the axis with a preponderance of "yaw" to the right. As the rate of change of inclination of the tangent increases, the angle of yaw increases, thus offering an explanation of the fact that the drift of the shell is not merely proportional to the range, but approximately as the square of the time of flight.

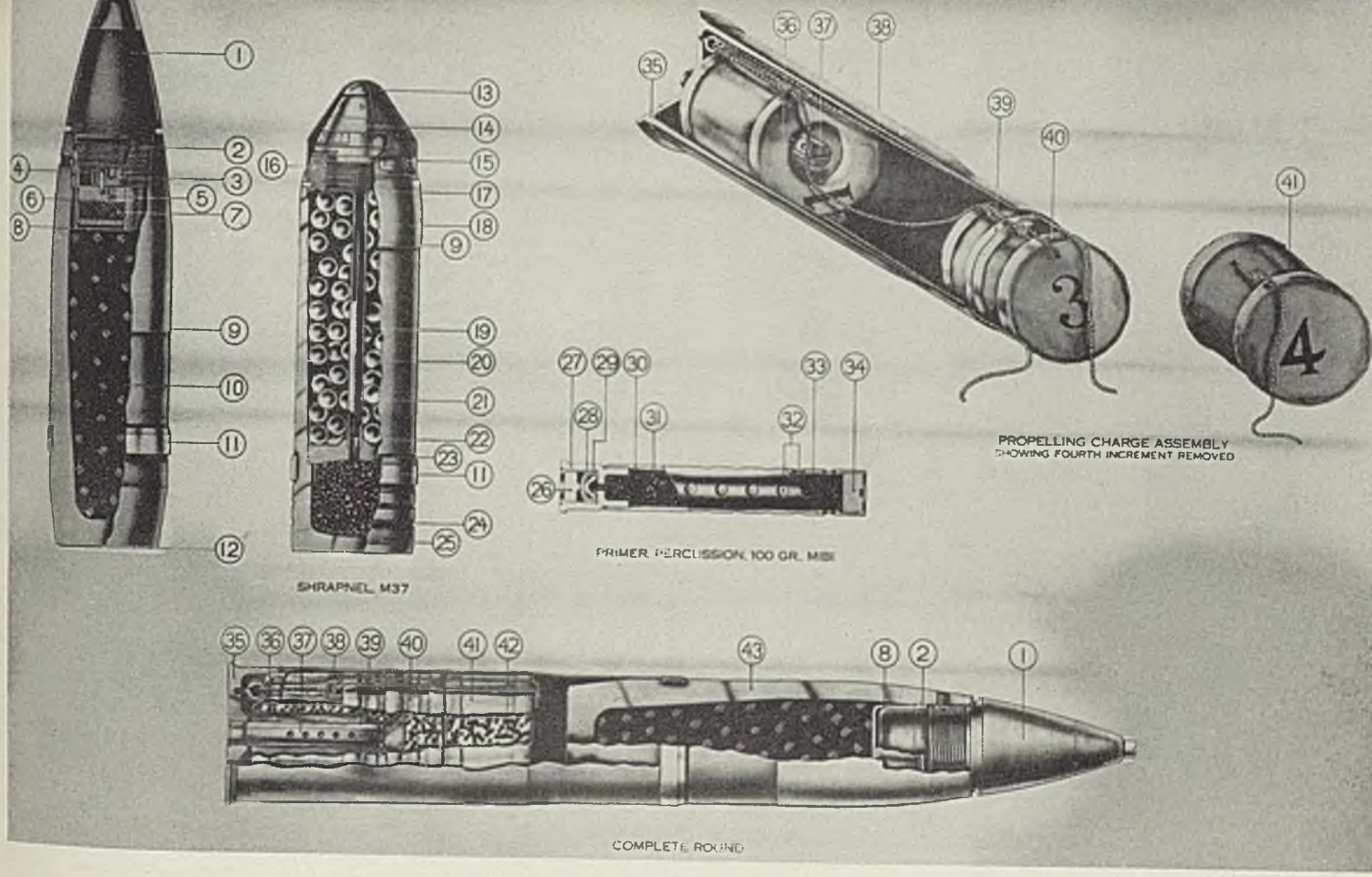
While it is generally conceded that the principal explanation of the behavior of the projectile is to be found in its gyroscopic characteris-

Fig. 4—Today graphs such as this, at left, are widely used in calculating range and ballistic tables for fire control work. This one shows retardation in feet per second for various shell velocities

Fig. 6—This chart, at right, shows striking velocity of the airplane bomb at different altitudes of release and at different plane speeds for two different bomb types. These curves show the initial velocity of the bomb (plane) may have a considerable influence on the striking velocity at low altitudes but that it has relatively little effect at high altitudes since there air resistance plays a more important part. From Hayes' **Elements of Ordnance**







tics, outlined above, the effect of skin friction between the shell and the atmosphere (often referred to as the Magnus effect) cannot be entirely neglected. Every golfer is familiar with the result of imparting rotation to the ball about a vertical axis. Depending upon whether this has a clockwise or anticlockwise sense, when viewed from above, a slice or a hook is the penalty; while if the art of the player contrives a rotation about a horizontal axis normal to the line of flight and of counterclockwise sense when viewed from the right, the ball "floats" in a long flat trajectory. In the case of a shell having right-handed spin, skin friction drags a current of air into the main stream past the underside when the nose is above the tangent, thus causing an increase in pressure from the right. As the slow precession of the axis brings the point down, this effect is reversed, the result being a rarefaction. Thus the effects on either side of the shell are additive and produce alternate deviations of the projectile first to one side and then to the other—now up and then down.

Other Air Effects: Opposed to the Magnus effect is the so-called "cushioning effect". Depending on the manner of presenting the nose of the shell to the air stream, the density of the air in contact with the body of the projectile is greatest first on one side and then on the other, now above and then below.

Fig. 7—The 75-millimeter pack howitzer fires the 14.2-pound high-explosive shell shown a maximum distance of 9490 yards at a maximum elevation of 45 degrees and with maximum muzzle velocity of 1270 feet per second. Propelling charge assembly, upper right, is divided into increments and loaded into the bags shown, the number of bags used corresponding to the zones of fire (range desired). In service, the shell is removed from the case (to which it is not firmly attached), thus allowing the gunner to remove one or more bags of powder, and reassemble the round. The latter is then loaded into the gun like fixed ammunition.

The popularity of shrapnel, see detail M37 above, has declined, little now being used. This type of shell does not fragment as does the high-explosive shell but after blowing off fuze sprays balls out of nose. Observe that the cavity within the drawn steel body is filled with 0.5-inch lead-antimony balls, set in a matrix of rosin so as not to upset the ballistics of the shell. The diaphragm (23) supported by a shoulder closes the cavity in the base which contains the bursting charge of black powder.

The action of shrapnel shell is as follows: On firing the gun, the shock arms the fuze and starts the powder train burning. After the lapse of the specified time for which the fuze has been set, the magazine charge is ignited and a flame passes down the tube to the charge of black powder in the base cavity. The force of the resulting explosion is insufficient to split the case, but merely blows off the head, ejecting diaphragm, balls, fuze, etc., in a cone of dispersion on the extension of the trajectory. Incidentally, the black powder produces an easily visible puff of smoke which aids the battery to adjust its fire.

The 100-grain M1B1 primer shown is one of the more modern types, now generally used in fixed ammunition. This primer is somewhat longer than former designs, the intention being to ignite the propelling charge nearer to the center and to spread the flame over a considerable area by forcing it out through perforations in the primer body.

Parts are: 1—Fuze, point detonating, M39A2; 2—booster, M20; 3—rotor; 4—pin, rotor pivot; 5—pellets (tetryl); 6-cup, booster closing; 7—charge, booster (tetryl); 8—cup, fuze well (bakelite); 9—bourrelet; 10—TNT; 11—band, rotating; 12—cover, base; 13—cover, fuze; 14—fuze, 21 sec. combination; 15—strip, tear; 16—head; 17—washer (steel); 18—tube, inner; 19—matrix (rosin); 20—ball (lead); 21—tube (brass); 22—cup (fiber); 23—diaphragm; 24—charge, base (black powder); 25—case; 26—plug, firing; 27—head; 28—cup, battery; 29—percussion element assembly; 30—body; 31—charge, primer (black powder); 32—holes, vent; 33—wrapper (paper foiling); 34—plug, body; 35—case, cartridge, M5; 36—charge, base, zone 1, assembly; 37—primer, percussion, 100 gr., M1B1; 38—twine, tying; 39—increment, zone 2, assembly; 40—increment, zone 3, assembly; 41—increment, zone 4, assembly; 42—charge, propelling (smokeless powder); 43—shell, H.E., M41. Figs. 7 and 8 courtesy Public Relations Division, Ordnance Department, Washington

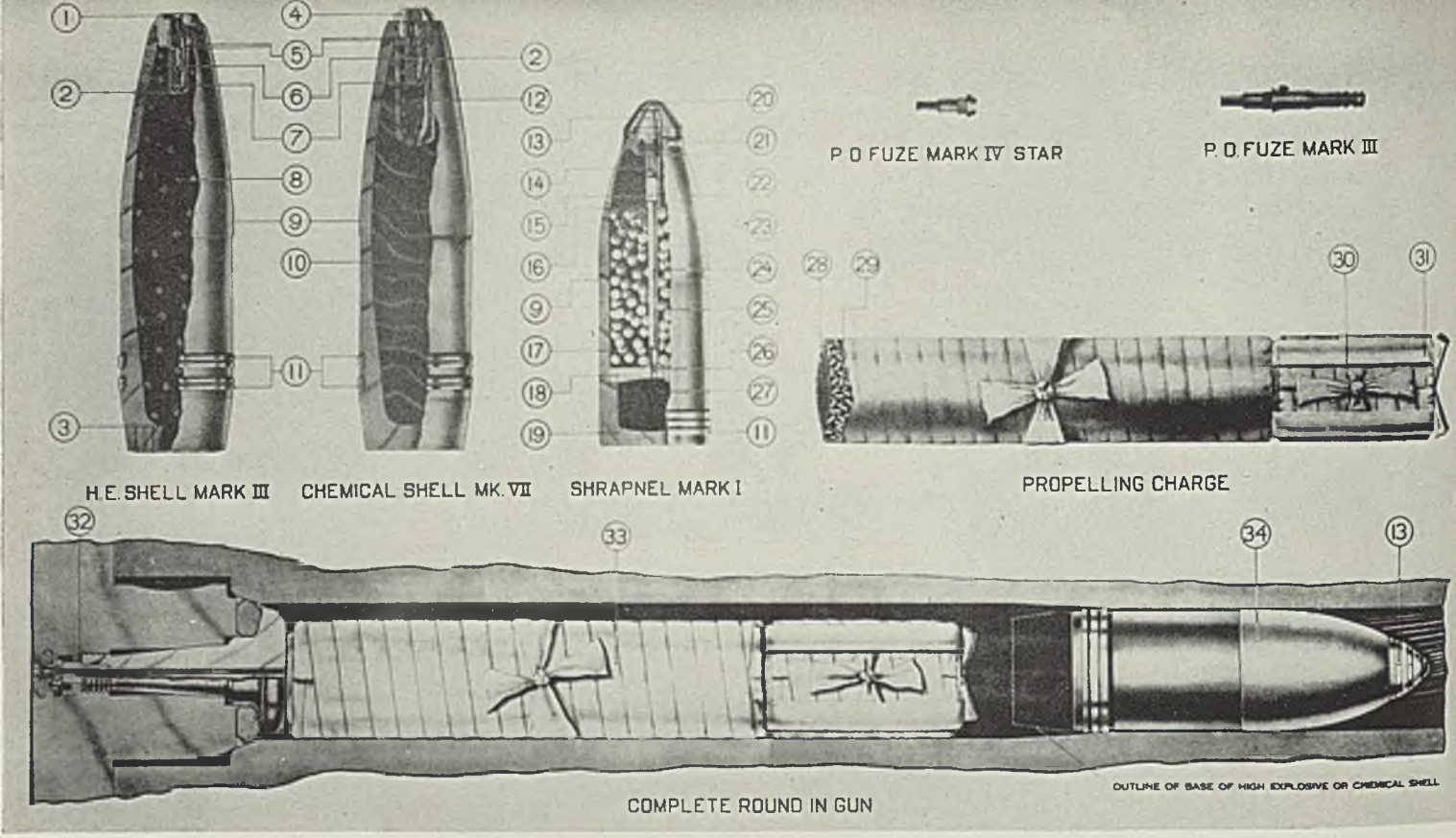


Fig. 8—This shows three types of 155-millimeter ammunition—high-explosive shell, Mark III; chemical shell, Mark VII; shrapnel shell, Mark I—with propelling charge, two types of fuzes, and view of complete round in the gun (bottom). Parts are: 1—Adapter and booster, Mark III A; 2—booster casing, Mark III; 3—base cover, lead disk and caulking wire; 4—adapter and booster, Mark VI B; 5—washer (felt); 6—fuze socket; 7—tetryl; 8—TNT; 9—bourrelet; 10—gas; 11—rotating band; 12—TNT (Grade No. 1); 13—45 sec. comb. fuze; 14—inner tube; 15—retainer; 16—matrix cover; 17—matrix; 18—diaphragm; 19—case; 20—fuze cover; 21—tear strip; 22—washer; 23—head; 24—flash tube; 25—ball (lead); 26—powder tube cup (fiber); 27—black powder; 28—igniter (base section); 29—smokeless powder; 30—increment section; 31—tying strip; 32—21 gr. percussion primer; 33—propelling charge; 34—shrapnel, Mark I

The greater friction of contact where the air is of highest density causes the shell to "roll" on the air in a manner which tends to neutralize the gyrations due to the variations in dynamic pressure. *However, neither the Magnus effect nor the cushioning effect are supposed to have any considerable influence on the final result.* As previously indicated, we approach most nearly to the observed behavior of the shell when it is treated as a gyroscope with all three degrees of rotational freedom.

Reference has already been made to the flight of the projectile fired at Paris from the long-range gun passing through the rarefied upper regions of the atmosphere, and we are now obliged to give the matter of variation in the density of the atmosphere a certain consideration. Not only does this variation affect the head-on resistance to flight, but as the projectile ascends into strata of ever decreasing density, the overturning moment upon which we depend for the maintenance of an axial position substantially coincident with the tangent to the path also diminishes, thus imposing the necessity of diminishing the rotational velocity in order to reduce the gyroscopic stability of the shell. It should be apparent that with very high rotational velocities in flight, the projectile would tend very strongly to retain its position in space; precession would be very slow, the amplitude of the precessional arc very large and the lateral deviation excessive and no doubt quite erratic, thus making accurate and consistent shelling impossible. Further, in the neighborhood of the maximum ordinate of the trajectory, the rate of change of inclination of the tangent is considerable. This further complicates our situation, more especially since experience shows that the decline in rotational velocity is less than the loss of translational velocity.

Thus we are forced to seek a compromise in determining rates of spin best suited to both long and short ranges.

Influence of Weather: The variation in the density of the atmosphere arises principally from the change in the length of the vertical column above us as we rise from the surface of the earth. But local variations of barometric pressure due to weather conditions, including the amount of water vapor present (water vapor being lighter than air) also affect the result. Changes in temperature not only affect the density but also the elasticity of the atmosphere — a factor which must also be reckoned with in the preparation of ballistic tables. The pressure at any height above the surface of the earth (and hence the density when the temperature and humidity are known) can be calculated. This weight being subtracted from the entire weight of the atmospheric column resting on the surface of the earth gives the net pressure.

The equation expressing the relation between the retardation of the projectile, the velocity of flight and those other factors which influence the final result was first given by Mayevski in 1881. These Mayevski functions, as they are termed, are represented by the general expression:

$$R = \frac{A}{C} v^a$$

in which R denotes the retardation in feet per second, corresponding to the velocity v in feet per second. The coefficient A and the exponent of v, namely a, vary with the velocity of flight, but for convenience of calculation are assumed to remain constant within prescribed limits. The "ballistic coefficient" C is a combination of factors relating to the weight, cross section and

"form" of the shell; also to the atmospheric density.

The present tendency is rather away from the use of the Mayevski functions and similar attempts to express the relation between the velocity and the retardation of the projectile. Instead, graphical methods, especially those based on the conclusions of the Commission de Gavre in 1888 are now used in the computation of trajectories. Fig. 4 shows one of these graphs for finding the retardation corresponding to a given velocity for some particular shell under a selected set of atmospheric conditions.

Nature of Air Resistance: The shape of the "G" curve, Fig. 4, changes markedly below the velocity of sound (approximately 1100 feet per second), leading to the conclusion that the nature of resistance to motion of the projectile changes at this point. Photographic studies of projectiles, especially bullets, in flight bear this out. Beyond the velocity of sound, the path is marked by a sharply pointed wave front diverging from the point, together with a rear train of turbulence. Below the velocity of sound, the V-shaped wave front disappears, its place being taken by a detached wave of condensation ahead of the projectile.

The results of calculations pertaining to the flight of the shell are assembled in what are known as "Range and Ballistic Tables". In the first column of such tables is given the range. Then follow the angle of departure (or the angle of elevation of the gun, plus the "jump"); the increase in angle of departure for 100 yards increase in range; the angle of fall; the time of flight; the striking velocity; the drift; the "danger space" for a target 200 feet high; and the maximum ordinate of the path of flight (or height attained by the projectile).

Range Examples: Taking, for example, the case of the 5-inch naval gun with a muzzle velocity of 3150 feet per second, a range of 9500 yards requires an angle of departure of 5 degrees 49.4 minutes. The angle of fall is 11 degrees 18 minutes; the time of flight 15.67 seconds; the striking velocity, 1147 feet per second; and the maximum ordinate, 1011 feet. The drift of this projectile is given as 60.9 yards for this range, and the "danger space", 33 yards. This last mentioned is defined as the distance through which the target may be moved in the line of fire and still be intersected at some point by the trajectory. Put a little differently, it obviously gives us a measure of the tolerable variation in the range for effective results.

Taking another illustration from the tables, we find that the 16-inch rifle firing a shell weighing 2100 pounds, Fig. 5, with an initial velocity of 2600 feet per second, requires an angle of departure of 15 degrees 4.5 minutes when the range is 23,000 yards. The angle of fall at this range is 21 degrees 34 minutes; the time of flight, 37.34 seconds; the striking velocity, 1486 feet per second; and the "drift", 307.6 yards. The maximum height reached by this projectile, when fired at this range, is 5620 feet, and the "danger space" for a target 20 feet high, is 17 yards.

Penetrative Power: The kinetic energy of this projectile on arrival at the target has the almost incredible value of 72,000,000 foot-pounds. If this energy were all usefully applied to the punching of a hole 16 inches in diameter in a plate 16 inches thick, the plate could have a shearing resistance of as much as 44.8 tons per square inch! Since the kinetic energy on impact increases as the square of the striking velocity, the capacity to "defeat" armor plate possessed by armor-piercing shell increases very rapidly with the shortening of the range. For instance, this same 16-inch shell has a striking velocity of 2003 feet per second at a range of 9700 yards. The translational energy liberated on impact in this case is in the neighborhood of 130,000,000 foot-pounds, or 65,000 foot-tons, almost double the first case.

The high terminal velocity of armor-piercing shell explains the superiority of the battleship over the bomber in attack against heavily armored vessels. If Fig. 5 be considered for a moment, it will be observed that unless the armor-piercing bomb be dropped from a great height (in which case accurate aim is difficult) or the initial velocity be increased by dive bombing, the striking velocity is comparatively low and cannot, in any event, be increased to compare with the armor-piercing shell.

In this connection it may be of interest to investigate the penetrative capacity of the armor piercer. The basis of all such calculations is an expression due to a Frenchman, J. DeMarre. In its modernized form, as applied to nickel steel armor it is generally written as follows:

log $v = 3.00945 + 0.75 \log d + 0.70 \log e - 0.50 \log w$ in which v is the velocity of the shell in feet per second,

d is the diameter of the projectile in inches,

e is the penetration in inches and

w is the weight of the projectile in pounds.

Taking the case above cited of a 16-inch armor-piercing shell, fired with a muzzle velocity of 2600 feet per second at a target 23,000 yards distant and striking with a terminal velocity of 1486 feet per second, and applying the formula given above in the form in which it is applicable to face-hardened armor, we find the thickness of plate which could be penetrated on the above assumptions is about 15.63 inches. A very approximate rule is that the armor-piercer is effective against plate of thickness equal to the caliber of the shell. The recent disaster to H. M. S. Hood caused by a shell fired from more than 13 miles away bears out once more the great advantage of first piercing the armor before exploding on the chance that the powder magazine may be fired.

Bombs Can't Penetrate: By way of contrast, let us repeat the above calculation, except that a figure for the striking velocity will be taken more nearly in line with the impact velocity of the airplane bomb, or let us say, 600 feet per second. See chart, Fig. 6. In this case, the thickness of plate which may be penetrated is only 4.27 inches, roughly one-fourth the first value.

Admittedly the formula is most accurately applied to striking velocities between around 1400 and 2000 feet per second and to those cases where the caliber of the shell is comparable with the thickness of the plate. However, the example cited will serve to indicate the order of the results to be anticipated. (It should also be noted that the formula relates to "normal" impact.)

As though the determination of the trajectory of a shell were not sufficiently complicated, we are still under the necessity of taking into account such factors as the variation in the muzzle velocity arising from departure of the powder temperature from the standard 90 degrees; of the variation in the weight of the shell itself; the effect of wind; and last, but not altogether unimportant, especially in long tra-

(*Please turn to Page* 90)

Modern Shell Production

The first part of Professor Macconochie's series of articles on ordnance has been reprinted into a 76-page handbook entitled "Modern Shell Production." The equipment and procedures necessary for efficient production of high-explosive shell are described and illustrated in detail. Copies of the handbook are still available at $1.00 each. Orders should be addressed to STEEL, Readers Service Department, Penton building, Cleveland.

Certain sacrifices in physical characteristics and serviceability of some grades of steel may have to be made if steelmakers are obliged to depend entirely upon domestic alloying elements. Undue hardship is not expected. Means for decreasing ferromanganese consumption without seriously affecting the quality of steel are presented by well-known metallurgists

What About QUALITY OF STEEL?

By C. H. HERTY JR.
Research Engineer,
Bethlehem Steel Co.,
Bethlehem, Pa.

What Can Be Done to Reduce the Consumption of Ferromanganese Without Seriously Affecting Steel Quality?

■ OUR CONSUMPTION of standard ferromanganese, about 15.5 pounds per net ton of steel, is dictated by four conditions:

1. Specifications set by the consumer.
2. Specifications set by the producer to meet physical properties.
3. Specifications set by the producer to give the optimum rolling conditions.
4. Open hearth practice as regards charge, working of the heat and deoxidation practice.

1. Manganese specifications set by the consumer can be revised downward by balancing the lowered manganese with increased carbon and/or silicon. This rebalancing of composition may, in many cases, require a modification of heat treatment, or a slight revision of existing specifications on certain physical properties such as the tensile specification on structural steels which are subject to welding. It should be noted here that substitution elements other than carbon and silicon are either much more costly than manganese or are more "critical" from a "strategic" standpoint. A considerable decrease in manganese consumption can be effected by suitable revisions of consumer specifications.

2. Specifications set by the producer are in much the same category as those set by the consumer. However, the producer may be able to go somewhat further through a less conservative attitude toward phosphorus in certain products, because phosphorus can replace manganese in its effect on tensile strength within the normal commercial limits on phosphorus and the usual phosphorus contents produced.

3. In a large tonnage of steels the manganese content is set to assist in developing the best possible surface qualities in the rolled or finished product. A large saving in manganese can be effected through relaxation of the consumers' requirements on surface combined with extra precautions on the part of the producer to reduce the sulphur content of the steel. Such a procedure will no doubt involve some additional costs, but the amount of manganese to be saved by these two steps is considerable.

4. Open-hearth practice can be regulated to conserve standard ferromanganese by:

A. Increasing the residual manganese by increasing the manganese content of the charge or by lowering the slag volume in the open hearth. Such an increase in residual manganese automatically decreases the ferromanganese requirement, but if the added residual manganese is obtained from manganiferous ores an increase in cost may result.

B. By careful slag control the maximum possible residual manganese from a given charge and the maximum recovery of added ferromanganese can be assured for a given grade on a high percentage of heats.

C. Deoxidation of the heat before the manganese addition, as is now practiced in many grades, will increase the manganese efficiency and reduce the requirements of ferromanganese.

D. The manganese efficiency of a ladle addition is about 10 per cent higher than for a furnace addition. Therefore as much manganese should be added to the ladle as is consistent with the desired quality of the product.

E. The substitution of manganese alloys lower in manganese than standard ferromanganese is entirely feasible for a considerable amount of ferromanganese, if and when such alloys are available.

These various steps in specifications and practices are capable of markedly decreasing our consumption of ferromanganese without seriously affecting steel quality.

Presented before the American Iron and Steel Institute, New York, May 22.

By W. G. BISCHOFF
Metallurgical Engineer,
Timken Roller Bearing Co.,
Canton, O.

To What Extent Can We Use Domestic Alloying Elements, Rather Than Those That Have To Be Imported, To Meet Essential Steel Qualities?

■ IN ORDER to thoroughly understand just which elements can be classified as domestic or imported, we must examine the following list of common alloying metals used in the steel industry and the relative quantity of each which we import.

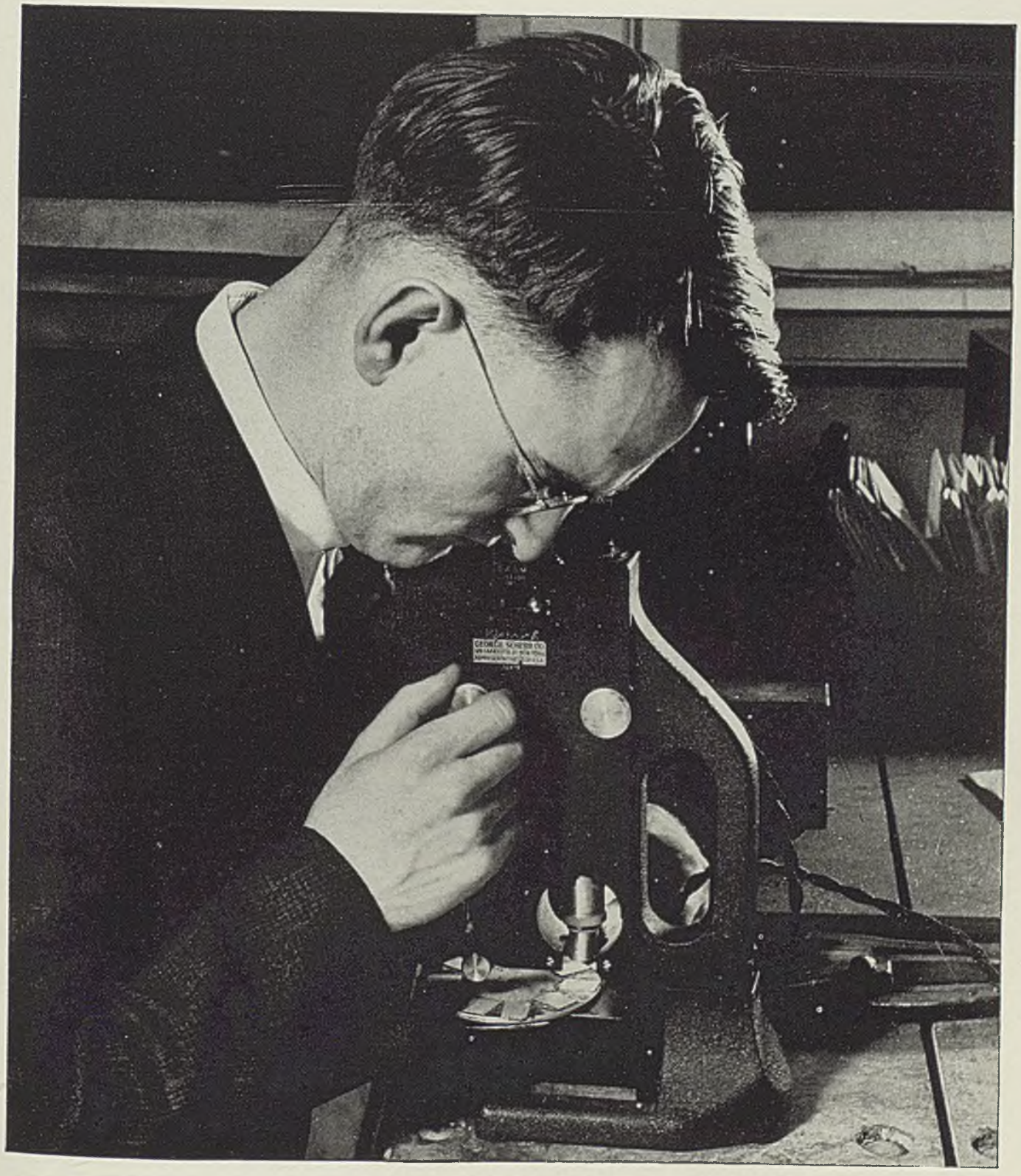
Element	% Imported, approx.
Manganese	75
Silicon	3
Chromium	90
Nickel	99+
Molybdenum	None
Vanadium	50
Tungsten	55

Aluminum has not been considered as an alloying metal, mainly because its use in this respect is limited to a few special types of steel.

Of the foregoing metals, the use of manganese and silicon is imperative in the manufacture of steels, either plain carbon or alloy, made by either open-hearth or electric furnace process.

The fact that at the present time 75 per cent of the manganese used in this country is imported, infers that the entire steel industry is dependent upon imported manganese. The true facts, however, are that there are large deposits of low-grade manganese ore available in this country which can be used at such a time as emergency decrees or the economics of refining justify the working of these deposits.

Chromium is a common alloying element in steel, having considerable effect on the depth hardening and wear-resistant properties of steels; however, certain of these



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properties can be duplicated to some extent by the use of molybdenum. One exception to the above is the ball bearing analysis for which we have been unable to substitute at the present time. While practically all our chromium is at present imported, there has been located recently a large deposit of low-grade ore in this country. This, and numerous small deposits now being worked, may tend to alleviate the critical situation expected.

It happens that vanadium may soon be classed with molybdenum in that we are, or soon will be, able to produce domestically enough to satisfy our requirements.

We have been successful in substituting molybdenum for tungsten to a certain extent, particularly in high-speed tool steels, and this combined with an expected increase in the production of tungsten from domestic mines, may not cause us undue hardship.

Nickel appears to be one alloying element imparting certain properties to steels for which adequate substitution is somewhat of a problem. The fact that nickel in steel develops a pronounced increase in ductile and impact properties makes our problem of developing a nickel-free steel with comparable properties rather difficult.

We have, therefore, available from reasonably certain domestic sources manganese, silicon, molybdenum, and probably vanadium from which to develop the required properties of our alloy steels.

Various alloy constructional steels containing molybdenum generally together with some other alloying element are common at the present time and there is also considerable indication that steels alloyed by molybdenum alone are finding extensive use for various applications.

Obviously should we be limited by circumstances to the use of only those metals found domestically in appreciable quantities, certain sacrifices in physical properties of steels must be expected. However, new developments in combining various ratios of those elements during melting, changes in methods of heat treatment and improvements in the design of finished parts are all products of necessity, particularly in times of emergencies. These expected developments and improvements indicate that in part the new steels will be reasonably satisfactory.

There are many applications where satisfactory substitution of domestic alloys for imported alloys maintaining essentially the same steel qualities, cannot be made. Those steels of exceptionally high alloy content, particularly those containing nickel or chromium, or both, will be impossible to replace. On the other hand, there are many applications where high alloy steels are being used at present when undoubtedly steels of lower and possibly different alloy content would serve equally as well.

Furthermore, the proper segregation of steel scrap, primarily nickel bearing scrap, should enable us to produce nickel steels with a minimum consumption of virgin nickel.

We must also recognize that general steel quality has shown decided improvement during the past decade and for this reason many of our carbon and low alloy steels of today are nearly the equivalent of our higher alloys of sometime past.

We may, therefore, conclude from our present information and experience, should we be forced to rely entirely upon domestic alloying metals, that certain sacrifices in physical characteristics and serviceability of some steels must be expected. But, with a well-engineered research and experimental program, we should be able to look forward into the immediate future with a certain degree of confidence in the expectation that for the majority of our purposes steels alloyed with domestic metals will not cause us undue hardship, at least under normal conditions of service.

Cadillac Halves Production Time Of Aircraft Engine Entrance Vanes

■ CUTTING production time on Allison supercharger entrance vanes by more than 50 per cent, effected by Cadillac Motor Car Division, Detroit, appears to be a major automotive contribution to aircraft engine manufacture.

The supercharger entrance vane is a fan-shaped steel part, 6 inches in diameter and comprising 15 curved blades extending outward from a splined hub. Precise machining of the SAE 4340 steel forging is imperative. Even a microscopic variation in the blades from specifications would cause unbalance and impair efficiency at the vanes which operate at 24,000 revolutions per minute.

Before Cadillac took a parts contract for the Allison aircraft engine, the vanes were entirely hand-milled and shaped. It was decided to adapt the part to automotive machining. A principal stumbling block came in the odd number of blades which necessitated cutting of each member separately. To overcome this a common center point was located and a sine bar employed to rotate the pancake forging around a central axis. This point was developed to serve as an index as well as the support against cutter pressure.

Since the conventional cutter and feeder would not meet the demands for uniform generation, a special milling machine was required. This machine furnished a normal straight cut to a permanent stop within thousandths and then fed climb-cut on reverse. Eleven of these machines were installed for progressive operations in roughing, semi-finishing and finishing.

After preliminary steps to turn, bore, broach and machine the special centers, the forging proceeds through 13 operations on 11 special types of milling machines previously mentioned. Front and back faces, face radii and edges are rough, semifinish and finish milled. Series of bench finishing operations then is performed, and the 7-pound rough forging finally emerges as a finished vane with 93 per cent of its weight removed in the machining operations, giving an indication of the intricary of the processing steps.

Comparing finished Allison Supercharger entrance vane, left, with the original 7-pound SAE 4340 steel forging: Special types of milling machines have reduced production time by half the former finishing methods

NEWPORT'S *latest development*

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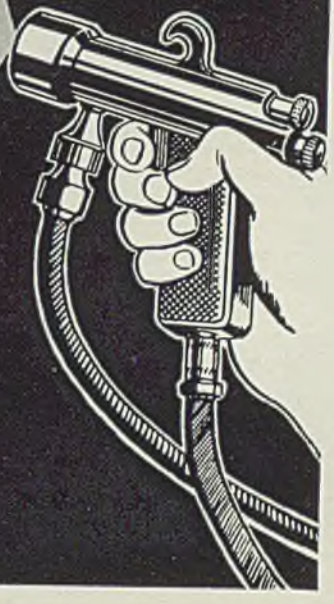

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BETWEEN HEATS

WITH Shorty

■ Say Fellers:

I wanta tell y' a good one on the boys workin' on No. 3 furnace over in the open-hearth. They were talkin' 'bout vacations 'n where they planned to spend their time when it came their turn to knock off.

Scoopie Mills, squattin' on the back of his shovel the way the open-hearth fellers do, speaks up 'n sez, "youse guys all thinkin' 'bout vacations when the country needs fellers as the likes of you to keep steel comin' in the ladle. When this thing 'cross the waters comes to an end, we'll all be gittin' more time fer vacations than any of us bargained fer. Why doncha exercise yer option the company's given y'—working straight through 'n takin' your cold cash in a lump sum instead ot spendin' a few days in the woods somewhere doin' the "red ridin' hood" stuff?"

"It sure makes sense to a guy as the like of me," sez Spike Horton. "I kin use the pin money as sure as your livin'."

"Yea, but whaddya goin' to do on the Fourth of July," asked Chubby Story. "Is the shop goin' to close down or is she gonna run right through?"

Aims To Please

"Well if its fireworks your lookin' fer, Chubby ol' kid, we kin 'ave 'er right here with all the trimmin's," sez Scoopie. " 'Fore you guys started here in the shop some bozo sold the boss a 'bill of goods' that was the cat's meow. Mustta been 10 years ago, I guess. One shot in the ladle durin' the tap and you'd get all the Fourth of July stuff y' wanted."

"I'll tellya, Scoopie. In case we're running straight through on the Fourth mebbe we could sorta dig up some of the dope 'n stick 'er in one of the ladles. Whaddya say?"

"Boy, y' got somethin' there," sez Scoopie. "I'll keep snoopin' 'round until I locate a can of the stuff and we'll plant 'er in the ladle on the furnace nexta ours."

"What kinda stuff are y' talkin 'bout?" asked Spike.

"O the boss use to call 'er 'Boomite,' or some such name, 'n believe me, when y' heaved a can into the ladle, she lived up to 'er name alright. I remember ol' Jim Dunn standin' on the platform at the back of the furnace with some cans of the stuff in his hands but before he could heave 'er in the ladle the stuff exploded. Y' should 'ave seen the fellers on the platform take a quarterback sneak. Ol' Jim blurts out, 'Whose idea was it to 'ave us use canned dynamite, huh? That stuff 'll really let go if it sees its shadow. Y' got some control over a hand grenade but a couple of cans of that stuff 'n y'd be through the roof in no time.' "

Added in Ladle

"What was the stuff supposed to do to a heat?" inquired Spike.

"I'll tellya. She was supposed to be a finely ground mixture of carbon and other chemicals. We added 'er to the ladle during the tap at the rate of about 4 pounds per ton of metal. Once in the ladle she produced a rapid evolution of CO and when the force of the expanding gas had been dissipated and the refining material spread throughout the bath, the CO gas in rising to the surface caused ebbulitions of metal and in its upward movement, increases the elimination of a large portion of inclusions. That's the dope as far as I can recall it," sez Scoopie.

"Boy, the Boss is always in for buyin' some cure-all fer takin' the defects outta the ingots. Reminds me of a story I heard a guy tellin' the other day . . "

Spike got that far with his statement when Scoopie Mills who had been restin' on the back of his shovel, pulled it from between his legs and started rattlin' it on the steel plate flooring, pausing now and then to shout, "Hey, gang, come a runnin', Spike 's goin' to speak a piece." The fellers from the nearby furnaces went into a huddle and Spike proceeded. He sez:

"Seems as though there was a guy 'bout 55 years old who couldn't get a job so he starts makin' a patent medicine. He called 'er 'Cure-All' 'cause she was good fer anything that ails y'—hoopin' cough, stiffness, bruises, etc. One afternoon his boy on his way home from high school was about to pass a young lady wheeling a youngster in a baby buggy when the lady grabbed 'im by the arm 'n sez,

'Johnny, how 's come you are outta school so early?'

'Wouldn't y' like to know, huh? It 's nothin' to you.'

'Why it 's everything to me. Don't you recognize me?' she inquired.

'No, lady, I don't. What's your name?'

'Why, Johnny, I'm your mother,' she sez.

'My mother? Gowan, lady, y' don't look any older than I do.'

'I know,' she sez, 'but I took a swig of your father's 'Cure-All' and it made me appear like a young girl again.'

Takes a Closer Squint

Johnny took a closer look and he sez, 'That so. Well who 's the kid you got in the baby buggy?'

'Oh,' sez his mother, 'that 's your father. Y' see, he took an over dose.'

The fellers came outta their huddle laughin' like fools. One guy gave Spike's cap a yank down over 'is eyes 'n another grabbed a handful of dolomite and put it down 'is back.

'N as Spike pulled 'is shirt out of 'is trousers to get rid of the dolomite, he sez, " 'N so I suppose all these 'Cure-All's' that the boss buys are supposed to make a sick ingot appear jus' like it come from a good heat, huh? Well, they don't work that way."

"Yeah, you're right, Spike. I recall durin' the last war some guy came 'round the shop where I was workin' 'n sold the boss some stuff that he called burroughlite. Y' add 'er to the ladle 'n y' getta steel that has the carbon on the low side 'n y' kin do anything with 'er. Fer insance, the guy made a chisel out of a bar of the steel without heatin' 'er 'n then he took the chisel 'n put a good size nick in a case-hardened monkey wrench. All it did to the chisel was to round 'er off on the edge. I'll tellya more 'bout 'er sometime. Watch your 'cure-alls'."

Anyway, fellers, that 's the story 'n when it comes Fourth of July, the gang intends to plant a can of the 'Boomite' in a nearby ladle and watch 'er scare the dickens outta the gang.

So long, fellers. I'll be seein' ya.

"Shorty" Long

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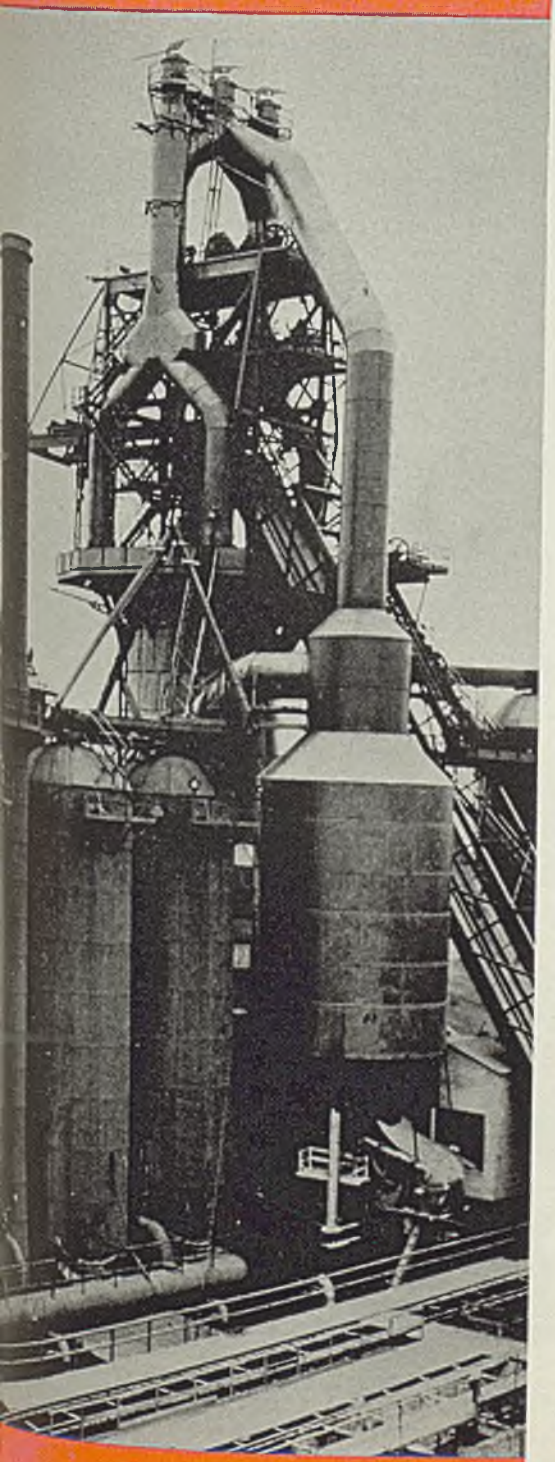

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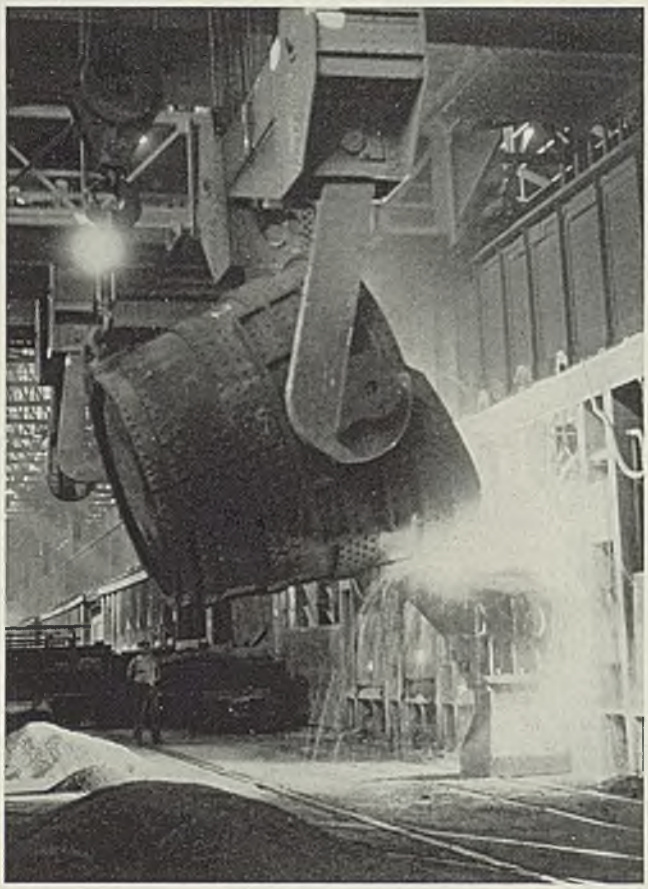
The Manufacture of

HIGH-QUALITY, LOW COST STEEL

basic open-hearth iron

By PAUL J. McKIMM

Cleveland



Charging basic iron into the open hearth for conversion into steel

■ REFERENCES frequently are made by open-hearth furnace operators to certain types of iron as bad iron, dirty iron, cold metal, dead iron, etc. Claim is made, however, that with these irons, although within specified chemical analysis, it is impossible to produce quality steels. It has been suggested that these characteristics are encountered when analyses from cast to cast vary; when bushelings, borings, turnings and other cheapeners are utilized, as well as flue dust and unsuitable ore mixes; and when cold hearths are encountered. The quality of iron also is questioned when blast furnaces are working on slow blowing because of slackness of orders. Most of these contentions are without foundation.

The theory as to what actually takes place inside a blast furnace is little understood. With all our metallurgical advancement little exploration of the furnace interior has taken place and most knowledge is gained from the materials charged and the product obtained. Specimens have been obtained at the tuyere line, bosh and shaft, but little data are available at the hearth which is most important because this is where the final chemical and metallurgical characteristics prevail. Ralph H. Sweetser, New York, points out that samples of iron and slag taken at tuyere level throughout the cross section indicate wide variation in carbon from low to high and from sort of a sponge iron to white iron, and also in basicity. He contends that with our present lack of information at this most important region of the blast furnace it is impossible to formulate theories for the varying chemical, metallurgical or thermodynamical reactions.

Quality steels cannot be manufactured without good iron. This, however, does not mean cheap iron because the lowest cost iron is the logical procedure.

Where a specific and definite open-hearth charge has been established and assuming that the flux stone and scrap are near constant the ultimate rejections will vary greatly with the variance in iron quality unless erratic changes are made during melting or the early stages of the refining period. If the melt is high, excessive ore is required which may or may not need additional lime; or, if the melt is low, additional iron either hot or cold is added which may also necessitate slag conditioning. Both require time which decreases the tonnage per furnace operating hour.

Frequently it is assumed that iron of suitable quality must be produced from high-quality virgin ores, utilizing high-grade coke obtained by processing high-grade expensive coals and would result in high cost iron which may or may not be good quality. The iron which may also be within optimum ranges of analyses is fully dependent on blast furnace operation and skill of blast furnace operators. Therefore, it can reasonably be assumed that whether or not good iron is obtained remains a function of the ironmaker irrespective of the type of charge or whether or not cheapeners were employed.

The practice of using virgin ores which contain approximately 50 to 56 per cent iron and pushing the blast furnace beyond practical operating limits for production in order to meet economical cost, may result in questionable quality iron. An alternative to obtain a good yield and low cost is to resort to "scrapping," when the price of scrap permits. Scrap yields practically 100 per cent. Other cheapeners should be used to attain cost advantages and generally produce a more desirable iron due to a smoother movement of the furnace.

Certain grades of scrap like oil country cables and small rusty parts are not desirable for open-hearth use because of the loss of oxide and the tendency to clog checkers but are economical when used in the blast furnace.

The logical procedure is to employ cheapeners principally scrap, also interplant material such as soaking pit and heating furnace cinder, roll scale and open-hearth slag. Practically all furnaces use open-hearth

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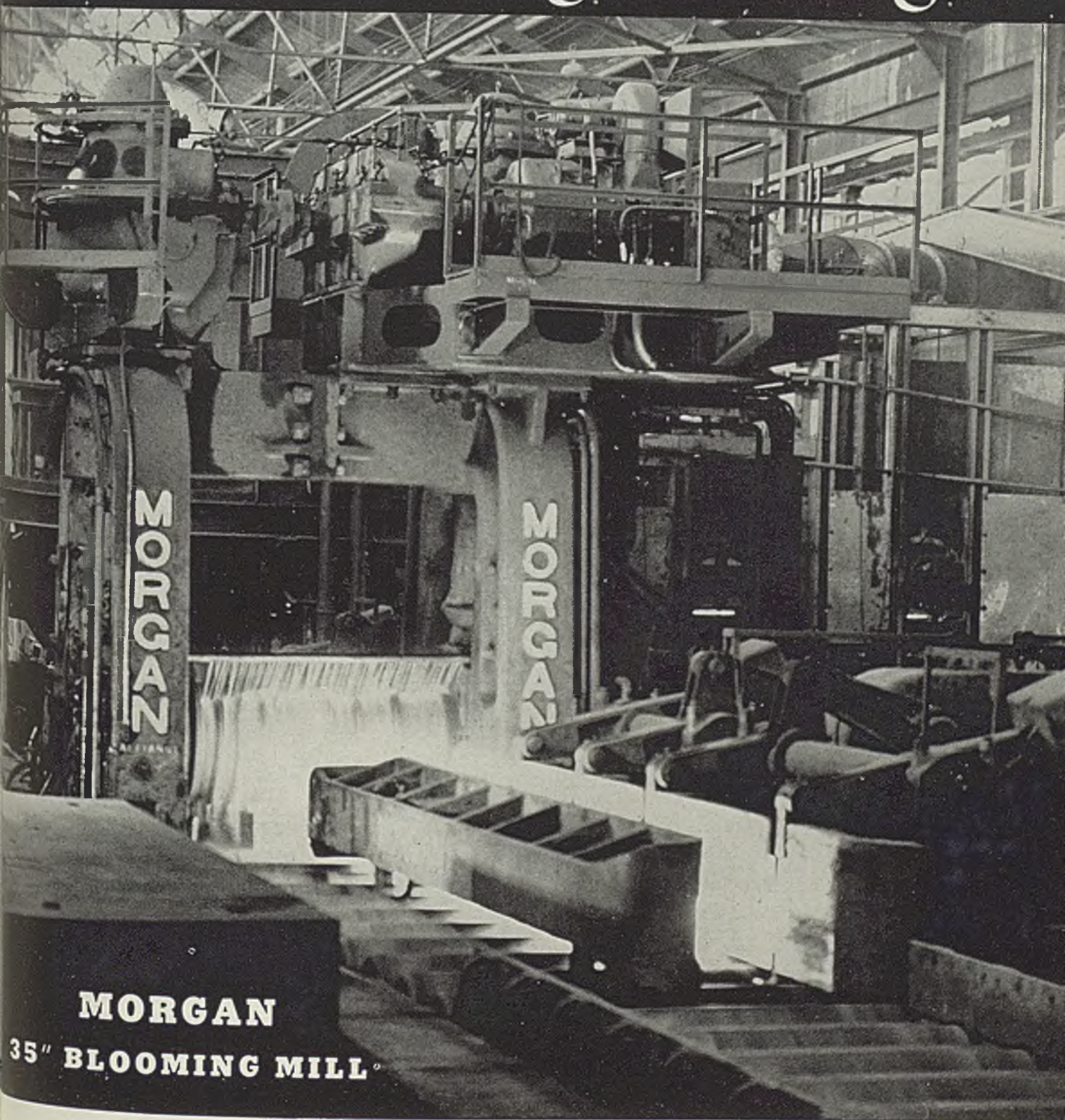

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35" BLOOMING MILL

ABOVE is shown a Morgan 35" two-high blooming mill complete with double manipulator, front and rear tables. A hydraulic roll changing device is provided. Housings are one-piece steel castings of the closed top type. Top roll balance is of the counterweight type.

Manipulator is of the overhead type, compact and accessible. Tables are of heavy design, equipped with anti-friction bearings. Screw-down drive is arranged to provide crane hook access when changing guides. Provision is made for automatic lubrication and exclusion of scale and dirt.

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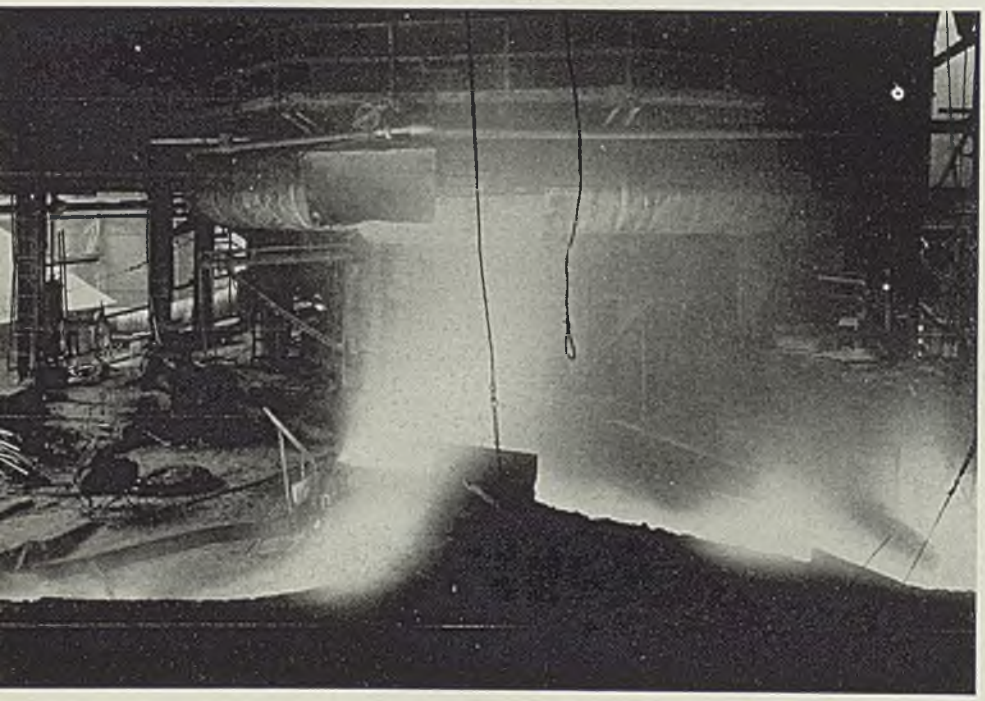
slag, cinder and mill or roll scale but do not follow scrapping except during extreme peak production periods and then only to improve tonnage demands irrespective of scrap cost. High-quality open-hearth iron has been consistently produced for years with the burden containing 16 per cent open-hearth slag and 35 per cent scrap and reaching as high as 45 per cent scrap for some periods. This advantage in cost varied with scrap prices but amounted to a saving of 400 pounds of coke and 450 pounds of limestone over straight ore, cinder, mill scale and slag. This also permitted tonnage far in excess of the furnaces rating with the greatest smoothness and constancy of movement and yielding extremely uniformity of analyses.



Tapping a blast furnace burdened on basic iron for open-hearth use

Furnace operators view the use of scrap with considerable skepticism because of alloy contamination but this need cause no worry because alloys can exist to greater amounts than previously claimed[1]. Where alloy contamination is not permissible it can be controlled within predetermined limits by careful scrap selection. That quality iron can be made with the blast furnace burden varied from 100 per cent ore to be the opposite end of the range of a 100 per cent scrap is possible. Hence, the ratios of 90 and 10, 80 and 20, 60 and 40, etc., to 100 per cent scrap burden, providing that each system of burdening is properly aligned to a respective operating practice for a given charge. The fact that iron produced with 100 per cent scrap in the blast furnace burden can be used in high-quality steel manufacture without any ill open-hearth effects has been definitely established, especially where scrap has been employed up to 50 per cent of the burden. C. L. T. Edwards has ably treated this phase of iron production[2].

Utilizing approximately 35 per cent scrap and 16 to 20 per cent open-hearth slag in the burden, iron has been consistently produced analyzing 0.90 to 1.15 per cent silicon with the third and last ladle in the cast dropping to 0.85 per cent silicon. This silicon range is preferable whether the amount of iron charged into the open hearth is small or high, say up to 65 per cent. In plants where it is economical to have a lower silicon content it is perhaps best to have the cast of normal silicon and reduce this constituent in the iron ladle or mixer with additions of mill scale.

In this instance the iron is charged directly into the open-hearth furnace from the iron ladle without mixer or mixer-cars; therefore, it is imperative to have uniform analyses, from cast to cast and over all. Furthermore, where silicon in the iron fluctuates over wide limits (0.60 to 1.60 per cent), it is not a good quality iron. The main feature of uniformity of analyses is the fact that these indicate the smoothness and regularity of the furnace movement which is most important.

The principal function of the silicon is to attain a point in the open-hearth melt sufficiently high enough to prevent the heat melting soft and thus necessitating extra iron additions or other carburizing agents, especially where mostly soft scrap is used.

The amount of open-hearth slag that can be utilized in the blast furnace burden ranges from 16 to 20 per cent. This causes no ill effects even though the phosphorus increases to 0.350 per cent. Of course the phosphorus necessitates additional limestone or lime in the open-hearth, the quantity being greater than generally is used to properly shape up the heats.

Steel Quality Is Not Affected

Many blast furnacemen contend that higher percentages of manganese are beneficial even to the extent of maintaining a more costly burden to attain 2.00 per cent and as high as 2.50 per cent manganese. It has no apparent effect on steel quality because irrespective of the percentage of manganese in the charge the residual will usually be the same depending on open-hearth procedure where the loss is greatest with poor slag and poor practice. A number of heats was produced with an iron charge of 65 to 72 per cent, the iron containing 2.25 per cent manganese. Ferromanganese was added with the charge in one case and in another case the same iron was charged without the ferromanganese. A number of heats also was made having an iron charge of 42 and 43 per cent with a manganese analyses of 1.75 per cent; some heats had an addition of ferromanganese. In all cases it developed that the residual manganese was fully controlled by open-hearth procedure. A higher manganese iron or an addition of manganese early in the open-hearth charge is necessary for sulphur reduction when this element is permitted to run high in the iron. The place most economical for sulphur reduction is in the blast furnace and not in the open-hearth.

The analyses discussed were taken for 24 hours run and are as follows:

Iron	
Element	Per cent
Silicon	0.92-1.09
Phosphorus	0.314
Manganese	1.78-1.90
Sulphur	0.019-0.028

Slag	
Element	Per cent
Silica	35.92-35.78
Alumina	11.04-10.52
Lime	44.86-44.98
Magnesia	7.86-8.03
Sulphur	1.41-1.36

With present demands for iron

[1] See "Residual Tin in Sheet Steel"; STEEL, May 6, 13, and June 17, 1940. Also "Bibliography on Influence of Arsenic and Tin on Properties of Iron and Steel"; in Bibliographical Series No. 4, the Iron and Steel Institute (British).

[2] Technical publication, No. 1270, American Institute of Mining and Metallurgical Engineers, New York.

necessitating heavy demand for coke it may become necessary to coke higher sulphur coals and this may result in the production of higher sulphur iron. In this case means of desulphurization will be employed, such as the use of soda ash. Considerable experimentation with soda ash as a desulphurizer has been conducted in England and Germany and more recently in this country.[3]

At a plant in this country where all casts from two furnaces for one month varied in sulphur from 0.034 to 0.063 per cent a purifier and desulphurizer was employed in the iron ladle. Soda ash was also charged in the open hearth along with the hot metal. A reduction of sulphur took place with the use of soda ash in the iron but not with its use in the open hearth. This may be due to the fact that high sulphur producer coal yielded a high-sulphur gas and it was evident that any reduction of sulphur at this phase of processing was offset by sulphur absorption from the fuel gas. Sulphur can be considerably higher than the general specified percentages because there is always sufficient manganese to maintain manganese-sulphide with no excess sulphur to form iron-sulphide which would be detrimental. In fact tests were conducted with steel for extra deep drawing cold strip where the ladle sulphur analyses were three times as high as the maximum permissible without ill effects in processing or in test. Such high sulphur, however, would not be desired and is merely mentioned here to show that when the ladle sulphur specification is 0.030 to 0.033 per cent maximum, it should not even be questioned.

Other causes affecting basic iron quality are unreduced oxides principally of silicate, and various oxide formation usually of complex nature and/or complex compounds.

This so-called disreputable iron is encountered during irregular furnace operations, when analyses fluctuate over wide ranges. The wide variance in analysis due to erratic movement of stock in the furnace indicates that some furnace factor is out of proper balance and this lack of uniformity alone would condemn the iron as not of proper quality. When erratic movement of the stock in the furnace occurs cold material chills the metal to such low temperatures that proper chemical, metallurgical or thermal reactions are not carried to their proper completion. Under such conditions fluctuation in analyses of both the slag and the iron is encountered.

As the hearth temperature increases the total carbon and the ratio of graphitic to combined carbon increase, while an increase in the silicon content is accompanied by a decrease in the total carbon and an increase in the ratio of graphitic to combined carbon. Silicon promotes graphitization. Silicon variance is not solely dependent on hearth temperatures but on ratios of acids to bases in the slag and as the slag balance varies the silicon content of the iron will vary. The importance of temperatures and their uniformity are shown in graphs by R. H. Sweetser[4].

Irrespective of the charge, chemically or physically, the furnace can be operated in such manner as to maintain uniform temperatures, smooth movement of the stock, and normal reactions thus producing quality iron.

Whether iron is charged molten or in pig form into the open hearth makes no difference as to the ultimate quality of the resultant steel but it does affect the processing.

Much of the condemnation of iron quality on the part of open-hearth

[3] "Recent Developments in European Blast Furnace Practice," STEEL, April 14, 1941, p. 72.

[4] "Combined Carbon—A Controlling Factor in Quality Basic Pig Iron," A.I.M.E., Vol. 131, 1938, p. 162.

Gamma Rays Detect Flaws in Steel

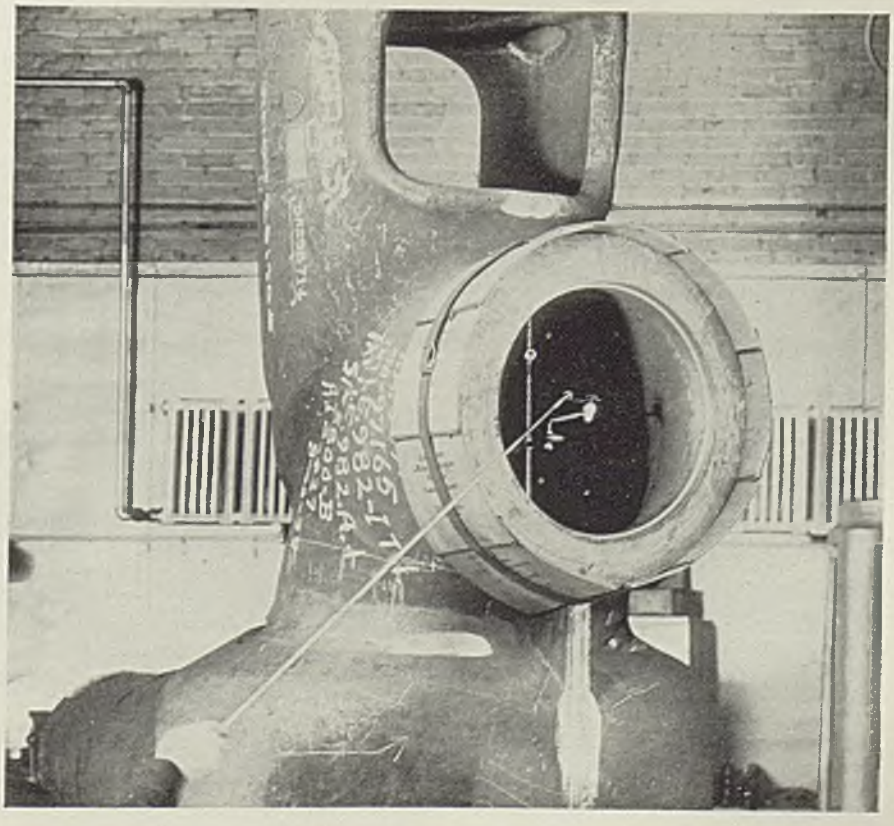
■ Gamma ray photographs now are being used to detect flaws in the steel structure of parts of steam turbines, propulsion gears and auxiliary apparatus for United States Navy fighting ships now in production at the Westinghouse Steam Division Works, Lester, Pa., is is reported.

The inspection process, worked out by navy engineers and research scientists through the use of radium sulphate also is being applied to commercial power apparatus.

Although quantities of radium sulphate are tiny in size, the biggest, 500 milligrams, is powerful enough for examining 10-inch steel.

In detecting flaws, sensitized film is first strapped in place on the outside of the metal—a pipe, for example. Then the radium compound, sealed in a minute silver kernel, which in turn is contained in a pear-shaped aluminum shell, is suspended on a midget rigging placed within the pipe. The film then registers the gamma rays as they penetrate the metal. Flaws in the metal appear on the film as dark areas, for the rays are able to reach the film with greater intensity during an exposure period through flaws than through a solid metallic structure.

Exposure of the film varies from a few minutes to 48 hours. Time of exposure is gaged by using a special slide rule developed for the purpose by navy engineers.



operators is unjustified inasmuch as the difficulty experienced lies within the scope of their own control. Frequently there is insufficient fusion of the scrap because the time of charging or the type of charge necessitates hot metal being added to cold material in the bath. This is the fastest manner of reducing temperatures and automatically interferes with the normal procedure. The iron acts sluggish and generally reacts on the bottom and/or foams and results in three-quarters to over an hour in the time of the heat. On the other hand when the charging is properly manipulated the hot metal immediately reacts on the scrap. This is important and will eliminate the often condemned iron quality which is actually all that is to be desired.

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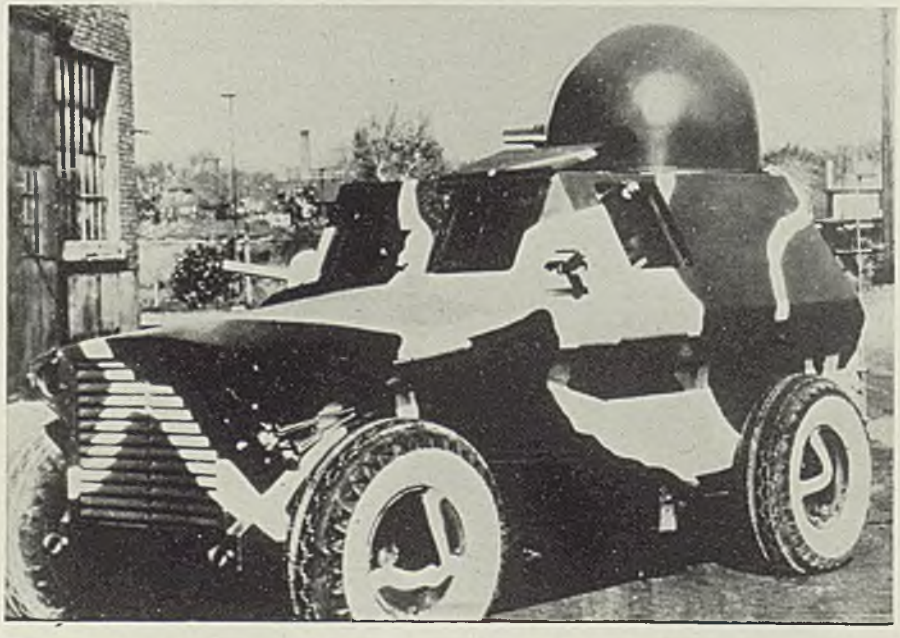
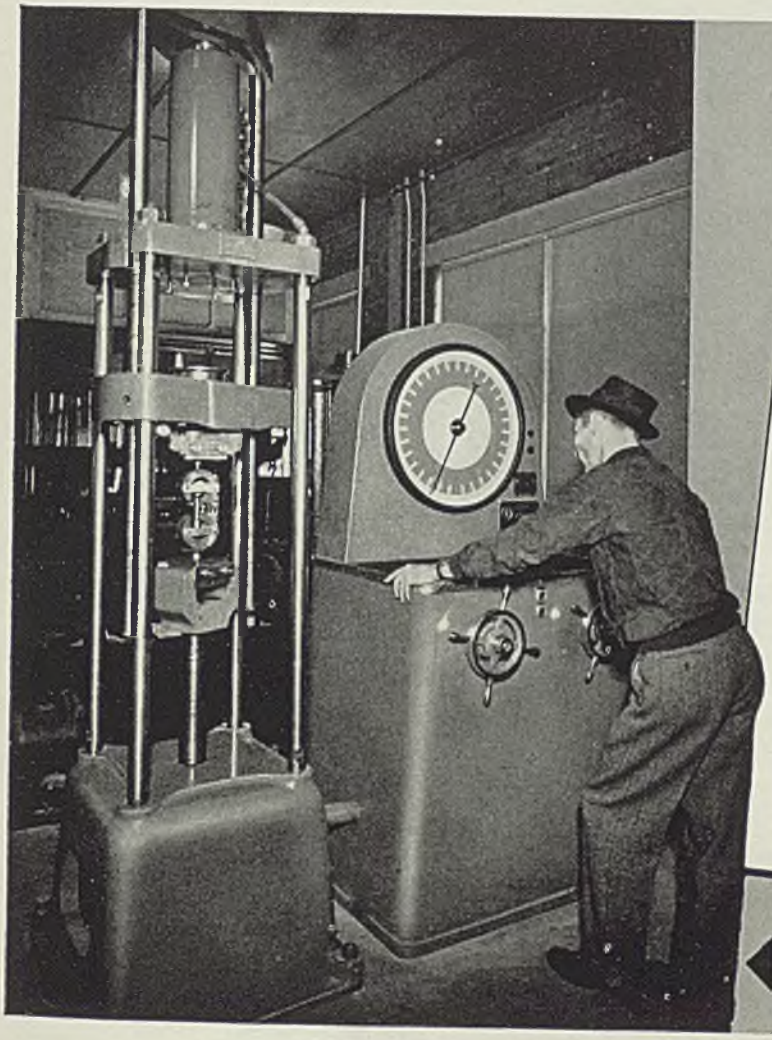
Welding Expedites Construction of Combat Cars



■ Typifying the part welding is playing in accelerating national defense work is the construction of anti-aircraft combat cars such as the one shown in the view above. Built entirely by arc welding, this mobile unit has a speed of 100 miles per hour and is for use in defense against aircraft ground strafing operations



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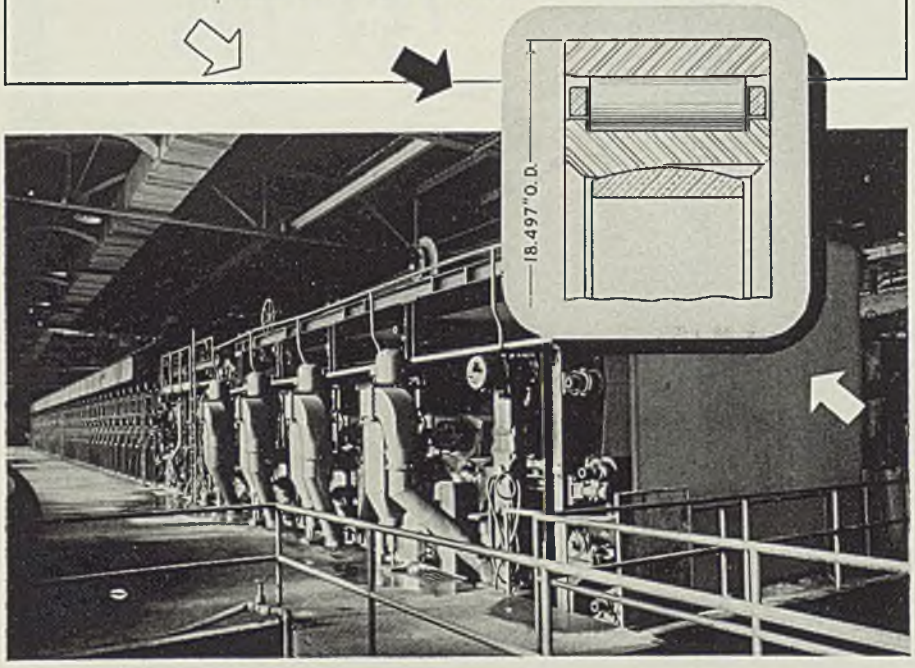
IN THE NEWS

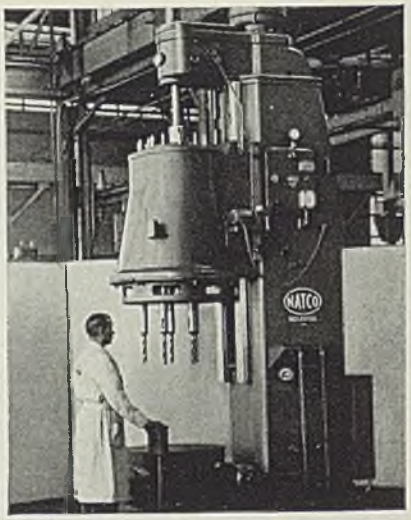
WITH BANTAM BEARINGS

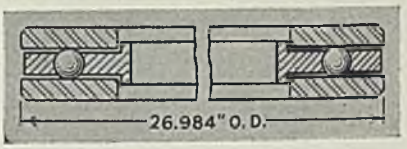


BUILT FOR FAST PRODUCTION, this paper-board machine at the plant of Alton Box Board Company turns out a continuous sheet of strawboard, .009" thick, at the rate of 520 feet a minute. Rolls furnished by Beloit Iron Works are equipped with large, heavy-duty Bantam Bearings. Supplying specially designed bearings for many applications in paper, steel, and rubber mills, and other industries where heavy loads and severe service are encountered is a major part of Bantam's service.

EVERY MAJOR TYPE OF ANTI-FRICTION BEARING is included in Bantam's line—tapered roller, straight roller, needle, and ball. Bantam engineers, with their broad background of experience in bearing design and application, recommend the type that best meets *your* requirements—or design special bearings for unusual conditions. If you have a difficult bearing problem, TURN TO BANTAM.

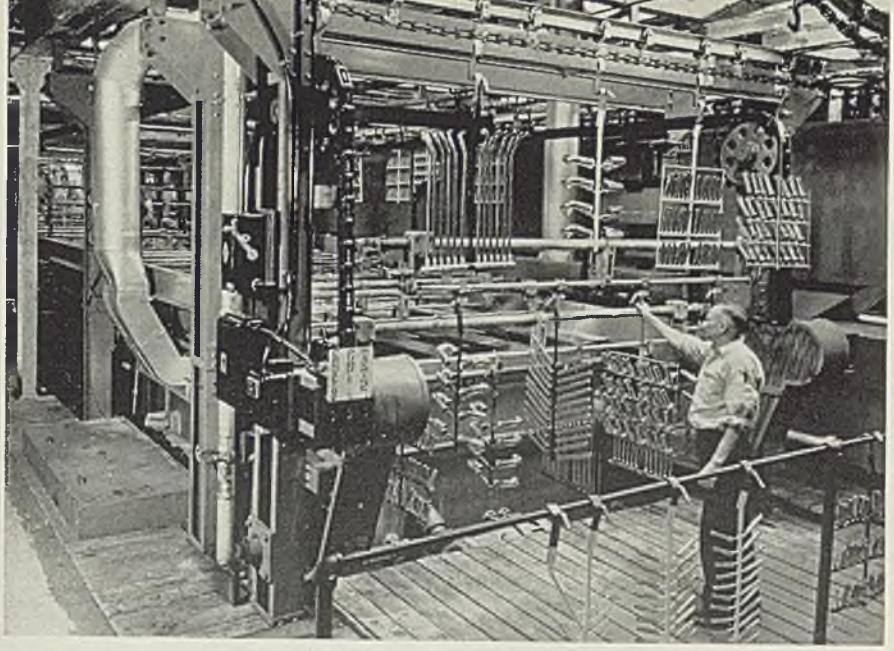
POWER ECONOMY is the design keynote of Oliver Farm Equipment Company's Row Crop 60 Tractor—built for heavy duty farm service. An important factor in its economy of operation is the use of Bantam Needle Rollers in the cluster gear transmission to provide efficient anti-friction operation in extremely limited space.





THIS HEAVY-DUTY DRILLING MACHINE of the multi-station type, built by The National Automatic Tool Co., is provided with a 36-inch diameter automatic indexing table. Table rotates on specially designed Bantam Ball Thrust Bearing, measuring 26 03/64" O.D., with load capacity of 8,000 pounds at 10 RPM, 30,000 pounds stationary.

HIGH OSCILLATING LOADS on the saddles and pitmans of The National Supply Company's pumping units are easily handled with Bantam Quill Bearings—the compact anti-friction bearings that combine high capacity with low cost and small size. For additional information on the Quill Bearing, write for Bulletin H-104.



This is the automatic cleaning unit which prepares the work for nickel plating before the application of chromium plating. Note operator loading racked work from overhead chain conveyors onto cleaning tank transfer mechanism

MECHANIZED MATERIALS HANDLING SYSTEM

featured in new plating department

■ BRASS goods for plumbing service must not only have chromium plating which is outstanding in appearance, but this plating must also stand up in plumbing service under conditions which are too severe for many ordinary finishes. So when the new plating department of Bridgeport Brass Co., Bridgeport, Conn., was recently designed, special attention was paid to handling the material in process to prevent marring and abrasion or other damage during handling.

The new fully automatic chromium-plating line is installed in a large single-story building with sawtooth roof construction. First experiments were carried out to determine the time necessary for immersion in the various solutions so the automatic equipment would function properly when finally installed. All work is carried in racks in specially designed overhead conveyors which avoid contact of parts so there is no possibility of scratching or denting the work and so production is not held up by the need for care in handling the parts by hand in production.

This plating department consists of two sections. The first is an air-conditioned room where the incoming work is racked and where the finished plated work returns for inspection and packing for shipment. This room contains special lighting facilities to facilitate inspection.

The second section contains the cleaning, plating and drawing equipment. Brass parts coming from the buffing department are placed on special racks which are attached to an overhead moving conveyor to carry them directly to the cleaning machine.

View above shows some of the handling equipment in the cleaning section. The machine consists of a battery of tanks in series containing a variety of cleaning solutions and rinse baths. An operator removes each rack of work from the overhead chain conveyor and places it upon bars of the automatic cleaning machine as shown in the view. The automatic machine then passes the work through the various tanks at a predetermined speed. Transfer from tank to tank also is automatic. Coming from the cleaning setup, the work is free from polishing compounds, grease and foreign matter.

Go Through Several Baths

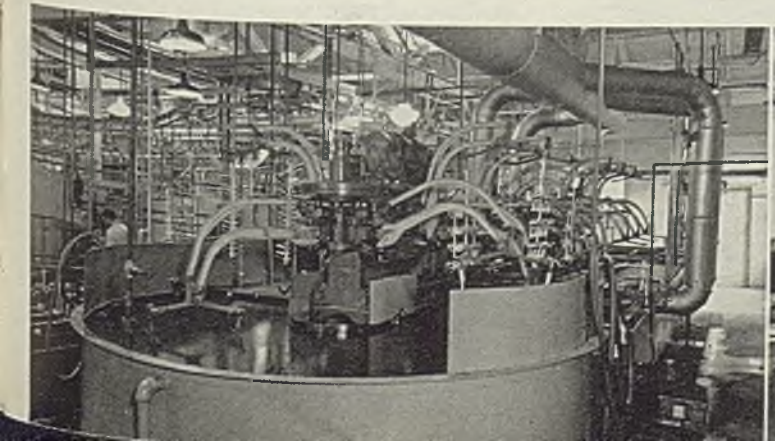
Next the work is transferred from the cleaning machine to the nickel plating tanks. These consist of another series of solutions with conveyors to transfer the work automatically from bath to bath. After the parts have been carried through the baths in proper sequence, each rack is transferred to another conveyor which carries it through rinsing tanks.

Now the work is taken from this conveyor and reracked for entering the chromium-plating line, the pieces being removed from the first racks and hung on special racks attached to another overhead conveyor which brings them to the automatic chromium plating unit.

As shown below, this modern fully automatic equipment is of the merry-go-round type. It carries the work in succession through a battery of tanks arranged in an oval. The work on the racks is hung on arms which are attached in turn to a series of links which pull the

Each arm of this fully automatic chromium plating unit in Bridgeport Brass Co.'s new plating department handles two racks of parts. Chain conveyors in background. See view at left

Air-conditioned inspection and packing room has overhead chain conveyor lines along each side and roller conveyors in between. Note excellent special lighting arrangements in same view at right



arms around the tanks. As the arms come opposite the wall of any tank, the work is lifted out of the tank, moved over the wall and lowered into the next tank by means of cams which raise the arms and racks from the solution. Then as the arm comes over the next tank in the series, the cam allows the arm to descend, lowering the work into the bath.

Upon completion of the plating cycle, the arm lifts the work out of the final bath and an operator removes the rack, placing it upon another overhead chain conveyor which carries the work through a drying machine. From there, the work is carried by the same chain conveyor back to the first air-conditioned room where the parts are removed from the rack, examined by inspectors and carefully wrapped for shipment.

Since the racks form such an important part of the materials handling equipment, a special rack department is maintained in an adjoining area where racks are designed and built specially to handle the different shaped articles. By placing all work on racks, assurance is given that handling of the work in process will proceed without the surfaces of the articles being exposed to contact with some other articles or with the handling equipment itself.

Again, proper handling methods and equipment assure a quality product.

New Device Determines Flow of Heat in Solids

■ An electric "brain" capable of solving problems involving the flow of heat through solid materials has been installed in a heat transfer laboratory recently completed at Columbia university, New York. The electric calculating device, according to Prof. George B. Karelitz, executive officer of the department of mechanical engineering, is designed to investigate heat flow in unsteady state. It can duplicate computations now made with great difficulty by experimental and mathematical methods in a fraction of the time required at present.

Heat changes that take place in industrial processes are simulated on an electric model and the heating cycle performed in less time than it actually takes, or the model can reproduce the process over an extended period in cases where heat transfer occurs almost instantaneously, according to Professor Karelitz.

"Cooling of the lens for the telescope at the Mount Wilson Observatory in California which took six months can be duplicated and studied in the laboratory in one hour," he said. "On the other hand, heat flow in the head of an automobile or airplane engine which reaches its peak of intensity in one-twentieth of a second can be studied over a period of ten minutes in the laboratory."

The apparatus contains 75,000 separate parts, including 525 condensers, and required 1200 man-hours for its construction. It was designed by Dr. Victor Paschkis, a research associate of the university. The only other electrified heat transfer laboratory that can accurately measure heat flow in unsteady state was built in Maastricht, The Netherlands.

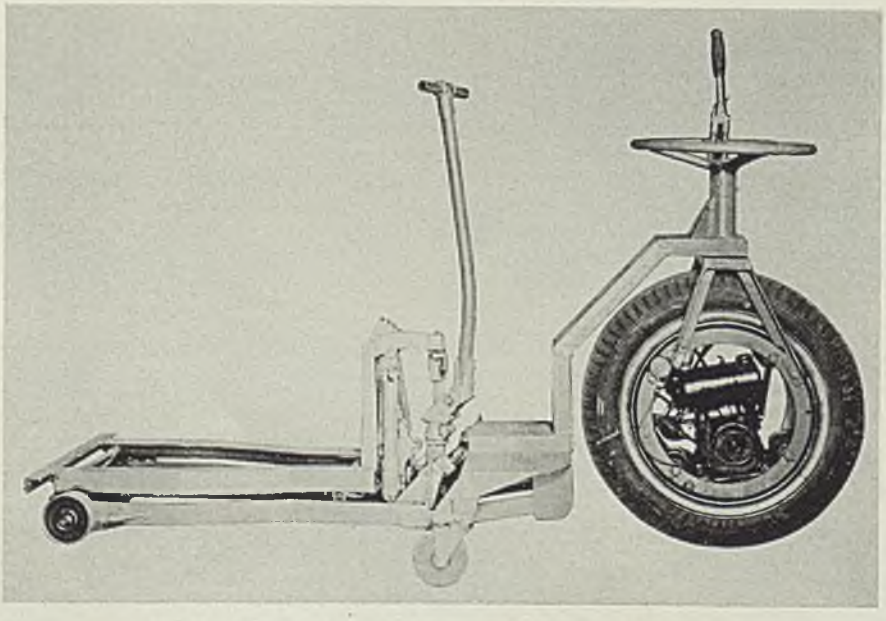
"Application of the mechanism to heat flow research in industry has infinite possibilities," Dr. Paschkis declares. The laboratory will minimize the amount of experimental study that now takes days and months and thus can be of great assistance in steel, canning, automotive or airplane, rubber, chemical, plastic and other major industries.

Based on the theory that electricity can be made to simulate the course of heat flowing through a solid or combination of solids, the apparatus at Columbia is equipped with resistance coils to affect the flow of electricity in the same way that the flow of heat passing through a body is affected by the thermal resistance of the solid. Condensers are used to duplicate the heat-storing capacity of the materials being studied.

The method of studying heat flow employed in the laboratory is derived from discoveries made in 1913 by Dr. Irving Langmuir, Nobel prize winner and associate director of research of General Electric Co., Schenectady, N. Y. Dr. Langmuir pointed out that heat flowing through solids follows the same mathematical laws that apply to certain analogous electric circuits.

The apparatus utilizes the principle that voltage corresponds to heat flow. Similarly, resistance in the model represents thermal conductivity in the same ratio as electrical capacity of the apparatus represents specific heat of the material.

Mechanical "Factory Mule"

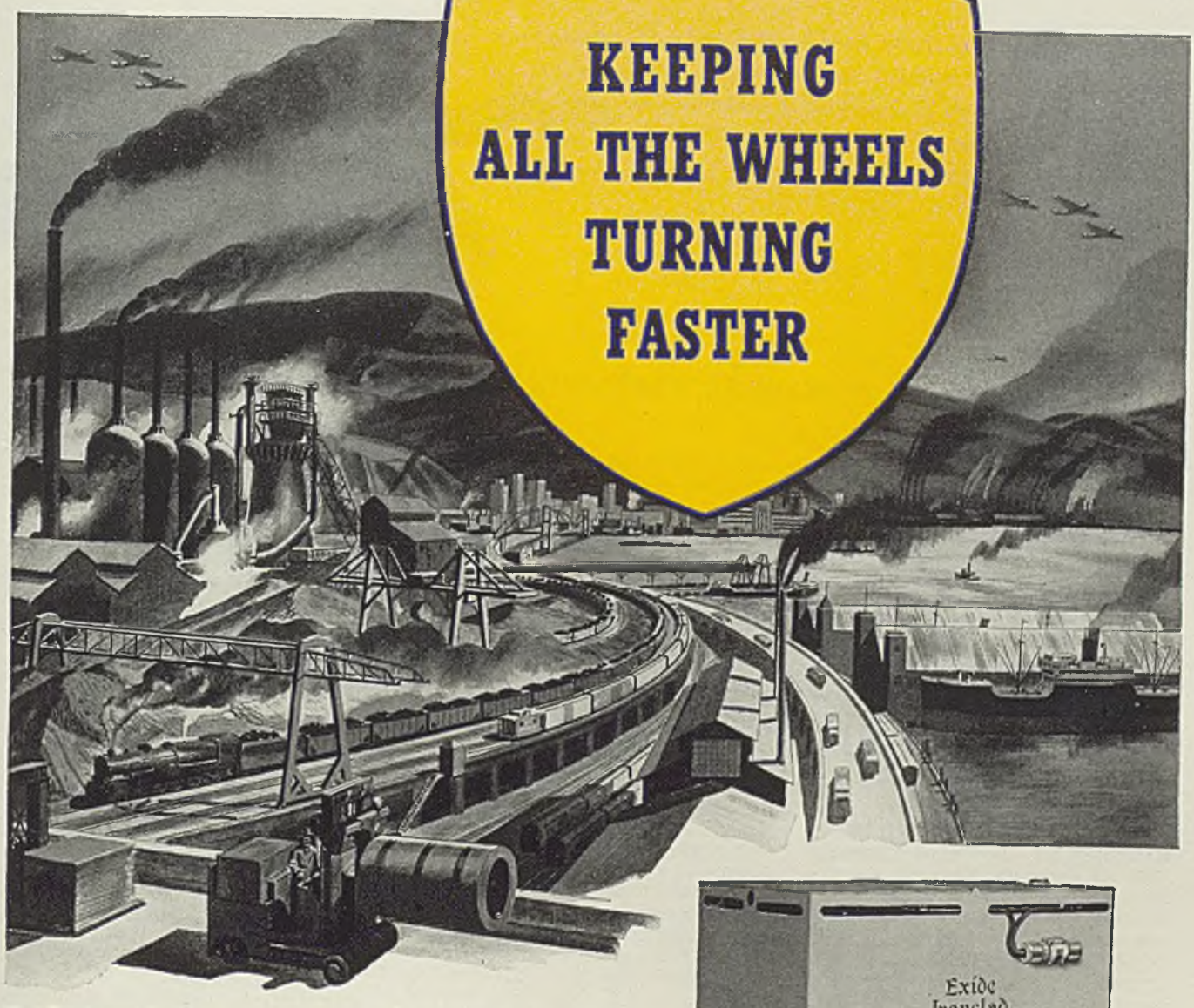


■ This "factory mule" manufactured by R. D. Eaglesfield, 301 South La Salle street, Indianapolis, moves standard lift-trucks, towing-trucks, tote-boxes or drums, as well as special material-handling tubs or tanks. Having only a 38-inch turning radius, it goes into freight cars, trucks or elevators, as well as through narrow aisles and doors. A Briggs & Stratton motor, mounted inside the front wheel, supplies the power through a sprocket operating in a ring gear on the inside rim. Backing is accomplished by simply reversing the steering wheel. The rod above the steering wheel operates clutch and brake and supports throttle control

Blinds for Black Outs

■ All-metal venetian jalousies, a product of F. C. Russell Co., Cleveland, are being studied by several manufacturers throughout the country for their possibility as a means of blacking out plants. If adopted, the wide slats will admit adequate natural light during the day, then can be closed at night, concealing all light from the plant and giving additional protection against flying debris. The jalousies are of Paintgrip galvanized steel, made by American Rolling Mill Co.

KEEPING ALL THE WHEELS TURNING FASTER



Exide-Ironclads speed up and smooth out the handling of today's heavy steel coils

AS delivery speeds from continuous strip mills creep upward toward 30 miles per hour, no wonder the faster handling of heavier coils becomes a matter of paramount importance! The electric trucks to do this job are fully equal to the requirements. All that is needed are batteries which will bring the power, speed and endurance of these trucks into play.

You get such a battery in an Exide-Ironclad. You get tremendous power that makes light work of handling 15-ton steel coils. You get plenty of pep and pick-up in your truck ... and good running speed, because of the good voltage an Exide-Ironclad delivers throughout each turn.

You also get battery dependability so great that handling interruptions are materially reduced. And by making use of the Exide System, you can guard still further against such delays, while increasing the long life of your Exide-Ironclad Battery. Write for free booklet, "The Exide System for Better Material Handling."

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Exide Batteries of Canada, Limited, Toronto

Here Professor Arnold shows how we can make an adequate supply of nitric acid without dependence upon imports from any country. Thus we are assured of sufficient raw materials to produce any amount of explosive. The only possible bottleneck is adequate plant capacity—and that is now being built

Metals as

■ Explosive production, a possible bottleneck in the defense program, has received little attention since we have not as yet reached the stage where shell are being loaded. However, explosives will be a bottleneck in the immediate future, in the opinion of many authorities. Since all explosives are made from nitric acid, the whole thing boils down to "How much nitric acid can we make?"

Since most nitric acid is made catalytically by oxidation of ammonia with air—as against the alternative of importing saltpeter from Chile—the importance of the catalytic process is evident. It is interesting to note also that the ammonia in turn is made by another catalytic process from the nitrogen in the air and hydrogen from any source, very often water.

To understand the general principles of catalytic reactions and the problems involved, see section one of this series, STEEL, p. 54, June 16. Next week, read why fighting grade airplane gasoline has been made possible largely through catalyzed reactions and how this process thus contributes an essential element of our defense program.

■ THE SYNTHESIS of ammonia from its elements, nitrogen and hydrogen, is an industrially catalyzed reaction that has had a marked effect on the economic life of the world. Before the discovery of this process, our supply of nitrogen compounds for fertilization of the soil and for explosives depended largely upon the mineral deposits of Chile. But due to abnormal conditions prevailing during the World war of 1914-18, the synthesis of ammonia became a reality first in Germany—largely the work of Haber and Bosch. Haber had attacked this problem from its theoretical side in the years immediately preceding the war. When a supply of nitric acid for making explosives became necessary, Bosch attacked the problem from its engineering side and the result was a supply of fixed nitrogen that could be manufactured from materials available in ample quantities within the country.

After the close of the war, interest in the military as well as the general economic value of this process caused much research in all of the industrial nations of the world. However, only two of the many patented processes that developed out of this research will be discussed.

The Haber-Bosch process, in essence, passes a mixture of purified nitrogen and hydrogen in the proportion of three parts by volume of hydrogen to one part of nitrogen over a promoted iron catalyst maintained at 450 degrees to 600 degrees Cent. and at pressures of from 200 to 250 pounds per square inch. The pressure determines the efficiency as far as ammonia yield is concerned so that pressures as high as are consistent with safe operation of the particular plant will be used.

Fig. 1 shows schematic flow sheet of the actual conversion of the mixture to ammonia. The 3-to-1 mixture of purified hydrogen and nitrogen is compressed in compressor 1 to 200 atmospheres or over. It next passes into a combined heat interchanger and catalytic converter represented by 2. The exit gases contain ammonia, and unreacted 3 to 1 mixture of hydrogen and nitrogen. These gases next pass into a scrubber 3 where the ammonia is scrubbed out with water. The ammonia liquor is stored in 6 and the unreacted nitrogen and hydrogen passes on through a drier 4. This is necessary before recirculating over the catalyst in 2 again because water vapor exerts a retarding influence on the catalyst which tends to reduce temporarily its activity. 5 is merely a booster pump to raise the pressure of the unreacted nitrogen and hydrogen back to the initial working pressure before it enters the incoming stream on the way to the converter.

The converter is in reality the heart of the process. Two factors in a large measure influence its design. The reaction between nitrogen and hydrogen liberates considerable heat. Therefore the unit must be designed so the gases pass through and react in such a way that the heat energy accompanying the reaction will be balanced with the heat carried out to maintain a uniform optimum temperature in the converter at all times. This is very necessary as excessive temperatures cause surface rearrangement in the catalyst with resulting loss in activity. The second design problem is to provide sufficient strength as the converter must be made of such materials as will withstand the pressure and temperature used with a sufficient factor of safety.

Exact dimensions, yields per unit weight of catalyst weight of catalyst per converter cannot be given because of widely varying plant practice. For a typical Haber converter, the following data can be given. It is commonly a tungsten steel forging about 20 feet long, 4 feet outside diameter and about 7 to 8 inches wall thickness. It is closed at the ends by heavy steel caps fastened in place with steel bolts. To prevent decarburization of the steel by the hydrogen to form methane, a mild steel lining is fitted snugly into the inside of the high pressure shell.

Fig. 2 shows a detail of the closure of the converter which will also give some idea of the flow of the gas mixture through it. A is the heavy wall of the bomb made of tungsten steel and B is the heavy-walled cap held in place by 4-inch bolts. C is the mild steel liner in the converter used to prevent decarburization. The outer shell A is perforated radially with holes a few millimeters in diameter to allow the escape of hydrogen which may diffuse through the liner.

The outer wall serves to give the

Catalysts In Explosive Production

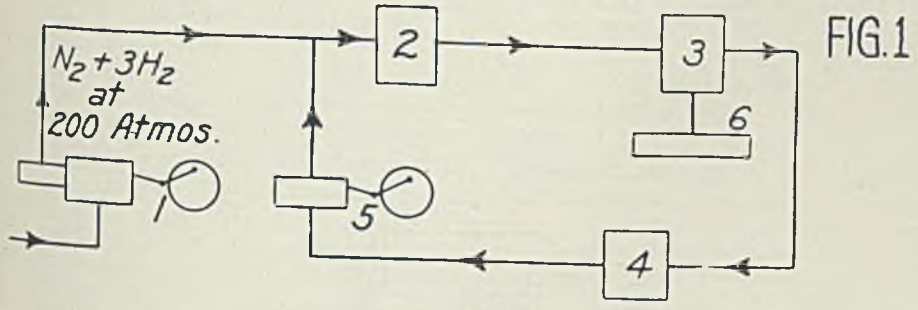
By E. A. ARNOLD
Associate Professor of Chemistry
Case School of Applied Science
Cleveland

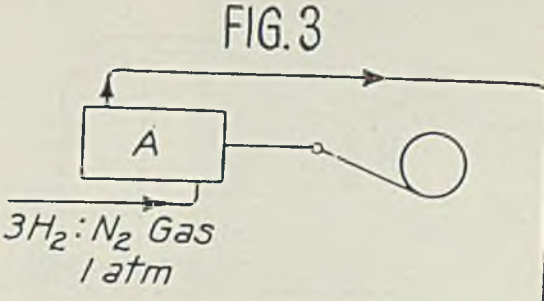
necessary strength while the liner actually in contact with the nitrogen-hydrogen mixture prevents decarburization. D and F are again mild steel liners and E is a layer of heat insulating brick. The catalyst is charged between the liner F and a 4-inch pipe which runs vertically the length of the converter. This pipe conducts the gases to the catalyst.

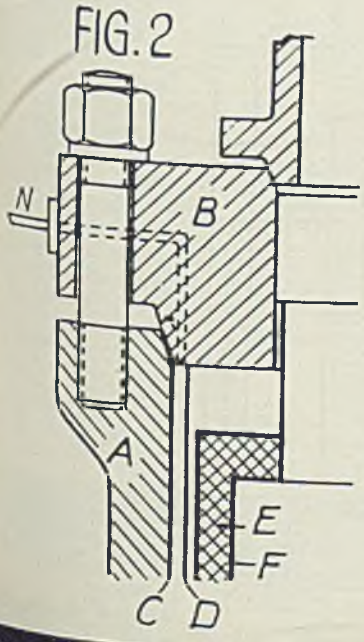
The charge of catalyst in such a converter is about 5000 pounds. With proper operations, about 20 tons of ammonia are produced per day. The circulatory process described would result in the accumulation of argon, methane and other inert gases in the system which would effect the yield of ammonia were it not for the fact that there is a constant purging by blowing off a small portion of the gas. By this means, the total concentration of inert gases is kept below 5 per cent in the gas stream. About 5 to 10 per cent ammonia is found in the exit gases coming from the converter but by using the circulatory system, the overall conversion to ammonia over a long period of time is about 80 per cent.

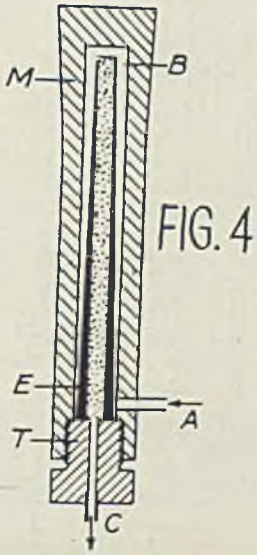
The Claude process differs in one essential feature from the process just discussed. It is a high-pressure process in which the nitrogen-hydrogen mixture is compressed to 800 to 1000 atmospheres before entering the converters. Fig. 3 shows diagramatically the arrangement of the Claude process. The 3-to-1 mixture

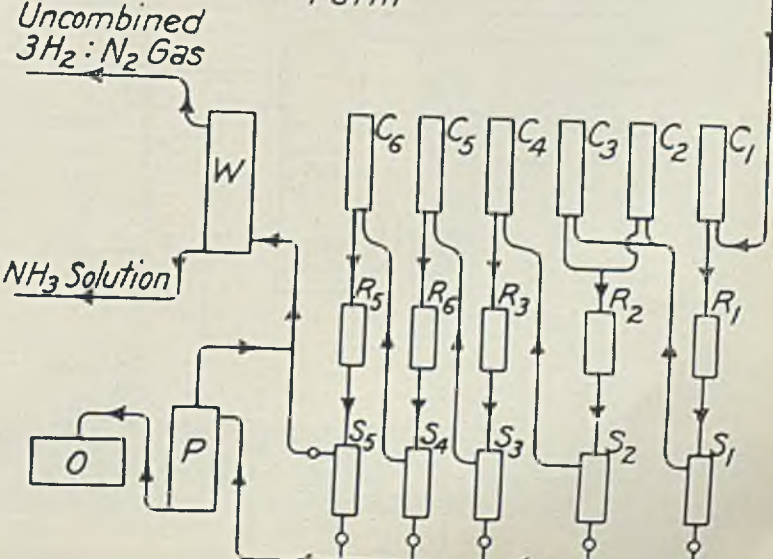
Fig. 1—Schematic diagram of the Haber process for the synthesis of ammonia from nitrogen and hydrogen. Fig. 2—Portion of Haber synthetic ammonia converter. Figs. 1, 2, 3, 4, 6 and 7 from "Fixed Nitrogen", by H. A. Curtis, New York, Chemical Catalogue Co. Inc. (Reinhold Publishing Corp.) Fig. 3—Schematic of Claude process for synthesis of ammonia from nitrogen and hydrogen. The actual reaction takes place in the converters C_1, C_2, C_3, C_4, C_5 and C_6. Fig. 4—Claude converter. Catalytic material is shown dotted











of hydrogen and nitrogen is compressed to 800 to 1000 atmospheres in a compressor A and then passes through a number of converters, condensers, collectors in a series-parallel arrangement. After compression the gas goes to the first converter C, where ammonia is formed on the catalyst. The gases leaving the converter contain 30 to 40 per cent of ammonia by volume and pass immediately to the condenser R_1 where they are cooled. Since the pressure is so high, cooling will cause the ammonia to liquefy and flow to the collector S_1. The unreacted gas still containing much nitrogen and hydrogen flows through a series of converters, condensers, and collectors as shown and finally the last traces of ammonia are scrubbed out with water in the scrubber W.

The overall conversion to ammonia is about 75 to 80 per cent and the residual gases are reduced to atmospheric pressure and used for fuel since they contain considerable hydrogen.

Fig. 4 details a single converter in the form of a cylinder of nickel-chromium steel, 7 feet long, 9 inches outside and 4 inches inside diameter. To the inside of the head is fastened a thin sheet metal tube which reaches nearly to the bottom of the converter when the head is in place. Into this is packed the promoted iron catalyst, essentially the same as that used in the Haber-Bosch process. The path of the gas is through a heavy-walled side tube A into the converter and then down through the catalyst bed and out of the cover C. From 12 to 16 of these converters are arranged in a series-parallel arrangement so the gases largely freed of ammonia in one converter are passed through the next and so on. In this process, recirculation is not used, therefore accumulation of inert gases offers no problem.

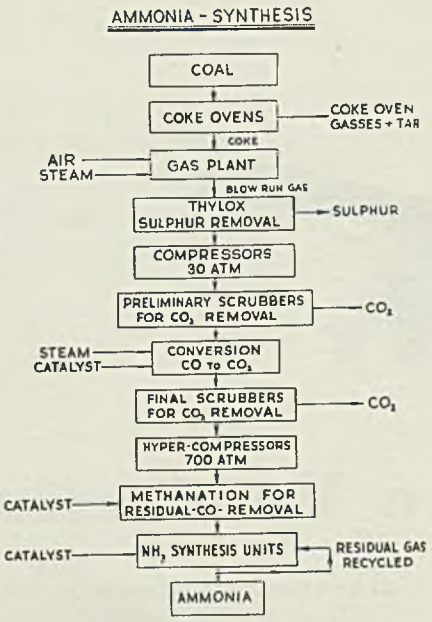


Fig. 5—Flow sheet for catalytic ammonia synthesis used by E. I. du Pont de Nemours & Co.

A yield of ammonia per pound of catalyst per hour of 5 to 6 pounds is claimed for this process as compared to the similar yield for the Haber-Bosch process of 0.3 to 0.4 pounds. A single converter requires about 150 to 200 pounds of catalyst. If from 12 to 16 converters are used, this calls for a total amount of catalyst of the order of 1 to 1½ tons. For the production of 20 tons of ammonia, 16 of these small Claude converters weighing in the neighborhood of 11 to 12 tons are needed as compared with the corresponding converter for the Haber-Bosch process weighing about 70 tons for the same daily production.

Fig. 5 is the flow sheet used by the E. I. du Pont de Nemours & Co. for the synthesis of ammonia. Coal is first coked in an ordinary coke oven yielding as by-products, coke-oven gas and tar. The coke is then charged into a water gas producer and treated with steam at high temperatures. The gas produced is essentially a mixture of carbon monoxide and hydrogen. The sulphur compounds are removed by a patented process and the gas then compressed to 30 atmospheres. It is next scrubbed with water to remove small amounts of carbon dioxide. Steam is mixed with the gas.

Then it passes through a catalyst which promotes a reaction between the carbon monoxide and the steam to form carbon dioxide and hydrogen. This is followed by the final scrubbing with water to remove the carbon dioxide formed in the previous step. The gas is now composed of nitrogen and hydrogen in a 1 to 3 ratio by volume, together with small amounts of argon from the air used and carbon monoxide and dioxide from the previous steps. This mixture is compressed to 700 atmospheres and then first passed over a catalyst which converts the last traces of carbon monoxide present

(*Please turn to Page* 89)

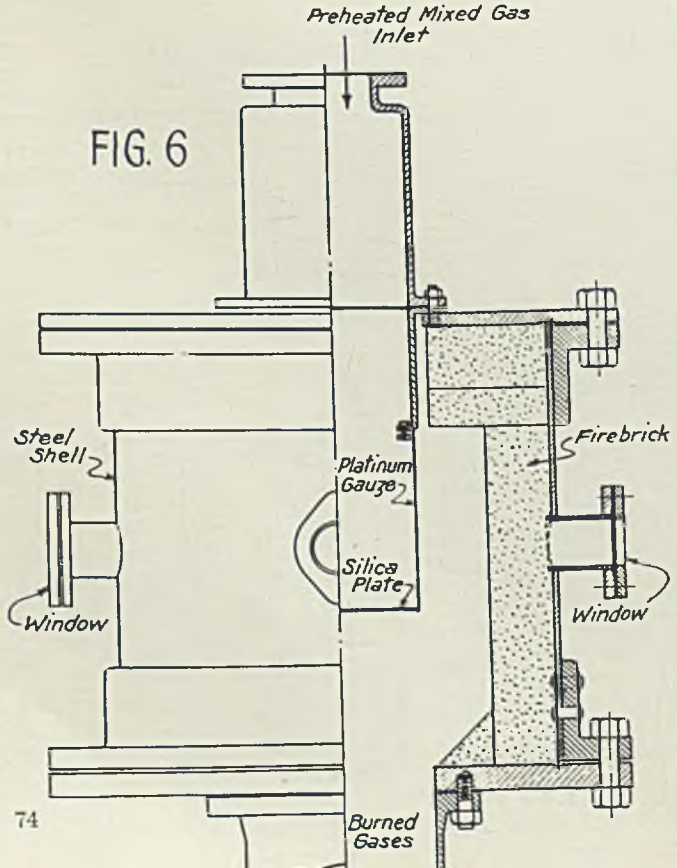


Fig. 6—Arrangement of modern circular gauze converter for oxidizing ammonia to nitric acid

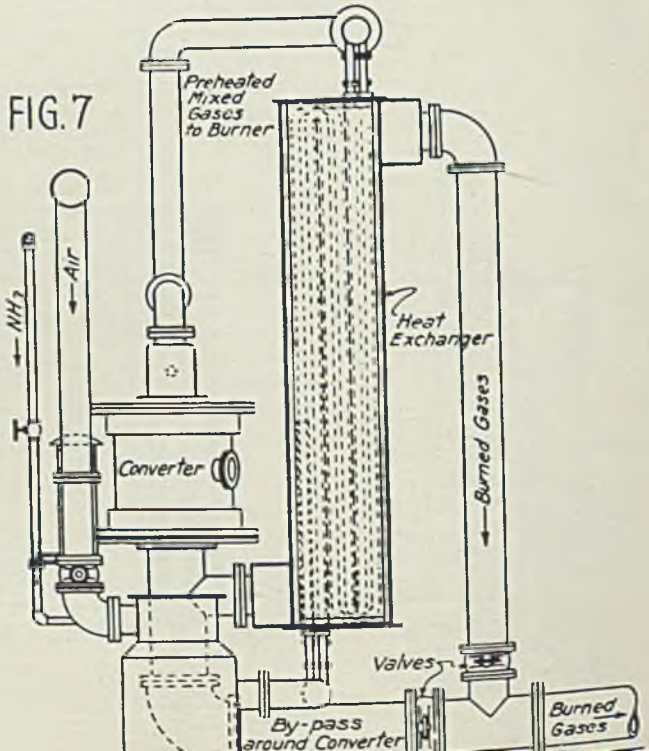


Fig. 7—Commercial type of cylindrical gauze converter installation for oxidizing ammonia to nitric acid

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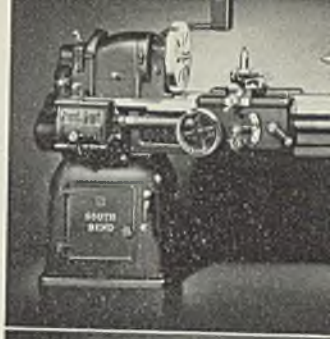
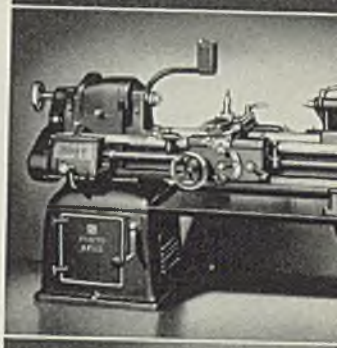
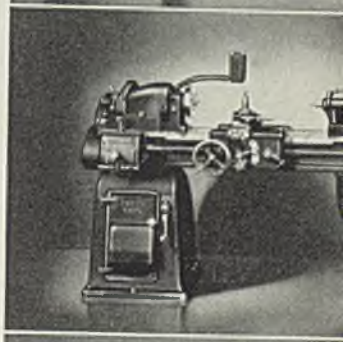
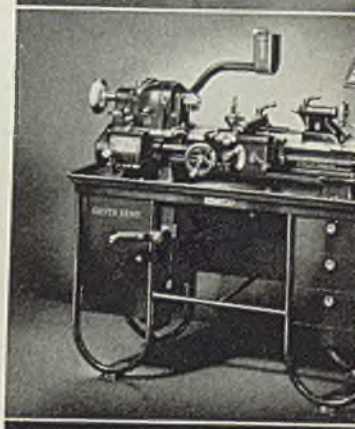
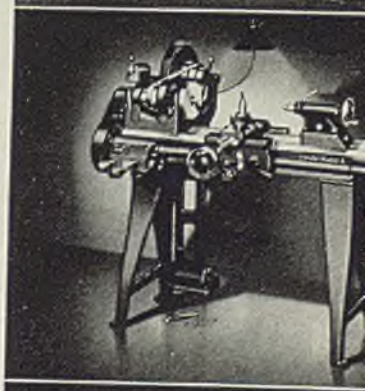


SOUTH BEND LATHE WORKS

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TRADE MARK SOUTH BEND

WELDING STAINLESS STEEL

for fighting aircraft

By W .D. WILKINSON jR.
Electro Metallurgical Co.
New York

■ IMAGINE building a vehicle, weighing 6000 pounds and mounting a 37-millimeter cannon plus a battery of 30 and 50-caliber machine guns, being thrust through the air at 400 miles an hour—yet that is exactly what is being done today by manufacturers of fighting aircraft.

An important reason for use of stainless steel for aircraft of this type is that perfectly smooth exteriors may be produced since joints are made by spot welding. Today other equally important advantages are focusing more and more attention on stainless steel in aircraft.

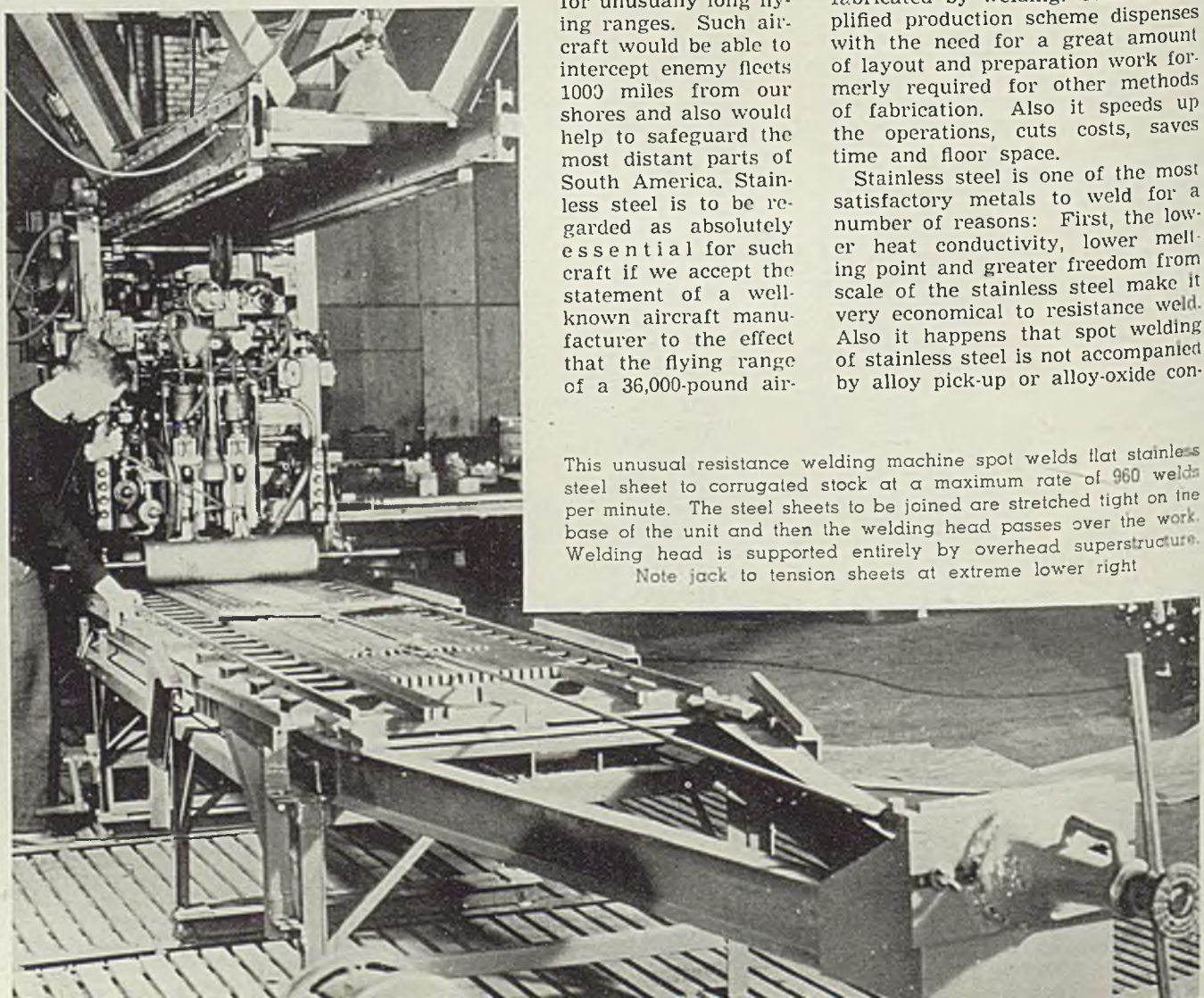
For instance, early stainless steel designs called for a great deal of ingenuity in design and fabrication to utilize extremely thin gages of stainless steel. While this is still more or less the case with some low-powered nonmilitary craft, today's need for thin highly loaded wings in military aircraft—wings having maximum resistance to gunfire—makes it possible to use stainless steel in more reasonable thicknesses and along simpler designs which lend themselves to easy large-scale production.

Regarding the design of aircraft for the defense of the western hemisphere, military experts have pointed to the need for unusually long flying ranges. Such aircraft would be able to intercept enemy fleets 1000 miles from our shores and also would help to safeguard the most distant parts of South America. Stainless steel is to be regarded as absolutely essential for such craft if we accept the statement of a well-known aircraft manufacturer to the effect that the flying range of a 36,000-pound airplane can be increased 800 miles beyond a normal range of 4500 miles merely by using suitably designed wings of stainless steel instead of other aircraft metals.

Too, structural design emphasizes the use of shapes built from stainless steel strip—a form which lends itself to efficient fabrication since stainless can be obtained in coils up to 2000 feet in length, placed in jigs and fabricated by welding at high speeds and with great efficiency.

All this keys in with the statement of one manufacturer who recently pointed out that stainless steel fabrication considerably simplifies plant arrangement by using strip formed, placed on jigs and fabricated by welding. Such a simplified production scheme dispenses with the need for a great amount of layout and preparation work formerly required for other methods of fabrication. Also it speeds up the operations, cuts costs, saves time and floor space.

Stainless steel is one of the most satisfactory metals to weld for a number of reasons: First, the lower heat conductivity, lower melting point and greater freedom from scale of the stainless steel make it very economical to resistance weld. Also it happens that spot welding of stainless steel is not accompanied by alloy pick-up or alloy-oxide con-



This unusual resistance welding machine spot welds flat stainless steel sheet to corrugated stock at a maximum rate of 960 welds per minute. The steel sheets to be joined are stretched tight on the base of the unit and then the welding head passes over the work. Welding head is supported entirely by overhead superstructure. Note jack to tension sheets at extreme lower right

ALTER EGO: Literally "one's other self"—the still, small voice that questions, inspires and corrects our conscious action.

ALTER EGO: So you want to get welds that you love to touch?

Well, I like 'em smooth.

ALTER EGO: We're getting 'em smooth, with "Fleetweld." What you're looking for is *glamour*. But, remember what the "Fleetweld" man told us—about the fellow who was sacrificing 25% in welding speed because he had been sold on glamour.

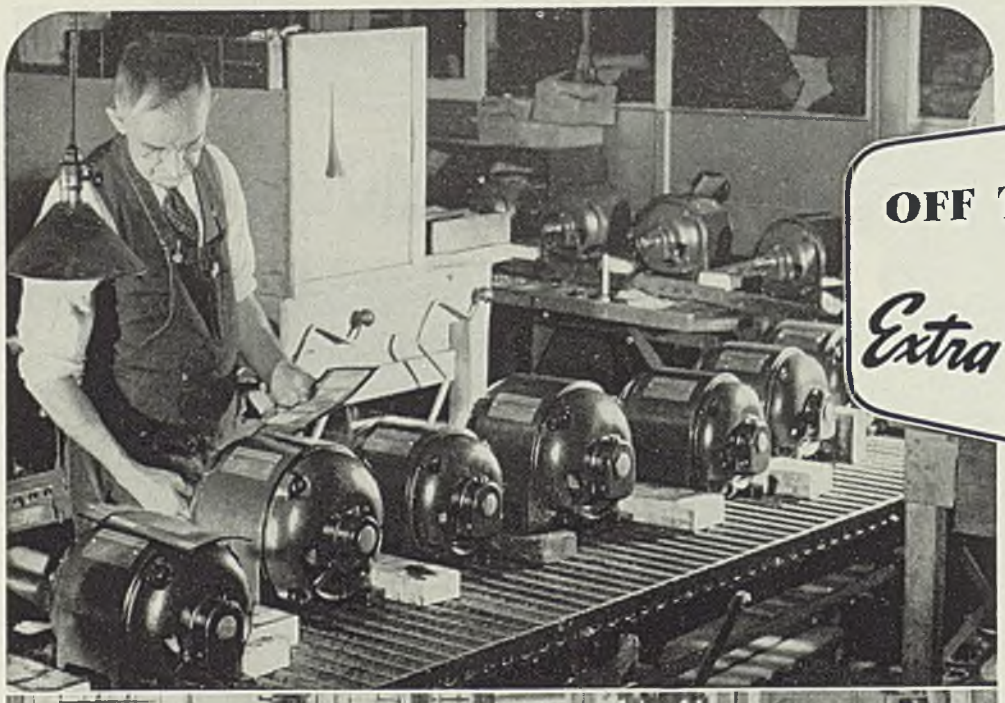
Oh, yes, the Super-Glamour Electrode gave him sagging fillets, requiring excess metal for the required size of weld.

ALTER EGO: Right! And with "Fleetweld" he got his right fillet size, plus SMOOTHNESS, plus STRENGTH, plus DUCTILITY, plus FASTER WELDING.

Well, suppose we skip the glamour emotion and concentrate on bread-winning qualities.

• •

LINCOLN SUGGESTS: A well-balanced electrode such as "Fleetweld" gives you in large measure: Speedy welding; efficient operation; strength and ductility; smoothness and other values. Page 5 of the "Weldirectory" (sent gratis) charts the 30 qualities any electrode should have to give the kind of welds any user has a right to expect.



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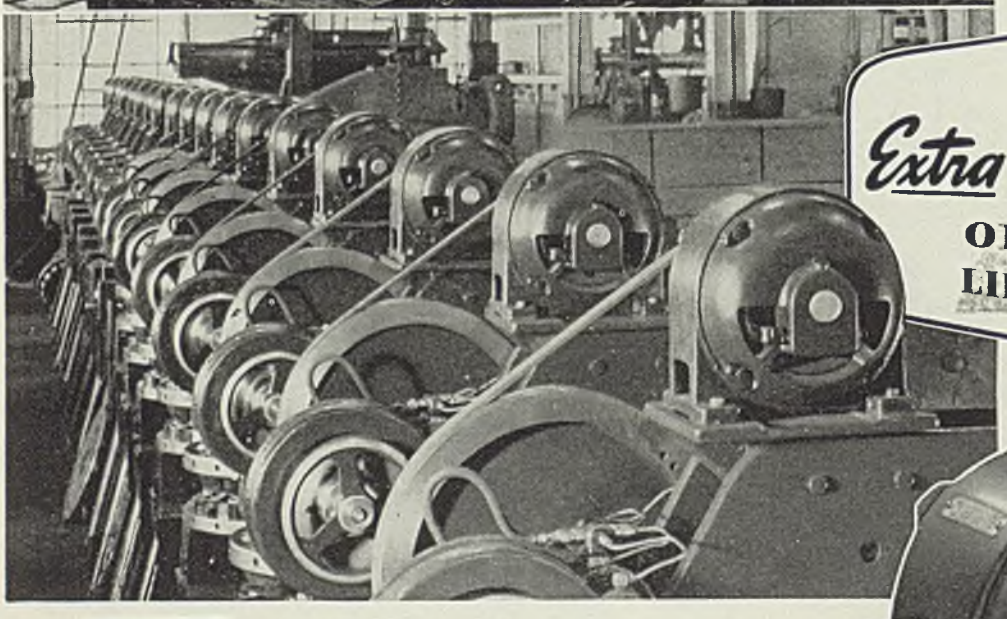
with
Extra Protection



for
Extra Production
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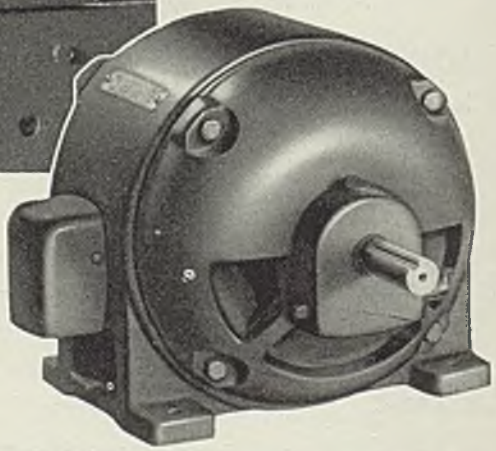
LIKE THIS!



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1. **Extra Protection against Physical Damage**
2. **Extra Protection against Electrical Breakdown**
3. **Extra Protection against Operating Wear and Tear**

Specify Tri-Clad on your next order. General Electric, Schenectady, N. Y.

GENERAL ELECTRIC

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tamination of the electrode tips, commonly the cause of costly delays for cleaning and of poor or nonuniform results in welding.

These factors, according to data from one of the large aircraft companies who obtained a saving of 15 per cent in production costs after changing over to stainless steel—after the first 50 duplicate parts were produced—indicate that should this percentage hold in other plants, retooling for stainless steel fabrication would make possible tremendous production economies, increasing with the amount of production contemplated. Thus the present demand for large numbers of aircraft should make a changeover feasible in many cases.

Economically Welded

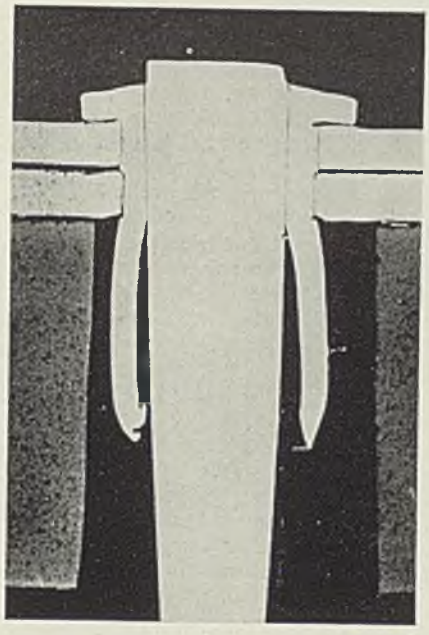
The relatively high electrical resistance of stainless steel is especially advantageous from a design standpoint because it permits closer spacing of spots in spot welding without trouble from shunting of the current through adjacent welds.

The most rapid as well as satisfactory results in aircraft production are obtained when it is possible to fabricate the majority of structural parts by spot welding. Authorities state that automatic machines will g.ve 1000 spot welds on stainless steel in from 1 to 5 minutes at a total cost of only 5 or 10 cents. Other methods of joining are reported to cost as much as 1000 times this amount and to require a much longer time to apply. Even hand spot welding, which is necessary only on complicated work, need never be slower than 10 welds per minute—still much faster than other methods of joining. When it is considered that a bomber may require fastenings as many as 250,000 points, it is obvious that spot welding may save an important amount of time as well as money.

Because stainless steel is so easily spot welded, smaller spot welding equipment can be employed with lighter and handier electric conductors, smaller and lighter welding tools, with first cost and operating costs lower.

Stainless steel is unique in that the cold-rolled variety, which is the type used in aircraft structures, can be spot welded so the weld zones acquire improved ductility with little if any impairment of resistance to corrosion. Spot welds in stainless steel are so ductile that they will yield sufficiently in use for all the spots in a joint to carry the load equally. This characteristic of distributing the load among spot welds is exceedingly important.

The recent development of heat treatable, copper chromium alloy castings makes it possible to produce unusually serviceable electrodes for high-speed resistance welding. Such electrodes resist deformation even at moderately elevated temperatures of 750 to 950 degrees Fahr. At the same time they have high thermal and electrical conductivities, making them very nearly ideal for high-speed spot welding of stainless steel. These are now available both as cylindrical and conical rollers and as special cast shapes.

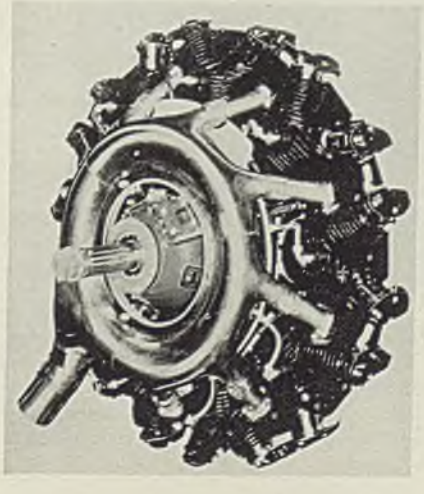


This shows how Breeze Corp. joins two sheets by means of a hollow stainless steel rivet applied entirely from one side of the work. The rivet is sealed with a stainless steel plug

Electronic or vacuum controls now permit application of welding current for any portion of a cycle of alternating current or for any number of cycles desired. Such extremely accurate timing results in uniform spot welds and prevents deterioration of electrodes.

Various spot welding techniques have been developed to increase the adaptability of the process. Stitch welding with roller-type electrodes along straight lines or templet guided curves is an extremely rapid means for repetitive fabrication of parts. Some plants have jigs for assembling these parts at individual welding tables, each equipped with an individual welding machine. Or a number of hand welding tools at one assembly station may all take their welding current from the same two bus bars connected to a single common welding machine.

This Wright aircraft engine has a stainless steel exhaust manifold cut from sheet, formed and fusion welded as shown. Engine also uses stainless in valve seats, carburetor air-intake screens, butterfly valves, cotter pins, valves



Electric Resistance—An Asset

Because of its high electrical resistance, stainless steel is particularly suitable for fabrication by the indirect spot-welding process, where two electrodes suitably spaced on one side of the stainless steel sheet make two welds simultaneously by passing the current through one side of the sheet to a copper back-up bar on the opposite side, across the bar to the other spot weld and back through the sheets to the second electrode on the first side of the sheet. Substantially all of the current flows through the copper conductor and returns through the stainless steel at a point opposite the second electrode since very little of the current is shunted through the stainless steel itself.

Spot welding with electrodes entirely on one side thus is possible if a copper plate can be located suitably on the opposite side. In pontoons and similar structures, this may not always be possible and resort must be made to some other method of joining.

In such cases, rivets designed to be applied entirely from one side may be used. Such a rivet may be spread by a mandrel or various patented devices or the rivet end may be upset by a minute explosion set off either by an electrical discharge or by heat.

Riveting also is utilized to join some types of air hardening, straight chromium steels when heat treatment after welding would be impracticable. The only possible aircraft application of importance of such steels would seem to be for armor plate, however, as these steels have limited application.

Although resistance welding is commonly preferred for fabricating stainless steel structures, flash welding and fusion welding are employed to make stainless steel collector rings and exhaust stacks.

Ease of manipulation and control afforded by the oxyacetylene process is especially advantageous in

working on complicated shapes. The steel welded by this process should be of such a composition or thickness as not to be detrimentally affected to more than a slight extent by the heat of welding unless a restorative heat treatment is contemplated.

Arc welding or atomic hydrogen welding of stainless steel aircraft parts sometimes is recommended when the composition or thickness demands a briefer more concentrated application of heat than that afforded by the oxyacetylene flame. Largely for economic reasons, the role of atomic hydrogen welding in aircraft manufacture is limited principally to the alteration and repair of high-chromium steel dies.

Soldering also plays a role in aircraft manufacture, principally in sealing spot welded seams in fuel tanks. It is, however, highly desirable to use silver solder or material of equivalent strength and corrosion resistance as vibrations are apt to cause leakage in joints.

Whether or not a heating operation, such as welding, makes a plain austenitic stainless steel susceptible to intergranular corrosion depends on the length of time it is subjected to the detrimental temperature range, from 800 to 1500 degrees Fahr. Properly controlled spot welding applies such a small amount of heat for such a short time—usually 0.001 to 0.01-second—that the spot welds lose little if any of their corrosion resistance. Since they are annealed, they may even acquire slightly better corrosion resistance than that of the unannealed cold-worked steel. The exact effect depends on such factors as the thickness of the metal, the method of spot welding, and the amount and proportions of carbon and alloying elements.

Fusion welding, however, is apt to make plain austenitic stainless steel susceptible to intergranular corrosion unless the welding is unusually rapid and the welded metal thin enough to be quenched by the air. Oxyacetylene welding, because its ease of control makes it especially suitable to the fusion welding of thin sheets without melting through, can sometimes be satisfactorily applied to thin sheets of plain austenitic stainless steel without substantially affecting their corrosion resistance. In general, however, when plain austenitic steel is welded by the oxyacetylene or other fusion welding process, subsequent heat treatment is necessary if full corrosion resistance is acquired.

The need for such heat treatment can be eliminated if the composition of the austenitic stainless steel is modified by the addition of a small percentage of columbium or titanium as these elements not only inhibit susceptibility to intergranular corrosion caused by the heat of welding but also to that caused by subjection to high temperatures in service. For this reason, the austenitic steel is modified with additions of columbium or titanium when intended for service in exhausts or heating systems.

Oxyacetylene welds made with columbium-bearing welding rods on either columbium or titanium-bearing austenitic stainless steel have shown tensile strengths of over 75,000 pounds per square inch in many tests. Free bends of 180 degrees without cracking, even in cases of ¼-inch thick work, have been made in many specimens. Large numbers of aircraft engine collector rings are made by forming the stainless steel into shapes subsequently assembled on jigs by oxyacetylene welding.

These welds are under stress during fabrication, and some varieties of stainless steel have frequently developed fine cracks. However, these are prevented by using a steel modified by the addition of 1 to 4 per cent of manganese as well as by the columbium addition. The manganese improves the hot ductility of the steel, and is important not only in austenitic stainless steels intended for hot working but also in those intended for fabrication by oxyacetylene welding.

Modification Depends Upon Use

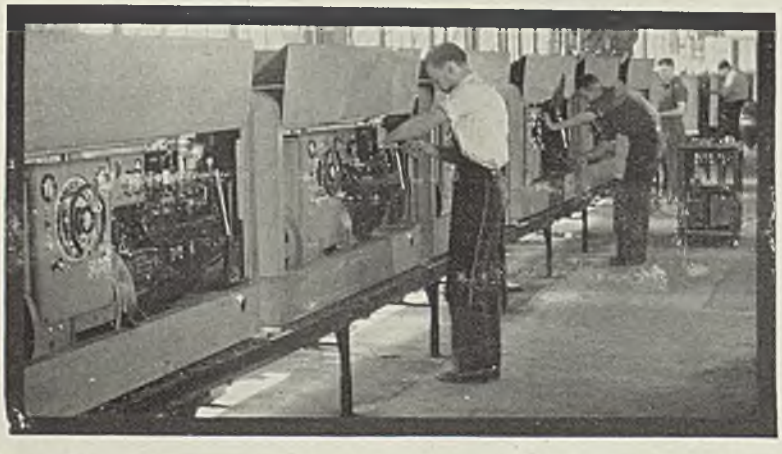
While the 18-8 type austenitic stainless steels intended for service at high temperatures generally have modifying additions and are, in many instances, used in the annealed condition, those intended for structural service generally are not modified in composition and almost always are used in the cold-rolled condition. However, modifications containing additions of up to 2 or 3 per cent of molybdenum (preferably balanced with increased nickel or manganese) can be used in structural applications in which especially good corrosion resistance is desired.

Spot-welded zones of cold-rolled austenitic stainless steel are, of course, more or less annealed. Therefore, they have the strength of annealed stainless steel rather than that of cold-rolled stainless steel. This is no practical disadvantage, however, since the stresses on the joints of spot welded structures are principally shear and torsion stresses. Experience has shown that joints of small area can be designed with sufficient spots to give practically any strength desired.

One fabricator finds that adequate strength is obtained when flanges of stainless steel stringers are only 3/16-inch wide and that flanges only ⅛-inch wide are sufficient for many structural members. The fact that small-diameter spot welds can be spaced closely in stainless steel without shunting makes possible the use of these flanges.

As for ductility and strength, sample spot welds made with properly adjusted machines will twist at least 80 degrees before shearing. A spot weld in austenitic stainless steel can be counted on by the designer for twice the shearing resistance of a rivet of like diameter and same material. Within the limits of error in determining the shear of its area, the shear value is probably in the neighborhood of 90,000 pounds per square inch.

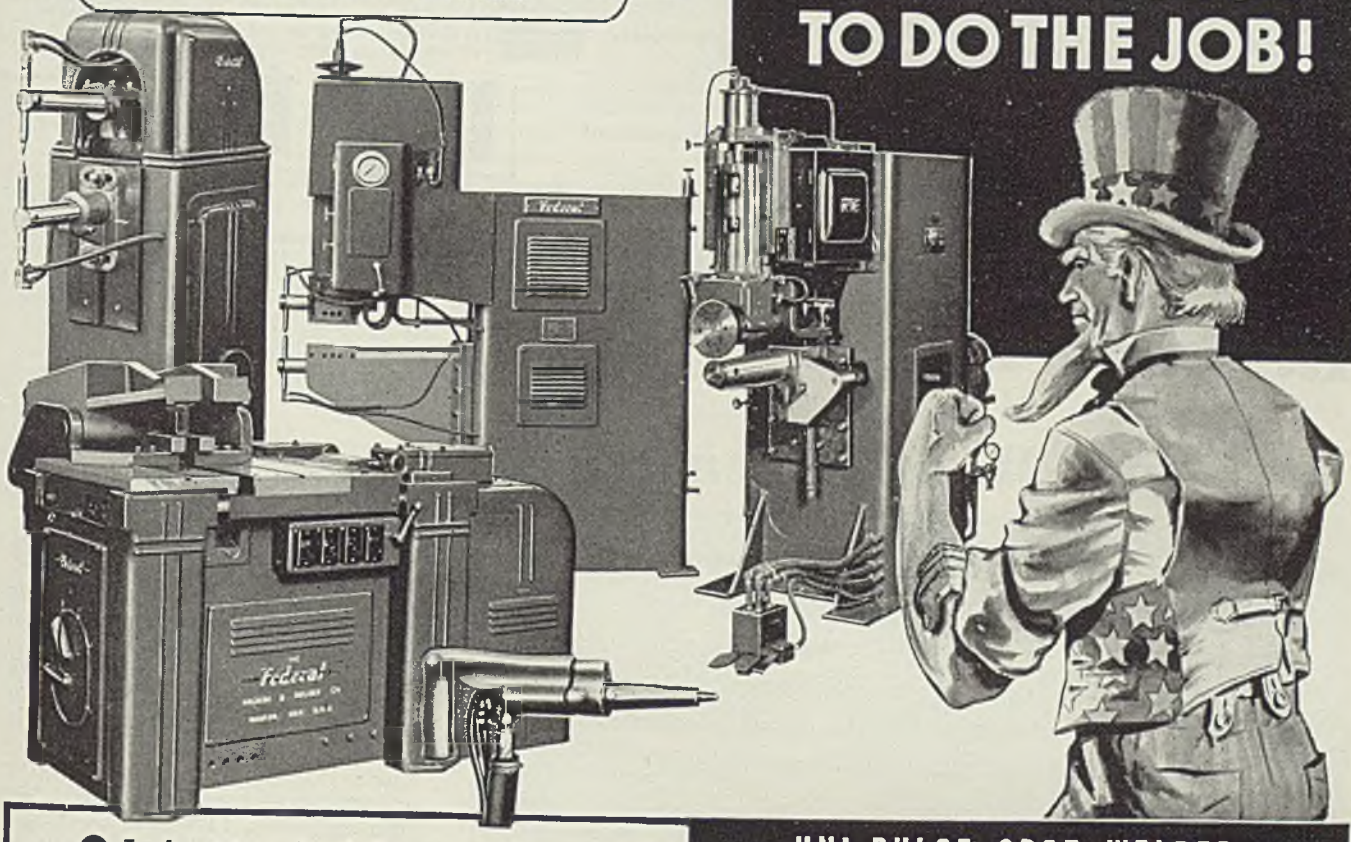
Machines for Repairing Army Units



■ Shown above is a quarter of a million dollar War Department order of gasoline-driven arc welders for the United States Army flowing off the production line at the plant of Hobart Bros., Troy, O. Mounted on army repair trucks, these units enable repairs to be made on the field. Although utilized especially for welding, the machines are capable of generating power for lighting and electric machine tool work

ALWAYS CONSIDER
RESISTANCE WELDING

FEDERAL WELDING *Machines* TO DO THE JOB!



● Industries, both large and small, engaged in the gigantic task of assisting Uncle Sam to speed up the output of defense products, find Federal Resistance Welders indispensable on production lines. In the fabricating of both ferrous and non-ferrous metals, Federal Resistance Welding provides strength in excess of standard specifications and substantially reduces production costs. Federal machines in standard and special designs are used extensively by manufacturers of aircraft and such major defense units, as well as in the production of shells, bombs and other auxiliary products.

UNI-PULSE SPOT WELDERS

Employed by the aircraft industry in welding various gauge thicknesses of alloys such as 24 S-T Alclad. Employs electrostatic storage of energy and provides flexible control of current wave form.

COMBINATION SPOT AND PROJECTION WELDERS

Conventional type machines lending themselves to both spot and projection welding operations. Adaptable and in wide demand for many metal fabricating uses.

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Used in operations which necessitate the welding together of abutting ends of two pieces of metal. Strength in excess of parent material developed at place of weld.

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For lap welding sheet stock or for fabricating such articles as various type containers. The welded seam may be either of the "intermittent stitch" type or continuous to render the welded seam gas tight.

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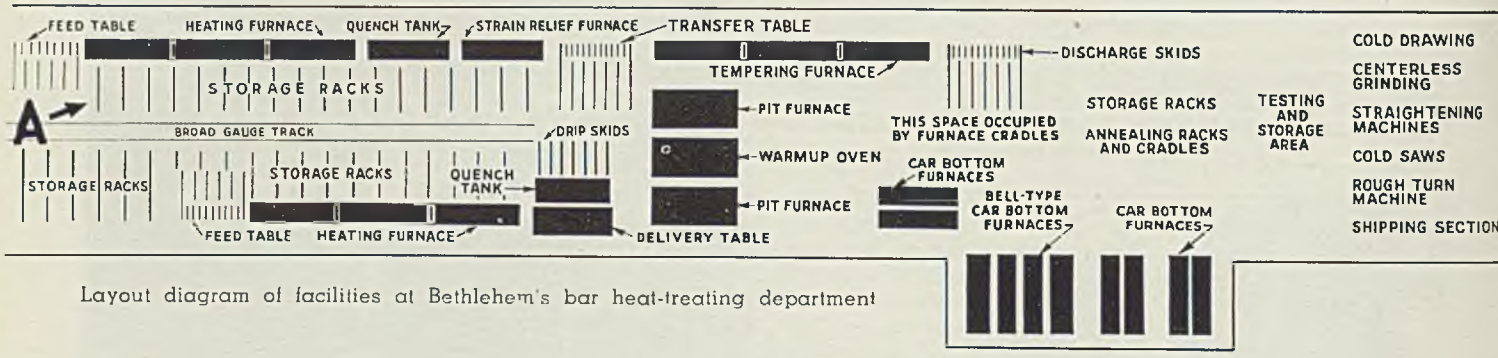


Layout diagram of facilities at Bethlehem's bar heat-treating department

Refinements in Electric Heat Treating

Bar heat-treating department relocates all furnace units in line to allow straight line processing of work. Handling is now done completely on conveyors, which eliminates need for overhead crane and greatly facilitates the work

■ BY ARRANGING in line the furnaces recently installed in its electric heat-treating department, Bethlehem Steel Co., Bethlehem, Pa., has obtained a number of advantages that have special application to large scale operations called for by the national defense program.

The straight-line arrangement for hardening and tempering alloy steel and special carbon steel bars includes three roller-hearth furnaces and a quench tank. The heating furnace, first in sequence, has three chambers, as has also the tempering furnace, last in sequence. Thus with the one-chambered hardening and stress-relief furnace, the line has a total of seven heating chambers. Including feed discharge and by-pass table, it is 330 feet in length.

Bars 25 feet long from ½-inch up to 5 inches in cross section can be handled. The sequence by units is: 3-chamber heating furnace divided into preheating, intermediate and high-temperature chambers, each with separate doors; quenching tank for either oil or water quenching; hardening stress-relief furnace and a 3-chamber tempering furnace which, like the heating furnace, also has separate doors for each chamber.

A discharge table and cross-feed conveyor located between the stress-relief furnace and the tempering furnace adds flexibility to the unit. Bars not to be tempered in the straight-line tempering furnace can thus be kicked off at this table in either the normalized or quenched condition after stress relieving and then routed to the main shop aisle for further treatment or processing. This discharge table can also be operated in reverse, making it possible if occasion demands to load hardened bars on the roller line at this point for tempering. Chain drives are employed both for the roller line and for all conveyors.

Eliminates Lost Motion

The outstanding advantage of the straight-line setup is the elimination of most of the lost motion that results while work routed through a normally arranged heat-treating shop is being transferred by crane from furnace to furnace. As contrasted to about 10 crane lifts usually involved in a tempering cycle, for example, work may go through the hardening and tempering line with only a single crane lift, namely, from the cars on which it arrives onto the feed table that serves the preheat furnace. It is only when hardened bars from the roller hearth furnace are bypassed for tempering or annealing that crane handling is necessary.

Aside from the gain in operating efficiency that is very considerable in large-batch operations of, say, 50 tons and upward, it is also believed that the straight-line arrangement definitely tends to promote quality factors in the work turned out. As the bars go through the line, they are laid on the rolls of the 3-chamber furnaces in a single layer, rather than in three or more layers as is generally the case in batch furnaces. A single layer is of particular advantage in tempering since it assures uniformity, good hardness, strength and other desired qualities.

Also characteristic is the relative straightness of the tempered bars. While naturally there is some deformation, this is less than might normally be expected so the bars can be put through the straightening machines in shorter time. Too, cold working stresses are reduced to a minimum.

One other advantage of the straight-line arrangement is the unified instrument control that it allows. While bars are going through the line of furnaces, all heat-recording instruments are working from the same thermocouples, and all adjustments are identical.

Other minor innovations in the equipment itself promote further refinement. For example the furnaces in-line are equipped with more rolls of smaller diameter than furnaces of a similar type that were originally installed in 1930. Rolls are on 12-inch rather than 18-inch centers as in the older furnaces. This closer spacing carries the bars better and facilitates handling stock of smaller cross section.

The straight-line arrangement is particularly advantageous in quenching, as the load is run out directly from the high-temperature

furnace to the quenching cradle without intermediate handling, thus shortening the time from furnace to quench and preventing excessive cooling of smaller sizes prior to entering the quench. As further insurance against excessive cooling, high-temperature furnace and quench table rolls are independently powered by variable speed motors for runout speeds from 100 feet to 300 feet per minute.

Each of the seven chambers of the roller-hearth furnaces is 29 feet long inside. Chambers of both the stress-relief furnace and the tempering furnace, however, are wider (5½ feet) than the heating furnace, 4½ feet. This greater width supplies room for the bars to lie evenly after the bowing or distortion that normally results from quenching.

Heated from Two Directions

Heating units in the 3-chamber heating furnace are mounted in the roof and on the side walls underneath the rolls. Those in the first or preheating chamber are rated 420 kilowatts, two equal groups of 210 kilowatts each. Intermediate chamber units are in three groups, 105 kilowatts at each end and 210 kilowatts in the middle. The units that heat the high-temperature chamber to 1650 degrees Fahr. are rated at 209 kilowatts, consisting of two 52-kilowatt end groups and a 105-kilowatt middle group. Total rating of the heating furnace is 1049 kilowatts, 220 volts, 3-phase, in eight control groups.

The quenching tank, 10 feet deep by 29 feet long, is designed for oil or water quenching but is expected to be employed mainly for oil quenching. A thermostatically controlled circulating water cooler strains as well as cools the quenching medium. Quenching equipment mounted integrally with the quenching tank consists of a roller table upon which the bars may be run out and a superstructure which mounts a hoist mechanism and drive that lowers the roller table and its load of bars into the quenching fluid, oscillating them up and down under the control of a timer.

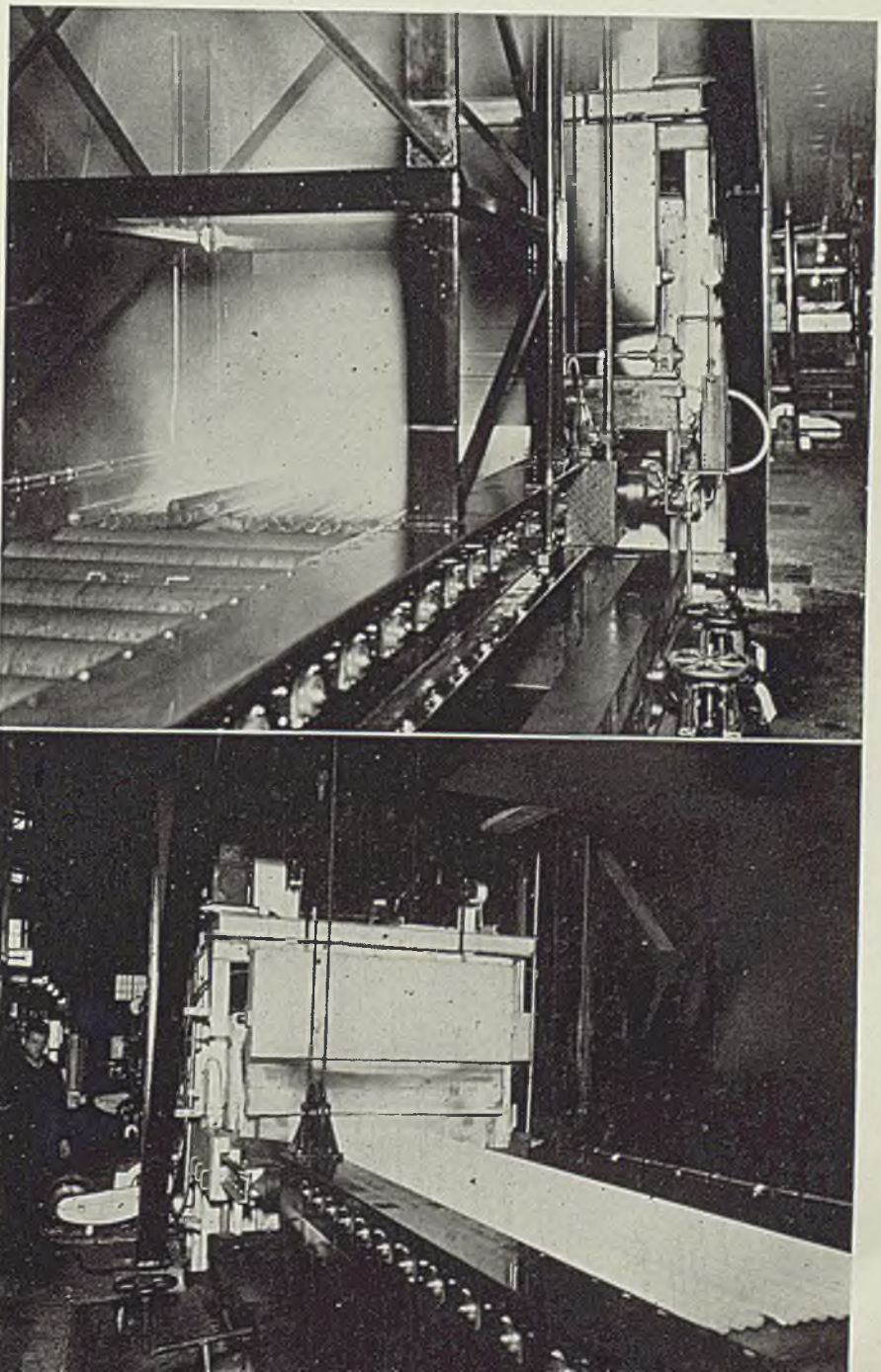
The roller table has a separate drive motor that can be matched to the speed of the rolls in the high-temperature furnace for run-out purposes. The run-in after quenching can similarly be matched to the speed of the rolls in the stress-relief furnace.

The stress-relief furnace is equipped with three roof fans. All three chambers of the tempering furnace are similarly equipped. Fans are driven by 3-horsepower motors through V-belt drives. These fans materially increase the effectiveness of the heating units as well as efficiently distribute the heat. In fact, side-bottom mounted heating units, used in the other two furnaces in the line, are not employed in this furnace, thus obviating trouble from short circuiting that might result from the relatively heavy fall of scale that takes place as the bars come from the quench. The stress-relief furnace is rated at 315 kilowatts in three 105-kilowatt sections.

Each of the three tempering-furnace chambers is rated 315 kilowatts in three 105-kilowatt sections. Total rating is 945 kilowatts. While normal temperatures will range from 950 to 1200 degrees Fahr., it is possible to hold 1550 degrees so the furnace can also be used as an annealing or normalizing unit. The heating units are located on both roof and side walls under the rolls as in the heating furnace. Like the stress-relief furnace, it has roof fans.

A combination of line-shaft drives and individual motor hookups provide the power for operating the rolls, furnace doors and other mechanized equipment. Feed table and rolls in the preheat, intermediate and high-temperature chambers are driven from a line shaft geared to a 15-horsepower direct-current motor. Sprockets from line shafting drive the feed table, preheat and intermediate heating furnace rolls at a bar speed of 50 feet per minute. Rolls in the high-temperature fur-

Above, bars entering strain-relief furnace following quenching. Below, hot bars as they are run out from the high-temperature chamber of the heating furnace onto quench tank rolls for lowering into quench tank



nace, are driven separately by a 5-horsepower variable speed motor with hot bar speeds from 100 to 300 feet per minute.

A 5-horsepower motor of this type also operates the quench table rolls. Roller tables for the three chambers of the heating furnace are connected together by magnetic clutches at all times except when under hand control for run-out or run-in. To promote uniform heating and to prevent cold spots on the bars, the rolls are continuously rocked during the treatment cycle. This practice also prevents sagging of the rolls when large size bars are being treated. A 2-horsepower motor drives the rocking mechanism.

Heating-furnace doors, except the run-out door, are operated by a 5-horsepower direct-current motor through line shafting and speed reducers. Run-out door furnace has a separate 1-horsepower motor. The quench hoist, stress-relief roll table and rolls in the stress-relief furnace are all separately operated by 5-horsepower motors, while a 2-horsepower motor works the doors of the stress-relief furnace. A 5-horsepower motor operates the cross-feed hoist and a 10-horsepower motor drives the cross-feed travel rolls.

Rolls in tempering furnace and discharge table are driven by a 15-horsepower motor from a main line shaft with bar speed of 50 feet per minute. The six doors of the tempering furnaces are mechanically interlocked and can all be operated from a line shaft powered by a 5-horsepower motor. All motors are 30-minute rating except those on the rocking drives which are continuous rating.

Assuming that a load of bars is in each of the heating chambers, the cycle of operation is as follows:

Cycle of Operation: The operator pushes the run-out push button raising the end door of the high-temperature furnace and disconnecting its roll table from the main drive. When fully open, the roll table of both the high-temperature chamber and quench table are started and the bars are run out on the quenching table, striking a limit switch that starts a motor which lowers the bars into the quench, and automatically raises and lowers them from a time determined by their size and composition.

Then the operator pushes the run-in button which opens the other five doors of the heating furnace, running untreated bars from the feed table into the pre-heat furnaces; preheated bars from this chamber to intermediate chamber, and bars in intermediate chamber into high-temperature chamber. Separate hand controls enable the operator to job roller tables back and forth to set bars in position in any one of the three chambers if necessary.

Travel of bars in stress-relief and tempering furnaces is similarly controlled at the transfer table, located between the stress-relief furnace and tempering furnace, for travel may either be continued into the tempering furnaces, or bypassed for annealing or tempering.

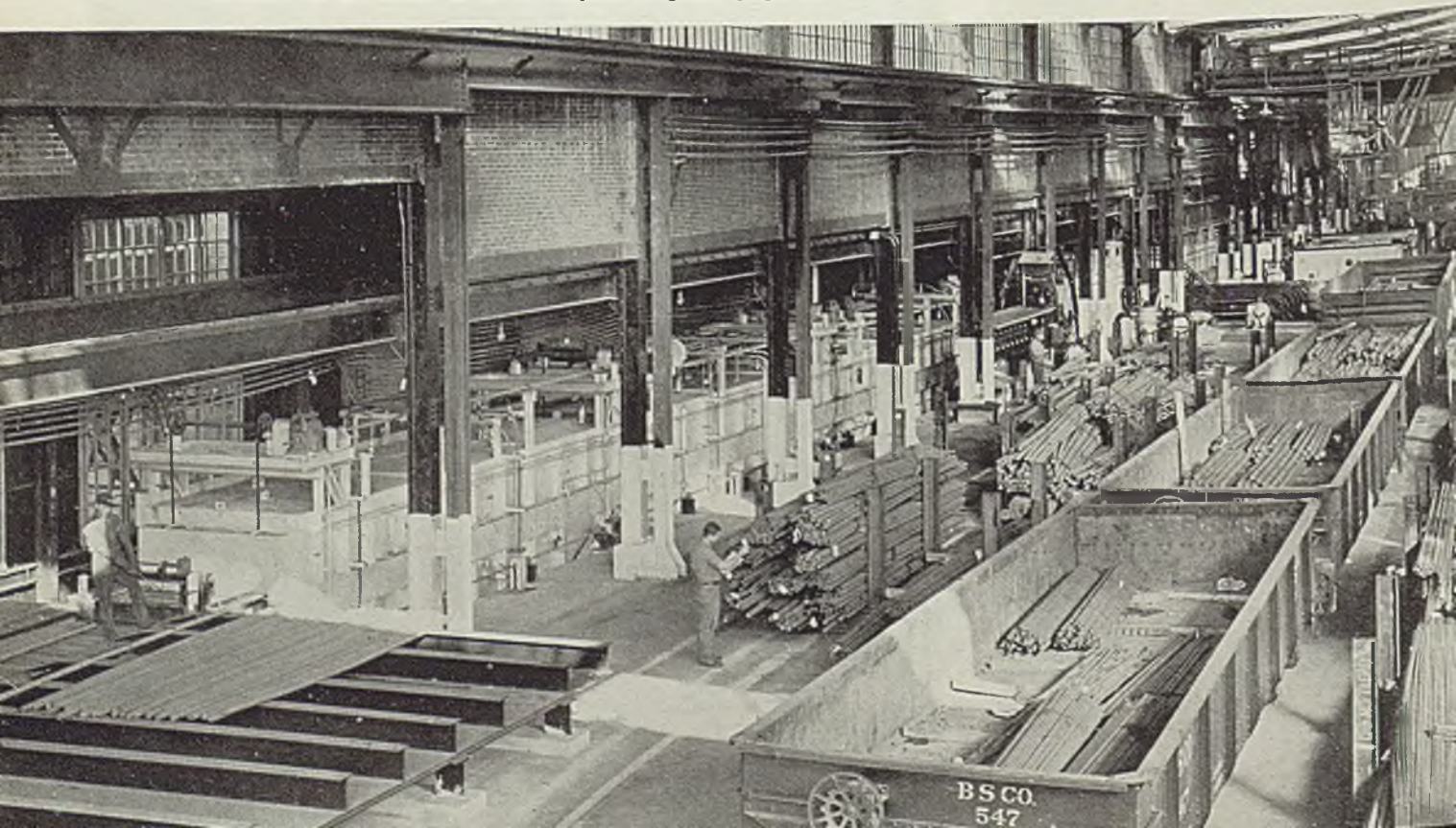
From the discharge table, bars go to the finishing departments for testing, machine straightening, centerless grinding, cold drawing or other final processing as required. Adjacent space that had been utilized in billet preparation has been taken over to provide the increased area required for operations incidental to loading and shipping, such as marking, bundling, weighing, tagging and final analysis identification by spark testing. Space that was formerly used for shipping and storage is now available for the increased volume in testing and straightening resulting from the enlarged facilities.

How To Read Blueprints

■ *Machine Trades Blueprint Reading*, by Russell W. Ihne and Walter E. Streeter; looseleaf, paper, 138 pages 8½ x 11 inches; published by American Technical Society, Chicago, for $2.

This is a textbook for the apprentice, making clear what a blueprint is, what information it conveys and rules for reading and applying. The first part is devoted to instruction on basic information necessary to interpret a print. It covers the alphabet of lines, methods of projection, relationship of views and understanding of dimensions. Various problems are presented and a glossary of shop terms is given. Problems of shop arithmetic are included. In addition to prints used to illustrate principles, prints taken from industry are shown, with problems posed for the learner to solve.

General view of Bethlehem's electric heat-treating department looking in the direction of the arrow A in the layout diagram, page 82



1

JOB-SITE FABRICATION

■ MODERN cutting and welding equipment make fabrication of structural steel for additional plant facilities a simple matter. An excellent example of job-site fabrication is the Lincoln Electric Co.'s building at Leaside, Ont., Canada. This 100 x 302-foot building has eight bays with a monitor-type roof with end bays of flat roof construction. Four rows of eight columns spaced 32 feet 10 inches apart with the columns themselves on 30-foot centers carry the steel frame of the building. Columns in exterior wall are 8 x 8 inches while inner rows are 12 x 8 inches. Exterior columns carry 18-inch wide-flange beams as wall girders. Longitudinal girders, carried by the interior columns, are 24 inches in depth.

Use 125 Tons of Steel

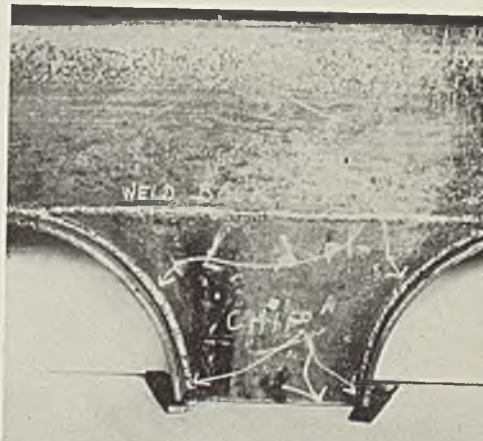
Roof purlins are continuous from wall to wall over raised part of the roof, being bent up to form the monitor section seen in the architect's sketch of the completed building, Fig. 1. Two interior girders carry the straight central part which is cantilevered out 8 feet. The building required 125 tons of structural steel.

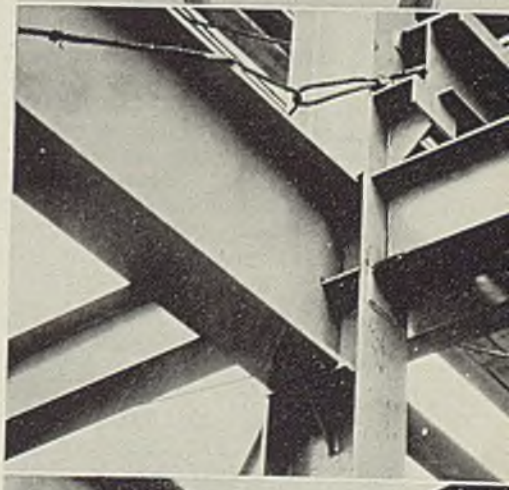
Interior is attractive for the welded steel work provides curves at the connections, unbroken surfaces of steel, and an absence of any cross braces. Further advantages are a definite saving in steel, better surfaces for painting and greater freedom from rust troubles.

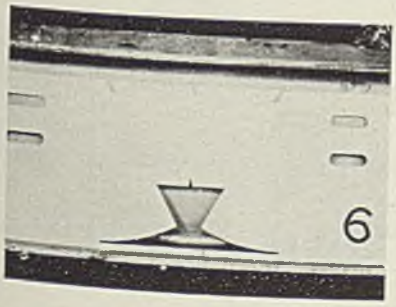
One of the most interesting portions of this work is the column-to-purlin connection in Fig. 2. To fabricate this, it was first necessary to cut away the lower flange of the purlin and curve it to the proper radius as shown in Fig. 3. The next step was to cut the filler plate to shape, as in Fig. 3. This then was placed on the lower part of the purlin web and completion of the connection made by welding the filler plate to the web of the purlin and also to the bent-down lower flange.

The roof purlin, Fig. 7, is another example that shows the facility of job-site fabrication. Purlins were first marked using the templet shown in Fig. 6. Then a triangular portion was cut out of the web and top flange and the small area at the bottom of the web also cut out. This allows bending the lower flange to the proper curve, following which the unit was rewelded to form an integral 1-piece part and further assembled into the structure—Fig. 7.

Other examples of facilities provided in steel erection are the assembly of the various clip angle seats, split I-beam segments, tie rod clips, etc. For instance, Fig. 4 shows a typical connection of girder and beam to a column. Note the seats and angles welded in place to facilitate positioning the structural sections as well as adding strength to the permanent assembly after welding has been completed. Fig. 5 shows junction of roof beam and eaves strut at rear. Here also is shown one of the tie-rod clips welded in place.







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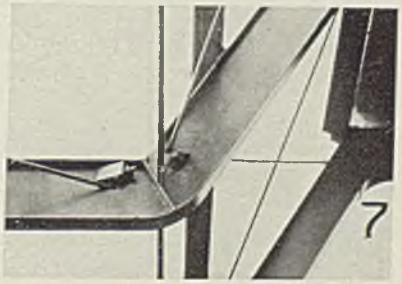
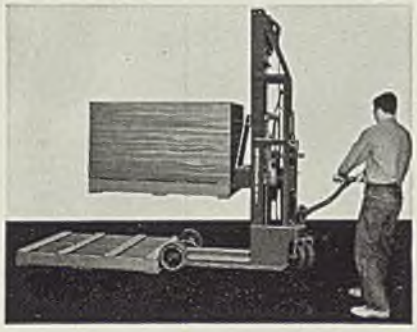


7

Industrial

Pallet Stacker

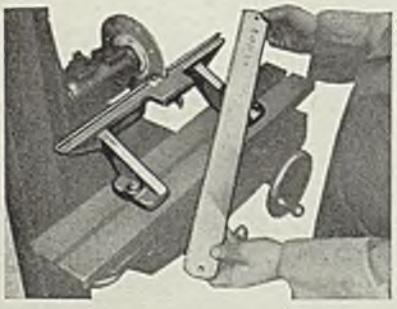
■ Lewis-Shepard Sales Corp., 245 Walnut street, Watertown, Mass., offers a new transporting pallet stacker for handling materials shipped or stored on double-faced pallets. Equipped with a new type of running gear it permits operator to approach stacker to pallet and



throw lever, braking the wheels, to continue pushing stacker while wheels remain stationary—stacker arms going into the upper pallet and base member into the lower pallet. The illustration shows the stacker in transporting position. The running gear is here automatically extended to a 52-inch wheel base, with wheels beneath load, and operator ready to move load to destination. Overall height of this unit allows entrance to freight cars. The large floor wheels give ample underclearance for sills.

Fixture for High Speed Power Hack Saw Blades

■Industrial Engineering Co. Inc., Pence building, Minneapolis, has placed on the market a redesigned fixture for grinding high speed power hack saw blades. Its use is so simplified that even an apprentice or shop laborer is able to grind the blades correctly. The table of the fixture is 6 inches longer to enable blades to be adequately supported while being ground. A new pat-



ented feature has been added so that the set of the teeth is compensated for as the blade lies on the table. The teeth lie in a groove so the blade lies perfectly flat. Then the grinding wheel contacts the teeth exactly at right angles. Because of another groove provided at the front of the table, double edged blades also can be ground. While one row of teeth is being ground, the other row lies in this second groove, preventing any tilt of the blade.

Portable Drill

■ Speedway Mfg. Co., 1834 Fifty-second avenue, Cicero, Ill., announces a ½-inch drill equipped with a new type breastplate handle which is instrumental in producing a more direct application of power. The drill itself is light enough for portable use, yet heavy enough to stand up under production drilling operations. It features a powerful,

high torque back geared drill motor, oilless bearings, forced air cooling and modern design features. The unit's low load speed makes it particularly adaptable for use with carbide drill bits in drilling brick, stone, concrete, etc., as well as regular production drilling in steel, iron, wood, etc.

Fuel Flow Controller

■ Brown Instrument Co., Wayne and Roberts avenues, Philadelphia, announces a system for controlling the fuel feed rates of regenerative furnaces. It automatically maintains the fuel rate at the desirable value so that the ultimate in overall furnace efficiency is more easily obtained. The system can be used on any oil, tar, or gas-fired regenerative furnace, such as open hearth, soaking pit, slab furnace, etc. It also may be used in combination with a ratio control system wherein combustion air is delivered to the furnace in proportion to the metered fuel. In steel plants the system is capable of maintaining a better balance in the checker system. It also reduces burner cok-

ing by quickly shutting off fuel on the outgoing end.

Oscillating Fan

■ Emerson Electric Mfg. Co., 1824 Washington avenue, St. Louis, has introduced a new overlapping-blade, 12-inch oscillating fan mounted on an adjustable floor stand for ventilating purposes. Its capacitor motor operates at slow speed yet it has great breeze penetration. Finger-tip control provides instant adjustment of arc of oscillation

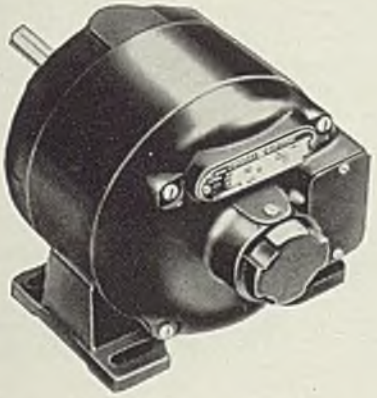
from 90 degrees to any lower range or stationary position. Floor stand is adjustable from 3 feet 3 inches to 4 feet 9 inches. The unit has a chuck arrangement, with fluted collar, for adjusting height of fan and holding elevating section of fan column in place. Slot and stop features in lower section of column prevent separation of sections when

Equipment

fan is raised and also prevent twisting of the motor cord.

Motor for Machine Tools

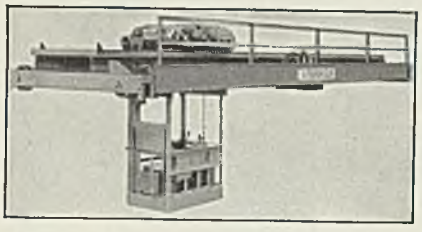
■ General Electric Co., Schenectady, N. Y., has introduced a new fractional-horsepower motor for machine tools and other industrial applications where frequent start-stop service, plugging and metal-dust atmospheres are encountered. It is available in ¼, 1/3, ½ and ¾-horsepower sizes for operation on 3-phase



and direct-current systems. The motor is totally enclosed. Its outstanding features include a sturdy cast-iron base, closely machined end-shield and stator rabbets, Formex wire, ball bearings, a 1-piece cast-aluminum rotor and firmly anchored windings. Because of the thrust encountered on the majority of machine tool applications, ball-bearing assemblies are used in the new motors. This allows mounting of the motors with the shaft at any angle to the horizontal and the stator can be rotated to any desired position. End-mounted motors can be mounted vertically as well as horizontally and may be obtained for flange, flat-face or rabbet-machine mounting.

Auxiliary Cranes

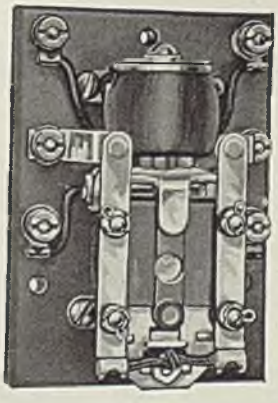
■ Northern Engineering Works, 2615 Atwater street, Detroit, announces a new line of cranes—types S. A. and L. S. A. to supplement its heavier line of cranes. The units in the line are designed to provide a more economical installation where service is not extreme and continuous. Each crane features a one-piece, all steel welded trolley frame, a horizontally split hoist gear housing,



splash lubricated hoist gearing and bearings, removable, safety type mechanical load brake, standard foot-mounted ball bearing motors and special heavy, wide flange, triple girder bridge construction. Controls are available for either cab or floor operation.

Electric Reset Relay

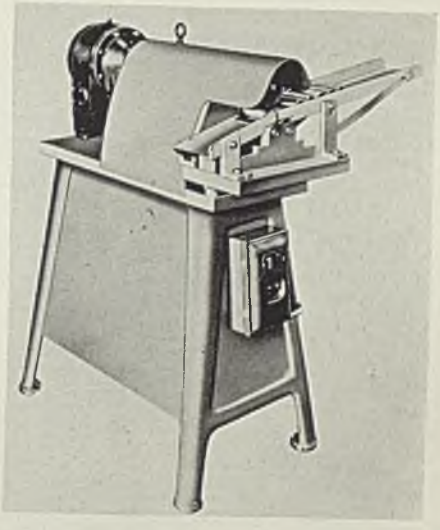
■ Struthers Dunn Inc., 1335 Cherry street, Philadelphia, has introduced a new improved midget size mechanical latch-in electric reset relay for industrial use. Mounted on a base only 3¼ x 2⅜ inches,



it has a noninductive load contact rating of 110 volts, 6 amperes or 220 volts, 3 amperes alternating current; and 115 volts, 1 ampere direct current. Coils may be obtained as specified ranging from 5 to 200 volts alternating current at approximately 4 watts each; or 2 to 230 volts direct current at approximately 2 watts each. A series resistor is employed in the coil circuits when direct current voltages above 90 volts are specified. The relay known as type ABB-In is available in practically any required contact arrangement. In addition to numerous other industrial uses it is widely used for interlocking purposes on public utility equipment.

Shell Marking Machine

■ Jas. H. Matthews & Co., 3942 Forbes street, Pittsburgh, announce a No. 79 marking machine for high speed marking of shell. It also serves equally well for fast and legible marking of many other symmetrical rounds, such as couplings, heavy tubing, etc. It will mark shell or other round parts from 1¼ to 6 inches in diameter, and marks 10 to 40 pieces per minute. This machine is furnished complete with approximately 18 inches of gravity feed ways and 10 inches of gravity take away. Its frame is of extra heavy fabricated steel plate. Aside from the gravity feed ways the machine



is entirely automatic. It selects, marks and ejects shell at high speed, commensurable with the size of the piece to be marked and the amount of marking. The depth of the marking is controlled by a screw adjustment at the bottom of the machine. The "Selector" or feed mechanism is simple and fool-proof. It requires no adjustment at any time. In adjusting the machine for marking various size parts, only two simple adjustments are required—one to adjust the raising or lowering screw and the other to narrow or widen the gravity feed ways. The marking die or steel type holders can be quickly and easily removed for changing lettering. The unit uses a ¾-horsepower geared head motor. Its starter is mounted at the front of the machine.

Gear Checking Recorder

■ Michigan Tool Co., 7171 East McNichols avenue, Detroit, announces a new development in gear checking equipment by which chart records of involute form and lead can be obtained from gear checkers

of the indicating type. It operates on a new electrical principle and can be coupled to any Michigan Sine-Line lead checker or involute checker for gears or hobs by simple changes. It also is adaptable to other makes of checking equipment. Operation of the recorder is based on the use of synchronous devices, one located in the recorder and one installed on a bracket in the base of the gear checker. Any motion imparted to one of them is duplicated automatically in the other through electrical connections. The synchronous device in the gear checker is connected directly to the sinebar table while the device in the recorder is connected to the chart drive. A second electrical connection between the checker and the recorder actuates the cross movement of the recording pen in relation to movement of an indicator mounted on the gear checker. This indicator replaces the conventional indicator by merely removing two screws and attaching the new unit. Movement of the electrical indicator pen on the chart is magnified several times between the indicator and the recorder, vertical graduations on the recorder

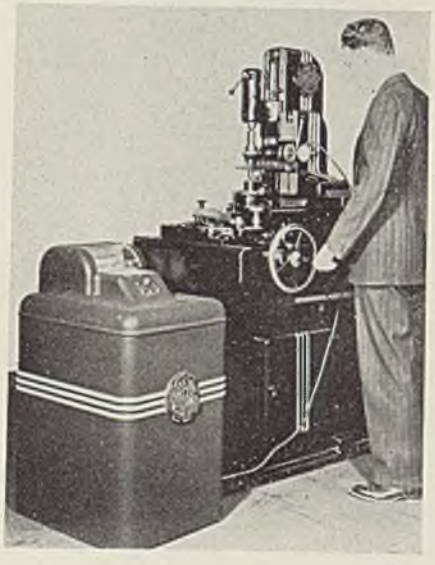
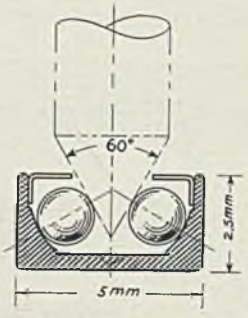


chart are thus, in ten thousandths of an inch, while horizontally, one inch is equivalent to 4 degrees of rotation of the work carrying spindle. Three switches are provided on the recorder. One of these is a master switch. The second switch disconnects the synchronous device in the recorder, and the third reverses the action of the synchronous motor in the recorder. When latter switch is on the chart, paper will move in a proper direction to check the opposite side of the gear tooth. A button release is provided on the chart roll to permit moving the chart by hand. The entire unit is mounted on rubber tired casters. It operates on 110 volts alternating current. It is claimed that accuracy of operation of the recorder is not affected by normal variations in line voltage. Installation in the field merely involves placing a sprocket on the sinebar table shaft, mounting the motor brackets in the base of the machine and replacing the indicator.

Pivot Ball Bearing

■ Miniature Precision Bearings, associated with Split Ballbearing Corp., Lebanon, N. H., announces a new self-aligning ball bearing to provide precision antifriction opera-



tion for radia or thrust loads. It is of high-carbon chrome bearing steel machined, hardened and highly finished on raceway and exterior surfaces. The pivot, normally supplied by the customer, is made by the company to specifications. It usually is supplied in high-carbon chrome steel, hardened and ground to a 60-degree cone. The balls used measure 4 1/16 inches. The pivot has a minimum diameter of about 0.050-inch, the maximum, however, is unlimited. The bearing's load ratings per pound for thrust only is 1.5, 1.0, and 0.7 pounds at 1000, 5000, and 10,0000 revolutions per minute, respectively. For the radial only it is 0.6, 0.4 and 0.3 pounds, respectively at the foremen-tioned speeds.

Rivet Washing Tips

■ National Cylinder Gas Co., 205 West Wacker drive, Chicago, has placed on the market new Rego KXW copper rivet washing tips suitable for washing out rivet heads of all types and sizes for repair or

reclaiming for removing frozen nuts from bolts without damage to the bolt threads, for removing minor defects in castings or for hand or machine gougings. Design of the tips enables the cutting oxygen stream to travel at comparatively low velocity, eliminating excessive "blowing" of molten metal. This permits the operator to work with greater accuracy, without sacrificing speed or using extra gas. The tips are available in three sizes—KXW-25, KXW-1 and KXW-K. The first is for removing rivets up to and including ½-inch in diameter. The second is for rivets from ½ to ⅞-inch in diameter and the third is for rivets ⅞-inch in diameter and larger. These tips will produce a deep, narrow gouge or a wide, shallow gouge, depending on the speeds and pressures at which the tips are operated.

Broaching Machines

■ Colonial Broach Co., 147 Jos. Campau avenue, Detroit, has introduced a complete new standard line of horizontal broaching machines ranging in capacity from 3 tons and 36-inch stroke to 25 tons and 90-inch stroke. Two important features of the units include a shock-proof control mechanism to prevent impact of the starting lever at each end of the stroke, and a readily accessible and increased vertical adjustment for the drive head. In addition, each unit incorporates means for mounting spiral broach drive heads. The cylinders are of steel tube construc-

tion with welded joints. Valves and piping have been simplified, and an integral motor and pump bracket assures correct alignment. The chip pan provided also can be used for a broach follow-rest support, when required. Due to the simplified piping system, additional reserve space is available within the machine for storage of tools, pullers, adapters, etc. The main frame is of welded steel construction and so designed that it completely encloses the operating mechanism of the machine. The machine face is of sufficient area to support and attach surface broach fixtures, and provided with an extremely large hole to permit maximum broach capacity. The face has two keyways placed centrally with the hole and 90 degrees to each other. The cross-head has replaceable hard bronze shoes which ride on hardened and ground ways. Both cross-head and pull-head have identification marks to indicate when pullers are adjusted centrally with keyways on the face of the machine. All machines are equipped with heavy-duty, large volume coolant pumps.

Metals as Catalysts

(*Continued from Page 74*)

a cheap supply of ammonia which was not subject to the hazards of importation in case of war, another catalytic process known as the Ostwald process could be used for the oxidation of the ammonia to produce a mixture of the oxides of nitrogen which dissolve in water to form nitric acid.

Catalyst Activated by Heat

The catalyst most commonly used in this country is a series of platinum gauzes mounted as shown in the converter picture in Fig. 6. The preheated mixture of ammonia and air is blown through this gauze and oxidation takes place to produce nitric oxide and some water vapor. At the beginning of the process, it is necessary to supply heat to the catalyst to bring it to the temperature at which it is catalytically active. However, the reaction taking place is one which gives off heat so after reaction begins, a regenerating system can be used to heat the incoming gas stream with the excess heat of the oxidized mixture. The catalyst is commonly one or more 80-mesh platinum gauzes made of wire 0.003-inch in diameter. The rate of flow is such that the time of contact on the gauze is about 0.0015-second. In this brief time the oxidation of the ammonia is complete. The gauze is maintained at a temperature of from 850 to 950 degrees, Cent.

The process is essentially, then, one of passing a 10 per cent mixture of ammonia and air through the gauze at a rate corresponding to about 50 to 70 pounds of ammonia per day per ounce of platinum.

But after passing the gauze, the nitrogen has been converted to nitric oxide (NO) and before it can be absorbed to form nitric acid, it must be converted into nitrogen peroxide (NO_2). It can be seen, then, that more oxygen than that necessary for the catalyzed reaction on the gauze is necessary. The 10 per cent ammonia-air mixture passed into the converter supplies this excess, so the reaction to form the peroxide immediately begins. But this reaction is favored by low temperature and is comparatively slow. Therefore this reaction goes more or less to completion in the heat exchanger.

Fig. 7 is a complete unit consisting of a converter and heat exchanger. The metered ammonia and air pass directly into the heat exchanger. The hot gas after leaving the gauze in the converter passes through tubes inside the converter itself.

In this way the incoming gases are heated and the oxidized gas is cooled, thus favoring the formation of the nitrogen peroxide. Those parts of the apparatus exposed to the preheated ammonia-air mixture are made of nickel, while those parts exposed to the cooled or partially cooled oxidized mixture are made of cast aluminum. The converter itself is made of steel and is lined with refractory brick.

The absorption of these gases in water or dilute nitric acid is done in aluminum equipment and the strength of the acid obtained is about 50 per cent.

In general practice, there are a number of substances which act as poisons for the platinum catalyst. The hydride of phosphorus, or phosphine as it is called, will be noticed by the decreased yield of nitric oxide if present to the extent of only 2 or 3 parts per 100 million, while amounts of the order of 20 to 30 parts per 100 million will completely destroy the activity of the catalyst. However, it is a comparatively easy matter to remove phosphine from ammonia completely by an auxiliary chemical process. Small amounts of organic matter such as are present in ordinary grades of coke oven by-product ammonia also act as a poison. Ordinary dust which may cover the surface of the catalyst also acts as a poison

but adequate filter systems for cleaning the air used greatly reduce the importance of this poison. And, further, merely heating the platinum gauze with hydrochloric acid in the event that this occurs will restore the catalyst to almost normal activity but with consequent small losses of platinum.

Other catalysts are patented and used abroad which claim certain advantages. For example, iron oxide promoted with about 3 to 4 per cent of bismuth oxide is used to a considerable extent in Germany.

It has been said that one reason at least why the German armed forces in the present war have been able to maintain the heretofore unheard-of concentration of gun fire is that the manufacture of nitric acid through a serious of steps like the one just discussed has been stepped up to an enormous daily output. Of course, the materials used are not capable of being shut off by naval blockade.

In our own defense program we, too, will be forced to step up production of many commodities—notably nitric acid. Thus, it appears likely that the processes discussed will assume much greater importance in the immediate future.

Flight of the Shell

(*Concluded from Page* 55)

jectories, of the rotation of the earth. For instance, if the gun be pointed north in the northern hemisphere, the shell tends to drift toward the east since the tangential velocity of successively more northerly locations diminishes, while the shell tends to preserve its original component due to the earth's rotation.

Earth Rotation: Again, if the gun be pointed eastward, the earth continues to rotate during the flight of the shell and so the range is increased. Conversely when the gun is pointed south, the drift is to the west; and when turned toward the west, the range is diminished.

The caliber of shells varies all the way from the smallest 20-millimeter high-explosive up to the 16-inch armor piercer, each having its characteristic application. Nowadays, shrapnel is disappearing and high-explosive taking its place. The old 75-millimeter tends to give way before the 90 and 105; and armor-piercing shells are making their appearance for service against armored land cruisers (the 37-millimeter solid armor piercer, for instance, will pierce 1½ inches of armor plate at 1000 yards).

EDITOR'S NOTE: Since preparing the caption for Fig. 3 p. 50 of this issue Professor Macconochie reports a further development: In addition to solid 37 millimeter armor piercing shell for anti-tank guns, explosive shell of this caliber also now are being made.

Announces List of Standards for 1941

■ American Standards Association recently announced publication of a new List of American standards for 1941. It embraces more than 400 standards, covering definitions, technical terms, specifications for metals and other materials, methods of test for the finished product, dimensions, safety provisions for use of machinery and methods of work.

The list reaches into every important engineering field and serves as a basis for many municipal, state and federal regulations. Six hundred manufacturing, government and user groups have shared in the development of these standards, representing the best in current practice. Provisions also are made for their frequent review to keep them in line with a changing industrial setup.

This list is offered free to anyone interested in the work. Requests should be addressed to association headquarters, 29 West Thirty-ninth street, New York.

Half Steel Inquiries Carry Priority Ratings

This percentage increases constantly. Civilian supply problem called temporary only. Shortages of scrap and pig iron may cut production soon.

MARKET IN TABLOID

Demand
Sales still run 40 per ce ahead of production.

Prices
Are of little consideration anxiety to be supplied.

Production
Unchanged at 99.

■ BETWEEN 40 and 50 per cent of current inquiries for steel carry priority certificates, or photostatic copies of the same, the highest percentage to date and a percentage which is increasing constantly. One large company reports having made sales the past week on a 100 per cent priority basis, refusing all civilian needs, though it so happens its regular civilian customers are taken care of for the time being.

The possession of a priority rating does not of itself guarantee securing of steel, especially from a maker who is other than the usual source of supply for that consumer. However, such a priority holder, if turned down by a steel supplier, fills out blanks and reports to Washington and usually gets his steel eventually.

A recognized danger of the priority system is that holders of certificates may become so common as to defeat the very purpose for which the system was devised. Perhaps the most difficult sales problem of steelmakers today is making decisions on cases on the fringe of defense.

Take the instance of small hand tools for skilled artisans in aircraft factories, who must furnish their own tools, usually of alloy material. Makers of these tools, noting keen shortages, try to get more steel for further tool making. They secure oral orders from Washington to apply to certain steelmakers, but, having no priority certificates to display, are refused.

Again, makers of stoves and ranges, made of sheet steel, being ostensibly civilian manufacturers, do not have access to priority ratings, yet claim their stoves are needed, not only for armed forces but for absolutely essential civilian requirements to survive rigors of winter.

Despite this comparatively new civilian problem steelmakers, after scanning figures pertaining to probable amount of steel going into defense and total steel manufacture, conclude that eventually there will be enough steel to go around.

Raw materials' scarcity is again at the forefront, particularly scrap and pig iron. Producers of the latter are inclined to attribute scrap scarcity as the major reason for pig iron shortage because of necessity of using higher pig iron percentages. Moreover many materials which are now used strictly for direct defense, such as aluminum, find cast iron as a substitute. Because of scarcity of forgings cast iron or steel are frequently used as substitute. The greatly enlarged car building program requires much cast iron.

Because of scrap steel scarcity some steel company officials predict that present high production rate cannot be maintained much longer. Republic will build two more electric furnaces, rated 122,000 tons annually, and has bought 400 tons of structural steel to house them; also 240 tons for a blooming mill extension, South Chicago, Ill. Another Cleveland steelmaker is sounding out costs of constructing two more openhearths, requiring 1500 tons of structurals.

Oil authorities estimate that, with the commandeering of tankers for service to Britain, transportation facilities from Oklahoma and Texas to the Atlantic Coast are 40 per cent short; preliminary negotiations for pipelines pend with more tank cars to be built.

Inquiries and awards by the railroads have been the most impressive this year to date. The Pennsylvania has bought 150,000 tons of rails and 15 locomotives and will build 6020 freight cars in its own shops. The Chicago, Burlington & Quincy will build 4425 freight cars in its own shops. Other locomotive purchases were: New York Central 7, Nickel Plate 15 and Nashville, Chattanooga & St. Louis 10.

About 460,000 tons of finished and semifinished steel for Great Britain is being divided among American producers through the Procurement division, Treasury Department, with an additional 540,000 tons to come.

Scheduled automobile production for the week ended June 21 was 133,565 units, down 1117 from the previous week, comparing with 90,060 in 1940.

The national steel ingot production rate last week was unchanged at 99 per cent. Gains took place at Cleveland, by 3 points to 95 per cent, at Cincinnati by 6 points to 95 and at Detroit by 2 points to 94. Pittsburgh dropped 1½ points to 99. Unchanged were the following: Chicago at 102, eastern Pennsylvania at 97, Wheeling at 88, Buffalo at 90½, Birmingham at 95, New England at 94, St. Louis at 98 and Youngstown at 98.

STEEL's three composite price groups for last week were unchanged: iron and steel at $38.15, finished steel at $56.60 and steelworks scrap at $19.16.

COMPOSITE MARKET AVERAGES

	June 21	June 14	June 7	One Month Ago May, 1941	Three Months Ago March, 1941	One Year Ago June, 1940	Five Years Ago June, 1936
Iron and Steel	$38.15	$38.15	$38.15	$38.15	$38.27	$37.69	$32.79
Finished Steel	56.60	56.60	56.60	56.60	56.60	56.60	52.20
Steelworks Scrap..	19.16	19.16	19.16	19.16	20.04	19.03	12.55

Iron and Steel Composite:—Pig iron, scrap, billets, sheet bars, wire rods, tin plate, wire, sheets, plates, shapes, bars, black pipe, rails, alloy steel, hot strip, and cast iron pipe at representative centers. Finished Steel Composite:—Plates, shapes, bars, hot strip, nails, tin plate, pipe. Steelworks Scrap Composite:—Heavy melting steel and compressed sheets.

COMPARISON OF PRICES

Representative Market Figures for Current Week; Average for Last Month, Three Months and One Year Ago

Finished Material

	June 21, 1941	May 1941	March 1941	June 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
Iron bars, Chicago	2.25	2.25	2.25	2.25
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	2.225	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

	June 21, 1941	May 1941	March 1941	June 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	31.09	30.34	30.34
Gray forge, del. Pittsburgh	24.19	24.19	24.18	23.17
Ferromanganese, del. Pittsburgh	125.33	125.33	125.33	115.33

Scrap

Heavy melting steel, Pitts.	$20.00	$20.00	$20.75	$19.90
Heavy melt. steel, No. 2, E. Pa.	17.75	17.75	18.65	18.10
Heavy melting steel, Chicago	18.75	18.75	19.43	18.00
Rails for rolling, Chicago	22.25	22.25	20.75	22.22
No. 1 Cast, Chicago	20.00	20.00	21.35	16.60

Coke

Connellsville, furnace, ovens	$6.25	$5.70	$5.50	$4.75
Connellsville, foundry, ovens	7.25	6.30	6.00	5.75
Chicago, by-product fdry., del.	12.25	12.25	11.75	11.25

STEEL, IRON, RAW MATERIAL, FUEL AND METALS PRICES

Except when otherwise designated, prices are base, f.o.b. cars.

Sheet Steel

Hot Rolled

Pittsburgh	2.10c
Chicago, Gary	2.10c
Cleveland	2.10c
Detroit, del.	2.20c
Buffalo	2.10c
Sparrows Point, Md.	2.10c
New York, del.	2.34c
Philadelphia, del.	2.27c
Granite City, Ill.	2.20c
Middletown, O.	2.10c
Youngstown, O.	2.10c
Birmingham	2.10c
Pacific Coast ports	2.65c

Cold Rolled

Pittsburgh	3.05c
Chicago, Gary	3.05c
Buffalo	3.05c
Cleveland	3.05c
Detroit, delivered	3.15c
Philadelphia, del.	3.37c
New York, del.	3.39c
Granite City, Ill.	3.15c
Middletown, O.	3.05c
Youngstown, O.	3.05c
Pacific Coast ports	3.70c

Galvanized No. 24

Pittsburgh	3.50c
Chicago, Gary	3.50c
Buffalo	3.50c
Sparrows Point, Md.	3.50c
Philadelphia, del.	3.67c
New York, delivered	3.74c
Birmingham	3.50c
Granite City, Ill	3.60c
Middletown, O.	3.50c
Youngstown, O.	3.50c
Pacific Coast ports	4.05c

Black Plate, No. 29 and Lighter

Pittsburgh	3.05c
Chicago, Gary	3.05c
Granite City, Ill.	3.15c

Long Ternes No. 24 Unassorfed

Pittsburgh, Gary	3.80c
Pacific Coast	4.55c

Enameling Sheets

	No. 10	No. 20
Pittsburgh	2.75c	3.35c
Chicago, Gary	2.75c	3.35c
Granite City, Ill.	2.85c	3.45c
Youngstown, O.	2.75c	3.35c
Cleveland	2.75c	3.35c
Middletown, O.	2.75c	3.35c
Pacific Coast	3.40c	4.00c

Corrosion and Heat-Resistant Alloys

Pittsburgh base, cents per lb.

Chrome-Nickel

	No. 302	No. 303	No 304
Bars	24.00	26.00	25.00
Plates	27.00	29.00	29.00
Sheets	34.00	36.00	36.00
Hot strip	21.50	27.00	23.50
Cold strip	28.00	33.00	30.00

20% Ni.-Cr. Clad

Plates	18.00*
Sheets	19.00

**Annealed and pickled*

Straight Chromes

	No. 410	No. 416	No. 430	No. 442
Bars	18.50	19.00	19.00	22.50
Plates	21.50	22.00	22.00	25.50
Sheets	26.50	27.00	29.00	32.50
Hot strip	17.00	18.25	17.50	24.00
Cold stp.	22.00	23.50	22.50	32.00

Steel Plate

Pittsburgh	2.10c
New York, del.	2.29c-2.54c
Philadelphia, del.	2.15c
Boston, delivered	2.42c-2.57c
Buffalo, delivered	2.33c
Chicago or Gary	2.10c
Cleveland	2.10c
Birmingham	2.10c
Coatesville, Pa.	2.10c-2.35c
Sparrows Point, Md.	2.10c-2.35c
Claymont, Del.	2.10c-2.35c
Youngstown	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	2.10c
Philadelphia, del.	2.21½c
New York, del.	2.27c
Boston, delivered	2.41c
Bethlehem	2.10c
Chicago	2.10c
Cleveland, del.	2.30c
Buffalo	2.10c
Gulf ports	2.45c
Birmingham	2.10c
St. Louis, del.	2.34c
Pacific Coast ports	2.75c

Tin and Terne Plate

Tin Plate, Coke (base box)

Pittsburgh, Gary, Chicago	$5.00
Granite City, Ill.	5.10

Mfg. Terne Plate (base box)

Pittsburgh, Gary, Chicago	$4.30
Granite City, Ill.	4.40

Roofing Ternes

Pittsburgh base, 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

Bars

Soft Steel

(Base, 20 tons or over)

Pittsburgh	2.15c
Chicago or Gary	2.15c
Duluth	2.25c
Birmingham	2.15c
Cleveland	2.15c
Buffalo	2.15c
Detroit, delivered	2.25c
Philadelphia, del.	2.47c
Boston, delivered	2.52c
New York, del.	2.49c
Gulf ports	2.50c
Pacific Coast ports	2.80c

Rail Steel

(Base, 5 tons or over)

Pittsburgh	2.15c
Chicago or Gary	2.15c
Detroit, delivered	2.25c
Cleveland	2.15c

Buffalo	2.15c
Birmingham	2.15c
Gulf ports	2.50c
Pacific Coast ports	2.80c

Iron

Chicago	2.25c
Philadelphia, del.	2.37c
Pittsburgh, refined	3.50-8.00c
Terre Haute, Ind.	2.15c

Reinforcing

New Billet Bars, Base

Chicago, Gary, Buffalo, Cleve., Birm., Young., Sparrows Pt., Pitts.	2.15c
Gulf ports	2.50c
Pacific Coast ports	2.60c

Rail Steel Bars, Base

Pittsburgh, Gary, Chicago, Buffalo, Cleveland, Birm.	2.15c
Gulf ports	2.50c
Pacific Coast ports	2.60c

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)

Bright bess., basic wire	2.60c
Galvanized wire	2.60c
Spring wire	3.20c

Worcester, Mass., $2 higher on bright basic and spring wire.

Cut Nails

Carload, Pittsburgh, keg $3.85

Cold-Finished Bars

	Carbon	Alloy
Pittsburgh	2.65c	3.35c
Chicago	2.65c	3.35c
Gary, Ind.	2.65c	3.35c
Detroit	2.70c	*3.45c
Cleveland	2.65c	3.35c
Buffalo	2.65c	3.35c

*Delivered.

Alloy Bars (Hot)

(Base, 20 tons or over)

Pittsburgh, Buffalo, Chicago, Massillon, Canton, Bethlehem 2.70c
Detroit, delivered 2.80c

S.A.E.	Alloy 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	0.15 to 0.25 Mo.		0.55
4600	0.20 to 0.30 Mo. 1.50-2.00 Ni.		1.20
5100	0.80-1.10 Cr.		0.45
5100	Cr. spring flats		0.15
6100	bars		1.20
6100	spring flats		0.85
Cr. N., Van.			1.50
Carbon Van.			0.85
9200	spring flats		0.15
9200	spring rounds, squares		0.40

Electric furnace up 50 cents.

Alloy Plates (Hot)

Pittsburgh, Chicago, Coatesville, Pa. 3.50c

Strip and Hoops

(Base, hot strip, 1 ton or over; cold, 3 tons or over)

Hot Strip, 12-inch and less

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Middletown, Birmingham	2.10c
Detroit, del.	2.20c
Philadelphia, del.	2.42c
New York, del.	2.46c
Pacific Coast ports	2.75c
Cooperage hoop, Young., Pitts.; Chicago, Birm.	2.20c

Cold strip, 0.25 carbon and under, Pittsburgh, Cleveland, Youngstown 2.80c
Chicago 2.90c
Detroit, del. 2.90c
Worcester, Mass. 3.00c

Carbon	Cleve., Pitts.
0.26—0.50	2.80c
0.51—0.75	4.30c
0.76—1.00	6.15c
Over 1.00	8.35c

Worcester, Mass. $4 higher.

Commodity Cold-Rolled Strip

Pitts.-Cleve.-Youngstown	2.95c
Chicago	3.05c
Detroit, del.	3.05c
Worcester, Mass.	3.35c

Lamp stock up 10 cents.

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, B'ham.	$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	4.15c
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., ⅝ and ¾ x 6-in. and shorter 63½ off
Do., ¾ to 1 x 6-in. and shorter 61 off
1⅛ and larger, all lengths 59 off
All diameters, over 6-in. long 59 off
Tire bolts 50 off

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 64 off

Square Head Set Screws

Upset, 1-in., smaller 71 off
Headless set screws 60 off

Piling

Pitts., Chgo., Buffalo 2.40c

Rivets, Washers

F.o.b. Pitts., Cleve., Chgo., Bham.

Structural 3.75c
⅞-inch and under 60-5-5 off
Wrought washers, Pitts., Chi., Phila., to jobbers and large nut, bolt mfrs. l.c.l. $4.50

Tool Steels

Pittsburgh base, cents per lb.

Carb. Reg. 14.00	Oil-hardening 24.00
Carb. Ext. 18.00	High car.-chr. 45.00
Carb. Spec. 22.00	

High Speed Tool Steels

Tung.	Chr.	Van.	Moly.	
18.00	4	1	...	67.00
18.00	4	2	1	77.00
1.5	4	1	8.5	54.00
....	4	2	8	54.00
5.5	4	1.5	4	57.50
0.15	4	1	8.5	54.00

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

In.	Blk.	Galv.
Steel		
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

Steel	
1 to 3, butt weld	67½
2, lap weld	60
2½ to 3, lap weld	63
3½ to 6, lap weld	65
7 and 8, lap weld	64

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
2¼"O.D.	12	15.16	....
2½"O.D.	12	16.58	26.57
2¾"O.D.	12	17.54	29.00
3" O.D.	12	18.35	31.36
3½"O.D.	11	23.15	39.81
4" O.D.	10	28.66	49.90
5" O.D.	9	44.25	73.93
6" O.D.	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
2¾"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

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. fittgs., 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 11/32-in. incl. 2.15
Worcester up $0.10; Galveston up $0.25; Pacific Coast up $0.50.

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.	11.75
Milwaukee, ovens	12.25
New England, del.	13.75
St. Louis, del.	12.25
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.)	13.75c
Do. (1000 lbs. or over)	12.75c

Eastern Plants, per lb.

Naphthalene flakes, balls, bbls. to jobbers	7.00c

Per ton, bulk, f.o.b. port

Sulphate of ammonia	$30.00

Pig Iron

Delivered prices include switching charges only as noted. No. 2 foundry is 1.75-2.25 sil.; 25c diff. for each 0.25 sil. above 2.25 sil.; 50c diff. below 1.75 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	24.00
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	24.50
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	†24.12	.....	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: 6-6.50 per cent $29.50; 6.51-7—$30.00; 7-7.50—$30.50; 7.51-8—$31.00; 8-8.50—$31.50; 8.51-9—$32.00; 9-9.50—$32.50; Buffalo, $1.25 higher.

Bessemer Ferrosilicon†

Jackson county, O., base; Prices are the same as for silveries, plus $1 a ton.

†The lower all-rail delivered price from Jackson, O., or Buffalo, is quoted with freight allowed.

Manganese differentials in silvery iron and ferrosilicon, 2 to 3%, $1 per ton add. Each unit over 3%, add $1 per ton.

Refractories

Per 1000 f.o.b. Works, Net Prices

Fire Clay Brick

Super Quality

Pa., Mo., Ky.	$60.80

First Quality

Pa., Ill., Md., Mo., Ky.	47.50
Alabama, Georgia	47.50
New Jersey	56.00

Second Quality

Pa., Ill., Ky., Md., Mo.	42.75
Georgia, Alabama	34.20
New Jersey	49.00

Ohio

First quality	39.90
Intermediate	36.10
Second quality	31.35

Malleable Bung Brick

All bases	$56.05

Silica Brick

Pennsylvania	$47.50
Joliet, E. Chicago	55.10
Birmingham, Ala.	47.50

Ladle Brick

(Pa., O., W. Va., Mo.)

Dry press	$28.00
Wire cut	26.00

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	$50.00
Chem. bonded chrome	50.00
Magnesite brick	72.00
Chem. bonded magnesite	61.00

Fluorspar

Washed gravel, duty pd., tide, net ton	$25.00-$26.00
Washed gravel, f.o.b. Ill., Ky., net ton, carloads, all rail	20.00-21.00
Do. barge	20.00
No. 2 lump	20.00-21.00

Ferroalloy Prices

Ferromanganese, 78-82%, Carlots, duty paid, sbd. $120.00; Carlots, del. Pitts. 125.33; Carlots, f.o.b. Southern furn. 145.00. For ton lots add $10, for less-than-ton lots $13.50, for less than 200-lb. lots $18.

Spiegeleisen, 19-21% dom. Palmerton, Pa., spot.. 36.00

Ferrosilicon, 50%, freight allowed, c.l. 74.50; Do., ton lot 87.00; Do., 75 per cent 135.00; Do., ton lots 151.00. Spot, $5 a ton higher.

Silicomanganese, c.l., 2½ per cent carbon 118.00; 1¼% carbon 128.00. Contract ton price $12.50 higher; spot $5 over contract.

Ferrotungsten, stand., lb. con. del. cars 1.90-2.00

Ferrovanadium, 35 to 40%, lb., cont. 2.70-2.80-2.90

Ferrophosphorus, gr. ton, c.l., 17-18% Rockdale, Tenn., basis, 18%, $3 unitage, 58.50; electric furn., per ton, c. l., 23-26% f.o.b. Mt. Pleasant, Tenn., 24% $3 unitage 75.00

Ferrochrome, 66-70 chromium, 4-6 carbon, cts. lb., contained cr., del. carlots 11.00c; Do., ton lots 11.75c; Do., less-ton lots 12.00c; less than 200 lb. lots 12.25c

67-72% low carbon:

	Carloads	Ton lots	Less ton
2% carb.	17.50c	18.25c	18.75c
1% carb.	18.50c	19.25c	19.75c
0.10% carb.	20.50c	21.25c	21.75c
0.20% carb.	19.50c	20.25c	20.75c

Spot ¼c higher

Ferromolybdenum, 55-65% molyb. cont., f.o.b. mill, lb. 0.95

Calcium molybdate, lb. molyb. cont., f.o.b. mill 0.80

Molybdenum Oxide, lb. Molyb. cont., 5-20-lb. containers, f. o. b., Washington, Pa., lb. 0.80

Ferrotitanium, 40-45%, lb., con. ti., f.o.b. Niagara Falls, ton lots $1.23; Do., less-ton lots 1.25; 20-25% carbon, 0.10 max., ton lots, lb. 1.35; Do., less-ton lots 1.40. Spot 5c higher

Ferrocolumbium, 50-60% contract, lb. con. col., f.o.b. Niagara Falls $2.25; Do., less-ton lots 2.30. Spot is 10c higher

Technical molybdenum trioxide, 53 to 60% molybdenum, lb. molyb. cont., f.o.b. mill 0.80

Ferro-carbon-titanium, 15-18%, ti., 6-8% carb., carlots, contr., net ton $142.50; Do., spot 145.00; Do., contract, ton lots 145.00; Do., spot, ton lots 150.00

15-18% ti., 3-5% carbon, carlots, contr., net ton 157.50; Do., spot 160.00; Do., contract, ton lots 160.00; Do., spot, ton lots 165.00

Alsifer, contract carlots, f.o.b. Niagara Falls, lb. 7.50c; Do., ton lots 8.00c; Do., less-ton lots 8.50c. Spot ½c lb. higher

Chromium Briquets, contract, freight allowed, lb. carlots, bulk 7.00c; Do., ton lots 7.50c; Do., less-ton lots 7.75c; Do., less 200 lbs. 8.00c. Spot ¼c lb. higher

Tungsten Metal Powder, according to grade, spot shipment, 200-lb. drum lots, lb. $2.50; Do., smaller lots 2.60

Vanadium Pentoxide, contract, lb. contained $1.10; Do., spot 1.15

Chromium Metal, 98% cr., contract, lb. con. chrome, ton lots 80.00c; Do., spot 85.00c

88% chrome, cont. tons 79.00c; Do., spot 84.00c

Silicon Metal, 1% iron, contract, carlots, 2 x ⅛-in., lb. 14.50c; Do., 2% 13.00c. Spot ¼c higher

Silicon Briquets, contract carloads, bulk, freight allowed, ton $74.50; Ton lots 84.50; Less-ton lots, lb. 4.00c; Less 200 lb. lots, lb. 4.25c. Spot ¼-cent higher

Manganese Briquets, contract carloads, bulk freight allowed, lb. 5.50c; Ton lots 6.00c; Less-ton lots 6.25c. Spot ¼c higher

Zirconium Alloy, 12-15%, contract, carloads, bulk, gross ton 102.50; Do., ton 108.00

35-40%, contract, carloads, lb., alloy 14.00c; Do., ton lots 15.00c; Do., less-ton lots 16.00c. Spot ¼c higher

Molybdenum Powder, 99%, f.o.b. York, Pa. 200-lb. kegs, lb. $2.60; Do., 100-200 lb. lots 2.75; Do., under 100-lb. lots 3.00

Molybdenum Oxide Briquets, 48-52% molybdenum, per pound contained, f.o.b. producers' plant 80.00c

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	7.16
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
Omaha	4.10	4.20	4.20	4.15	4.15	5.75	3.85	5.32	5.50	....	4.42	....	....
Cincinnati	3.60	3.67	3.67	3.65	3.68	5.28	3.42	4.00	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	....	....
Indianapolis	3.60	3.75	3.75	3.70	3.70	5.30	3.45	....	5.01	....	3.97	....	....
Memphis	3.90	4.10	4.10	3.95	3.95	5.71	3.85	....	5.25	....	4.31	....	....
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	....	6.90	....	....
Seattle	4.00	4.00	5.20	4.00	4.00	5.75	4.00	6.50	5.25	....	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	7.67	5.97	5.72	7.19
Cincinnati	3.65	7.69	5.99	5.74	7.84
Chicago	3.70	7.35	5.65	5.40	7.50
Twin Cities	3.95	7.70	6.00	6.09	8.19
Milwaukee	3.83	7.33	5.88	5.63	7.73
St. Louis	3.84	7.72	6.02	5.77	7.87
Seattle	5.85	....	8.00	7.85	8.65
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 1499 in Los Angeles; 300-4999 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; 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	£66.50	16	10	0
Merchant bars, small, under 3-inch, re-rolled	3.60c	20	0	0
Structural shapes	2.79c	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, 21 gage	4.61c	25	12	6
Tin plate, base box, 20 x 14, 108 pounds	$ 6.29	1	11	4

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	7.15	1	15	6
Billets, basic soft, 100-ton lots and over	49.37	12	5	0
Standard rails, 60 lbs. per yard, 500-ton lots & over	2.61c	14	10	6
Merchant bars, rounds and squares, under 3-inch	3.17c	17	12	0††
Shapes	2.77c	15	8	0††
Ship plates	2.91c	16	3	0††
Boiler plates	3.06c	17	0	6††
Sheets, black, 24 gage, 4-ton lots and over	4.10c	22	15	0
Sheets, galvanized 24 gage, corrugated, 4-ton lots & over	4.70c	26	2	6
Plain wire, mild drawn, catch weight coils, 2-ton lots and over	4.28c	23	15	0
Bands and strips, hot-rolled	3.30c	18	7	0

(a) del. Middlesbrough 5s rebate to approved customers. ††Rebate 15s on certain conditions.

Ores

Lake Superior Iron Ore

Gross ton, 51½%

Lower Lake Ports

Old range bessemer	$4.75
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	10.00

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.	$24.00-25.00
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, cif.	$43.00-46.00

Manganese Ore

Including war risk but not duty, cents per unit cargo lots.

Caucasian, 50-52%	....
So. African, 48%	70.00-72.00
Brazilian, 46%	69.00-71.00
Chilean, 47%	65.00-70.00
Cuban, 50-51%, duty free	....

Molybdenum

Sulphide conc., lb., Mo. cont., mines	$0.75

IRON AND STEEL SCRAP PRICES

Maximum Prices Announced June 18 by Office of Price Administration and Civilian Supply (Gross Tons)

	Pittsburgh, Weirton, Steubenville(a)	Youngstown, Canton, Sharon	Chicago, Kokomo	Bethlehem	*East. Pa.	Sparrows Pt.	Cleveland	Buffalo	South Ohio†
No. 1 heavy melting	$20.00	$20.00	$18.75	$18.25	$18.75	$18.75	$19.50	$19.25	$19.50
No. 1 hyd. comp. black sheets	20.00	20.00	18.75	18.25	18.75	18.75	19.50	19.25	19.50
No. 2 heavy melting	19.00	19.00	17.75	17.25	17.75	17.75	18.50	18.25	18.50
Dealer No. 1 bundles	19.00	19.00	17.75	17.25	17.75	17.75	18.50	18.25	18.50
Dealer No. 2 bundles	18.00	18.00	16.75	16.25	16.75	16.75	17.50	17.25	17.50
Mixed borings and turnings	15.25	15.25	14.00	13.50	14.00	14.00	14.75	14.50	14.75
Machine shop turnings	15.50	15.50	14.25	13.75	14.25	14.25	15.00	14.75	15.00
Shovel turnings	16.50	16.50	15.25	14.75	15.25	15.25	16.00	15.75	16.00
No. 1 busheling	19.50	19.50	18.25	17.75	18.25	18.25	19.00	18.75	19.00
No. 2 busheling	15.50	15.50	14.25	13.75	14.25	14.25	15.00	14.75	15.00
Cast iron borings	15.75	15.75	14.50	14.00	14.50	14.50	15.25	15.00	15.25
Uncut structurals and plate	19.00	19.00	17.75	17.25	17.75	17.75	18.50	18.25	18.50
No. 1 cupola	21.00	21.00	20.00	22.50	23.00	22.00	22.00	20.00	21.00
Heavy breakable cast	19.50	19.50	18.50	21.00	21.50	21.00	20.50	18.50	19.50
Stove plate	19.00	....	17.00	18.00	18.50	18.00	18.00	19.00	17.50
Low phos. billet, bloom crops	25.00	25.00	23.75	23.25	23.75	23.75	24.50	24.25	23.50
Low phos. bar crops and smaller	23.00	23.00	21.75	21.25	21.75	21.75	22.50	22.25	21.50
Low phos. punch., plate scrap	23.00	23.00	21.75	21.25	21.75	21.75	22.50	22.25	21.50
Machinery cast cupola size	22.00	22.00	21.00	23.50	24.00	23.50	23.00	21.00	22.00
No. 1 machine cast, drop broken, 150 pounds and under	22.50	22.50	21.50	24.00	24.50	24.00	23.50	21.50	22.50
Clean auto cast	22.50	22.50	21.50	24.00	24.50	24.00	23.50	21.50	22.50
Punchings and plate scrap‡‡	22.00	22.00	20.75	20.25	20.75	20.75	21.50	21.25	20.50
Punchings and plate scrap§§	21.00	21.00	19.75	19.25	19.75	19.75	20.50	20.25	19.50
Heavy axle and forge turnings	19.50	19.50	18.25	17.75	18.25	18.25	19.00	18.75	18.00
Medium heavy elec. furnace turnings	18.00	18.00	16.75	16.25	16.75	16.75	17.50	17.25	16.50

	St. Louis	Toledo, O.	Detroit	Duluth	Birmingham¶	Chattanooga	Radford, Va.	New England‡	Pacific Coast§
No. 1 heavy melting	$17.50	$....	$17.85	$18.00	$17.00	$	$	$16.50	$14.50
No. 1 hyd. comp. black sheets	17.50	....	17.85	18.00	17.00	....	....	....	14.50
No. 2 heavy melting	16.50	....	16.85	17.00	16.00	....	....	....	13.50
Dealer No. 1 bundles	16.50	....	16.85	17.00	16.00	....	....	....	13.50
Dealer No. 2 bundles	15.50	....	15.85	16.00	15.00	....	....	....	12.50
Mixed borings and turnings	12.75	....	13.10	....	12.25	....	....	....	9.75
Machine shop turnings	13.00	....	13.35	15.50	15.00	....	....	....	10.00
Shoveling turnings	14.00	....	14.35	16.50	....	....	....	....	11.00
No. 1 busheling	17.00	....	17.35	17.50	16.50	....	....	....	14.00
No. 2 busheling	13.00	....	13.35	13.50	12.50	....	....	....	10.00
Cast iron borings	13.25	....	13.60	13.75	12.75	....	....	....	10.25
Uncut structurals and plate	18.50	....	16.85	17.00	16.00	....	....	....	13.50
No. 1 cupola	20.00	....	20.35	18.00	20.00	20.50	21.00	22.00	18.00
Heavy breakable cast	18.50	....	18.85	16.50	18.50	....	....	20.50	17.00
Stove plate	17.00	15.60	14.10	....	17.00	17.50	18.00	14.00	14.00
Low phos. billet and bloom crops	22.50	....	22.85	23.00	22.00	....	....	....	....
Low phos. bar crops and smaller	20.50	....	20.85	21.00	20.00	....	....	....	....
Low phos. punch. and plate scrap**	20.50	....	20.85	21.00	20.00	....	....	....	....
Machinery cast cupola size††	21.00	....	21.35	19.00	21.00	21.50	22.00	23.00	19.00
No. 1 machine cast, drop broken, 150 pounds and under	21.50	....	21.85	19.50	21.50	22.00	22.50	23.50	19.50
Clean auto cast	21.50	....	21.85	19.50	21.50	22.00	22.50	23.50	19.50
Punchings and plate scrap‡‡	19.50	....	19.85	20.00	19.00	....	....	....	....
Punchings and plate scrap§§	18.50	....	18.85	19.00	18.00	....	....	....	....
Heavy axle and forge turnings	17.00	....	17.35	17.50	16.50	....	....	....	14.00
Medium heavy elec. furnace turnings	15.50	....	15.85	16.00	15.00	....	....	....	12.50

*Claymont, Del., Coatesville, Phoenixville, Harrisburg, Pa. †Portsmouth, Middletown, O., Ashland, Ky. ‡Worcester, Mass.; Bridgeport, Conn.; Phillipsdale, R. I. §Los Angeles, San Francisco, Seattle; ¶Prices are for scrap delivered to the Birmingham, Ala., consuming point, excepting scrap for Birmingham consumption originating west of the western boundary of Alabama. In the latter case the Birmingham, Ala., consumer may pay $1 more than the prices indicated under "Birmingham"; **¾-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.

Maximum Prices for Iron and Steel Scrap Originating from Railroads

	Pittsburgh, Wheeling, Steubenville	Youngstown, Canton, Sharon	Chicago, Kokomo	Bethlehem	*East. Pa.	Sparrows Pt.	Cleveland	Buffalo	South Ohio†
No. 1 Railroad grade heavy melting steel	$21.00	$21.00	$19.75	$....	$19.75	$19.75	$20.50	$20.25	$20.50
Scrap rails	22.00	22.00	20.75	....	20.75	20.75	21.50	21.25	21.50
Rerolling quality rails	23.50	23.50	22.25	....	22.25	22.25	23.00	22.75	23.00
Scrap rails 3 feet and under	24.00	24.00	22.75	....	22.75	22.75	23.50	23.25	23.50
Scrap rails 2 feet and under	24.25	24.25	23.00	....	23.00	23.00	23.75	23.50	23.75
Scrap rails 18 inches and under	24.50	24.50	23.25	....	23.25	23.25	24.00	23.75	24.00

	St. Louis	Kansas City	Detroit	Duluth	Birmingham	Minnequa, Colo.	Radford, Va.	New England‡	Pacific Coast§
No. 1 Railroad grade heavy melting steel	$18.50	$17.00	$18.85	$19.00	$18.00	$17.50	$....	$16.50	$15.50
Scrap rails	19.50	18.00	19.85	20.00	19.00	18.50	....	17.50	16.50
Rerolling quality rails	21.00	19.50	21.35	21.50	20.50	20.00	....	19.00	18.00
Scrap rails 3 feet and under	21.50	20.00	21.85	22.00	21.00	20.50	....	19.50	18.50
Scrap rails 2 feet and under	21.75	20.25	22.10	22.25	21.25	20.75	....	19.75	18.75
Scrap rails 18 inches and under	22.00	20.50	22.35	22.50	21.50	21.00	....	20.25	19.00

*Philadelphia, Wilmington, Del., Claymont, Del., Coatesville, Phoenixville, Harrisburg, Pa.; †Portsmouth, Middletown, O., Ashland, Ky. ‡Worcester, Mass.; Bridgeport, Conn.; Phillipsdale, R. I. §Los Angeles, San Francisco, Seattle. (a) also Johnstown, Pa., Warren, O.

NOTE: Where the railroad maker of scrap operates in two or more of the consuming points named above, the highest of the maximum prices set out above for such consuming points shall be the maximum price at consumer's plant at any point on the railroad's line, except that switching charges of 84 cents per gross ton shall be subtracted from the maximum price of scrap originating from railroads operating in Chicago and sold for consumption outside Chicago.

Scrap delivered to a consumer's plant located off the line of the railroad from which the scrap originated, the maximum price is either of the following, whichever is greater: The maximum price for scrap delivered to a consumer on the line of the railroad from which the scrap originated, or, if the consumer can establish that he has been served by the same source of scrap in the past, this maximum price plus transportation charges, (including off-the-line switching charges), from the railroad's line to the consumer's plant, of not more than two dollars per gross ton for rails for rerolling, scrap axles and other scrap for rerolling, and of not more than one dollar per gross ton for all other grades of scrap; or the prices set forth above, for the basing point nearest the consumer's plant.

Sheets, Strip

Sheet & Strip Prices, Page 92, 93

Conversion of continuous sheet mills to production of plates promises to decrease sheet production, but proposed cut of automobile production to half that of the present season will offset this to some extent.

A tendency is noted for sheet specifications to call for more of the heavier gages than normal, due to the nature of defense needs. This has caused a shifting of schedules to meet the altered demand.

Sheet producers have practically nothing to offer for delivery the remainder of this year and orders accepted for 1942 delivery are not given promise of delivery. Much tonnage scheduled for this year will be deferred to next year by pressure of priority material, which is increasing. One interest reports that all its sheet sales the past week have been accompanied by priority certificates.

Stovemakers are seeking better consideration of their orders on the plea that heating stoves will be needed for winter in cantonments and material for accumulating a stock of stoves is being sought.

Stocks of miscellaneous steel for original account of European countries now under German control are being sold for domestic use and some for export. Within the past few days one lot of 54 cars of sheets, about 2000 tons, has been sold abroad and another lot of 1000 tons of wire.

Plates

Plate Prices, Page 92

Steel producers are confronted by increasing demand for plates and other forms of steel for car building, priorities for which will be in effect soon. Shipbuilding needs are important and specifications are being filed continuously as construction proceeds, the aggregate being large, with additional construction planned.

Civilian needs are being pushed further into the future. Some measure of relief may result from increased plate production on sheet mills, changes to bring this about being in the making.

An important platemaker in the Pittsburgh district indicates that there is little possibility of any plate shipments in last half unless the order carries priority. This condition appears to be general. Some plate consumers find it difficult to obtain their needs even with priorities. Railroad car builders will be in better position, with preferential treatment.

Builders of marine equipment for naval and merchant ships, including turbines, forced draft blowers and other devices, will be in better position as to steel supplies now that they have been given high priority. Previously they have not been well served, causing some delay in ship work.

Broadly speaking most plate ton-

nage now being delivered is for direct or indirect defense work, including airfield fueling systems, hundreds of which are being fabricated. These tanks are of 25,000 gallons capacity, welded, of ⅜-inch plates and some fields require as many as 40 tanks.

Barge builders are asking plate priorities on the ground that barges are as important as freight cars. Inquiry for oil barges is active, to replace oil-carrying capacity lost in withdrawal of ocean tankers. Barge builders believe considerable help would be supplied by oil barges carrying cargo from the Gulf to Pittsburgh and other river points, if it were possible to obtain steel to construct them. One builder in the Pittsburgh district has been launching 18 barges per month and others are working at top speed, subject to delays in receiving steel plates. Deliveries of this material are far behind promises.

A lot consisting of 6000 tons of plates and shapes for shipbuilding, aboard a sabotaged Italian vessel recently taken into custody by the United States government, is being offered for sale by an Italian agent. The attitude of this government on such a sale has not been announced.

PLATE CONTRACTS PLACED

125 tons, 250,000-gallon tank and tower, for army, at Ogden, Utah, to Pittsburgh-Des Moines Steel Co., Pittsburgh.

PLATE CONTRACTS PENDING

5000 tons, estimates, seventy 500-ton lighters and group of car floats, bureau of supplies and accounts, navy department, delivery Brooklyn, Norfolk, Va., and Mare Island, Calif., mostly Brooklyn; bids in.

175 tons, 500,000-gallon elevated water tank, Fort Logan, Colo.; bids June 23, U. S. engineer, Omaha, Nebr., inv. 23.

165 tons, fabricated high-strength, low-alloy steel plates and structural steel cap plates, Panama, sch. 5208; bids June 26, Washington.

100 tons, floor plates, bureau of supplies and accounts, navy, sch. 7395, delivery, Oakland, Calif., bids July 1; also 125 tons, bar rivet steel, sch. 7388, delivery same point, bids July 3.

Bars

Bar Prices, Page 92

Demand for steel bars is heavy, fairly evenly divided between carbon and alloy grades. Consumers are more interested in obtaining delivery than in placing new orders. Many makers are refusing tonnage for 1942 delivery as defense priorities are steadily pushing civilian tonnage further into the future. A substantial tonnage now on books for nondefense work will be deferred to next year.

Producers of alloy bars are hard pressed to meet specifications for defense needs. Makers of small tools seek heavier volume of bars, much commanding indirect priority rating. Forging shops consume a substantial tonnage, with finished forgings delivery somewhat more extended. Warehouses and secondary distributors of special tool steels are squeezed for material, though the latter are meeting machine tool needs.

Nickel steel bars for forged alloy chains for Boston navy yard went at 5.06c per pound, delivered, only two mills quoting on the entire lot of 703 tons. Marine demand, including ship construction, is among the heaviest users in New England, small arms and forging specifications also heavy.

Picatinny, N. J., arsenal closes June 25 on 250 tons of chromium-molybdenum steel bars under pro. 2538 and Frankford, Pa., arsenal on 465 tons of cold-drawn under pro. 2001.

Pipe

Pipe Prices, Page 93

Black and galvanized merchant pipe is unusually active for this season, defense construction and housing being a major factor and shipbuilding also taking considerable tonnage. Lack of brass pipe is turning some business to steel pipe for residential use. Deliveries have tightened in recent weeks, compared with four to five-week deliveries possible in first quarter. Distributors have anticipated needs to a degree that many inquiries are filled promptly from stock in small lots, at firm prices. Alloy tubing is active and deliveries are well extended.

Line pipe orders are difficult to place, because of heavy backlogs and probability that long lines taking priority will be allocated soon. Some lines now planned probably will be abandoned because of difficulty of providing steel. It is expected the

most needed lines may be placed within the next 30 to 60 days, with priority for immediate production. Seamless pipe may be relied on for much of this pipe, to relieve pressure on plate production.

Municipal specifications for cast iron pipe are lagging behind recent years but defense projects, notably airfields, are supplying large spot orders. Steady releases in small lots against blanket orders serve to sustain production.

Considerable cast iron pipe is being awarded on a delivery basis, for delivery at Atlantic bases, about 1400 tons for Newfoundland being placed recently on promise of shipment in 30 days.

CAST PIPE PLACED

3275 tons, 12 and 16-inch, Los Angeles; 1400 tons to United States Pipe & Foundry Co., Burlington, N. J., 950 tons to National Cast Iron Pipe Co., Birmingham, Ala., and 925 tons to American Cast Iron Pipe Co., Birmingham, Ala.

420 tons, 6 to 12-inch, Portland, Oreg., to United States Pipe & Foundry Co., Birmingham, Ala.

250 tons, various sizes, Panama, sch. 5168, class 3, to American Cast Iron Pipe Co., Birmingham, $15,256.

100 tons, 4 and 6-inch, district No. 3, King county, Washington, to United States Pipe & Foundry Co., Burlington, N. J.

CAST PIPE PENDING

550 tons, 8 and 16-inch, Avalon Way improvement, Seattle; bids June 26.

540 tons, 12 and 16-inch, cement-lined, Panama sch. 5225; bids June 24, Washington.

325 tons, Sand Point Way and Eighth avenue N. W. project, Seattle; bids June 19.

275 tons, 14, 16 and 18-inch, Puyallup, Wash.; bids June 18.

Wire

Wire Prices, Page 93

Wire mills are operating at capacity but offered business continues heavier than shipments, most lines being sold for the remainder of the year by many producers. The automobile industry continues to press for deliveries against orders despite efforts of mills to reduce such specifications.

Specialties for defense are in active demand and orders for spring wire are increasing. Most of this business takes high priority, but requires long processing. In an effort to maintain balance in production schedules many wire mills are operating processing departments, heat treating, annealing and other finishing units on a seven-day basis. Processing, coupled with limited supplies of semifinished steel, approaches a choke point on some products. A New England mill usually producing all its own rods now is seeking deliveries from other suppliers.

Buying of nonclimable fence to enclose plants is heavy. This class of fence has been installed to the extent of more than 700 miles. Additional needs are heavy, much of which will be placed this month. One inquiry is for 51,000 feet of eight-foot fence for Aberdeen Proving Ground, Maryland. Most of the fence is seven feet high with

three strands of barbed wire at top. A considerable proportion is ten feet high. Mills producing this material are operating 24 hours a day.

Rails, Cars

Track Material Prices, Page 93

Close to 75,000 tons of rolled steel will be required for equipment to be built by the Pennsylvania railroad in its own shops. This includes 6020 freight cars, 50 cabin cars, 15 electric locomotives and 12 steam locomotive tenders. The new rolling stock, it was announced, is to provide for increasing needs in 1942 and is in addition to 7245 freight cars placed with its shops last summer and early this year.

Chicago, Burlington & Quincy has awarded 4425 cars to its own shops for 1942 construction, 3295 for its own use and the remainder for two subsidiaries.

Pennsylvania railroad has closed on 150,000 tons of rail, 75,000 to Carnegie-Illinois Steel Corp., Pittsburgh, 66,000 to Bethlehem Steel Co., Bethlehem, Pa., and 9000 to Inland Steel Co., Chicago. The rail is for laying in 1942 and marks the largest purchase of rail by the Pennsylvania since 1931. It doubles the amount scheduled for laying this year and also that laid in 1940. The purchase includes 152-pound rail as well as standard main line 131-pound rail.

In June 26,025 cars have been placed, 12,995 with railroad shops, this total exceeding any monthly record in recent years and brings the total so far this year to 88,051 cars.

CAR ORDERS PLACED

Atlantic Coast Line, 16 streamlined cars, to Edward G. Budd Mfg. Co., Philadelphia, including one dining-lounge car, two dining cars, two tavern cars, three coach-baggage-dormitory cars and eight coaches.

Chesapeake & Ohio, 1000 fifty-ton hoppers to American Car & Foundry Co., New York; 1000 fifty-ton box cars to Pullman-Standard Car Mfg. Co., Chicago.

Chicago, Burlington & Quincy, 4425 freight cars, to own shops, for construction in 1942; 3295 will be for its own operation and will include 2000 fifty-ton steel sheathed box cars, 300 fifty-ton flat cars, 250 fifty-ton hoppers, 200 forty-ton stock cars, 70 mill-type gondolas, 250 seventy-ton hoppers, 50 seventy-ton covered hoppers and 175 automobile cars with loading devices; 650 cars will be built for its subsidiary line, the Colorado & Southern, and will comprise 500 fifty-ton steel sheathed box cars, 100 flat cars and 30 mill-type gondolas; and 500 fifty-ton steel sheathed box cars will be for the Ft. Worth & Denver City, another subsidiary.

Chicago, Indianapolis & Louisville, seven baggage cars, to St. Louis Car Co., St. Louis.

Indiana Harbor Belt Line, 1000 fifty-ton box cars and 500 gondolas, to Despatch Shops Inc., Rochester, N. Y.

Midland Valley, five 50-ton box cars, to Mt. Vernon Car Mfg. Co., Mt. Vernon, Ill.

Pennsylvania railroad, 6020 freight cars and 50 cabin cars, to its own shops; the freight cars include 2700 fifty-five-ton hoppers, 2000 fifty-ton box, 1000 seventy-ton gondolas, 300 seventy-ton hoppers, ten 125-ton heavy-duty flats and ten 125-ton heavy-duty well cars.

Western Pacific, four chair cars, to Edward G. Budd Mfg. Co., Philadelphia.

Wabash, 1000 box cars, to own shops; an additional 25 hopper cars will be purchased.

CAR ORDERS PENDING

Akron, Canton & Youngstown, 30 seventy-ton gondolas; contemplated.

Chicago, Rock Island & Pacific, 800 box, 200 gondolas; court authority granted.

Chicago, St. Paul, Minneapolis & Omaha, 1000 fifty-ton box cars and 250 fifty-ton gondolas; contemplated.

Central of New Jersey, 500 to 1000 seventy-ton gondolas; bids asked.

Delaware Lackawanna & Western, 750 fifty-ton box cars; bids asked.

LOCOMOTIVES PLACED

Alabama, Tennessee & Northern, one light switch engine, to General Electric Co., Schenectady, N. Y.

Atlantic Coast Line, nine 2000-horsepower diesel-electric, to Electro Motive Corp., La Grange, Ill.

Canadian National, 25 4-8-4 type locomotives, to Montreal Locomotive Works, Montreal; and 20 1000-horsepower Diesel-electric locomotives, with 15 going to the Electro-Motive Corp., La Grange, Ill., and five to the American Locomotive Co., New York.

Nashville, Chattanooga & St. Louis, ten 4-8-4 steam locomotives to American Locomotive Co., New York.

New York Central, seven 350-horsepower Diesel-electric locomotives, to General Electric Co., Schenectady, N. Y.; these are in addition to the eight 600-horsepower units reported in a recent issue

as having been awarded; seven to Electro-Motive Corp., La Grange, Ill., and one to Baldwin Locomotive Works, Eddystone, Pa.

New York, Chicago & St. Louis, 15 2-8-2 type freight engines, with 22,000-gallon tenders, to Lima Locomotive Works, Lima, O.

Pennsylvania, 15 electric locomotives for either freight or passenger service, and twelve 21,000-gallon tenders, to own shops; electrical equipment to be purchased.

War department, one 45-ton and four 60-ton Diesel-electric switch engines, to General Electric Co., Schenectady, N. Y.

Western Pacific, three 5400-horsepower diesel-electric to Electro Motive Corp., La Grange, Ill.

LOCOMOTIVES PENDING

Army Ordnance department, Jefferson Proving Ground, Madison, Ind., two 70-ton Diesel-electric locomotives, bids close July 18.

Navy bureau of supplies and accounts, two diesel-electric locomotives and spare parts, delivery f.a.s. New York; bids June 24, sch. 7477, Washington.

Puget Sound Navy Yard, Wash., 45-ton diesel-electric; Vulcan Iron Works, Wilkes-Barre, Pa., low $28,400, delivery 145 days.

Wabash, two 660-horsepower diesel locomotives; court authority granted.

RAIL ORDERS PLACED

Pennsylvania, 150,000 tons; 75,000 tons to Carnegie-Illinois Steel Corp., Pittsburgh, 66,000 tons to Bethlehem Steel Co., Bethlehem, Pa., 9000 tons to Inland Steel Co., Chicago.

RAIL ORDERS PENDING

Chicago, Rock Island & Pacific, 35,000 tons rails, plus accessories; court authority granted.

BUSES BOOKED

Twin Coach Co., Kent, O.; Twenty-two 29 passenger for Milwaukee Electric Railway & Transport Co., Milwaukee; eleven 27-passenger for Carolina Light & Power Co., Raleigh, N. C.; ten 41-passenger for Railway Equipment & Realty Co., Oakland, Calif.; ten 31-passenger for Winnipeg Electric Co., Winnipeg, Man.; eight 31-passenger for Motor Transit Co., Jacksonville, Fla.; six 31-passenger for Galveston Electric Co., Galveston, Tex.; five 27-passenger for Georgia Power Co., Atlanta, Ga.; four 27-passenger for Springfield Transportation Co., Springfield, Ill.; four 33-passenger for Bluebird System Inc., Chicago; two buses, 29 and 31-passenger, for White Transit Co., Wilkes-Barre, Pa.; two 32-passenger for Buffalo Transit Co., Buffalo; two 31-passenger for Savannah Electric & Power Co., Savannah Ga.; two 42-passenger for Youngstown Municipal Railway Co., Youngstown, O.

Tin Plate

Tin Plate Prices, Page 92

Tin mill operation is estimated at 94 per cent, a gain of 2 points, representing virtual capacity. Carnegie-Illinois Steel Corp. has started production on its new five-stand cold mill at Irvin works, doubling capacity for cold-reduced black plate, already the largest in this district. Part of the output will be cold-rolled sheets.

Tin plate for Great Britain is not being taken by mills as rapidly as desired and allocation and priority may be resorted to in the effort to meet British needs. Mills have heavy backlogs for early delivery without the British tonnage.

Structural Shapes

Structural Shape Prices, Page 92

A large completely-integrated steelmaker requires showing of priority certificates, or photostatic copies, before the fabricating subsidiary can get a pound of plain material, which marks another step in the tightening of supply for civilian jobs. However several state highway jobs have been let, particularly for Pennsylvania, Ohio and Iowa.

In northern Ohio several manufacturers on defense work are going through another wave of expanding plants, many having been expanded several times previously. Chicago reports fabricators have enough orders to insure capacity operations for three months. Pittsburgh reports that state, municipal and commercial structural jobs are being sidetracked in most cases. There plant expansion, subcontract work for shipyards and in some cases direct defense contracts have filled up available fabricating capacity.

SHAPE CONTRACTS PLACED

15,000 tons, piling, two drydocks, navy yard, Brooklyn, N. Y., divided between Bethlehem Steel Co., Bethlehem, Pa. and Carnegie-Illinois Steel Corp., Pittsburgh, through Drydocks Inc.

4000 tons, U. S. naval ordnance plant, Lukas-Harold Corp., Indianapolis, to Fort Pitt Bridge Works, Pittsburgh.

3375 tons, including 2975 tons, 10 air corps hangars, Aviation Mechanics' school, Wichita Falls, Tex., to Mosher Steel Co., Dallas, Tex., $313,655, delivered; 400 tons, door assemblies, to Capital Steel & Iron Co., Oklahoma City, Oklahoma, $97,510, delivered; bids June 6, inv. 64, U. S. engineer, Denison, Tex.

1500 tons, two warehouses, quartermaster depot, Jeffersonville, Ind., to International Steel Co., Evansville, Ind. through Pearson Construction Co., Benton Harbor, Mich.

1100 tons, east and west transit sheds, naval depot, Bayonne, N. J., to Harris Structural Steel Co., New York; Wigton-Abbott and Mahoney & Troast Co., New York and Passaic, N. J., joint contractors.

1000 tons, machine shop, Falk Corp., Milwaukee, to Worden-Allen Co., Milwaukee.

825 tons, contract 57, subway approach, Lincoln tunnel, New York, to American Bridge Co., Pittsburgh, through George J. Atwell Co., New York.

820 tons, addition, existing transit shed, naval depot, Bayonne, N. J., to Savary & Glaeser Co., Dunnellen, N. J.; Wigton-Abbott and Mahoney & Troast Co., New York and Passaic N. J., joint contractors.

800 tons, reconstruction bridges AO-1 and H-25, Melrose avenue, New York, for city, to American Bridge Co., Pittsburgh.

600 tons, power house, Rochester Gas & Electric Co., Rochester, N. Y., to American Bridge Co., Pittsburgh.

600 tons, Cedar river highway bridge, Mt. Vernon, Linn county, Iowa, for state, to Clinton Bridge Works, Clinton, Iowa; A. Olsen Construction Co., Waterloo, Iowa, contractor; bids June 10.

550 tons, plant addition, National Carbide Co., Louisville, Ky., to Bethlehem Steel Co., Bethlehem, Pa.

540 tons, Western high school, Lansing, Mich., to American Bridge Co., Pittsburgh.

500 tons, store, Broad and Market streets, Philadelphia, to Lehigh Structural Steel Co., Allentown, Pa.

500 tons, steel piling, flood control project, U. S. engineer, Elmira, N. Y., to Bethlehem Steel Co., Bethlehem, Pa.; Binghamton Construction Co., Binghamton, N. Y., contractor.

400 tons, electric furnace building extension, Canton, O., Republic Steel Corp., to Fort Pitt Bridge Works, Pittsburgh.

400 tons, state bridges, Arapahoe, Furnas county, Neb. to St. Joseph Structural Steel Co., St. Joseph, Mo.; Bushman Construction Co., St. Joseph, Mo., contractor.

350 tons, department store addition, B. Forman Co., Rochester, N. Y., to American Bridge Co., Pittsburgh.

300 tons, building, Dime Savings bank, Brooklyn, N. Y., to Weatherly Steel Co., Weatherly, Pa.

280 tons, hangar, military airport, Phoenix, Ariz., to Consolidated Steel Corp., Los Angeles.

280 tons, hangar, military airport, Las Vegas, Nev., to Consolidated Steel Corp., Los Angeles.

250 tons, office building, Homestake Mining Co., Lead, S. Dak., to Worden-Allen Co., Milwaukee.

SHAPE AWARDS COMPARED

	Tons
Week ended June 21	37,195
Week ended June 14	11,926
Week ended June 7	21,577
This week, 1940	13,835
Weekly average, 1941	32,015
Weekly average, 1940	28,414
Weekly average, May, 1941	29,872
Total to date, 1940	452,295
Total to date, 1941	800,382

Includes awards of 100 tons or more.

250 tons, warehouse, Camp Dodge, Iowa, for government, to Des Moines Steel Co., Des Moines, Iowa.

245 tons, viaduct, FAGM-183-3-3, Elkhorn, Douglas county, Nebraska, for state, to Omaha Steel Works, Omaha, Neb.

243 tons, viaduct, FAP185, Draper, Jones and Lyman counties, South Dakota, for state, to Bethlehem Steel Co., Bethlehem, Pa.

240 tons, blooming mill extension, S. Chicago, Ill., Republic Steel Corp., to Joseph T. Ryerson & Son Inc., Chicago.

200 tons, overpass, Pennsylvania railroad, Landover, Md., for state, to American Bridge Co., Pittsburgh.

200 tons, shop and crane runway, General Drop Forge Co., Buffalo, to R. S. McMannus Steel Construction Co., Buffalo.

192 tons, ore dock spouts, dock No. 4, Allouez, Wis., for Great Northern railway, to American Bridge Co., Pittsburgh.

160 tons, Second avenue retail market building, New York, to Dreier Structural Steel Co. Inc., New York, through Gotham Construction Co., New York.

150 tons, extension to building 431, Bremerton, Wash., for navy, to American Bridge Co., Pittsburgh.

144 tons, state bridge, FAS-521, Long Point, Tama county, Iowa, to Des Moines Steel Co., Des Moines, Iowa.

129 tons, highway bridge, FAGH-185, Draper, Jones county, South Dakota, to Hassenstein Steel Co., Sioux Falls, S. Dak.

125 tons, addition, Canister Co., Phillipsburg, N. J., to Easton Steel Structures Inc., Easton, Pa.; Collins & Maxwell Inc., Easton, contractor.

120 tons, Putnam county, Ohio, bridge, to Fort Pitt Bridge Works, Pittsburgh.

120 tons, Overpass FAGM-48-A (1), Chicago, Burlington & Quincy railroad, Denver, Colo., for state, to American Bridge Co., Pittsburgh.

107 tons, state bridge, FSN-502, Hudson, Blackhawk county, Iowa, to Clinton Bridge Works, Clinton, Iowa; A. Olsen Construction Co., Waterloo, Iowa, contractor; bids June 10.

100 tons, gymnasium, University of Nevada, Reno, Nev., to Schrader Iron Works, San Francisco.

100 tons, power station, du Pont de Nemours Co., Niagara Falls, N. Y., to Ernst Iron Works, Buffalo.

100 tons, bridge, New Haven railroad, Granby, Conn., to American Bridge Co., Pittsburgh, through George F. Collins Co., New York.

100 tons, warehouse, Watervliet arsenal, New York, to Utica Structural Steel Co., Utica, N. Y.; M. Shaperio & Sons, New York, contractor.

100 tons, plant addition, Otis Elevator Co., Buffalo, to Bethlehem Steel Co., Buffalo, through Everett Construction Co., same city.

100 tons, shapes and bars, bridge and approaches, Stowe, Vt., to Vermont Structural Steel Corp., Burlington, Vt.; T. J. Harvey & Son, Adam, Mass., contractor.

100 tons, extension to plant, Addressograph-Multigraph Corp., Cleveland, to Pittsburgh Bridge & Iron Co., Pittsburgh.

SHAPE CONTRACTS PENDING

4000 tons, warehouse, Rock Island arsenal, Rock Island, Ill., for government, Permanent Construction Co., Chicago, contractor; bids June 14.

2000 tons, power station, Edison Electric Illuminating Co., Everett, Mass., to American Bridge Co., Pittsburgh; Thomas O'Connor & Co. Cambridge, Mass., contractor.

1800 tons, construction trestle, Wolf Creek dam, Burnside, Ky., for government.

1700 tons, foundry building, navy yard, Brooklyn, N. Y.; bids in, Thompson-Starrett Co., New York, contractor.

1500 tons, tin smelting plant, Texas City, Tex., for government.

1140 tons, highway bridges, state of Kansas; low bidders as follows: Maxwell Construction Co., Columbus, Kans., 324 tons; Carrothers & Crouch, Kansas City, Mo., 294 tons; C. E. Gray, Emporia, Kans., 150 tons; Rhodes Construction Co., Newton, Kans., 150 tons; Banta Construction Co., Harper, Kans., 137 tons, and Harry Taylor, Salina, Kans., 100 tons.

1000 tons, plant addition, Linde Air Products Co., Buffalo, John W. Cowper Co., Buffalo, contractor; tonnage increased as job was expanded.

850 tons, outfitting shop, New York Shipbuilding Corp., Camden, N. J.; bids June 26.

850 tons, airplane repair dock, Middletown, Pa.; bids June 23, U. S. engineer, Baltimore.

800 tons, plaza, Lincoln tunnel, New York; P. J. Carlin Construction Co., New York, low.

660 tons, three buildings, Frankford arsenal, Philadelphia; bids June 23.

650 tons, Florin overpass, E. Donegal township, Pennsylvania, for state.

640 tons, Mill creek pump station, Cincinnati, for army engineers.

625 tons, buildings, Picatinny arsenal, Dover, N. J., for army.

615 tons, ventilation building, contract MHT-57, New York, for Port of New York authority.

550 tons, engine repair shop, Middletown, Pa.; bids in.

525 tons, sub-assembly shop addition, Norfolk, Va., for navy.

500 tons, warehouse and shed, Watertown, Mass., arsenal.

500 tons, 850 transmission towers, Coulee-Covington line; new bids to Bonneville Project, June 20; Spec. 1932.

500 tons, New York ventilation building, north tube, Lincoln tunnel, contract MHT-57; bids July 1, Port of New York Authority.

500 tons, bridge over Illinois river, FA 172, section 15, E and F, Peoria, Ill., for state highway commission, American Bridge Co., Pittsburgh, low on fabrication; Strobel Construction Co., Chicago, low on erection; bids June 13.

430 tons, six magazine buildings, Westland, Oreg., for army.

400 tons, general storehouse and supply pier, Puget Sound navy yard; bids to Com. R. E. Thomas, June 26.

375 tons, national guard hangar, Beltsville, Md., for District of Columbia.

350 tons, store addition, B. Forman Co., Rochester, N. Y., to American Bridge Co., Pittsburgh.

325 tons, crane building, Oldsmobile division, General Motors Corp., Lansing, Mich.

300 tons, building, Phelps Dodge Corp., Laurel Hill, Long Island.

280 tons, hangar, Mather Field, Sacramento, Calif.; bids opened.

280 tons, hangar, Fresno, Calif., air base; bids opened.

275 tons, building, B. Phillespone Co., Passaic, N. J.

270 tons, state bridge, route FA-12, section 56-2-VF, Stubblefield, Bond county, Illinois; Bethlehem Steel Co., Bethlehem, Pa., low; bids June 13.

200 tons, ordnance building, Fort Lewis, Wash.; bids June 18.

200 tons, bridge, Peterboro, N. H., to American Bridge Co., Pittsburgh.

200 tons, building, Republic Aviation Corp., Farmingdale, N. Y.

200 tons, library, University of Maine, Orono, Me., to Lyons Iron Works Inc., Manchester, N. H.

200 tons, crane runway and shop building, General Drop Forge Co., Buffalo, to R. S. McMannus Structural Steel Co., Buffalo.

180 tons, housing project, Providence, R. I.

175 tons, state bridges, route FA-155, section 1-XF, Haypress, Ill.

160 tons, state highway bridges LR-585, Derry township, Pennsylvania.

158 tons, state bridges, route FA-155, section 1-XF, Haypress, Green county, Illinois; Illinois Steel Bridge Co., Jacksonville, Ill., low; bids June 13.

150 tons, state bridge FAGS-SH-41-1, Schenectady, N. Y.

130 tons, bridge 10.62, West Waterford, N. Y., Delaware & Hudson railroad.

130 tons, factory building, Firestone Tire & Rubber Co., Akron, O.; bids June 20.

120 tons, addition to open hearth building, American Locomotive Co., Latrobe, Pa.

110 tons, girder beams, Baldwin Locomotive Works, Eddystone, Pa.

100 tons, steel roof framing, Shasta power plant, Coram, Calif.; bids June 26.

100 tons, also 40 tons reinforcing, overpass, route 1, Fairview, N. J.; J. P. Burns, Dumont, N. J., low.

100 tons, also 35 tons reinforcing, Racoon Creek, Swedesboro, N. J.; Edward H. Ellis Inc., Westville, N. J., low.

100 tons, Kinsman Road bridge, Cleveland; 72 tons structurals and remainder reinforcing bars; bids June 19.

100 tons, shapes and bars, highway project, including two-span wide flanged bridge, Salisbury, Vt.; bids June 27, Montpelier.

Unstated tonnage, 22 buildings, Ft. Belvoir, Va.; contractors' bids June 26.

Unstated, tunnel supports for Coulee dam; Commercial Shearing & Stamping Co., Youngstown, O., contractor.

Unstated, but large, tonnage, factory No. 15, Warner & Swasey Co., Cleveland; bids June 20.

Unstated, plant addition, Buffalo Arms Corporation, Cheektowago, N. Y., contract received from government of $10,870,000 for additional plant, machinery and equipment.

Reinforcing Bars

Reinforcing Bar Prices, Page 93

Several producers and sellers who previously kept close records of pending and placed concrete bar jobs, have ceased listing them because of inability to fill orders. Mills and suppliers bid only on the choice jobs, with the result that the tough engineering jobs go begging. Both billet steel bars and rail bars are scarce. Little is available at under 10 weeks and it is difficult to obtain definite promises for shipment beyond that.

REINFORCING STEEL AWARDS

5000 tons, naval bases, Alaska, to Bethlehem Steel Co., Seattle; Siems-Drake-Puget Sound, Seattle, contractors.

1500 tons, partial requirements, dry dock, Bayonne, N. J., to Bethlehem Steel Co., Bethlehem, Pa., George H. Flinn Corp. and associated companies, New York, contractors.

1000 tons, Panama, sch. 5168, class 1, to

Bethlehem Steel Export Corp., New York, $53,850.

1000 tons, acid plant, Monsanto Chemical Co., Alton, Ill., to Missouri Rolling Mill Corp., St. Louis; Esslinger-Misch, contractors.

1000 tons, dry dock, Portsmouth, Va., to Jones & Laughlin Steel Corp., Pittsburgh; Dry Dock Associates Inc., New York, contractors.

1000 tons, 13 ways and shipbuilding facilities, Baltimore, to Bethlehem Steel Co., Bethlehem, Pa.; Booth & Flinn, Pittsburgh, contractors.

770 tons, flood protection, sect. 5, Johnstown, Pa., to Bethlehem Steel Co., Bethlehem, Pa.; S. J. Groves & Sons Co., contractor.

400 tons, Des Moines Elevator Co., Des Moines, Iowa, to Sheffield Steel Corp., Kansas City, Mo.; Jones-Hettelsater Co., contractor.

360 tons, substructure, Canal street bridge, Chicago, to Bethlehem Steel Co., Bethlehem, Pa.; Midwest Construction Co., contractor.

300 tons, municipal sewage work, Philadelphia, to Taylor-Davis Inc.

280 tons, fuel pier, Craney Island, naval operating base, Norfolk, Va. to Bethlehem Steel Co., Bethlehem, Pa.; McLean Contracting Co.

270 tons, Dauphin county court house, Harrisburg, Pa., to Bethlehem Steel Co., Bethlehem, Pa.; William A. Berbusse Co., New York, contractor.

200 tons, naval base administration building, Norfolk, Va., to Truscon Steel Co., Youngstown, O.; Doyle & Russell, contractors.

200 tons, flood control project, U. S. engineer, Elmira, N. Y., to Joseph T. Ryerson & Son Inc., New York; Binghamton Construction Co., Binghamton, N. Y., contractor.

178 tons, housing project, Quincy, Ill., for government, to Ceco Steel Products Corp., Chicago; J. R. Barnes, Logansport, Ind., contractor; bids May 22.

175 tons, two warehouses, quartermaster depot, Jeffersonville, Ind., to Ceco Steel Products Co., Chicago, through Pearson Construction Co., Benton Harbor, Mich.

150 tons, grain elevator, Superior, Wis., to Paper-Colmenson Co., St. Paul.

150 tons, Allis Chalmers addition, Milwaukee, to Joseph T. Ryerson & Son Inc., Chicago; Siesel & Co., contractors.

150 tons, exchange building, New England Telephone & Telegraph Co., Fitchburg, Mass., to Truscon Steel Co., South Boston; H. P. Cummings Construction Co., Ware, Mass., contractor.

150 tons, renovation plant and boiler house, general depot, Columbus, O., to Hausman Steel Co., Columbus; Trapp-Carroll Co., Columbus, contractor; Bethlehem Steel Co., Bethlehem, Pa., to furnish bars.

145 tons, highway bridge, state of Arkansas, to Laclede Steel Co., St. Louis, through S. N. Dickson, Warren, Ark., contractor.

125 tons, grade elimination, Pennsylvania railroad, Landover, Md., to Bethlehem Steel Co., Bethlehem, Pa.; Potts & Callahan, contractors.

112 tons, inquiry R-2649, State Procurement office, Tulsa, Okla., to J. B. Klein Iron & Foundry Co., Oklahoma City, Okla.

100 tons, tape plant; Minnesota Mining Co., St. Paul, to Paper-Colmenson Co., St. Paul.

100 tons, church, Portland, Me., to Concrete Steel Co., Boston; F. W. Cunningham Co., Portland, contractor.

100 tons, paving, Rock Island arsenal, Rock Island, Ill., to Bethlehem Steel Co., Bethlehem, Pa.; Central Engineering Co., contractor.

REINFORCING STEEL PENDING

5000 tons, ammunition plants, divided equally between Kingsbury, Ind. and Burlington, Iowa.

1700 tons, warehouse and storage shed, Watertown, Mass., arsenal; bids in June 19.

1500 tons, inert storage units, Western Cartridge Co., Weldon Springs, Mo.; Fraser Brace Engineering Co., contractor; bids June 19.

1500 tons, additional requirements, naval depot buildings, Bayonne, N. J.; Wigton-Abbott Co. and Mahony-Toast Co., New York, and Paterson, N. J., joint contractors.

1400 tons, Wolfe Creek dam, Jamestown, Ky.

1000 tons, brass rolling mill, Revere Copper & Brass Inc., Chicago; James Stewart Corp., Chicago, contractor; bids June 19.

950 tons, flood control project, section 4, U. S. engineer, Binghamton, N. Y.; L. B. Strandberg & Son, Chicago, low, $957,748, bids June 9.

900 tons, quay wall, navy yard annex, S. Boston, Mass.; project cancelled.

800 tons, 800-ft. pier, Puget Sound navy

CONCRETE BARS COMPARED

	Tons
Week ended June 21	14,915
Week ended June 14	7,679
Week ended June 7	13,653
This week, 1940	12,073
Weekly average, 1941	11,797
Weekly average, 1940	9,661
Weekly average, May, 1941	10,521
Total to date, 1940	207,897
Total to date, 1941	294,919

Includes awards of 100 tons or more.

Behind the Scenes with STEEL

Thanks To Judge Gary

☐ The publication in last week's issue of the figures denoting 1940 distribution of steel to consuming industries brings to mind the visit of a young writer on the staff of this paper with the late Judge Elbert H. Gary in the early fall of 1921. By virtue of his personality and great ability, as well as by his occupancy of the posts of chairman of the United States Steel Corp. and head of the American Iron and Steel Institute, the Judge then was the unquestioned leader of the iron and steel industry.

On this particular day he was convalescing from a severe cold and looked pale and drawn but he still retained that patience which always characterized his dealing with young men.

"Judge," asked the writer, "how would you explain the fact that the percentage of the total steel tonnage that goes into each finished product varies rather widely from year to year?"

The Judge paced slowly back and forth past two windows overlooking the Hudson river and then replied substantially as follows:

"Go to Pittsburgh and see Mr. Clyde. He will tell you where the steel goes and when you get that information you will have clues as to the reasons for the annual fluctuations."

At Pittsburgh the late William G. Clyde set in motion the card filing and tabulating system which at that time was the Carnegie Steel Co.'s pride. Then a check was made with certain large steel companies which turned out products not made by Carnegie. As a result, this paper, in its issue of Jan. 5, 1922, was able to publish a tabulation breaking down the "normal" distribution of steel as of that time.

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So pleased was Judge Gary with this result that he urged similar tabulations in the future to show the actual distribution of steel products for each year. With his approval, immediate co-operation was given by substantially the entire iron and steel industry, and STEEL has been able to publish these breakdowns annually ever since.

Making of these tabulations was not a simple matter. Very few steel companies were able to report accurately and in the beginning quite a few reports had to be left out because the editors were unable to resolve them. For this reason the breakdown for 1922 was based on reports from companies representing 70.88 per cent of the capacity. The percentage of the industry furnishing usable figures has increased steadily since and the tabulation for 1940 is based on statistics from more than 98 per cent of the capacity.

Always recognized as valuable, and widely used in studies both by business and by the government, these statistics did not come to be regarded as "vital" until urgent need for detailed and accurate tabulations on steel consumption developed in connection with the searching investigation to which the Temporary National Economic Committee subjected the iron and steel industry. It was due to this realization that the American Iron and Steel Institute officially took over the task. The 1940 figures represent the institute's first tabulation of this kind.

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The writer, as he looks back on those memorable weekly visits with Judge Gary, only now recognizes fully the extent to which the industry is indebted to the Judge's broad experience and ripe wisdom. For instance, without his co-operation the steel distribution statistics could not have been gathered in those days. The Judge broke down long-standing policies of secrecy and, to mention just one of the many beneficial results, made it possible to give to his industry the benefit of more adequate journalistic service.

E. C. K.

yard, Wash.; General Construction Co., Seattle, contractor.

550 tons, including 320 tons bars and 230 tons wire mesh, warehouse, Rock Island arsenal, Rock Island, Ill., for government; Permanent Construction Co., Chicago, contractor, bids June 14.

470 tons, three over-crossings, Los Angeles county, California, for state; bids July 3.

450 tons, 14 inert material army warehouses, proving ground, Savanna, Ill., for government; bids June 20.

400 tons, 6-story Indian hospital, Tacoma, Wash.; L. H. Hoffman, Portland, Oreg., low, $998,443.

400 to 700 tons, plane engine test building, Studebaker Corp., South Bend Ind.; bids postponed from June 10 to June 20 for revision in plans.

310 tons, U. S. engineer, Los Angeles, inv 509-41-235; bids opened.

300 tons, connecting tunnel, Standard Oil Co., East Chicago, Ill.

299 tons, highway bridge, state of Minnesota, Polans Construction Co., low; bids June 6.

290 tons, Stout field, Indianapolis.

250 tons, marine railway navy yard, Boston, Mass.

240 tons, flood wall, unit 3, Portsmouth, O., U. S. engineer.

200 tons, Frankford arsenal, Philadelphia; bids June 23.

200 tons, Washington navy yard torpedo tube shop, Alexandria, Va.

176 tons, WPA 57253, Chicago.

150 tons, naval ordnance plant, Indianapolis.

130 tons, highway project, Fort Belvoir, Va.; bids June 24, constructing quartermaster, that station.

120 tons, Chicago, Burlington & Quincy railroad overpass, Des Moines, Iowa.

113 tons, addition to St. Bedes Abbey, Peru, Ill.; bids June 10.

113 tons, highway bridge, state of Minnesota; Andrews Construction Co., low; bids June 6.

110 tons, sewage disposal plant, Tonawanda, N. Y.

110 tons, highway paving, route 33-35, Monmouth county, New Jersey; Jannarone Contracting Co., Belleville, N. J., low $216,717.80; bids June 13, Trenton.

107 tons, two bridges, Los Angeles county, California, for state; bids June 26.

103 tons, highway bridge, state of Minnesota; Nelson, Haffner & Lundin, low; bids June 6.

100 tons, paving, Milwaukee avenue, Chicago.

100 tons, Y. M. C. A. building, Mt. Vernon, Wash.; T. D. MacNeil, Mt. Vernon, low.

100 tons, approaches and retaining wall, Morrison St. Bridge, Portland, Oreg., state project; L. H. Hoffman, Portland, low, $87,265.

100 tons, 182-foot state viaduct, Lincoln county, Oregon; Harry I. Hamilton, Eugene, Oreg., low.

100 tons, tower foundations and substation for Seattle light department; Henrik Vallee, Seattle, low.

100 tons, mesh highway project, Camden county, New Jersey; bids July 1, Trenton.

Unstated, state viaducts in Grant and Tillamook counties, Oregon; Averill & Corbin and C. J. Eldon, Portland, low.

Unstated, storehouse and supply pier, Puget Sound navy yard; bids to Com. R. E. Thomas, June 26.

Iron Ore

Iron Ore Prices, Page 95

The Great Lakes ore fleet was 100 per cent engaged in transportation of ore, as of June 15, 1941,

the same as a month before, but comparing with 98.44 per cent engagement a year before, according to C. C. Lindeman, statistician, M. A. Hanna Co., Cleveland. June 15, 292 vessels were in operation, with capacity, and in commission, of 2,688,040 gross tons. A year ago 291 vessels were engaged, with a trip capacity of 2,717,040 tons and tonnage in commission of 2,674,540 tons.

Consumption of Lake Superior iron ore in May totaled 6,232,213 gross tons, an all-time high for that month, according to the Lake Superior Iron Ore Association, Cleveland, a gain of 7 per cent over the previous month, though slightly below the all-time high in March, this year, of 6,411,531 tons. For this year to June 1 ore use totaled 30,450,916 tons, a gain of 38 per cent over the 22,119,967 tons consumed in the like period of 1940.

Scrap

Scrap Prices, Page 96

Amendments to price schedule No. 4, relating to steel and iron scrap, have been issued by Leon Henderson, administrator, OPACS, effective June 18. The amendments do not make major changes in determining ceiling prices or the level of the ceilings but do make minor adjustments to facilitate flow of scrap to consumers.

The principal changes from schedule No. 4 include:

Provision has been made for bringing in so-called semi-remote scrap by allowing consumers to pay up to $1 more per ton for such scrap to cover additional transportation costs.

Maximum shipping point prices, as contrasted to basing point prices, are defined and the method of computing them is explained.

Provision is made for bringing in of remote scrap located beyond zones where the railroad freight rate to Pittsburgh is $11.20 per ton. In such cases consumers must apply to OPACS for permission to absorb the additional freight charges and must meet other requirements set forth in the schedule.

A different method of determining prices of scrap for export is set forth in the schedule. Separate methods are provided for railroad scrap and other scrap.

Other changes include definitions of No. 1 and No. 2 bundles, several changes in the cities established as basing points, a new formula for establishing maximum prices for scrap originating on railroads not operating through any basing point, inclusion of a new form to be used by consumers in making monthly reports of transactions, a revision of switching provisions relating to railroad scrap, and a prohibition against dealers who have never acted as brokers prior to June 18 being allowed brokerage commissions.

In announcing the revisions in the schedule Administrator Henderson stated that the existing ceiling prices are well above the levels prevailing for all but a few months of the past 20 years.

"These ceiling prices," he stated, "are high enough to fully compensate all individuals in the scrap collection trade and, in the absence of speculative hoarding, to insure a supply of iron and steel scrap adequate to support the current high level of steel production.

"Unfortunately, circulation of rumors to the effect that ceiling prices were to be raised by substantial amounts has caused some hoarding by both dealers and original suppliers of scrap. This office is engaged in securing names of such individuals and the tonnages which they are holding. OPACS is prepared, if necessary, to take vigorous action to get this scrap moving into consumption. Individuals cannot profit by violating the schedule in this respect since they cannot expect to secure any higher prices than those now prevailing."

Meanwhile, scrap remains scarce and melters continue to eat deeply into reserves, which are not being replaced. Application of the revised prices and regulations may improve conditons to some degree. Principal changes in ceiling prices are in cast grades and stove plate, in which inequalities were most apparent under the former schedule.

Until full applicaton of the changes has been effected the market will be in some confusion and results cannot be predicted. Current supplies are light and collections are much below normal.

Under the new regulations consumers may pay up to $1 per ton above maximum prices, plus broker's commission of 50 cents.

To take a specific example, machine shop turnings shipped from the Youngstown district to a Pittsburgh district consumer would take the Youngstown district price of $15.50 on turnings, the local switching charge of 42 cents may be deducted, leaving a net price of $15.08. To this is added $1.39 to the Pittsburgh district consumer or a total delivered price of $16.47. If the delivered price worked out to more than $16.50, the Pittsburgh consumer could not take the material. This consumer, incidentally, also may pay the broker 50 cents commission.

Youngstown district consumers cannot draw material out of Cleveland, as shown by the following figures: The Cleveland base is $19.50 from which 55 cents in switching charges may be deducted leaving $18.95. The freight rate from Cleveland to Youngstown and other nearby consuming points is $2.08. Adding this to $18.95, brings the cost of the scrap delivered to $21.03. Thus, it exceeds the maximum allowed by 3 cents. A Youngstown district consumer, however, could compete with a Cleveland mill for scrap produced at some intervening point where the freight rate is lower.

Pig Iron

Pig Iron Prices, Page 94

That consumption of pig iron by foundries has been greater than receipts from furnaces is shown by dwindling reserve stocks in hands of practically all melters. Allocation for defense needs is expected to be applied soon, as cases are arising where holders of top priority orders have been unable to place tonnage. Occasional instances of work interruption are occurring, though for most part deliveries have been sufficient to keep plants running.

Pressure for defense materials has caused foundries in many sections to increase operations to six days a week, putting a further drain on pig iron supply. With scrap supply more difficult the situation is tight from both aspects. Silvery iron is difficult to obtain and some interruptions to production have been caused by lack of this grade. Special attention to this material may result, with definite priorities applied for defense use.

Practically all available blast furnaces are in blast, the Buffalo district being at 100 per cent and all stacks but one in the Pittsburgh district are active or under repair.

No price announcement has been made for third quarter and it is believed sales will continue on the basis of price at time of delivery. Some producers believe no change in price is imminent, in spite of rising costs, under the attitude of Washington as to increases.

Substantial export tonnage could be booked if producers could handle it. The largest inquiry is for 240,000 tons of low phos and bessemer for Great Britain, for which bids were asked recently by the procurement division of the treasury. Difficulty in handling the tonnage is believed to have caused the delay in distribution.

Pacific Coast

Seattle — Important army and navy projects continue to animate the situation in this area and others are shortly to be out for bids. Immediately pending is the $3,000,000 expansion at Puget Sound navy yard, bids June 26, for an 800-foot supply pier and 451 x 150-foot steel storehouse, involving 400 tons of shapes and considerable concrete bars. General Construction Co., Seattle, has the contract to build a quay wall at this yard, involving 800 tons of concrete bars and bids were opened June 18 at Fort Lewis for an ordnance building requiring 200 tons of shapes. Bonneville project has rejected the sole bid, $914,276 by Fritz Ziebarth, Vancouver, Wash., for Coulee-Covington power line, involving 850 transmission towers, 500 tons or more, and new bids will be received June 20, Spec. 1932.

Inquiry for cast iron pipe has assumed considerable volume, paced by requirements of army and navy building.

Foundries are at capacity and sales of pig iron have more than doubled in three months. Columbia iron, Provo, Utah, is still quoted at $22 base plus $4.95 freight to the Coast, and no announcement for third quarter has been received. Foreign coke is out of the market and consumers rely on eastern ovens but many users are having difficulty obtaining deliveries, some suppliers refusing to quote.

Principal buyers of steel scrap, who were paying the maximum of $13.50 and $14.50 gross for No. 2 and No. 1 respectively have dropped their prices $1 a ton with the result that little material is offering and receipts from the country have dwindled. Steel scrap has been "pegged" at $19.50 gross or $17.40 net, demand exceeding supply.

San Francisco—Demand continues strong but practically all producers find they cannot promise material on a specified date for other than defense work.

Awards of cast iron pipe aggregated 3872 tons and brought the total for the year to 28,033 tons, compared with 15,084 tons for the corresponding period in 1940. The only plate award of size went to Pittsburgh-Des Moines Steel Co., 125 tons for a 250,000-gallon tank and tower for the army at Ogden, Utah.

Included among the larger lettings of structurals were 280 tons each for military airport hangars at Phoenix, Ariz., and Las Vegas, Nev., placed with Consolidated Steel Corp. Practically all reinforcing bar awards reported were confined to lots of less than 100 tons.

Canada

Toronto, Ont.—While curtailment of sales and deliveries of iron and steel to non-war industries are being more rigidly enforced, there is no slackening in demand and orders for steel continue on war account. Steel production has risen to the highest rate in Canadian history and imports also are making new records, but despite this large increase in steel for Canadian consumption, there is not sufficient material to take care of the ever expanding war demand. Steel mill representatives state that upwards of 75 percent of orders on their books are the direct result of war activities and announcements from government officials indicate that a much greater proportion of new business is now coming under this listing.

Sheet orders continue in large number and inquiries indicate that consumers are prepared to place contracts in much greater volume if producers will accept the business. The latter, however, report backlogs that will absorb entire output for the next nine months and some are not accepting business beyond that period.

Orders for merchant bars are increasing rapidly and mills experience more difficulty in maintaining deliveries to meet current pressing war demands. In addition to the big flow of orders in Canadian producers, local representatives of United States producers, report

numerous inquiries for shell steel and other materials. Most orders accepted now are for delivery during fourth quarter.

Suspension of forward delivery contracts for merchant pig iron was reflected in a deluge of orders during the past week for foundry and malleable grades. All orders now must pass through the priorities officers of the steel controller, which is causing some delay in deliveries.

Scrap sales showed increase during the week and consumers are inquiring for large tonnages. Demand centers largely around cast and stove plate.

Steel in Europe

Foreign Steel Prices, Page 95

London — (*By Cable*) — Second quarter deliveries of steel in Great Britain are well up to schedule and third quarter requirements are being considered. Semifinished supplies are sufficient to justify reduction of imports, allowing larger import of certain finished products. Plate mills are working to capacity and tube mills are active. Output of sheets and galvanized sheets is large, largely for home defense requirements.

Refractories

Refractories Prices, Page 94

Leading makers of fire brick have announced price advances of 8 per cent in basis grades of clay and silicon brick, as of July 1. Thus those descriptions which have been selling at $47.50 per 1000 bricks will become $51.30, as of July 1. Prices of other descriptions are being market up accordingly. Justifications for the price advance is given as a raise in wages by 10 cents per hour, as of April 1.

Coke Oven By-Products

Coke By-Product Prices, Page 93

Phenol prices are being revised upward, effective shortly, with demand for all coke oven by-products heavy. Priorities are being employed by consumers with defense contracts, notably on phenol. As with users of distillates practically all classes of consumers are specifying heavily against contracts, with little spot material available.

Nonferrous Metals

New York—Formation of a war service committee for the copper industry and subsequently committees for other metal industries is a likely possibility. These committees would act in behalf of producers and would advise government officials who are working on supply and price problems.

Copper—At the end of the third week of delay, the OPM still had not made allocations out of the 18,000-ton pool created by taking from each producer 20 per cent of his April domestic production of refined metal. It is believed that OPM and OPACS have not

Nonferrous Metal Prices

June	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
14	12.00	12.00	12.25	52.37½	52.12½	5.85	5.70	7.25	17.00	14.00	35.00
16	12.00	12.00	12.25	52.25	51.87½	5.85	5.70	7.25	17.00	14.00	35.00
17	12.00	12.00	12.25	52.37½	52.00	5.85	5.70	7.25	17.00	14.00	35.00
18	12.00	12.00	12.25	52.62½	52.25	5.85	5.70	7.25	17.00	14.00	35.00
19	12.00	12.00	12.25	52.87½	52.37½	5.85	5.70	7.25	17.00	14.00	35.00
20	12.00	12.00	12.25	53.00	52.50	5.85	5.70	7.25	17.00	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	12.50

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

Nom. Dealers' Buying Prices

No. 1 Composition Red Brass

New York	9.25
Cleveland	9.50-10.00
Chicago	9.00-9.25
St. Louis	9.00

Heavy Copper and Wire

New York, No. 1	10.25-10.37½
Cleveland, No. 1	10.00-10.50
Chicago, No. 1	10.00-10.25
St. Louis	10.00

Composition Brass Turnings

New York	9.00

Light Copper

New York	8.25-8.37½
Cleveland	8.00-8.50
Chicago	8.00-8.25
St. Louis	8.00

Light Brass

Cleveland	4.50-5.00
Chicago	6.25-6.50
St. Louis	5.00

Lead

New York	4.85-5.00
Cleveland	4.75-5.00
Chicago	4.75-5.00
St. Louis	4.50

Old Zinc

New York	4.50
Cleveland	4.00-4.12½
St. Louis	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	16.00

agreed on how to distribute tonnages of various metals not directly required by OPM for defense "hot spots". OPACS will consider selling prices for old copper and brass at a conference with trade representatives Monday. The prices will be fixed on fabricated articles made from these metals rather than scrap obtained from machine shops.

Lead—Producers' allocations are meeting all defense demands as well as all civilian demands, though not all orders can be filled as promptly as desired. Demand continues to expand but reductions now planned in auto output and in other industries will automatically cut lead consumption.

Zinc—Priorities Division announced Friday that the amount of zinc to be set aside for the July emergency pool will be booked at 22 per cent of May production. This will approximate 16,000 tons. Producers of zinc oxide will be required to set aside 10 per cent of May production, or approximately 1500 tons. No zinc dust is required for the pool during July.

Tin—Demand generally was light as Straits spot advanced steadily to 53.00c following advices of a strong market in the Far East.

Equipment

Boston—Contracts for machine tools placed with New England shops within the last month include more than 1250 major units. This is a conservative estimate, award of 300 milling machines to a Springfield, Mass., builder supplementing large orders which also involve 600 tool room lathes to be built at Worcester, Mass. Substantial part of heavy government purchases is for machinery to be delivered at various defense plants now building or being expanded. All business is strictly on a priority basis as regards defense requirements, only repair parts being supplied to fabricators of nonesential products. The automobile industry is not asking for new tools for normal production of vehicles, but will probably require some equipment for defense operations later. Flow of material for machine tool assemblies is ample to maintain capacity operations, only in spots there being temporary lack of steel and parts. Deliveries of motors are generally satisfactory, even special types being available in about 14 weeks.

Seattle—Deliveries are a greater worry than sales, some important equipment for defense work in private plants being held back. Transportation facilities from eastern centers is also seriously curtailed, adding to difficulties. Airport improvements require heavy construction equipment and other items. Electric goods continue in strong demand. United States engineer, Seattle, has purchased a radial drill, $34,127, from Perrine Machinery Co., Seattle, for Snohomish county airport, milling machine from Star Machine Works and pipe and fittings from Grinnell Co., Seattle.

CONSTRUCTION and ENTERPRISE

Ohio

ASHLAND, O.—Union Malleable Mfg. Co., Clark avenue, is forming a subsidiary, Ashland Malleable Iron Co., to take over Ashland Malleable Co., Virginia avenue, L. H. Katz president.

CANTON, O.—Timken Roller Bearing Co., 1835 Dueber avenue, will build a new plant for manufacture of bearing cages, 200 x 200 feet, costing $90,000, and other plant improvements, entire program to cost $6,000,000.

CLEVELAND—Champion Machine & Forging Co., 3695 East Seventy-eighth street, H. W. Foster, president, will

Additional Construction and Enterprise leads may be found in the list of Shapes Pending on page 103 and Reinforcing Bars Pending on page 105 in this issue.

double plant capacity by erection of machine shop and office, 14,400 square feet; forge shop 38,000 square feet; train shed and storage building, 20,000 square feet. Government will finance expansion by grant of $2,688,680, of which more than $2,000,000 will be for equipment. McGeorge-Hargett, 9400 Quincy avenue, is preparing plans.

CLEVELAND—Electric Products Co., 1725 Clarkstone avenue will build a 2600-square foot addition costing $9000.

CLEVELAND—W. J. Schoenberger Co., 8810 Harvard avenue, manufacturer of valves, will build plant addition covering 4800 square feet floor space. Christian, Schwartzenberg & Goade, 1836 Euclid avenue, architects, are taking bids.

CLEVELAND—Stotter Metal Co., 7700 Bessemer avenue, formerly a partnership of Louis B. Stotter and Louis Mielziner, has been incorporated and is planning addition of considerable new equipment to increase production.

CLEVELAND—Vargo Welding Co., J. J. Vargo, president, 7301 Grand avenue, will build addition covering 1400 square feet to increase production. Herman W. Maurer, architect, is taking bids.

CLEVELAND—Officials of Cleveland Porcelain Enameling Co., 3190 East Sixty-fifth street have incorporated a subsidiary, Standard Signs Inc., to handle production of safety and accident prevention signs. Verne E. Messner is president of the parent company.

CLEVELAND—Storage building with about 1000 square feet floor space is being erected by Champion Machine & Forging Co., 3695 East Seventy-eighth street, H. W. Foster, president.

CLEVELAND—United Screw & Bolt Corp., 3590 West Fifty-eighth street, Carl E. Cramer, vice president, is building two additions to its storage facilities providing about 4000 square feet. Hebing Co., 1832 West Fifty-fourth street is contractor.

CLEVELAND—Allyne Ryan Foundry Co., 8916 Aetna road, Frank Feldes, plant superintendent, is building additional storage space and enlarging core room, former 28 x 16 and 28 x 124 feet and latter 40 x 72 feet. United Erecting Co., 4500 Euclid avenue, has contract.

CLEVELAND—Park Drop Forge Co., 730 East Seventy-ninth street, has given contract for $125,000 machine shop building to Brown Construction Co., 1900 Euclid building.

CLEVELAND—Atlas Foundry Co., J. H. Bruce president, 3600 West Sixty-ninth street, is building an addition 33 x 100 feet, costing about $4500.

DAYTON, O.—Universal Tool Co., First and Madison streets, will build a one-story 100 x 120-foot machine tool plant on Leo street, general contract to Henry Stock & Son, 28 North Ludlow street, at cost of about $50,000.

WARREN, O.—Thomas Steel Co., Delaware avenue, will build new structure for plating department, 37 x 400 feet. Warren Engineering Co., 402 Atlantic street, is designer and builder.

WARSAW, O. — Village, Stuart B. Hayes, mayor, has WPA grant of $55,000 for aid in construction of waterworks project to cost about $105,000. Plans are by Arnold, Rosco & Hartline, 116 Fair street, New Philadelphia, O. Will include pumping station and equipment, reservoir and distribution system.

Connecticut

HAMDEN, CONN.—Acme Wire Co., 1255 Dixwell avenue, plans erection of a power plant costing $40,000. Westcott & Mapes Inc., 139 Orange street, New Haven, are engineers.

NORWICH, CONN.—American Thermos Bottle Co., Laurel Hill avenue, has let general contract for a three-story 40 x 102-foot plant to New England General Contracting Co., 341 State street, at cost of about $50,000.

STAMFORD, CONN. — Atlas Powder Co., 296 Ludlow street, has let contract for a second-story addition 70 x 150 feet and a one-story addition 70 x 95 feet, to Sanworth Hughes Co., 177 Van Houten street, Paterson, N. J., costing $53,000.

WATERBURY, CONN. — American Brass Co., Main street, will build a one-story 42 x 160 feet and 30 x 40 feet addition. General contract to W. J. Megin Inc., 51 Elm street, Naugatuck, Conn., costing about $40,000.

Massachusetts

DANVERS, MASS.—Hygrade Sylvania Corp., F. J. Healy, vice president, Salem, Mass., has given contract for design and construction of a $500,000 fluorescent lamp plant to the Austin Co., Cleveland. Will be two stories with 100,000 square feet floor space. (Noted April 28.)

New York

LONG ISLAND CITY, N. Y.—Ford Instrument Co., Dawson street and Forty-seventh avenue, will build a six-story 199 x 295-foot plant. General contract had been given to L. C. Roberts, 1 East Forty-second street, New York. Francisco & Jacobus, 511 Fifth avenue, New York, are architects.

NIAGARA FALLS, N. Y.—B. F. Goodrich Co., 500 South Main street, Akron, O., is expanding its synthetic rubber manufacturing plant on Buffalo avenue, at cost of about $325,000.

NIAGARA FALLS, N. Y.—Bell Aircraft Corp., L. D. Bell, president, 2050 Elmwood avenue, Buffalo, has let contract for design and construction of an additional unit of airplane assembly plant to the Austin Co., 16112 Euclid avenue, Cleveland.

New Jersey

BLOOMFIELD, N. J.—Bloomfield Tool Corp. has been allotted $220,177 by Defense Plant Corp. for additional machinery and equipment for manufacture of gages and production tools.

KEARNY, N. J.—Federal Shipbuilding & Drydock Co. has let general contract to Carl Buhr Inc., 70 East Forty-fifth street, New York, for extension to its assembly shop and a one-story 100 x 125-foot machine shop extension, to cost about $120,000.

TRENTON, N. J.—Acme Rubber Mfg. Co., East State street, has let general contract to N. A. K. Bugbee Co., 206 East Hanover street, Trenton, for a one-story 120 x 250-foot plant.

Michigan

DETROIT—Tex Steel Corp., 6456 East McNichols avenue, has been incorporated with $5000 capital to manufacture steel and metal products, by Melvin E. Fink, 19182 Mendota avenue.

GRAND RAPIDS, MICH.—Gandy Belting Co. has been incorporated with $10,000 capital to manufacture belting machinery and belts by F. F. Raniville, 241 Pearl street.

JACKSON, MICH. — Industrial Metal Abrasives Co., 1603 Wildwood avenue, has been incorporated with $150,000 capital to manufacture metal abrasives, by Benjamin J. Campbell, Jackson, Mich.

Pennsylvania

CREIGHTON, PA. — Pittsburgh Plate Glass Co., Grant building, Pittsburgh, is having plans made by Ralph D. Bole, the company's chief engineer, and will take bids soon on a four-story 30 x 228-foot safety glass manufacturing plant costing $100,000.

ERIE, PA.—Erie Resistor Co., G. R. Fryling, president, 644 West Twelfth street, has let general contract for one-story 150 x 210-foot plant to Upton Lang Co., Twelfth and State streets, costing about $50,000. (Noted June 9.)

PETROLIA, PA.—Pennsylvania Coal Products Co., N. F. Craig, purchasing

agent, will build a boiler plant, including 2300-horsepower unit, to cost about $50,000. J. Breslow, Oliver building, Pittsburgh, is engineer.

SEWARD, PA.—Pennsylvania Electric Co., P. H. Harris, president, Levergood street, Johnstown, Pa., is having plans drawn for a boilerhouse addition. E. M. Gilbert Engineering Corp., 412 Washington street, Reading, Pa., is engineer.

Illinois

CHICAGO—Whiting Stoker Co., 4711 West North avenue, will build a two-story addition and add a second story to present plant, increasing capacity 75 per cent.

CHICAGO—Revere Copper & Brass Inc. has lease agreement with Defense Plant Corp. for $10,000,000 for additional plant with 325,000 square feet floor space and equipment for production of cartridge brass and cases.

Indiana

CONNERSVILLE, IND.—Stant Mfg. Co. has bought plant of Ansteel Axle Co. and will remodel and re-equip and build additions, at cost of $50,000, with equipment.

ROCHESTER, IND. — Rochester Metal Products Co. plans plant expansion to cost $40,000, with equipment.

SOUTH BEND, IND.—Giffels & Vallet, engineers, Marquette building, Detroit, will let contract soon for a one-story 56 x 780-foot engine test building for Studebaker Corp., costing about $500,000.

Alabama

GADSDEN, ALA.—Alabama division Lansdowne Steel & Iron Co., Morton, Pa., will operate $6,000,000 ordnance plant under construction by the government, to manufacture 105-mm. shells. Building to be completed by September.

Maryland

BALTIMORE—Procter & Gamble Mfg. Co., 1400 Marriott street, main offices at Cincinnati, will build three one-story additions to copra department, costing over $85,000. H. K. Ferguson Co., Hanna building, Cleveland, is engineer.

Kentucky

LOUISVILLE, KY.—National Carbide Corp., 60 East Forty-second street, New York, has let general contract to Harry Bickel Co., 435 Garden street, for a calcium carbide manufacturing plant, with two electric furnaces, costing about $1,000,000. (Noted March 17.)

Tennessee

NASHVILLE, TENN.—Phillips & Buttorff Mfg. Co., 217 Third avenue North, is building a three-story stove foundry addition on Thirteenth street.

West Virginia

FAIRMOUNT, W. VA. — Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., will build two additional factory buildings 275 x 400 feet, to cost about $1,250,000. W. Schusler, care owner, is superintendent of construction. (Noted Feb. 17.)

Arkansas

JACKSONVILLE, ARK.—Ford, Bacon & Davis, New York, have been tentatively selected to supervise construction of $33,000,000 ammunition loading plant near Jacksonville, for the government.

TEXARKANA, ARK. — W. S. Dickey Clay Mfg. Co., New York Life building, Kansas City, Mo., will let contract soon for rebuilding its plant, including machine shop, dryer, pressroom and storage facilities, to cost $300,000. A. Benberg, New York Life building, is architect.

Wisconsin

MILWAUKEE — American Brass Co., 2293 Lincoln avenue, plans a new factory.

PORT WASHINGTON, WIS.—Wisconsin Electric Power Co., 231 West Michigan avenue, Milwaukee, will let contract soon for an electric generating plant estimated to cost $7,100,000. F. A. Luber, care owner, is architect. (Noted March 24.)

California

BURBANK, CALIF. — Lockheed Aircraft Corp. will build four warehouse structures, three being 96 x 200 feet, and one 192 x 200 feet, costing about $62,000.

LOS ANGELES—American Metal Bearing Co., 2277 East Sixteenth street, is having plans drawn for a plant addition containing 2200 square feet floor space.

LOS ANGELES—Friedman Iron Works, 3651 Whittier boulevard, has been organized by Ben K. Brown and Nat Handel.

LOS ANGELES—Torms Aircraft & Engineering Corp. has been organized with $25,000 capital by George L. Duke, 1031 South Broadway, and associates.

Washington

NACHES, WASH.—Thomas Moore and associates plan development of bentonite claims near Rimrock, Wash., where 1,000,000 tons have been blocked out and some orders have been booked.

PASCO, WASH. — Port of Pasco has leased public property to Pacific Power & Light Co. on which power substation, 150,000-bushel grain elevator and oil terminal facilities of 50,000-barrel capacity will be erected. Elevator will have modern conveyor system.

SEATTLE — Morrison-Knudsen Co., Boise, Idaho, has contract for an airport and radio base at Boundary, Alaska, including five 135-foot radio towers and three antenna masts, generators and other equipment to be furnished by the government.

SPOKANE WASH.—Hard Metal Co., subsidiary of Columbia Machine Inc., New York, is building a plant to handle a $300,000 navy contract for steel castings.

YAKIMA, WASH.—Wioning Oil Co. has been incorporated with $50,000 capital to build petroleum refinery, by W. P. Lass and associates, Ward building, Yakima.

Canada

GALT, ONT.—Galt Art Metal Co., 385 Dundas street, will build addition costing $45,000, general contract to Dunker Construction Co. Ltd., 251 King street West, Kitchener, Ont. B. A. Jones, 31 Ontario street, Kitchener, is architect.

HAMILTON, ONT.—Canadian Westinghouse Co. Ltd., 286 Sanford avenue, will build plant addition costing $100,000, plans by Hutton & Souter, 36 James street East, who will call for bids soon. D. P. Brown is plant manager.

HAMILTON, ONT.—Ford-Smith Machine Co. Ltd., Cavell avenue, will build a plant addition costing about $75,000, with equipment. General contract has been given W. Stuart Construction Co., 15 Hyde Park avenue. Prack & Prack, 36 James street North, are architects.

KITCHENER, ONT. — Philip Gies Foundry, Water street, will build foundry addition on Charles street, costing about $50,000, with equipment, general contract to Ball Bros., 49 King street. S. J. C. Klaehn, 49 King street East, is architect.

TORONTO, ONT.—Sully Brass Foundry Co. Ltd., 7 Wabash avenue, has let general contract to D. J. Benham, 351 Windermere avenue, for a plant addition to cost $20,000, exclusive of equipment.

TORONTO, ONT. — Link-Belt Ltd., Eastern avenue, will build $100,000 addition to its plant.

TORONTO, ONT.—Seiberling Rubber Co. of Canada Ltd., 99 Paton road, is having plans drawn for a plant addition costing $100,000. M. J. Brown is vice president and general manager.

LONGUEUIL, QUE.—Stowell Screw Co. Ltd., 214 Sixth avenue, has let general contract to James W. Ross, 1010 St. Catharine street West, Montreal, for a plant addition costing about $50,000, with equipment.

MONTREAL, QUE.—Montreal Drydocks Ltd., 1151 McGill street, will build machine shop to cost about $40,000, with equipment, general contract to Alphonse Gratton, care of the company.

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A. H. Goode
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ADVERTISING INDEX

Where-to-Buy Products Index carried in first issue of month.

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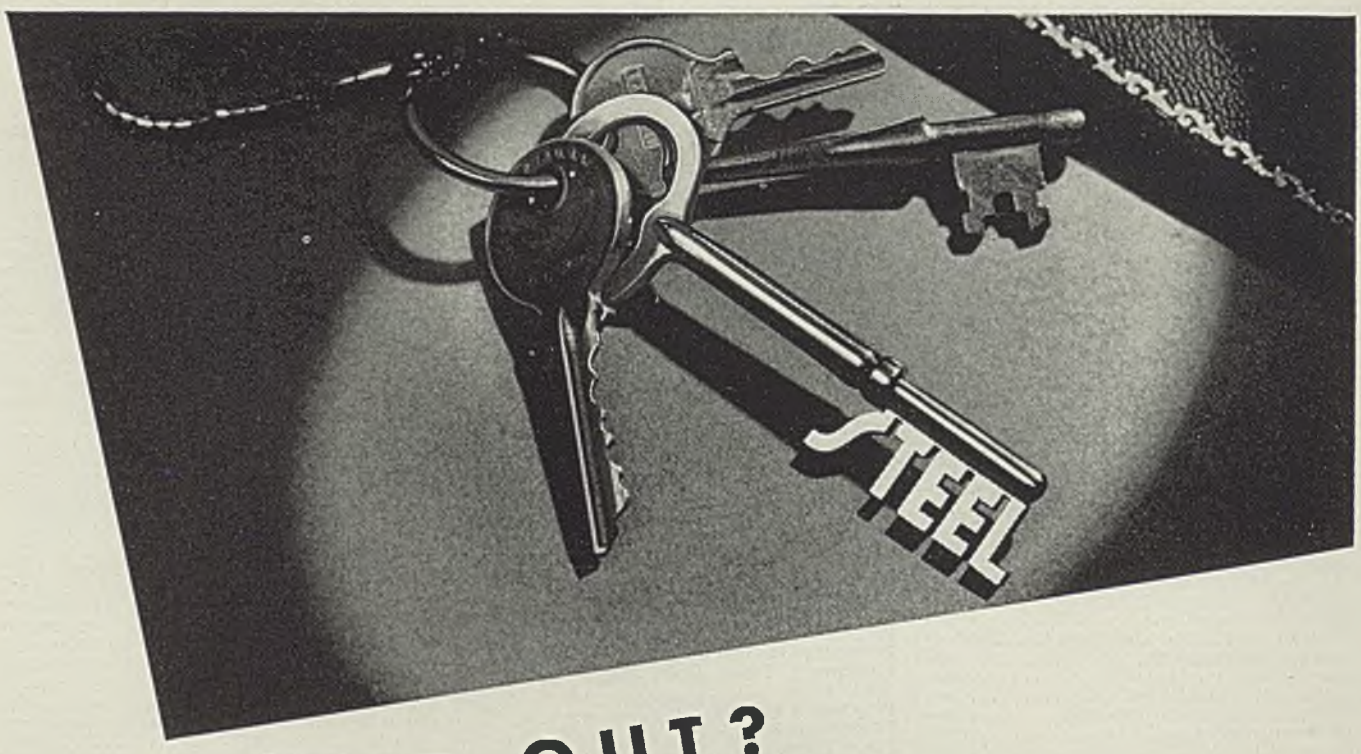

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