

Huge new blast furnace at Braddock, Pa. is vital factor in steel expansion program. Page 62

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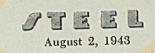
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AS THE EDITOR VIEWS THE NEWS



Fronts Are Identical, But . . .

In recent weeks deterioration in the administration of internal affairs in this country has assumed alarming proportions. In the East small employers have been forced to absorb the withholding tax of their employes. In some industrial sections it is charged that employers are maintaining workers in semi-idleness to insure an adequate personnel in the pinches to come. Black markets thrive. The threat of inflation is mounting.

With this disconcerting situation in mind, the American public—when first informed that the President would deliver another fireside talk—hoped that he would deal with these internal threats. In the meantime things began to happen in Europe. The Allies made better-than-expected progress in Sicily. Mussolini resigned. Europe seethed.

So, when the President spoke last Wednesday, he dealt primarily with the war. Probably the principal mission of his address was to clarify the terms of peace with Italy. His address was a studied forerunner of General Eisenhower's definite proposal on Thursday.

However, not every word the President uttered was beamed to Italy or the continent. He had a message for the people at home. He emphasized the fact that one cannot make a distinction between the battle front and the home front. The two are identical. The work which makes the soldier, sailor or marine effective in the battle zone begins at home. On the strength of this reasoning he appealed for more effective effort in the shop, farm and office. As if to acknowledge the fact that there is an internal problem, he said he would deal with it in another talk in a few weeks.

When he speaks on domestic affairs, we hope he will realize that the administration of civilian affairs has a direct bearing upon the outcome of the war. Wednesday night he gave the impression that everybody ought to put up with a few inconveniences if in doing so the war effort progressed more smoothly. Everybody agrees to that. It isn't a matter of convenience or inconvenience. It is a matter of dispatch in winning the war.

Confusion in rationing, price control, manpower allocation, financing, renegotiation of contracts, labor relations, etc., is definitely impairing the war effort. It is sapping the nation's strength at the very time when we should be preparing to deliver the knockout punch to the enemy.

We can do better than we are doing providing that we can organize our civilian effort as effectively as we have organized our war effort. This calls for a drastic reshuffling of authority at Washington. We hope the President has the answer in his publicly announced new approach to the problem.

DOCTOR UNCLE SAM: Every employe and employer should be vitally interested in the bill sponsored by Senators Wagner and Murray for broadening the scope of present social security legislation.

One of the features of the bill is provision for a government-operated medical setup. It is proposed that the surgeon general arrange for the general medical, special medical, laboratory and hospital services for the 110,000,000 individuals who would be covered by the broadened federal social security program.

The surgeon general's medical setup alone would require \$3,000,000,000 annually. The entire proposed program would increase payments by employer and employe up to 6 per cent on wages up to \$3000 per year.

Many citizens who see virtue in a practical degree

of social security will balk at federalizing medical and hospital services. This bill may come close to thrusting the entire issue of private versus federal activity out into the open, where it can be debated thoroughly. —p. 69

FIRST IN 50 YEARS? In announcing its suit to invalidate two Steckel mill patents, the Justice Department refers to it as the "first important proceeding of its kind in 50 years." It cites as a comparable case the government's unsuccessful attempt in 1893 to set aside patents of the American Bell Telephone Co. on the charge that the procedure of the Patent Office had been abused in order to delay the issuing of the patents.

Apparently the point of similarity in the Steckel and American Bell suits is the charge of abuse of patent procedure. However, unmentioned by the Justice Department, were a number of important cases about 25 years ago which also hinged upon abuse of patent procedure.

The patent contract stipulates that an investor reveal all of the essential facts regarding his invention. During World War I the government took over enemy-owned patents and licensed American manufacturers to use them. In many instances, the licensees discovered that the original patentees had withheld essential information. Since this failure to make full disclosure violated the patent contract, the patents were declared void.

The crux of the Steckel suit lies in the government's claim that the patents were obtained by "fraud and collusion." While this is a charge of abuse of patent procedure, it differs sharply from the claims involved in the American Bell and enemyowned patent cases. —p. 66

VERSATILE FABRICATORS: Changing demands of the war program have imposed difficult problems upon the structural steel fabricating industry. Early in the war effort structural mills and fabricating shops were busy rolling and fabricating structural steel for new war plants. This job has been largely completed and now the industry is trying to adapt itself to other war work.

The rolling of wide-flanged beams and heavy shapes has almost ceased. Most structural mills are rolling lighter shapes. Fabricating shops are turning more and more to subassemblies for ships and to other work quite different from the accustomed fabrication of buildings and bridges.

This shift has involved radical changes in opera-

tions. Many shops which normally were handling shapes almost exclusively now find that 90 per cent of the material handled consists of plates and sheets. More welding is done than heretofore. Jigs are used more extensively. Women are beginning to find their way into structural shops.

Here again, as in the machine tool and other industrics, the challenge of war has been met with a degree of ingenuity and adaptability which even the steel construction men themselves did not know they possessed. Some of this war-born versatility will pay postwar dividends. —p. 59

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JOBS AFTER THE WAR: U. S. Bureau of Labor Statistics estimates that 14,500,000 demobilized servicemen and released war workers will be seeking peacetime employment at the end of the war. According to its investigation, the problem of absorbing these individuals into jobs will be most severe in Michigan, Connecticut, Washington and Indiana.

Much will depend upon the manner in which demobilized servicemen and released workers are absorbed in the various geographical districts. Success in some localities and failure in others might cause violent shifts in population. This should be a good incentive for local postwar planning.

—р. 90

MORE STEEL IN SIGHT: Government officials and industrial leaders are a bit more optimistic over the prospect of obtaining 2,000,000 more tons of steel during the remainder of the year. They are encouraged by the increase to 650,000 tons in the volume of orders reduced or canceled in the "Share the Steel" campaign.

They also are heartened by the progress made in getting new facilities into operation ahead of schedule. Also gratifying is the return to near-normal production in the coal mines.

These favorable developments do not mean that the 2,000,000 tons are "in the bag." There are many obstacles yet to be overcome.

The "Steel for Victory" drive still needs all the support it can get. _____p. 62

E.L. Shar

EDITOR-IN-CHIEF



High strength and workability of Inland Hi-Steel are of great advantage in building heavy field gun and howitzer carriages.

Built Light and Tough with Inland Hi-Steel

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SHIP WORK AIDS FABRICATORS

By L. E. BROWNE Associate Editor, STEEL

NEW YORK

STRUCTURAL steel fabricating industry, one of the first to complete its initial wartime assignment of building the tremendous industrial plant for the arsenal of democracy, now is contributing largely to shipbuilding and other war materiel production.

Ship work is being taken on in increasing volume and much credit for the record output of vessels is due the fabricating shops. Complicated subassemblies are being fabricated by men who never sniffed salt water, for inland shops are heavily engaged as well as those located on the coasts.

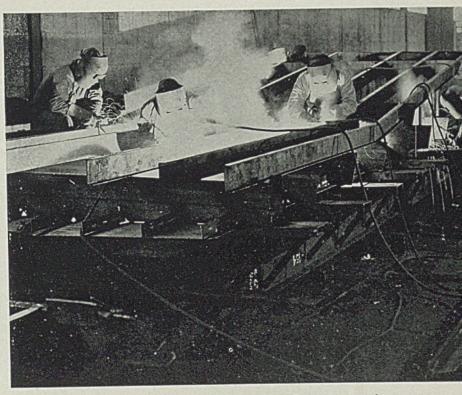
With this shift in the type of work fabricated has come far-reaching changes in operations, methods and the nature of material required. Shops normally fabricating shapes exclusively now take 90 per cent of their tonnage in plates and heavy sheets. Shapes needed are mostly lighter sections, channels and angles.

With riveting equipment idle, welding capacity is taxed and women are appearing in structural shops as welders.

An increasing tonnage is fabricated on jigs, many complicated, but reducing fit-up and layout time. With new materials and methods of fabrication many structural shop interiors are hardly recognizable as such. All this has been accomplished with a minimum of new equipment, the increase in welding capacity being most notable.

This emphasis on shipbuilding and the lack of demand for steel for bridges, buildings and other normal outlets has also great effect on structural rolling mills. Rolling of wide-flanged beams and heavier sections has practically halted. More pieces per ton are required for fabricating and the average tonnage of metal requires more fabrication. Ship tonnage is confined largely to 23 sizes of shapes, five bulb angles, 12 angles and five ship channels. On these sizes rollings are largely limited.

Some individual mills are operating full on ship sizes; one rolling junior beams, 3/16-inch in thickness, 6 to 12 inch size, is exclusively on ship tonnage; the beams are slit to make two tees New war plant construction completed, industry turns to materiel production. . Far-reaching changes in operations, methods and materials required result. . . Work delayed by hostilities contributing to potential postwar demand



Positioning of work for downhand welding justifies advantages gained in many current structural fabricating shop operations. Size and shape of subassemblies are planned and arranged so work can be turned over to assist welding operations. Jigs are designed as a container for the above work and no stress is imposed on the partially assembled units as its position is reversed

used largely in bulkheads. The largest consumer of this mill at the moment is a shipbuilding competitor.

Tonnage from structural mills this year will be more than 1,000,000 tons below 1942. An estimated 3,600,000 tons will be rolled against 4,938,000 tons last year which was 8 per cent over the 1941 peak. Currently operating at about 65 per cent of capacity, around 85 per cent of the output is going to ships, direct to yards or to subcontractors.

Inventories of shapes for the most part are in better balance and for the time there is less pressure for material.

Much of the 3,600,000 tons expected to be rolled this year will bypass structural fabricating. shops. Fabricators booked approximately 325,000 tons during the first half, which if maintained would indicate a 650,000-ton year for members of the American Institute of Steel Construction. Shipments are estimated at 590,000 tons in the first six months of a 1,180,000-ton year; the latter estimate is probably too large however, for shipments have been on the decline since March. Both estimates also include some tonnage required for the high octane gasoline and synthetic rubber programs, which are more evident in the shipment figures than bookings. Structural steel required for the first phase of the high octane approximated 34,500 tons. Supplemental programs for both gasoline and rubber are under consideration.

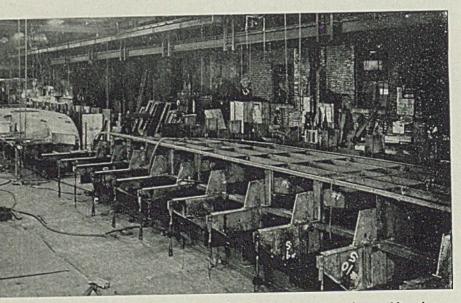
The radical changes affecting both fabricating shops and mills are revealed by bookings and shipments in the two

STRUCTURAL STEEL

years before 1943 when the demands for steel for the war industrial plant were at peak. Actually a substantial part of the plant was completed in 1941. In 1942 bookings totaled 1,762,453 tons and shipments 2,039,966 tons; 1941, bookings 2,296,954 tons, shipments 2,251,089 tons; thus 1941 was the peak year since 1929.

Sharp decline in demand which started in May-June, 1942, has continued. By April, this year, backlogs of many fabricators were exhausted. New inquiry was confined to supplemental requirements developing as the war progressed and the same situation continues. This situation made it imperative that fabricaing costs as high as \$20 a ton entered quotations on some gasoline plant extensions. One set of plans covering an assembly for one ship is frequently enough for the entire group. Nevertheless, frequent changes in deck equipment, loading details and new sections operate against a static situation in ship construction, providing new work and details for fabricators. An outstanding example is the construction of a secondary deck on tankers enabling that type of ship to carry a cargo of aircraft.

There are wide spreads in prices quoted for structural steel fabrication; prices are well above lean year levels, reflecting higher costs. Small construc-



Structural fabricating shops are engaged on more complicated assemblies than ever before requiring greater use of well planned jigs. When assembly of many component parts and a number of identical units are required, jig planning and assembling is frequently far more elaborate than on usual structural fabricated work. Cost of jigs is justified by savings in layout, fit-up time and labor

tors seek contracts in other directions; shipbuilding was the most logical.

Some fabricators were quick to make the change, but on the whole there was a lag: some shipbuilders were slow to sublet heavily and some fabricators were reluctant to embark on new seas. Gradually subcontracting gained momentum and now numerous shops are but adjuncts to the shipbuilding industry. Some of the larger structural units are building ships and barges as prime contractors, having built new yards for the work. One spent \$9,000,000 on a new yard.

The mechanics of estimating, engipurchases of fabricated portable bridges details have undergone changes as have shop operations. Compared with engineering costs and details involved in the high octane gasoline expansions, such problems for shipbuilding are relatively simple for estimators. Engineertion projects, 75 to 100 tons, while few in number, frequently go at $6\frac{1}{2}$ to 7 cents a pound, fabricated and erected. Range of quotations on some of the high octane gasoline construction has been as great as \$50 a ton. In quoting on ship subassemblies shops are frequently bidding on a payroll dollar basis, the Maritime Commission furnishing the material.

The war has demonstrated the flexibility of the industry and changing demands have been met with existing peacetime facilities and equipment for the most part. The industry is frequently classed as one with over-capacity in normal times. At the peak demand it never reached 100 per cent operations, although this was due in part to limitations on available plain material. Currently, from a standpoint of tonnage, the industry is not operating much better

than 50 per cent, ship work included, but because of the nature of operations and demand estimates as to capacity and operations mean little. Compared with normal years, based on fabrication of shapes, tonnage in 1943 will be below the drab year of 1932. Yet shop operations will be much higher as will rolling mill output. Bookings in June, the last available, were the heaviest of the year, approximately 100,000 tons. Barge coutracts accounted for this. Shipments for the month were lower.

Restrictions on steel in building and engineering construction continue tight. Nothing is authorized or approved by WPB unless its importance to the war program makes it imperative; stop orders are halting some construction. This precludes any improvement in normal demand for the duration; directive quotas aim at the constructive conservation of every ton of building steel for more necessary requirements.

Bridge Tonnage at Standstill

Bridge tonnage is at standstill, both highway and railroad, but substantial purchase of fabricated portable bridges for field service are being placed by the War Department. Stepping up of activity at the war fronts is stimulating requirements; these units are fabricated largely by welding.

The size of ship subassemblies fabricated at some of the larger plants tends to increase; in some cases the size of the assembly has about reached the limit for trucking and railroad transportation to shipyards. While shipbuilding offers the most work for structural shop fabrication, subcontracts on gun carriages, shell blanks, barges and other miscellaneous war products are on schedules: one eastern shop is making turnbuckles of bars and nuts by welding. Tanks are also fabricated. Welding departments in some instances are operating round the clock.

In view of the 4,000,000 tons of structural steel erected in two years, prospects for the postwar period at first glance would appear to be dim. However, the bulk of this volume went into industrial plant expansion and normal demand in other directions has not been met. This demand is cumulative and is backing up a potentially large tonnage. Bridges well illustrate this point; bridge building has been restricted and will take a substantial volume after the war. Railroads will need considerable steel for bridges and other structures.

A recent survey indicated 704 spans in New Jersey are too narrow and 717 have inadequate carrying capacity. Of 2272 bridges surveyed the state highway planning bureau found 717 unable to carry safely a 10-ton loading and recommends replacement with new bridges. capable of carrying 20-ton loads.

Extensions to plants producing consumer goods have been few and with a heavy demand backing up for these goods, to be released after the war, more steel will be required for structures of this type. The power capacity of the nation will be stepped up 500,000 kilowatts for 1945 operation and because of long fabrication and construction cycle involved in power plant construction, work must begin soon for completion in 1944 or early 1945. Seven specific projects have been given the right of way. Five of these will be steam plants.

While the postwar period augurs no great boom for the structural steel fabricating industry, the demand will probably be greater than superficial consideration of the prospects would indicate. It will be bolstered by large public works

Present, Past and Pending

CIVILIAN BUSINESS MAY DROP A FIFTH IN FINAL HALF

WASHINGTON-Arthur D. Whiteside, WPB vice chairman, has notified congressmen that he expects a 20 per cent reduction in dollar volume of civilian business for the last six months of this year, compared with sales for the same period of 1942. -0

STEEL PRODUCERS GET NEW MONTHLY REPORT FORM

WASHINGTON-Steel Division, War Production Board, has made up a new CMP form for steel producers' reports of monthly shipments and past due orders. The new form, WP-2633, supersedes CMP-8. It provides for 39 new categories of class B products and several further subdivisions of claimant agency programs, and sepacate reporting in several instances on maintenance, repairs and operating supplies.

STEEL MILLS MAY ROLL 12,500 TONS OF BRASS STRIP

NEW YORK-Because of labor shortages in brass mills, the rolling of approximately 12,500 tons of brass strip on steel mill capacity is under consideration. •

0 **F. B. HYDER HEADS UP IRON ORE SECTION OF WPB**

WASHINGTON-F. B. Hyder, consulting engineer, Los Angeles, has been appointed head of the Iron Ore Section, War Production Board. He succeeds S. O. Hobart, of Pottstown, Pa., resigned. 0 0 0

AT CROSSROADS IN INFLATION BATTLE, SAYS WLB

WASHINGTON-The War Labor Board warns the nation is at "a historic crossroad" in the battle against inflation. The statement was made in a decision denying a pay raise to 8500 employes of Bendix Corp., South Bend, Ind.

WMC COMPILING SUPER-CRITICAL OCCUPATION LIST

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WASHINGTON-War Manpower Commissioner McNutt discloses his commission is preparing a super-critical list of occupations to receive preferential treatment in administering the draft law. It is intended to supplement the present classification of essential jobs and assist the work of local draft boards.

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GOVERNMENT TO CONTROL TENTH OF STEEL CAPACITY

WASHINGTON-Jesse Jones, Reserve Finance Corp. chairman, states after the war the government will own about 10 per cent of the nation's total steel capacity, 92 per cent of magnesium capacity, and over half of the aluminum capacity. 0 0 0

U. S. SHIPYARDS MAY DOUBLE 1942 OUTPUT THIS YEAR

NEW YORK-J. Lewis Luckenbach, president, American Bureau of Shipping, reports last year's total of ships built will be considerably more than doubled in 1943 if American shipyards maintain their present rate of production. 0 0

MACHINE-TOOL MAKERS MAY DISCUSS ITALY

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WASHINGTON-When representatives of machine tool manufacturers meet with the War Production Board this week, one subject of discussion possibly may be machine tool requirements of Italian industrial firms. Such a program probably would be handled on a lend-lease basis.

STRUCTURAL STEEL

programs plans for which will be ready at the close of the war. New York city has a program taking more than 600,000 tons of structural steel, for subway extensions notably, while New York state has one almost as large. Public works with an increase in demand for work held up by the war will go far toward a return to normal tonnage years. However, there will be an abundance of surplus capacity in the fabricating end of the industry, also with mills, and the competition should be intense.

Labor Supply Situation **Tightens Further**

Changes by the War Manpower Commission in labor market area classifications, effective Aug. 1, indicate further tightening in the labor situation. The following cities have been advanced from Group II to Group I which consists of areas of acute labor shortages:

Anderson, Ind.; Everett, Wash.; Los Angeles, Calif.; New Bedford, Mass.; Oklahoma City, Okla.; Racine, Wis.; and Spokane, Wash. Classified and added to the list for the first time are the following in Group I: Butte, Mont.; Eureka, Calif.; Territory of Hawaii.

Dayton-Springfield, O., has been transferred from Group I to Group II which consists of areas of labor stringency or in which a labor shortage may be anticipated after six months. The following areas have been advanced from Group III to Group II: Atlanta, Ga.; Augusta, Ga.; Bakersfield, Calif.; Columbus, Ga.; Fresno, Calif.; Mansfield, O.; Muncie, Ind.; Pontiac, Mich.; Richmond-Petersburg, Va.; and Youngstown-Warren-Sharon, Ohio-Pa.

Areas in Group II

The following areas have been classified and added to the list for the first time, being placed in Group II: Amsterdam-Gloversville, N. Y.; Boise, Idaho; Brawler-El Centro, Calif.; Clinton, Iowa; Kenosha, Wis.; Lake Charles, La.; Longview-Kelso, Wash.; Middletown, Conn.; Modesto, Calif.

Duluth, Minn.-Superior Wis., and Greenfield, Mass., have been transferred from Group II to Group III, consisting of areas in which a general labor shortage may be anticipated after six months. Abilene, Tex., Galesburg, Ill., and Miami, Fla., have been transferred from Group III to Group IV, consisting of areas in which the labor supply is and will continue to be adequate to meet all known labor requirements. The following have been advanced from Group II to Group III: Birmingham, Ala.; La Crosse, Wis.; Lewiston, Me.; Omaha, Nebr.; Rome, Ga.; San Antonio, Tex.; Taunton, Mass. STEEL DRIVE

Campaign Forges Ahead with Work On New Plant Capacity Pushed

Government officials now expect expansion program to be completed by February. . . Order cancellations in "Share the Steel" effort total 650,000 tons. . . Indictment of 30 miners under anti-strike law highlights labor situation

WITH gratifying results reported to date in the "Share the Steel" campaign, the "Steel for Victory" drive is forging ahead and government officials are encouraged to hope that the 2,000,000 additional tons required for the war effort in the last half of the year will be obtained.

Reports available at the War Production Board indicate that up to late last week 650,000 tons of steel on mill order books had been canceled under the "Share the Steel" campaign, and officials are hoping to raise that figure materially.

Of the total amount canceled to date 80 per cent is for third quarter and 20 per cent for fourth quarter. Also, about 80 per cent is carbon steel and 20 per cent alloy steel.

Indications are that the "Share the Steel" campaign will wind up this

week with some 15 War Production Board officials now campaigning throughout the country returning to Washington. Reports are current that some 3000 to 4000 consumers have been actively solicited for order cancellations. It is believed there are some 35,000 large consumers in the country.

Further contributions to the success of the "Steel for Victory" drive are being made by completion of new plant facilities ahead of schedule, and by stepping up output from existing facilities through labor-management committees. WPB steel expansion officials profess to be well satisfied with the program as it is going today.

It is now expected that by the first of the year some 2,000,000 tons additional plate capacity will be in production, and it is the hope that if things continue



Steel expansion program moved another step closer to completion as this huge new blast furnace at Carnegie-Iltinois Steel Corp.'s Edgar Thomson Works, Braddock, Pa., was blown in recently to give added impetus to the "Steel for Victory" drive. The giant furnace, from which the first molten iron is shown being tapped, will play an important role in the effort to provide 2,000,-000 additional tons of steel before the year's end

STEEL UNAFFECTED

Recent developments in Italy have resulted in no cutbacks in steel orders so far as can be learned. What may develop should Italy soon collapse completely is being speculated upon, though trade leaders are inclined to believe that while there may be some shifting in steel requirements, overall volume will continue unchanged — certainly for some time.

While prior to news of the ousting of Mussolini, there were some cancellations of cold-drawn steel bar orders for lend-lease. Some of this tonnage, it is reported, was originally scheduled for Russia, where it has already been rolled, and is being easily converted to other channels as the steel is to American specifications.

as at present that by February, 1944, the steel expansion program, as now outlined, will be completed.

At the opening of the "Steel for Victory" drive, the WPB set out to push completion of seven steel expansion projects in record time and that plan is being carried out. It now looks as though the electric furnace expansion program will be finished by September, the blast furnace program by November, and the open-hearth furnace program by February of next year.

A report current throughout the country is to the effect that government claimant agencies have asked the War Production Board for 5,000,000 more tons of steel than are available for allotment for fourth quarter. During the third quarter these government agencies asked WPB, under the Controlled Materials Plan, for 6,000,000 tons more than were available.

With the coal strike settled blast furnace operations and steel ingot production have returned to near normal. Several stacks which had been taken out of blast were not returned to operation because it was thought advisable to repair them before returning them to production.

A factor which may hamper attainment of the desired steel production goal is that from now on blast furnace operations may be considerably affected by the need to take out stacks for relining and other repairs. Months of continuous operation are beginning to take toll of blast furnaces in the Great Lakes area. A report issued by the Lake Superior Iron Ore Association disclosed that 21

/TEEL

stacks—the largest number since May, 1941—now are idle. Others are to be taken out of blast as soon as those now on the inactive list are repaired and placed in commission. With 12 fewer blast furnaces operating in June than in May, June ore consumption declined to 6,939,998 tons. This marked the first time that consumption fell below the 7,000,000-ton mark since February, 1942.

In the first six months this year, however, consumption totaled 44,002,720 tons, an all-time record.

Solid Fuel Administrator Ickes last week said the Bituminous Coal Division estimated production of bituminous for the week ending July 17 at 11,860,000 tons against 11,170,000 tons in the week ended July 10. Prior to the general strike, weekly production of bituminous coal was considerably above the 12,000,000-ton level. In the calendar year to July 17, 313,348,000 tons of bituminous coal were produced. This compares with 312,056,000 tons in the like period of 1942.

Total coke production to date this year is estimated at 38,410,400 tons, against 38,042,500 tons in the like period of last year.

Indict Coal Union Leaders

As an aftermath to the coal mine strike, indictment of 30 insurgent union coal miners in southwestern Pennsylvania by the federal grand jury at Pittsburgh on charges of violating the recently enacted Smith-Connally antistrike law highlighted developments on the labor front last week.

The indicted miners are charged with having directed strikes and with having otherwise hindered operation of 24 coal mines which were in the possession of the government. All of the defendants are officials or members of local unions of the United Mine Workers of America.

Particular significance attaches to the action since it is the first taken under the Smith-Connally anti-strike law. The indicted men will be tried at a special term of court to be held in September and up to late last week it was uncertain whether the union would "go to bat" in defense of the indicted men.

"Have Not" in Raw Materials

Lacks coal, oil, scrap and nonferrous metals. . . Capitulation would make important munitions factories available on Continent to United Nations. . . Hydroelectric projects well developed

ITALY'S anticipated collapse as an Axis partner will have little effect on the mineral and raw material supplies of either Germany or the United Nations.

The peninsular nation's history has been one of insufficienty in such supplies, a situation that has been intensified by the loss of her briefly-held empire.

As a matter of fact, the United Nations will be faced with the problem of supplying such materials as coal, petroleum, iron and steel, ferroalloys, copper, nickel, tin, magnesium and rubber to maintain output of Italy's industrial machine. Practically the only minerals in which the country is self-sufficient are aluminum, zinc, lead, mercury and sulphur.

Conquest of the mainland, however, probably would make available to the Allies important munitions-producing factories. Output of these may be used to continue prosecution of the war against Germany while conserving vital shipping space.

Stockpiles of battlefield scrap accumulated in Africa may be shipped across the Mediterranean to provide Italian steel mills with a raw material most critically needed. Based on statistics released in 1938, the latest available, Italy's steel ingot and castings production was 2,307,392 metric tons.

Steel plants in the Piombino district are located at Terni, Portoferraio, and Piombino; in Brescia district at Bari, Naples, Bagnoli, Bergamo, Crema, Turin, Dalmine, Trieste, Aosta, and Breno; in the Milan district at Milan and Villadossola, Novara; and in the Genova district at Savona, Villadossola, Piedmont; Novi Liguri, Modena, Genova, Sestre Ponenti, Pra, Imperia, Bolzaneto, Liguria; and San Giovanni, Tuscany.

Over the past few years Hitler has profited enormously by using Italian

ITALY'S MINERALS, METALS PRODUCTION

3
2
2
8
7
7
1
5
1
7
1
6
2
13933

manpower. As early as 1942, Germany conscripted more than 300,000 Italian workers, approximately 45,000 of these skilled in metalworking and metalproducing.

Due to a lack of coal, Italy has dev loped extensively her "white coal" industry. At the end of 1941, Italy had 1171 hydroelectric power plants with installation of 5,307,000 kilowatts, 132 thermoelectric plants with 92,600 kilowatts, and 5 geothermic stations with installations of 70,300 kilowatts. Altogether the power plants total 1358 with 6,290,000 kilowatts.

Italy has helped pioneer development of electric furnace melting and refining in steel in an effort to reduce consumption of coke. More than 750,000 tons of steel were produced in electric furnaces in 1938. Existing progress in making steel from pyrite ash is a major Italian technical contribution to steel metallurgy. Pyrite, abundant in Italy, is an iron sulphur mineral used as raw material for sulphuric acid. After the sulphur is burned, the residue or ash, which contains about 50 per cent iron, is converted into steel.

Mine Ore in Alps

As part of Italy's self sufficiency program, the country has attempted to mine iron ore in the Italian Alps from the virtually inaccessible Cogne mines at an altitude of 8000 feet. This project was first undertaken during World War I. More recently Italy is reported to be using iron-bearing sea sands from part of the Italian coast to help supply the metallurgical industry. Ore deposits are found at Elba, Cogne, and Nurra in northern Sardinia, at Boratti, Fallonic, and Strettoia.

Cheap hydroelectric power has to a great extent aided in replacing the country's coal requirements in its metallurgical industry. Italy's coal resources are meager and of poor quality. A total of 11,914,967 metric tons was imported in 1938, nearly 85 per cent of consumption. Germany agreed to supply the Italians with 1,000,000 tons of coal a month but has not been able to live up to the agreement because of the strain on the rolling stock and the destruction wreaked on German railroads.

Italy's domestic production of iron

(Please turn to Page 164)

FINANCIAL REPORTS

U. S. Steel Corp. Ingot Output Cut By Coal Strike in Second Quarter

Chairman Olds states shift in war demands also figured in decline in finished steel shipments. Corporation's first half 1943 earnings down from like 1942 period. Expansion program being pushed

WORK stoppages at coal mines of United States Steel Corp. subsidiaries resulting in the blowing out or banking of a number of blast furnaces with consequent loss in steel ingot production, as well as some shift in war demand from heavy products to light finished steel items, brought about a decline of 260,-000 tons in finished steel shipments in the second quarter compared with the initial three months, Irving S. Olds, chairman, said in a statement accompanying the corporation's second quarter financial report.

Ingot yield in the period shifted from 74 to 70 per cent.

First half net earnings were \$31,086,-053, he said, while the corporation's ingot capacity of 31,330,700 on July 1 was at a new peak.

Eight open hearths are still to be brought in at Homestead, Pa., and nine at Geneva, Utah, both government financed. Three blast furnaces remain to be completed at Geneva, and one at the Edgar Thomson works, where a new stack was put in blast only recently.

First half 1943 earnings of \$31,086,-053 were equivalent to \$2.12 a common share, compared with \$33,866,907, or \$2.44 a share, in like 1942 period. Drop in income was occasioned primarily by a \$63 million increase in payroll costs during the first half. If results for the first six months 1942 are adjusted to allow for their prorata shares of the provisions for pensions and income taxes actually made in 1942, income for that period would be \$44.7 million, or \$13.6 million more than recorded in like period this year.

Net profit for the June quarter totaled \$15,679,456, compared with \$15,406,-597 in the initial three months.

Directors declared the regular quarterly dividend of \$1.75 per share on preferred, and also \$1 on common, payable Sept. 20 to record Aug. 20.

Mr. Olds said it was difficult to estimate exactly what the coal stoppages (there were three) cost the company in production of iron and steel. He pointed out they had to close down certain furnaces, and, morever, had to draw on inventories of iron. Together, the cost amounted to about 272,000 tons,

all of which was not instantly reflected in steel production, and probably will not be fully reflected for some time. He estimated the immediate effect on steel ingot production was 72,000 tons. He also pointed to the loss in coal tar byproducts, an important item in the war effort.

The corporation also had to dip into its scrap pile to the extent of 80,000 to 90,000 tons.

Average number of employes in the second quarter rose to a new peak of 344,031, the reported increase of about 4000 being due chiefly to additional shipbuilding workers. The corporation expects all the corporation's electrolytic tinning lines will be in operation by the end of this year.

Bethlehem Steel's First Half Net Is \$12,842,902

Net profit of Bethlehem Steel Co. for first half this year amounted to \$12,842,-902, equal to \$3.21 per common share, against \$12,211,601, or \$3 per share, in like 1942 period.

June quarter net totaled \$6,614,210, compared with \$6,228,693 in the initial three months and \$6,070,913 for the corresponding 1942 quarter.

Directors declared a dividend of \$1.50 on common, payable Sept. 1 to record Aug. 9.

Federal tax provisions for the first half totaled \$61,610,000, against \$49,400,000 in same period a year ago.

Eugene G. Grace, president, stated construction of plant additions in June period amounted to \$4,616,000, and estimated that the corporation would spend \$8 to \$9 million over the remainder of this year on such work.

Republic Steel Reports Net of \$6,003,732

Republic Steel Corp., Cleveland, had first half net profit of \$6,003,732, equal to 88 cents a common share. For corresponding 1942 period company earned \$8,072,121, or \$1,24 a share.

June quarter profit amounted to \$2,-337,175, against \$3,666,557 in the initial

three months and \$3,355,158 in second quarter last year.

Six months taxes were \$29,600,000, compared with \$35,800,000 in first half of 1942.

Jones & Laughlin Earns \$4,810,617 in First Half

First half net income reported by Jones & Laughlin Steel Corp., Pittsburgh, totals \$4,810,617, equal to \$2.08 a common share. In like 1942 period net profit amounted to \$4,930,470, or \$2.88 a share.

Profit for the second quarter was \$2,-411,248, compared with \$2,399,369 in the preceding period and \$2,438,752 in corresponding period last year.

Tax provisions for the first half this year of \$11,500,000, were substantially unchanged from like 1942 period total.

Sheet & Tube Reports Net of \$2,257,425

Net profit of Youngstown Sheet & Tube Co., Youngstown, totaled \$2,257,-425, equal to \$1.22 a common share in the three months ended June 30 last. This compares with \$2,147,023 earned in the initial quarter this year and \$2,-291,119, or \$1.24 a share, for the corresponding 1942 quarter.

Based on quarterly reports the net profit for the first half amounted to \$4,-404,448, compared with \$4,867,698 in like period a year ago.

Inland Steel Has Second Period Net of \$3,011,333

Inland Steel Co., Chicago, reports second quarter net profit of \$3,011,333, equal to \$1.84. In the initial three months this year the company had net income of \$2,796,321, while for the corresponding 1942 quarter profit totaled \$2,782,391, or \$1.70 a share.

Indicated six months net income amounted to \$5,807,654, compared with \$5,471,481 in like 1942 period.

Directors declared a dividend of \$1 per share, payable Sept. 1 to record Aug. 13.

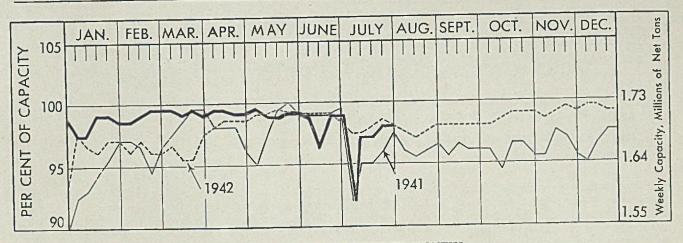
Wheeling Steel's Profit Totals \$2,290,401

Wheeling Steel Corp., Wheeling, W. Va., reports first half net income of \$2,-290,401, or \$2.43 a share, compared with \$1,995,648, equal to \$1.91 a share, earned in like 1942 period.

Second quarter profit totaled \$1,329,-010, against \$961,391 in the initial three

(Please turn to Page 160)

STEELWORKS OPERATIONS



STEEL INGOT PRODUCTION BY MONTHS

1943 1942	Jan. 7,424 7,112	Feb. 6,826 6,512	March 7,670 7,392	April 7,374 7,122	May 7,545 7,382	s, 000 omit June 7,027 7,022 6,792	July 7,148 6,812	Aug. 7,233 6,997	Sept. 7,067 6,811	Oct. 7,584 7,236	Nov. 7,184 6,960	Dec. 7,303 7,150
1941	6,922	6,230	7,124	6,754	7,044	and the second se		uju u				
					PIG IRON		TION					
1943	5,194	4,766	5,314	5,035	5,178	4,836			1005	5,236	5,083	5,201
1942	4,983	4,500	5,055	4,896	5,073	4,935	5,051	5,009	4,937	4,860	4,707	5,014
1941	4,666	4,206	4,702	4,340	4,596	4,551	4,766	4,784	4,721	4,000	4,101	0,011

Scrap Stocks Drop

May total declines slightly from 6,918,000 in April to about 6,905,000

STEEL and iron scrap stocks held at plants of consumers, suppliers and producers at the end of May approximated 6,905,000 gross tons, a slight decrease from the 6,918,000 tons reported as of April 30, the Bureau of Mines reports.

The decline was caused by a decrease of 3 per cent in stocks held by suppliers and producers, while consumers' stocks increased slightly. Suppliers' and producers' stocks May 30 were 1,299,000 tons, compared with 1,335,000 tons at the end of April; consumers' stocks were 5,606,000 tons, compared with 5,583,-000 tons. Most of the decrease in total stocks was due to a drop of 3 per cent in stocks in dealers' yards, while consumers' inventory gained 1 per cent.

Stocks at end of Month (000 omitted)

		Scrap								
		Purchased	Home	Pig iron						
May,	1943	. 5,414	1,491	1,328						
Apr.,	1943	. 5,416	1,502	1,327						
Mar.,	1943	5,343	1,507	1,350						
Feb.,	1943	5,354	1,517	1,370						
Jan.,	1943	. 5,401	1,476	1,302						
Dec.,	1942	5,501	1,429	1,272						
Nov.,	1942	. 5,363	1,379	1,191						
Oct.,	1942	4,956	1,304	1,130						
Jan., Dec., Nov.,	1942 1942	5,501 5,363	1,429 1,379	1,272 1,191						

Consumption during Month

		Scra		
		Purchased	Home	Pig iron
May,	1943	2,053	2,670	4,511
Apr.,	1943	2,019	2,623	4,423
Mar.,	1943	2,102	2,685	4,660
Feb.,	1943	1,857	2,321	4,162
Jan.,	1943	. 1,942	2,550	4,515
Dec.,	1942	. 2,016	2,481	4,465
Nov.,	1942	. 1,905	2,496	4,360
Oct.,	1942	. 2,061	2,709	4,594

DISTRICT STEEL RATES

Percentage of Ingot Capacity Engaged in Leading Districts

	Leaung	Lynourieus		
	Week Ended			ek
	July 31	Change	1942	1941
Pittsburgh Chicago Eastern Pa. Youngstown Wheeling Cleveland Buffalo Birmingham New England Cincinnati St. Louis		+ 1 None + 3 None -2.5 None + 2 + 1 None	$\begin{array}{c} 93.5\\ 100.5\\ 95\\ 96\\ 84\\ 93\\ 95.5\\ 95\\ 100\\ 88.5\\ 95.5\end{array}$	95.5 98 93 96 90.5 90 88 91.5 98
Detroit		- 1	89	87
Average • Based on	98	None aking caj	•98 pacities	•97.5 ns of
these dates.				

Coke Production for 1942 Sets 70,568,944-Ton Record

Production of coke in the United States during 1942 set a new high of 70,568,944 net tons, increase of 8 per cent over the 1941 total, according to the Bureau of Mines. The year's total comprised 62,294,909 tons of by-product coke, 7 per cent increase, and 8,274,035 tons of beehive, up 23 per cent above the 1941 figure.

Total value of coke, breeze, tar, and other by-products sold in 1942 was \$629,-408,422, another record and an increase of 17 per cent over the value for 1941. By-product coke showed a 19 per cent greater value over 1941.

Blast furnaces were the principal consumers of coke in 1942, using 55,491,570 tons, or 10 per cent more than for 1941. Foundries, manufacturers of producer gas and water gas, and other industrial plants consumed 9,190,418 tons, 12 per cent increase.

Ingot Rate 98%

Pittsburgh gains further from coal strike effects. Southern blast furnace taken off

PRODUCTION of open-hearth, bessemer and electric furnace ingots last week was unchanged at 98 per cent of capacity. Four districts advanced, three declined and five were unchanged. A year ago the rate was 98 per cent; two years ago it was 97½ per cent, both based on capacities as of those dates.

Pittsburgh continued to recover from effects of the coal strike and gained an additional point. The Birmingham district is expected to reach 100 per cent this week as the last open hearth is returned to service. Hot blast furnace of the Tennessee Coal, Iron & Railroad Co. has been taken off for extensive repairs. This makes three idle blast furnaces in the Birmingham district.

Coal and coke production continues to recover from the effects of the recent strike in the coal mines.

Bars Head Products List In Volume in First Half

Steel bars produced for sale in the first half of 1943 totaled 6,504,598 tons and topped in volume all other steel products, surpassing plate output of 6,399,825 by a small margin, the American Iron and Steel Institute reported last week.

Sheet and strip amounted to 4,674,541, shapes 1,886,415, cold reduced tin plate 1,076,295 and all steel products combined 33,245,073 tons. STECKEL MILL SUIT

Government Action Seeks To Void Cold Metal Process Co.'s Patents

Complaint, instituted in federal court at Cleveland "in public interest," alleges fraud. Objective is to free certain manufacturing methods from an "invalid" patent thus enabling government to save on war contracts

SUIT was filed last week in United States District Court for the northern district of Ohio, at Cleveland, by the government in a move aimed at cancellation of two patents on methods and machinery for cold-rolling steel and other metals secured by Abram P. Steckel and owned by the Cold Metal Process Co., both of Youngstown, O.

The patents (Nos. 1,744,016 and 1,779,195) relate to a "four-high" rolling mill, having relatively small working rolls and larger backing rolls, with roller bearings on the backing rolls; to the method of operating such a mill through supplying power largely by tension on the delivered strip; and to the manufacture produced by the methods and machinery claimed.

The civil suit, filed "in the public interest," alleges that the patents were obtained through "a fraudulent conspiracy" which has given the company a monopoly in the use of the methods and machinery involved.

Patent Is Held Grant

The suit is instituted under the principle that a patent is a grant made in the public interest, not simply for the protection of private interests, and with the objective of freeing certain manufacturing methods from an invalid patent and thus enabling the government to enjoy substantial savings on war contracts.

The public interest which the government invokes was, in the Department of Justice's view, ignored by the parties to the illegal arrangement charged, "however reasonable their dealings may have appeared when viewed purely as an adjustment of conflicting private interests."

The complaint charges that as a result of the patent monopoly the government, through contractors, subcontractors and other suppliers of war materials, is being obliged to pay to the Cold Metal company "very large sums of money as royalties which in justice and equity defendant (Cold Metal) is not entitled to exact."

According to the complaint, the fraudulent conspiracy was carried out in this manner:

1. On June 30, 1923, Steckel filed

application for a patent on a machine for cold-rolling metals, subsequently assigning the application to Cold Metals.

2. On April 6, 1926, Steckel canceled from his application certain claims after they had been turned down by

UNUSUAL ACTION

Government suit to void the patents of the Steckel mill held by the Cold Metal Process Co., Youngstown, O., is described by the Department of Justice as the most important action of its kind in 50 years.

In 1893 the government sought unsuccessfully to cancel the patents of the American Bell Telephone Co. In that suit the government charged that the procedure of the Patent Office had been abused in order to delay the issue of the patent for 14 years after the application was made so as to gain patent protection for a total of 31 years instead of the statutory period of 17 years.

In 1897 the Supreme Court held that the government had not shown such evidence of fraud or conspiracy to warrant cancellation of the patent.

the Patent Office for "lack of invention."

3. On April 20, 1926, through the same attorneys as filed the Steckel application, Florence C. Biggert Jr., and Lane Johnson, Pittsburgh, filed application for a patent on similar machinery, subsequently assigning the application to the United Engineering & Foundry Co., Pittsburgh.

4. Both applications were handled by the same attorneys who, the complaint states, "knew that there was a probable conflict between the two applications because both . . . disclosed common subject matter." The firm notified both clients of this fact, advising that Steckel was entitled to priority because of his earlier filing date.

5. On June 20, 1927, Cold Metals en-

tered into an agreement with United whereby Biggert and Johnson continued to seek a patent and asserted, as an argument in favor of a patentable invention (for lack of which the Steckel claim had been rejected by the Patent Office), that United had had commercial success in the sale of the Biggert-Johnson mills embodying the common subject matter.

6. After Biggert and Johnson obtained a patent, the complaint charges, their attorneys copied into the Steckel application the claims made in the Biggert-Johnson application and asked the Patent Office to declare an interference between the two, "with the contemplation that such interference claims would without a contest be awarded to Steckel because of his earlier filing date."

7. Cold Metals thereby secured a patent under the Steckel application and issued a license under it to United.

"Deprived of Truthful Facts"

The complaint charges that by this "means and artifice" . . . "the Patent Office was deprived of the complete and truthful presentation of facts to which it was entitled in the consideration of said common subject matter claims and was led to believe that said claims embodied patentable invention which they did not in fact and in law embody."

The complaint further alleges that the argument by Biggert and Johnson "as to the unprecedented commercial success of their mill was a carefully planned subterfuge and the execution of a fraudulent conspiracy to induce the patent examiner to allow the common subject matter claims to Biggert and Johnson which had been denied to Steckel, and thus to circumvent the examiner by having a patent issued to Biggert and Johnson and then to transfer into a patent to Steckel the common subject matter claims from the Biggert-Johnson patent by the instrumentality of an uncontested interference proceeding."

Steel Division Changes

Steel Division, WPB, has been reorganized with the following 11 branches under Jesse V. Honeycutt, assistant director of production:

ALLOYS STEEL BRANCH L. E. Creighton, chief; S. A. Crabtree and J. K. Kilmer, deputy chiefs; G. L. McBreen, chief, Aircraft Alloy Section; P. E. Floyd, chief, Stainless Steel Section; J. P. Larkin, chief, Tool Steel Section; J. F. Reid, chief, Scheduling Section. PLATE AND SHAPE BRANCH

PLATE AND SHAPE BRANCH M. W. Cole, chief; A. L. Meyer, chief, Plate Section; R. A. Marble, chief, Shape Section.

tion. **TUBING BRANCH** W. H. Wiewel, chief; L. W. Hartson, deputy chief; C. G. McDonald, chief, Aircraft Tubing Section; J. H. Weight, chief, Alloy Seamless Tubing Section; J. W. Davis, chief, Carbon Seamless Tubing Section; L. W. Hartson, chief, Welded Tubing Section.

RAIL AND TRACK ACCESSORIES BRANCH G. C. Bruner, chief; R. M. Thulean, chief, Rail Section; N. M. Bench, chief, Accessories Section.

COLD-FINISHED BAR BRANCH E. B. Files, chief; V. R. Bates, deputy chief.

TIN PLATE BRANCH R. F. Sentner, chief; J. T. Nichols, chief, Domestic Section; W. C. Brill, chief, Export Section.

SHEET AND STRIP BRANCH

L. F. Miller, chief; E. F. Clark, chief, Strip Section; M. M. Chapman, chief, Sheet Section.

CARBON BAR AND SEMIFINISHED BRANCH

W. F. Vosmer, chief; A. A. Wagner, deputy chief; E. A. Wallace, chief, Semifinished Section; A. A. Archibald, chief, Shell Steel Section; D. M. Schmid, chief, Carbon Bar Section; W. R. Klinkicht, chief, Reinforcing Bar and Rerolled Rail Section.

FORGINGS AND CASTINGS BRANCH G. F. Hocker, chief; B. L. Weaver, chief, Steel Castings Section; R. F. LaMarche, chief, Iron Section; A. A. Ohmer, chief, Press and Open Hammer Forging Section; A. H. Shoen, chief, Drop and Upset Forgings Section; H. W. Davidson, chief, Armor Plate and Wheel and Axle Section.

WIRE AND WIRE PRODUCTS SECTION H. M. Francis, chief; J. P. Barclay, chief, Wire Rope and Strand Section; H. E. Hartman, chief, Rod and Wire Products Section. PIPE BRANCH

D. F. Lacey, chief; J. W. Owings, deputy chief.

WPB Asks Users of Seamless Cold Drawn To Specify Standard Sizes

MANUFACTURERS of cold-drawn seamless steel mechanical tubing have been requested by the War Production Board to solicit co-operation from all direct users of this product to conform to a series of standard sizes.

This follows action earlier this year in order L-211, schedule 6, which limited the sizes of cold-drawn mechanical tubing which could be supplied by mills to jobbers or warehouse stocks. Common practice had supplied more than 1600 different sizes for the warehouse trade, as well as for direct consumption. The order directed producers to follow "List 500", consisting of about 500 sizes from ¼-inch to 10½-inch outside diameter and 0.022-inch to 1 inch wall thickness.

The list represents a condensation by National Tube Co. of its most commonly used sizes, and was made in an effort to speed up production by concentrating

output in as few variations as possible.

The WPB action does not require consumers of mechanical tubing to conform to these sizes, but requests that buyers stay within the limits of the table in their orders wherever possible.

Considerable gain in production of this critical product could result with full cooperation on this measure by consumers. "Down" time on the equipment producing seamless mechanical tubing is greatly extended when a large number of size changes must be made. Because of the nature of the product, orders are almost invariably small when judged by quantity standards of other steel products. Concentration on standard sizes would permit many of these small orders to be bunched together and run consecutively without need for changes in the equipment.

The list of standard sizes is shown in the following table:

Seamless Steel Mechanical Tubing—Round (Cold Drawn)

LIST 500-STANDARD SIZES-Theoretical Weight in Pounds Per Foot

	Vall kness	123				5.5							0	utsid	e Dia	meter	in ir	nches											
Deci- mal of inch	Equiv- alent fraction	*4	5 16	• * *	7.16	14	9. ₁₆	5/8	34	78	1	11,16	115	13 16	1)4	15/6	13/8	112	1%	134	17/A	2	2/8	21/4	23/8	2]2	25/8	23/4	27 ji
.022 .028 .035 .049		.054 .066 .080 .105	.068 .085 .104 .138	.083 .104 .127 .171	.123 .151 .204	.174 .236	.197	.221 .301	. 267	.314 .432	. 361 . 498	- 384 - 531		.431	-154 .629			.5.18		. 890									
.065 .083 .095 .120		••••• •••••	.172	.215	.259 .315 .348	. 302 . 370 . 411 . 487	-346 -426 -475	.389 .481 .538 .647	.807	.068	.813 .918 1.13	.869 .982 1.21	.923 1.05 1.29	1.11 1.37	1.03 1.17 1.45	1.24	1.15 1.30 1.61	.996 1.26 1.43 1.77	1.55	1.48 1.68 2.09	1.81	1.93	2.06	2.19	2.31 2.90	2.44	2.57 3.21	3.37	3-53
-156 188 -219 -250	5年1611年14								1.13	1.38	1.63	1.70	1,88 2,12 2,34	2.01 2.27 2.50	2.13 2.41 2.67	2.30 2.56 2.84	2.38 2.70 3.00	2.24 2.63 3.00 3.34	3.29	3.58	3.39	4.17	4.46 5.01	4.14 4.75 5.34	3.70 4.39 5.04 5.67	4.64 5.34 6.01	4.11 4.89 5.63 6.34	5.14 5.92 6.68	5.40 6.21 7.01
-313 -375 -438 -500	5 (8 3/8 1/2							· · · · · ·				· · · · · · · · · · · · · · · · · · ·			3.50	3.70	1.01	3.97 4.51 4.97 5.34	5.01 5.53 6.01	5.51 6.14 9.68	6.72 7-34	7.31 8.01	7.89	7.51 8.48 9.35	10.0	8.51 9.05 10.7	7.73 9.01 10.2 11.4	9.51 10.8 12.0	10.0 11.4 12.7
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.156 .188 .219 .250	Strain Strain	5.6		0.1	5 0.4	(6.0	5 7.1	5 10.0	8.10	8.0	9.1	9.0	a10.2	10.7	11.2	11.1	12.2	A COMPLET	17.4	1000		19.4	20.0	20.7	22.0	23.4	21.7	26.0	27.4
.313 .375 .438 .300	5/16 3/8 1/19 1/2	12 0	11.0	11.5	12.0 13.7 15.4	12.5 14.3 16.0	13.5 15.5 17.4	12.3 14.5 16.7 18.7	15.5 17.8 20.0	16.5 19.0 21.4	17.5 20.2 22.7	18.5	19.5	20.5	28.0	22.5	23.5	32.0	33-4	34.7	36.0	37.4	38.7					50.7	53.4
.625 .750 .875 1.000	3/8 3/1 7/8 X	18.0	+	17.5 20.0 22.2 24.0		. 22.0	24.0	22.5 26.0 29.2 32.0	28.0	30.0	32.0	34.0	36.1	38.1	40.1	42.1	44.1	46.1	48.1	50.1	52.1	54.1			62 I 80. I				

Items listed above have been adopted by WPB (L-211, Schedule 6, Feb.25, 1943) as standard sizes for cold-drawn seamless mechanical tubing with carbon 0.30 per cent or less and sulphur 0.05 per cent or less. Sizes marked with asterisk not available under present operating conditions.

WINDUWS of WASHINGIUN

May Get Action

THE report of the Truman Committee alleging that Wright Aeronautical Corp., a Curtiss-Wright subsidiary, delivered defective equipment to the government has revived interest in a bill introduced earlier this year by Senator Hobbs (D. Ala.). It would impose penalties of death, life imprisonment or a \$1,000,000 fine on officers of firms delivering defective equipment to the armed forces.

The bill has never been reported to the House by the Judiciary Committee. A subcommittee held hearings and the bill as originally written was modified. That was as far as it got. Representative Hobbs believes that inasmuch as more Truman disclosures are slated to be made public it is quite likely that his bill will come up for further consideration after Congress reconvenes in September.

More Shortages

Shortages: The paper supply, after a short, easier interlude, again is tightening; the shortage is particularly bad in brown paper and in paper and cardboard containers. . . The manila rope situation is becoming more critical, due largely to the huge quantities required on ships, in parachute flares and other war items. . . . Second half program calls for collection of 15,000,000 tons of iron and steel scrap and this is considered a colossal task in view of the shortage of labor in scrap yards.

Iron Customer

Food enrichment has provided a new customer for iron-the flour milling and white bread baking industries. At present, under voluntary compliance, 75 per cent of flour contains a minimum of 6 milligrams of iron per pound of product and 75 per cent of white bread contains a minimum of 4 milligrams of iron per pound of flour. The standard has been raised by the Federal Security Agency through the Food and Drug Administration and on and after Oct. 1 it will call for a minimum of 13 milligrams of iron in a pound of flour and 82/3 milligrams of iron in a pound of white bread. Whereas niacin and vitamin B-1 now are added, riboflavin also will be added on and after Oct. 1.

The iron is added in the form of reduced iron or pure iron, or in the form of compounds, principally sodium iron pyrophosphate and ferric phosphate. Somewhat less iron than the above figures actually are added because the flour in its original state has some iron, usually in the neighborhood of 3 milli-

grams a pound. In making their studies the experts even took into account the iron that goes into flour and bread because of wear on the milling and doughmixing machinery. The process is one, therefore, where bread eaters get added nutrition and makers of repair parts get added business.

In case anyone wants to figure out how much iron is used in making bread,

SELLING IN REVERSE

Rolf Nugent's idea of "installment selling in reverse" whereby consumers pay now for goods to be delivered after the emergency has been adopted by a number of business and manufacturing interests. Cessna Aircraft Co., Wichita, Kans., reports more than 1000 persons, by earmarking war bonds, are arranging to buy airplanes for delivery after the war.

Commercial Investment Trust Inc., 1 Park avenue, New York, has a plan under which used cars are sold to dealers and the money retained in the form of deposits to be used as partial payments for new cars in the future.

Radio Corp. of America is accepting payments now for movie theater equipment for delivery when and as produced.

Mr. Nugent, incidentally, has resigned as director of the credit policy office of the Office of Price Administration and now occupies a post in the War Food Administration.

current output of white flour is 120,000,-000 barrels yearly while output of white bread ranges between 12,000,000,000 and 13,000,000,000 pounds annually. About 75 per cent of bakers and millers comply voluntarily with the enrichment standard. The War Food Administration is expected soon to take action to make compliance mandatory.

Scrap Segregation

The revised alloy steel scrap segregation orders M-24-c and M-24-d are to be made "mandatory" in the near future. Despite the pressures that were brought to bear adequate segregation methods are not prevalent at all plants. The Navy's system of color identifications of different analyses has helped considerably, as have the color systems of some individual companies. However, segregation has not been "sold" with sufficient vigor to plant workers.

Not a Chance!

Informed observers in labor circles here do not believe Philip Murray's call upon the American Federation of Labor and the railroad brotherhoods to unite with the Congress of Industrial Organizations on 1944 election objectives has any remote chance of favorable action. AFL men accuse CIO of cashing in on AFL's prestige, that CIO is riding on Roosevelt's coat tails, and that CIO must favor a fourth term for survival. AFL. with dues-paying membership around 6.200,000, is resentful of CIO claims of 5.000.000 members; AFL officials say CIO dues-paying membership could not possibly be above 2,150,000. That is why AFL recently refused President Roosevelt's invitation to appoint representatives to a labor mission to Europe with an equal number of CIO representatives. AFL officials believe there is good chance that the United Automobile Workers will desert CIO and follow John L. Lewis into the AFL.

Cadmium Critical

The supply of cadmium is getting more critical. Conservation Division of the War Production Board is getting ready to launch a campaign to conserve cadmium through use of substitutions but principally by encouraging platers either to use thinner coating or to eliminate wasteful methods of plating by which the coat is thicker in some places than in others.

New Cartridge

Light, small, 30-caliber ammunition. of a new type requiring less than onethird the amount of brass used in the ordinary 30-caliber cartridge, is being produced in several plants of the Remington Arms Co., Bridgeport, Conn., at the rate of over 130,000,000 rounds a month.

The new ammunition, known as 30Ml. is less than half the weight and onefourth the volume of the usual type, and has deadly accuracy at 300 yards. It is used in the new 30-caliber carbine.

Production of type 30M1 ammunition was begun less than a year ago, but it has shown excellent battle results in Sicily and the Aleutians. Aside from the saving in brass, the new ammunition is so small and light that a hundred or more of the cartridges can be carried in a soldier's tunic pocket. Cargo space is also saved, as a case holding 3450 rounds occupies less than half the space of a 1500-round case of ordinary ammunition.

Tax Boost Involved in Proposed Broadening of Present Act

Implications in suggested changes merit close attention of employers. Benefits not only would be extended to larger part of population but socialized medicine setup, financed by steep increase in taxes, is included

MANUFACTURERS and other employers will do well to give thought to the bill now pending in the Senate to broaden the Social Security act. Sponsored by Senators Robert F. Wagner (D. N. Y.) and James E. Murray (D. Mont.), the bill is aimed at removing exemptions under the act as it now stands. These exemptions now prevent domestic and farm workers, sailors, employes of religious and charitable institutions, public servants and several other groups from enjoying the old age pension and unemployment insurance benefits of the act.

It seems unlikely that Congress will object to this feature of the Wagner-Murray bill since it is the general feeling that as long as we have social security it should be universal.

But the bill thereafter proposes a socialized medical setup—a government medicine scheme—that would be run from Washington by the United States surgeon general. It would be financed by a steep increase in all social security taxes. Employer and employe, each, would pay 6 per cent of wages up to \$3000 a year, as against the present 1 per cent from employes and up to 4 per cent from employers. That would come on top of the present 20 per cent withholding tax. Onefourth of the revenue thus raised would go to finance the federal government medical program, that is, an estimated \$3,000,000,000 a year.

Envisages Broad Program

The surgeon general would be required by this bill to arrange for general medical, special medical, laboratory and hospital services for some 110,000,000 Americans covered by the broadened Social Security act. He would have power to enlist physicians and hospitals, fix fees of physicians so enlisted, limit the number of patients to be cared for by each physician, prorate patients among available physicians, finance medical education and research.

Out of his \$3,000,000,000 a year the surgeon general would spend about \$600,-000,000 for administration and would pay out \$2,400,000,000 in benefits. Under the head of benefits he would spend 2 per cent of the \$2,400,000,000, or \$48,000,-000, on medical research and education.

By this setup, the surgcon general automatically would become one of the most powerful administrators in the land. With these huge funds at his disposal he could be absolute czar of the medical profession and of hospitals, medical schools and medicine.

Enactment of this bill in its present form would be a blow to our free enterprise system. Many members of Congress will oppose it on that basis, for the majority in Congress favors perpetua-

SOCIAL SECURITY

tion of the American free enterprise system if it is at all possible.

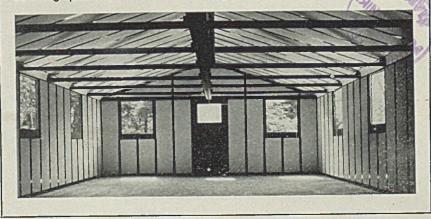
But what Congress will do about this particular proposal to nationalize medicine is not so sure. The trouble is that the medical profession as it has operated in the past has not done a very good public relations job for itself.

Many signs indicate that groups in this country in future will be treated on the basis of the degree of responsibility they are willing to assume. When the Wagner-Murray bill comes up for hearings, the doctors will have an opportunity to speak their piece and tell Congress what sort of a program they would be willing to work out voluntarily to take care of the physical well-being of all the people. If they fail to convince Congress of their ability to work toward this objective in an organized way, it is entirely likely Congress might take some action. But if the doctors tell a good story it is more than likely that Congress will refuse to place them in shackles.



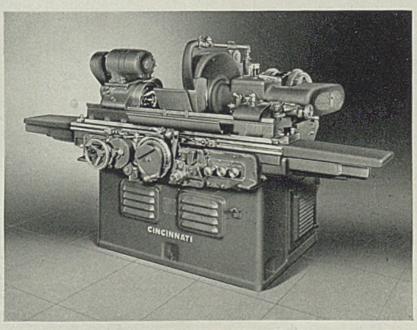
TASK FORCE BUILDING: Specially engineered by the Tennessee Coal, Iron & Railroad Co. in co-operation with Army and Navy personnel for use by our armed services overseas steel utility structures such as shown in the accompanying illustrations are designed so that component parts nest together and require a minimum of shipping space. A 20 x 50-foot unit requires slightly less than $5\frac{1}{2}$ tons of steel and all parts take only 225 cubic feet of shipping space.

They are manufactured by the Southern States Iron Roofing Co., Savannah, Ga., and distributed by the United States Steel Export Co., 30 Church street, New York. Large numbers of the units already have been ordered by the Navy for use as mobile hospitals. They also may be used as living quarters, mess halls or storage rooms.

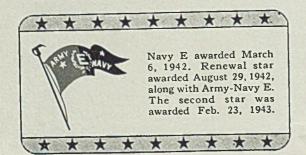


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(TEEL

PRIORITIES-ALLOCATIONS-PRICES

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

INSTRUCTIONS

STEEL PRODUCERS: Symbol "FC" will be used by the Steel Division to identify allotments of controlled materials mude to steel producers on form CMP-4B under CMP regulation No. 8. Steel producers who receive purchase orders bearing allotment numbers identified by the symbol "FC" should report their shipments of such orders under that symbol on "Monthly Reports of Shipments and Past Due Orders" form CMP-8.

RADIO WIRE: Radio jobbers may apply for relief to the War Production Board on form WPB-1161 (formerly PD-470) listing frozen stocks of copper wire mill products by amounts, sizes and types which cannot be sold in accordance with CMP regulation No. 4. In the event an application should be approved by WPB, copper wire sold under such authorization cannot be replaced in stock.

MRO SUPPLIES: Ratings assigned for third quarter of 1943 only, to governmental agencies and institutions on WPB-837 (formerly PD-408) for maintenance, repair and operating supplies may be used to the extent authorized on the form. Use of these ratings is permitted as an exception to restrictions of priorities regulation No. 3 which prohibits use of ratings assigned for MRO supplies for certain items on List B.

E ORDERS

HAND TOOLS: Special endorsement formerly needed for hand tools, including precision measuring instruments, will be eliminated Aug. 15 from provisions of order E-5-a since direction 9 to CMP regulation No. 5 now provides an overall method under which workers may obtain tools. (E-5-a)

L ORDERS

CLOSURES: Production of slide fasteners for civilian use may be resumed on a limited scale. Only distress stocks of carbon steel obtained from the Steel Recovery Corp. may be used for civilian needs and in no case may the quantity processed in any quarter exceed 3/3 of average quarterly consumption of all metals by the individual producer concerned during the year ended June 30, 1941, Slide fasteners of the year ended june 30, 1941. Slide fasteners of the separating type cannot exceed 27 inches in length. Production and sale of slide fasteners for skirts and dress plackets for uniforms for the women's auxiliaries of the armed forces are permitted. Carbon steel can be used for the manufacture of hooks, eyes, and snap fasteners for civilian use in an amount equal to 1941 consumption. Discrimination in sales and deliveries is prohibited. Slide fasteners or chain produced for the armed forces but failing to meet specifications may be sold or delivered only when specifically authorized by WPB. Manu-facturers wishing to produce slide fasteners for civilian use should file an appeal with WPB for relief from restrictions of order M-126, which now prohibits use of steel for that product. They should forward to J. D. Clokey Jr., Steel Recovery Corp., 5835 Baum boulevard. Pittsburgh, information regarding their requirements in properly balanced quantities of each item. indicating the exact dimensions and other specifications of material suited to their facilities, Initial allotments of metal will not be made prior to Aug. 5. (L-68)

SAFETY EQUIPMENT: Restrictions on use of copper-base alloys and alloy steel in manufacture of certain items of safety equipment have been eased. In addition to the permitted uses set forth in appendix "A" of the order as amended May 5, copper-base alloy may now be used in internal valve mechanisms of safety filling cans with flexible pour spouts, provided net weight of the alloy does not exceed 2 ounces per can and provided it is not used in screens (or parts thereof) designed for non-flash-back or strainer purposes. Alloy steel of NE-8630 or lower grade now may be used for foot and toe guards to the extent necessary to provide protection against impact injuries. (L-114)

USED CONSTRUCTION EQUIPMENT: Farmers are exempted from registering their used construction equipment under terms of order L-196 while registration of 22 small items, irrespective of ownership, is also exempt. Deleted items include: rock drills, jackhammers, screens, kettles and heaters. (L-196)

INDEX OF ORDER REVISIONS

Subject	Designations
Abrasives	
Alloys, Steel	
Cadmium	
Carbon Black	
Closures	
Equipment, Safety	
Equipment, Used Constructi	on. L-196
Equipment, Welding	
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Machinery, Farm	L-257
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Tools, Hand	E-5-a
Price Regulation	s C
Coke	No. 121
Magnesium	No. 302
Silver	GMPR

BUILDERS' FINISHING HARDWARE: Certain fabricated parts, hitherto frozen in inventory by order M-9-c, have been released for use in manufacture of builders' finishing hardware, cabinet locks and padlocks. Parts affected are those which were in possession of the producer on or before May 31, 1943, and in which 10% or more of the total weight is metal other than copper or copper base alloy. (L-236)

FARM MACHINERY: Small producers of farm machinery and equipment have been exempted from requirements that production schedules must be approved by WPB. Small producers are defined as any producer whose total net sales (including export and sales by affiliates) of all products did not exceed \$100,000 during 1941. Included also are any producers classified by the Smaller War Plants Corp. as a "smaller, distress producer" and specifically designated as such by WPB. (L-257)

LUGGAGE: Use of iron and steel for valances, bindings and corners on foot lockers and for hangar bracket assemblies in men's wardrobe luggage is now permitted. (L-284)

WELDING EQUIPMENT: Purchase orders for resistance welding equipment received prior to July 27 are exempt from delivery restrictions imposed previously by WPB. (L-298)

strictions imposed previously by WPB. (L-298) POWERCYCLES: Production of powercycles now are limited to those manufactured from fabricated parts in inventory on July 1, 1943, or to those specifically authorized by WPB. Production of repair parts is permitted at the rate of 125 per cent of 1942 output. Distribution is restricted to the Army, Navy, Maritime Commission, War Shipping Administration and for Lend-Lease. Persons engaged in essential war industries may apply on WPB-1319 for authorization to purchase powercycles, defined as any two or three wheeled vehicle propelled by an internal combustion engine which has a displacement of less than 25 cubic inches. Motor-cycles are not included. (L-301)

M ORDERS

STEEL ALLOYS: Technical descriptions of uses for which certain analysis of alloys are permissible have been clarified by the War Production Board. The order refers to heat-resistant chromium or chromium-nickel alloy iron and alloy steel materials. (M-21-g)

GRAPHITE: Manufacture of graphite crucibles has been limited by WPB. Certain sizes of standard erucibles may no longer be made and no manufacturer may make any size of special crucible he had not made before July 27. (M-61-a)

CADMIUM: Use of cadmium in pigments is prohibited, except for specific purposes, most of which are military. (M-65-a)

CARBON BLACK: Manufacturers requiring furnace type carbon black in quantities between 100 and 5000 pounds in any month are not required to obtain direct or specific allocation from the WPB. Under the new procedure, orders within these limits are placed directly upon suppliers of carbon black, who in turn on the 20th of each month furnish the Chemicals Division, WPB, with a list of orders received. The division then confirms or denies the orders. Specific allocation must be made for amounts of more than 5000 pounds. Primary products for which furnace type carbon black may be used are specified in the order. (M-244)

ABRASIVES: Production and sale of any bonded abrasive product containing abrasive grain manufactured from fused aluminum oxide (other than reclaimed grain) of any grit size 80 or coarser will be prohibited after Aug. 1 for mill, burr and hulling stones; grinding wheels used in the following operations: beveling or edging cut glass, grinding bath tubs and sanitary ware, grinding porcelain articles other than spark plugs, and grinding advertising novelties; non-slip products, including non-slip tiles. Manufacture or sale of the following bonded abrasive products containing aluminum oxide wheel grain (other than reclaimed grain) of any grit size 80 or coarser is prohibited: oil. scythe, and all other sharpening stones and hand rub bricks; pulp stones. grinding wheels for use on hand grinders; air diffuser plates and tubes, except for maintenance and repair of exist-ing facilities. Manufacture and sale of rubber bonded abrasives products is prohibited except for the following permitted types; centerless grinding and centerless control wheels; shank mounted wheels and nut mounted bobs three inches and smaller in diameter; mounted sticks: cut-off wheels: bonded cork or cotton products; or for the following operations if the order is certified as prescribed: ball and roller race-grinding; grinding heat-sensitive steels; grinding rubber and asbestos products; side grinding operations with thin wheels for removal of fine and burrs where safety requires use of a rubber honded wheel; soft polishing operations; form grinding; slot grinding; weld grinding at the bottom of slots: precision grinding operations where the use of rubber bonded abrasive prodwhere the use of rubber bonded abrasive prod-ucts is necessary to resist a dressing action: finish grinding stainless steel strip and sheet bars where rolling practice requires finishes ob-tainable only through the use of rubber bonded abrasive wheels. Coating and sale of coated abrasive graduets containing abrasive grain man-ufactured from funct aluminum order (other ufactured from fused aluminum oxide (other than reclaimed grain) of any grit size 80 or coarser is restricted for the following purposes: floor surfacing, wood working, shoe repairing, and non-slip products. (M-319-a)

U ORDERS

WIRE EQUIPMENT: Necessity for an eschange of ratings between operators of communications systems in transferring enuipment among one another has been climinated. (U-5)

PRICE REGULATIONS

SILVER: Manufacturers of semi-fabricated silver products now are authorized by OPA to charge the same prices for products made of Treasury silver sold under the Green act as they are permitted to charge for items made of newly-mined domestic silver. The Green act provides that Treasury silver sold under its terms cannot be sold at less than 71.11c per fine troy ounce. (GMPR)

COKE: Producers of coke now may file applications for an adjustment in their maximum prices when receipts from the sale of their entire production at ceiling prices do not equal total costs of production. (No. 121)

MAGNESIUM: Magnesium remelt ingot containing a combination of No. 4 and No. 17 alloys has been removed from the Class A ingot price list by Office of Price Administration. It is now priced as a Class B or Class C ingot, according to its alloy content. Maximum base price for Class A ingot is 21.50c a pound; for class B, 18.50c; and Class C, 16.00c. Premium of 1 cent a pound which sellers were permitted to charge for segregated scrap containing a combination of both No. 4 and No. 17 alloys has been revoked. (No. 302)

Simplifies Program for Farm Machinery Distribution

War Food Administration has authorized manufacturers of farm machinery and equipment to distribute up to 40 per cent of their production in the year beginning July 1, 1943 of items now listed for rationing under WPB order L-257, which provides for specific quotas for various farm machines and equipment and permits unlimited production of repair parts.

Under the terms of the order manufacturers may distribute up to 40 per cent of their production as they see fit through normal distribution channels. However, they are first required to fill quotas issued to them by the War Food Administration, which were designed to place rationed items of farm machinery and equipment where they would be needed to satisfy state and county quotas established under last year's machinery distribution program. This refers to machinery produced under WPB order L-170.

RFC Subsidiaries Organize Price Adjustment Board

Joint Price Adjustment Board has been established by Defense Plant Corp., Defense Supplies Corp., Metals Reserve Co. and Rubber Reserve Co. to carry out the recent act of Congress bringing these subsidiaries of the Reconstruction Finance Corp. under the Renegotiation of Contracts law. Members of this board are: C. B. Henderson, S. H. Husbands, H. J. Klossner, H. A. Mulligan and C. T. Fisher Jr., all directors of RFC.

Mr. Fisher has been named chairman of the board while R. C. Patterson, formerly of the Bureau of the Budget, has been appointed chief administrative officer to the Joint Price Adjustment Board.

Easier Supply Situation Develops in Magnesium and Some Ferroalloys

INCREASED production has resulted in an improved position in magnesium, while certain other critical nonferrous metals and ferroalloys are slightly easier, largely reflecting more direct channeling to essential needs. This is revealed in issue No. 9 of the Material Substitution and Supply List, issued by the Conservation Division, War Production Board.

Some 500 materials are classified by their relative availability and are divided into three groups. Group I lists those insufficient currently for essential war and industrial needs.

The metals in this group which are most critical are: Bismuth and cadmium (relatively small total production), tin, copper, zinc, tantalum, molybdenum, nickel, columbium, chrome-nickel stainless steel, straight chrome stainless steel, steel bars (1½ inches and larger), steel forgings, and seamless steel tubing.

Aluminum Still Critical

Metals which are only slightly less critical are: Aluminum, beryllium, lithium, iridium, osmium, tungsten, vanadium, silicon metal, chromium, AISI or SAE alloy steel, NE alloy steel, high speed tool steel, low phosphorous pig iron, alloy cast iron, open hearth carbon steel, and the following steel products: plates, sheet and strip, bars (under 1½ inches, except reinforcing), wire rope, wire products (except wire mesh reinforcing), castings, tin plate, terne plate, and galvanized sheet.

Manufacturers and individuals writing specifications are requested by the Conservation Division to keep relative tonnages in mind when planning substitutions. Otherwise small tonnage substitutes become exhausted quickly. For this reason any large tonnage ferrous metal is usually preferred to any smaller tonnage nonferrous or plastic.

The choice between steel and wood depends largely on type of need, application and local conditions, the report said. However, no relative change has occurred in the wood supply situation which necessitates wholesale switches back to steel, although most hardwoods and most one-inch boards of all species have been placed in group I.

Certain fabricated forms of metals are much tighter than the raw materials themselves or other fabricated forms because of shortage of processing facilities or manpower, for example aluminum forgings. In addition to straight substi-

tution, a growing practice that is easing critical requirements is "downgrading" or substitution of alloys with only slightly different characteristics, particularly in casting applications.

With the increasing prevalence of labor shortages, greater emphasis must be placed on the use of materials which are suitable for low unit labor processes, such as stamping, die molding and die casting.

Coal strikes and other labor difficulties have retarded steel production, and the scheduled increase in the military procurement program involves increases in steel consumption in excess of any presently scheduled expansion of steel production, the Conservation Division says.

Metals in group II, which includes those materials essential to the war program but which enjoy supplies at present sufficient to meet war demands plus essential industrial demands, include: Magnesium, calcium, platinum, ruthenium, rhodium, mercury, indium, silver, cobalt, low carbon ferromanganese, ferroboron, zirconium and alloys, silicomanganese, ferrosilicon, spiegeleisen, silvery iron, tool steel (except high speed), wrought iron, malleable and gray cast iron, pig iron (except low phosphorous), bessemer steel products and the following additional steel products: lead-coated sheets, black plate, pipe, rails, structurals, piling, wire mesh reinforcing, reinforcing bars, and rerolled rail products.

Metals which are available for essential uses and which should be substituted for the scarcer materials in groups I and II wherever possible unless supplies are restricted locally by labor, manufacturing or transportation difficulties follow: Antimony, antimonial lead, ferro-carbontitanium, high carbon ferromanganese, gold, lead, and palladium.

Construction of Shasta Power Line To Be Rushed

Bureau of Reclamation has been ordered to expedite construction of the Shasta-Oroville transmission line of the Central Valley project in northern California. The War Production Board has allotted 1,207,800 pounds of aluminum to be used in lieu of copper as the conductor for the electrical energy the line will carry. Estimated cost of the 98mile line is \$1,900,000. The Shasta Dam power plant will make available 150,000 kilowatts in March, 1944.

SLINGSHOT...

with a 1,000,000 pound wallop!



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HYATT ROLLER BEARINGS

By A. H. ALLEN

Detroit Editor, STEEL

MIRRORS of MOTORDOM

Australia's industry still has to build its first complete motor car but the industrial mobilization job which the commonwealth has done since 1939 is little short of amazing. Conversion to war production outstanding

THE COMMONWEALTH of Australia still has to see the first complete motor car built by its own industry, but the industrial mobilization job which the country of sheep and kangaroos has wrought since 1939 is little short of amazing when the facts are known.

Hundreds of thousands of American boys stationed in Australia perhaps now are gaining some realization of the commonwealth's war job, but there is scant perception of the extent of the task in this country. For that reason it may be pertinent to review some of the facts.

Intimately connected with war industry is the problem of manpower. Australia has a population of 7,000,000, of whom 5,000,000 are between the ages of 14 and 65. Of a total male population of 2,530,000 between these ages, about 1,500,000 are now on full-time war work, including members of the fighting forces. Since September, 1939, the number of factory workers on actual war jobs has increased 38-fold, total factory employes numbering 709,000, or not quite the equivalent of industrial employment right now in the metropolitan area of the city of Detroit.

At the outbreak of war in September, 1939, government and semigovernment munition factories, aircraft plants and shipbuilding yards employed 13,500 men and women. Today the figure, including workers on direct war contracts in private plants, has increased to 515,000 or roughly the equivalent of peak prewar employment in motor vehicle and body plants in the United States.

These figures and related information are from an illustrated booklet titled *The Job Australia Is Doing*, published in New York by the Australia News and Information Bureau, an agency of the commonwealth government.

With regard to arms production, when war broke out in 1939, Australia had four munitions factories; these had grown to eight in number when Japan struck at Pearl Harbor. Now there are 49 government munitions plants, 25 in operation and 24 more authorized, with 170 "munitions annexes." Production range includes cruiser tanks, combat war planes including engines, armored universal carriers and cars, destroyers, corvettes, harbor defense vessels, freighters, mines, aircraft bombs, three types of mortars, field guns including 25-pounders, two types of submachine guns, four types of machine guns, three types of antiair-

craft guns, pistols, rifles, respirators, grenades, parachutes, all forms of pyrotechnics, 53 types of radio, antiaircraft predictors (range finders), 32 types of optical munitions, searchlights, and 73 types of ammun'ition.

The heat was really turned on production in 1940 after the evacuation of Dunkirk by the British. Essington Lewis was appointed director-general of Australian munitions, and other leading executives were named by the government to control individual branches of production like ordnance and armored vehicles. Boards of Area Management were set up to consolidate and boost local resources.

Machine Tools Controlled

The government took control over all machine tools. None could be bought, sold or transferred without permission. It bought quantities of machinery from the United States, built up local industry and absorbed its output, and bought thousands of machines where they stood in private shops. Machinery was redistributed through expanding industry. If a plant could do better or quicker work by adding a process under its own roof instead of sending it out to a subcontractor it was allocated necessary machinery as soon as it was available.

The result? In 1939 Australia had five plants building machine tools; now there

are 75. In 1939 less than 100 machine tools would have been good production for Australia; at present 20,000 machines have been built or are building since the beginning of the war. Plants numbering 188 are now producing tools and gages, compared with two in 1939; and these 188 units are being asked to turn out 26,000 tools and gages daily.

Industry was decentralized away from the seaboard. New weapons were developed like the Owen machine gun which is made at a cost of \$28.16 against an average price of \$128 for a Thompson submachine gun. Manufacture of combat tanks was undertaken and technique developed for casting a complete tank hull before a similar procedure was developed in the United States. British Beaufort torpedo bombers were put into production. Production of advanced training and observation aircraft was extended. Armor plate is pouring from the steel mills of the Broken Hill Proprietary Co. Ltd. Five thousand miles of new strategic highways have been built by the Allied Works Council in the last year, three principal ones being the East Australian Inland road, the North-South-Transcontinental Road and the northern East-West road. Australian state railways showed a 68 per cent increase in gross ton-miles over a four-year period, despite the exasperating difficulties involved in transfer of freight at state borders because of differences in track gages.

Capital expenditures authorized on government munition plants to December, 1942, were \$170,570,000 and on munitions annexes \$45,860,000. Since the start of war the value of Australia's



Truck assembly line of the International Harvester Co. of Australia, Pty. Ltd. at Melbourne. These trucks are destined for the armed forces

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MIRRORS of MOTORDOM



Assembling military mobile tractor cranes at the Melbourne branch of the International Harvester Co. of Australia, Pty. Ltd. The entire Australian company went to war early in 1940 supplying a wide variety of war equipment

munitions output has reached \$167,351,-000. Striking as these figures are for a country of 7,000,000 population, they still fall far short of comparable expenditures in the United States, even applying a factor of 20 to compensate for the greater population of this country.

The Australians are a trifle touchy on the subject of lend-lease, pointing out that they have gone to great lengths on "reciprocal aid" which includes as a most important item the feeding and housing of American troops there. Estimated expenditure on reciprocal lendlease for the financial year 1942-43 by Australia is \$177,000,000, and figured on a population basis the value of reciprocal aid which Australia is giving the United States is calculated to be seven times as great as the aid which this country has made available to Australia. For purposes of Allied unity it is best to pass over this phase a little hurriedly.

By virtue of proximity, Japan is the commonwealth's No. 1 enemy, and although Anzac divisions fought Britain's fight on every front long before Pearl Harbor, the all-out phase of Australia's effort did not begin until the Japs began moving into the southwest Pacific. When General MacArthur arrived in Australia from the Philippines, he was greeted as the savior of the country and is still aces with the Aussies.

Study Japanese Equipment

Australian engineers have made detailed studies of various types of captured Japanese war equipment and they report a lot of it is surprisingly good construction. A captured 16-ton tank, for example, showed complete originality of design, fine workmanship and no stinting of materials. The power plant was a 6-cylinder in-line air-cooled diesel, a type of engine which many tank experts in this country would like to see available, but there is nothing like it now being built here.

Speaking of tanks, it is interesting to note the proportions of the job of spare parts supply for American tanks in the field. Such parts are produced in "sets," one set being the number of spare parts required to service 100 tanks in the field for one year, totaling nearly 90,000. A shipment of a complete set of parts weighs 500 tons and requires 16 freight cars to handle. Nearly 2000 boxes and bundles are involved plus more than 4 miles of steel strapping to secure them.

In addition, according to information supplied by Fisher Body Division which makes spares sets for M-4 tanks, many man-hours of preparation are involved. Highly polished parts are dipped in a nonrust solution before wrapping to protect their surfaces, the paper wrapping being self sealing and impregnated with paraffin solution. The package then is dipped into a hot nonrust sealing solution at 170 degrees Fahr. and is crated for shipment. Test packages are subjected to severe treatments such as submersion in fresh and salt water for periods of from one to two months.

Conversion Handled Smoothly

The most recent "conversion" of various motor plants to new types of war production has been accomplished with less than anticipated difficulty and monthly increases in overall output continue. As an example of the effect of changing requirements, military vehicle production which, at the time of Pearl Harbor, constituted 52 per cent of the total automotive job, 12 months later amounted to only 29 per cent of total production and by April of this year was down to 25 per cent.

One instance of the secondary conversion jobs is the 4500-pound amphibious truck recently placed in production by Yellow Truck & Coach at Pontiac.

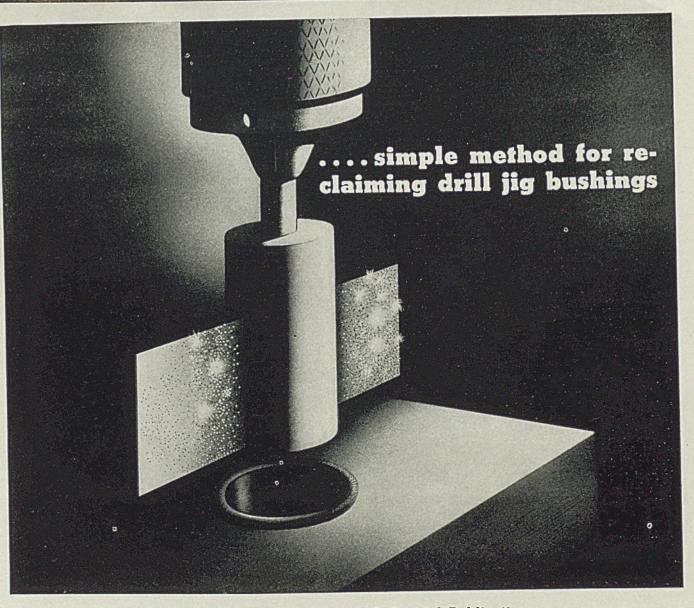
Easing of the combat tank program has resulted in one tank hull manufacturer turning to production of aircraft wings; another company, while continuing to make M-4 tanks in reduced quantities, has converted an assembly line to production of tank destroyers and is preparing its p'ant for work on another armored vehicle; still another, getting away from tank production altogether, is shifting over to assembly of large prime movers for the Army.

Enormity of the recent war contract cancellations is indicated by the fact that there were 3700 such terminations, out of which 2000 still are unsettled as far as final payments, disposal of inventories, etc., are concerned.

SAE Pacific Coast Groups Will Meet on Aug. 19, 20

Means and methods of maintaining wartime motor truck transportation, engineering plans for postwar air cargo development, comprise the program of the West Coast Transportation and Maintenance Meeting of the Society of Automotive Enginers scheduled for Aug. 19 and 20, Palace hotel, San Francisco.

The meeting is sponsored by SAE West Coast sections in San Francisco, Los Angeles, Seattle, and Portland, Oreg.



Information furnished by an Industrial Publication

The interior surface of drill jig bushings can be injured in several ways: by galling, burning, or seizing of the drill. In one manufacturing plant a simple but very effective method has been developed for restoring the surface by honing.

The equipment consists of a mandrel and a piece of abrasive cloth. The mandrel can be made from scrap rounds or cut-offs. The body is turned down to a diameter slightly less than that of the bushing, and the shank machined to fit into a conventional drill chuck. The body is slotted at the bottom to take a piece of abrasive cloth somewhat wider than the depth of the bushing. The cloth is wrapped around the mandrel and the assembly started in the hole before power is applied.

If a coolant or oil lubricant is used, the bushing can be "honed" by moving the mandrel up and down as it rotates. As the hole enlarges, or as the "gall" is removed, additional pieces of abrasive cloth can be caught under the original piece to enlarge the hole still further.

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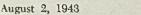
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WING TIPS_

Score of the Aviation Corp. plants, dotting the map from East to West and North to South, producing vast quantities of war materiel. . . Bids fair to hold important position in manufacturing and transportation field in postwar era

KNITTING together a corporate empire in the manufacturing and transportation field, the Aviation Corp., New York, and its manufacturing units and various associated companies now dot the map of the United States from New York to San Diego, and from Detroit to New Orleans. A score of plants now are operating full tilt on war production, but eventually may be shifted to peacetime manufacturing and service.

It is pertinent to examine the spreading activities of AVCO to see how it has been progressively expanded since the days when Erret Loban Cord first began building the framework of a holding company based around Auburn-Cord automobiles, Airplane Development Corp., (later Vultee Aircraft), New York Shipbuilding, American Air Lines and some others. Cord has now departed from the scene and in the driver's seat is swarthy, good-looking Victor Emanuel who, in his reconstruction job, has had able assistance from Tom Girdler, chairman of Republic Steel Corp., and now also chairman of Consolidated Vultee Aircraft Corp., one of AVCO's associated companies.

First, let's concentrate on AVCO's manufacturing units—Lycoming, American Propeller, Republic Aircraft Products, Northern Aircraft Products and Spencer Heater.

Lycoming Oldest of Group

Lycoming is the eldest of the group, and operates three plants at Williamsport, Pa., its original plant, a new government financed plant there and a third recently occupied building in South Williamsport. The company builds radial and horizontally opposed engines for primary and advanced trainer aircraft and for liaison planes, and also has converted one of its aircraft-type engines for use in light tanks and other mobile army equipment. Last year, 84 per cent of Lycoming's output was 9-cylinder 300horsepower radial engines to power single engine primary and navigational trainers being built by the Stinson Division of Vultee and by Boeing, and twin engine Beech, Cessna and Curtiss-Wright advance trainers. Total employment at Lyoming increased 50 per cent in 1942, one-third of them women. Lycoming is one of the old and respected names in the engine field.

American Propeller Corp. is a wholly owned subsidiary of the parent company

and in June, 1942, produced its first hollow steel propeller blades in a new plant government-financed at Toledo, O. Design for the blade, produced from seamless steel tubing (STEEL, April 19, p. 92), was worked out originally by engineers of Lycoming; in fact, the first blades were built in a pilot plant at Williamsport. In January of this year, after mass output of blades at Toledo was well under way, additional machinery and equipment was purchased to facilitate a 50 per cent expansion in production at Toledo without expanding the plant. The blades are now being built in at least three different sizes.

Two Plants in Detroit

Hardened and ground precision parts for aircraft engines and propellers are the principal products of Republic Aircraft Products Division, which operates two plants in Detroit. Republic originally was an independent manufacturer organized and nurtured through its early stages by William F. Wise, a former official of Ex-Cell-O Corp., Detroit, which has been the "breeding ground" of many an able executive currently holding a high position in various branches of the metalworking industry.

Mr. Wise is now executive vice president of AVCO, but Republic is still his "baby" and he keeps a particularly watchful eye over its bounding progress. Another former Ex-Cell-O executive is Ira J. Snader, now vice president in charge of Research Development and Labor of AVCO. He was at one time an associate of Wise, and is credited with being an exceptionally keen executive.

During 1942 Republic Aircraft Products saw its production leap to 2½ times the volume for 1941 without any major expansion in floor space. To help solve a critical employment problem Republic set up an enlarged training plan for new employes, including the establishment of a training center for pre-employment training of inspectors and machine tool operators.

Supplementing work of Republic Aircraft Products is another AVCO subsidiary in Toledo, the Northern Aircraft Products Division. Announced last summer, this division has gone into production, part of its job being the supply of cutting tools to the corporation's other manufacturing units.

The Spencer Heater Division of AVCO operates a heavy steel fabricating shop in Williamsport. in addition to gray iron,



T. M. GIRDLER



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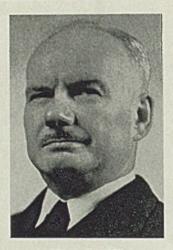
From metal working plants large and small on America's production front reports such as these are constantly being received. Facts that prove why the majority of metal working plants flood their tools and work with Sunoco to get more pieces between tool grinds, reduce rejects, and make every man-hour and machine-hour result in peak production. Call in a Sun Doctor of Industry, let him prove the production value of switching to Sunoco in your own plant. Write SUN OIL COMPANY, Philadelphia

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WING TIPS



IRA J. SNADER

steel and aluminum foundries, the latter supplying castings to Lycoming. Normally Spencer built low-pressure heating boilers, but it is now converted 100 per cent to war production, including such items as boilers for war industries and army and navy projects; bulkhead, struts, hatches, deckhouses, condensers and tanks for ship construction; also gun mounts, water heaters and cradle yokes for antiaircraft guns. The gray iron foundry supplies pressure castings for valves, pumps and engines used prineipally on shipboard, industrial locomotive parts and machine tool parts.

Grouped Under Operating Head

This is a quick slant at the AVCO manufacturing—but it is only the beginning of an analysis of the corporation's interests. These units are grouped under one operating head, exclusive of the associated companies and other investments. They even have their own unique advertising approach, and recent issues of popular Sunday supplements of the leading newspapers have carried pages in their behalf.

Turn now to consideration of the associated companies which in themselves are so big that they almost dwarf the entire corporation. Of first importance is Consolidated Vultee Aircraft Corp., which came into being in March, 1943, when Vultee Aircraft Inc. was merged into Consolidated Aircraft Corp. AVCO owns about 30 per cent of common stock of Consolidated Vultee.

Vultee itself began in 1932 as the Airplane Development Corp., one of the original Cord properties. In April, 1936, it moved to the present location at Downey, Calif., and the name was changed to the Vultee Aircraft Division of Aviation Mfg. Corp. In November, 1939, Vultee Aircraft Inc., was organized as a separate corporation with a majority of its stock being owned by The Aviation Corp.



I. M. LADDON

The following year Vultee bought the Stinson Division from AVCO, giving it aircraft manufacturing properties in Michigan and Tennessee. Harry Woodhead, previously associated with Girdler in Republic Steel, became chairman of the board of Vultee in 1940, president of Consolidated in late 1941 and is now president of the combined Consolidated Vultee, while I. M. Laddon, engineering brains of Consolidated and active with this company since 1927, is executive vice president of the combined companies.

Vultee had six divisions-the main plant at Vultee Field, Calif.; a second, Stinson, at Wayne, Mich.; a third at Nashville, Tenn.; a fourth, the former Intercontinent Aircraft Corp. at Miami, acquired in mid-1942; a fifth, a modification center, at Louisville, Ky.; and a sixth, a plant now preparing for production, at Allentown, Pa. Most of these divisions were set up during the past 18 months, following Vultee's acquisition in December, 1941 of a 34 per cent common stock interest in Consolidated Aircraft Corp. which then had a plant at San Diego. Consolidated alone had five divisions, so that now Consolidated Vultee has 11 divisions.

Named After Test Pilot

Vultee, taking its name from the famous test pilot and aviation designer, Gerard Vultee, who was killed in an airplane accident in 1938, is a pioneer in establishing mechanized assembly lines for aircraft mass production. The products of the Vultee plants include basic trainers, dive bombers and observation and liaison planes. The Louisville, Ky., operation is a "modification center" where war planes are adapted in equipment and fittings for specific theaters of action. The Allentown, Pa., plant involves the conversion of an existing structure there to the manufacture of torpedo bombers for the Navy under contracts to-



P. E. GARLENT

taling around \$100,000,000. New facilities alone there will cost \$11,000,000.

The Wayne, Mich., division is the original Stinson plant and has been extended considerably for production of liaison planes and navigational trainers. The Nashville, Tenn., plant originally was laid out to produce Vultee Vengeance dive bombers, production of which is now being tapered off and the plant is retooling for production of a Douglas A-20 two-engine attack bomber.

Organized By Major Fleet

Consolidated Aircraft was organized in 1923 by Maj. Reuben H. Fleet at Greenwich, R. I., it was moved to Buffalo in 1924 and to San Diego in 1935. Purchase of a substantial interest by Vultee late in 1941 meant retirement of Major Fleet as head of the company.

Consolidated designed and built the B-24 Liberator bomber and its cargo version, the C-87 Liberator Express; the Catalina two-engine flying boat for the Navy and the Coronado four-engine flying boat for the same branch of the service. It is now fitting out a new plant at New Orleans for production of a new two-engine patrol bomber for the Navy, the P4Y. Early in 1942 it started operating a vast new plant at Ft. Worth, Tex., for production of Liberators. Ford Motor Co.'s Willow Run plant and North American Aviation's Tulsa plant are also producing Liberator bombers.

Last year Consolidated opened another new division at Tucson, Ariz., as a modification center for combat craft, and still another of the same type at Elizabeth City, N. C. The two enormous plants which Consolidated operates at San Diego employed 22,000 in mid-1941, a figure which has greatly expanded in the intervening two years. Most recent addition to facilities is a seven-story reinforced concrete windowless administration building at the No. 1 plant in San Diego, housing 2000 and now the focal

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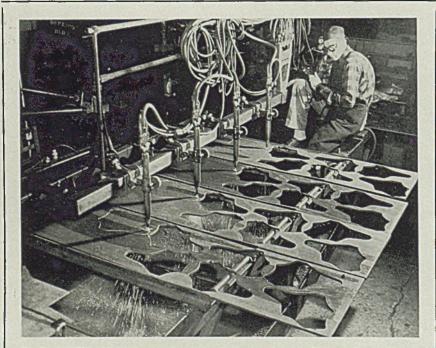
AVCO has a 59 per cent stake in the founders' stock of New York Shipbuilding Corp., or the equivalent of 21 per cent of total equity stock. The past year was a record one for New York Ship, whose products range from battleships to landing barges. From its yards on the Delaware river at Camden, N. J., the company delivered to the Navy the battleship South DAKOTA and five cruisers, the CLEVELAND, MONTPELIER, CO-LUMBIA, DENVER and SANTA FE. Three ships originally laid down as cruisers but converted into aircraft carriers, were launched during the 15 weeks between Aug. 22 and Dec. 6. Since then, up to May 24, the company launched four more ships of the same type, or a total of seven in nine months. Smaller types of craft built during 1942 totaled 148. New York Ship has been building naval and merchant vessels for 42 years.

Another associated company is American Central Mfg. Corp., Connersville, Ind., more than half of the stock owned by AVCO. This division received its first war order in March, 1941, for the fabrication of Army jeep bodies, but its toughest conversion problem was setting up to make airplane wings. Today the plant is divided roughly into two areas, one still concerned with making jeep bodies, the other given over entirely to partial fabrication and assembly of aircraft outer wings and fuselage sections. Welding equipment, riveting equipment, assembly jigs and special handling equipment and painting facilities all had to be installed in the conversion process.

Has Other Stock Interests

This just about rounds up the operating divisions of AVCO, but it should be pointed out that the corporation also owns 25 per cent of the common stock of American Airlines Inc., 9.5 per cent of the common stock of Pan American Airways Corp., and 20 per cent of the common stock of Roosevelt Field Inc., three accs in the hole which would appear to have highly important postwar profit-making possibilities.

In summary, AVCO's own manufacturing units delivered more than \$45,000, 000 worth of engines, propellers, precision parts and other materials for the armed forces in 1942, while aggregate deliveries of the corporation and its associated companies amounted to more than \$640,000,000. Employment of AVCO companies at the end of 1942 was approximately 120,000 and growing.



TIME SAVER: Multiple torch cuts wing attachment fittings from ¾-inch SAE X4340 chrome-nickel-molybdenum steel plate at Long Beach, Calif., plant of Douglas Aircraft Co. Inc. A template to one side of the four torches is followed by a magnetic tracer which holds dimensions within 0.010-inch. Plates are first preheated to 900 degrees so that when they are cut under the 2800-degree torch flame the heat differential will not be so excessive at the point of contact. Two men operating the oxygraph machine can do all the handling, drilling, preheating and cutting at the rate of 4.7 minutes per piece Backlogs of unfilled orders for AVCO and associate companies were then better than \$2,500,000,000.

AVCO's net income for the fiscal year ended Nov. 30, 1942, before provision for taxes, was \$11,223,894, leaving 82 cents a share profit after knocking off \$6,500,-000 for taxes. And the bugbear of contract renegotiation still hangs over these figures. This income included \$1,385,-629 dividends from the company's investments but did not include its equity in the undistributed earnings of subsidiaries not consolidated as of Nov. 30, 1942, then comprising Consolidated and Vultee, New York Ship and American Central. This equity was equivalent to 55 cents a share of AVCO stock. AVCO's sales for the six months ended May 31, the first half of the 1943 fiscal year, amounted to \$38,000,000.

If strategically located plants, astute management, facilities which may eventually be purchased from the government at attractive figures, and products which seem to have important postwar possibilities mean anything, then The Aviation Corp. bids fair to take its place alongside other leading industrial corporations of the United States.

Aviation Supply Depot Opened at Philadelphia

A new \$11,000,000 aviation supply depot, first to be devoted exclusively to storage of aviation materials, was placed in operation by the Navy at Philadelphia recently.

Covering 128 acres in northeastern Philadelphia, the depot was commissioned by Rear Admiral Milo F. Draemel, commandant of the Fourth Naval District and the Navy Yard.

Expanded Plant Facilities Make Top Use of Resources

In line with the War Production Board's policy of curtailing facility expansion and construction, non-industrial projects having a total cost of \$15,338,-390 have been halted in the past seven weeks. At the same time, WPB announced that the nation had completed a physical plant adequate to make the maximum use of its resources, and that in the future it would concentrate on the production of goods for the fighting fronts.

The projects halted are as follows: Roads, bridges and causeways, \$10,843,-963; airports, \$3,871,179; gasoline facilities, \$450,700; schools, \$125,085; alcohol facilities, \$7702; pipe line and petroleum facilities, \$4761.

CRITICAL MATERIALS

Overcoming Supply Shortages

Metallurgists and mining engineers breaking potential war production bottlenecks. Encouraging progress reported in battle to develop new sources and enlarge output of scarce minerals and metals

OFFICE of Production Research and Development of the War Production Board is winning the battle of materials against critical shortages that developed when the Japanese swept through the south Pacific and this country began to gear its industry for all-out war production.

Metallurgists and mineral experts have broken such potential bottlenecks as the shortage of quartz crystals by discovering new sources and rewording service specifications for radio detecting devices; they have stepped up aluminum production by further and more extensive development of low-grade, highsilica bauxite ore; they have made possible enormous quantities of magnesium from sea water, inland brine deposits, and a ferrosilicon process recovering the metal from dolomite.

Other similar and related activities have resulted in desperately needed increases in other critical materials and metals, including copper, chrome, and manganese.

OPRD Serves Vital Purposes

Organized in November, 1942, the Office of Production Research and Development is charged with the duty to "plan, direct and co-ordinate the scientific and engineering evaluation, research and development work with the WPB, in order to insure rapid appraisal and maximum effective utilization of mechanisms, materials, processes and inventions in war production; to this end to utilize as far as possible existing research personnel and facilities."

Scientists have tested and re-tested possibilities of increasing domestic supply by developing new deposits, in substituting more abundant metals in certain processes for those that are scarce, by developing low grade ores through new, laboratory-proven processes, and by lowering specifications.

Much of the work of many of America's outstanding technologists is channeled through WPB's OPRD. Their work is a two-fold task. First is to eliminate many processes or projects scientifically unsound or wasteful of materials. Second is to utilize to the utmost those processes which meet war requirements of maximum production in the shortest time, and involve minimum use

of valuable equipment, labor and plant.

Result of this specialized work is that supplies of critical and strategic materials have been stepped up to such an extent that only recently officials of WPB expressed conviction that no matter how long the war lasts, the United Nations generally will have enough to meet military needs. Remarkable strides

TEAMWORK PAYS

The War Production Board and the War Manpower Commission joined forces last week through Clinton S. Golden, vice chairman of both agencies, to secure enough bricklayers to prevent threatened loss of 36,000 tons of steel production.

Great Lakes Steel Corp. blew out a blast furnace near Detroit for relining and enlargement. The contractor, however, could only obtain 14 experienced bricklayers and 20 more were needed if a 15-day delay in completion of the job with consequent loss of 36,000 tons of steel production was to be avoided.

The Steel Division, WPB, notified Golden of the situation. He conferred with Harry Bates, president, International Bricklayers Union and very shortly the needed bricklayers were rounded up.

have been made in adaptation of offgrade quartz, and the flow of crystals to the Signal Corps is meeting day-to-day demands.

Half a dozen processes for stepping up aluminum production, designed to utilize high-silica bauxite, to make use of clays with heavy alumina content through a sintering process and to make use of an acid process to develop alunite deposits, have been given approval. Many scientists report that the alumina situation looks better today than it did a year ago.

Production of magnesium in 1942 was 30 times the output of 1939, and will be even higher this year, as a vast field was opened for its use in the airplane industry. Manufacture of the metal from sea water was supplemented by the use

of inland brine deposits and development of a ferrosilicon process to recover magnesium from dolomite.

Fifty-six technological reports cover processes for treating low-grade manganese ores. New processes permit digging of ore with only 10 per cent content compared with the standard process calling for use of ore bearing at least 50 per cent manganese, thereby greatly increasing supply.

Vast new deposits of low-grade chrome were found in western states and one deposit in Montana has been developed to the point where it could produce more chrome concentrates than any other country in the world. To date, this could be used only by mixing it with high-grade ore but processes have been worked out to improve the grade of domestic concentrates.

Issues Report on Methods Of Analyzing Tungsten Ores

Bureau of Mines has published a report on methods of analyzing tungsten ores, particularly those from low-grade deposits. The report describes in detail three methods proven in the Bureau's laboratory at Salt Lake City. They are the standard cinchonine method, tannic acid-anti-pyrine method, and a third method combining the first two.

The combination method was found most suitable for all types of low-grade tungsten ores and now is in use at the laboratory. Its advantages are that time required for analysis is less, amount of cinchonine needed is reduced, and the final precipitation of tungsten invariably is complete. A procedure of recovering the cinchonine, a reagent not readily available, also is outlined.

North Range Mining Co. Opens Its Fourth Mine

North Range Mining Co., 3600 Book building, Detroit, has started production of iron ore from Book mine at Alpha, Iron county, Mich. Output in the 1943 season is expected to be 350,000 gross tons. The Book mine was acquired by lease from the Oliver Iron Mining Co. in 1942 and stripping operations started last fall. This mine was explored in 1914. Ore is standard old-range nonbessemer type.

Operations at first will be open-pit but eventually it will be developed as an underground project, probably in 1944. North Range Mining Co. now has four properties in the Lake Superior district, Blueberry, Mary Charlotte, Schley and Book.

MEN of INDUSTRY

Walter L. Cherry, president, Cherry-Burrell Corp., Chicago, has resigned, effective Oct. 15, to become chairman of the executive committee. S. B. Berg, secretary and comptroller, and J. L. Mc-Intyre, treasurer, have been elected to the executive committee.

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C. O. Wanvig Jr., Wyeth Allen and J. Fletcher Harper were named to the board of directors, Globe Union Iuc., Milwaukee. William Wanvig was elected secretary of the company, succeeding W. B. Fyffe, now in service, and C. J. Ehrendreich was made secretary-treasurer to succeed Mr. Wanvig.

Albert V. Dolan has been elected chief engineer, Ft. Pitt Bridge Works, Pittsburgh, succeeding the late Charles G. Schade.

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Frank Cordes has been elected president and general manager, Pittsburgh Steel Foundry Corp., Glassport, Pa., following his resignation as board chairman, Blaw-Knox Co., Pittsburgh.

Z. G. Taylor has been named manager, East Cleveland (Ohio) Lamp Works, General Electric Co. Mr. Taylor succeeds W. B. Gillen, who has become manager of manufacturing for General Electric's new Tube Division of the Electronics Department. Mr. Gillen will be responsible for tube manufacturing activities at Buffalo, Cleveland, Lynn, Mass., and Schenectady, N. Y.

William P. Witherow, president and director, Blaw-Knox Co., Pittsburgh, and William C. Frye, former president of Chain Belt Co., Milwaukee, director of Interstate Drop Forge Co., Milwaukee, and other companies, have been elected



EUGENE P. HARTER

Who has been made general sales manager, Electro Refractories & Alloys Corp., Buffalo, as reported in STEEL, July 26, p. 56.



J. GUY GRIFFITH

to the board of trustees, Northwestern Mutual Life Insurance Co., Milwaukee.

J. Guy Griffith, president, J. Guy Griffith Co., Pittsburgh, has been appointed Pittsburgh representative of Wapakoneta Machine Co., Wapakoneta, O., succeeding the late Joseph E. Fawell.

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E. A. Renfer, manager of the Sycamore (Ill.) plant, Anaconda Wine & Cable Co., has been appointed manager of the Marion, Ind., plant also, succeeding Frank E. Hart, who has been transferred to the Chicago sales office.

Marvin S. Bandoli, formerly general sales manager, Victor Adding Machine Co., Chicago, has been elected vice president.

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John B. Barry has been appointed vice president, Designers For Industry Inc., Cleveland.

Matthew R. Rosse has been appointed sales manager, export division, Wickwire Spencer Steel Co., New York.

Philip Schane Jr., formerly chief metallurgist, Duquesne Works, Carnegie-Illinois Steel Corp., has been appointed chief process metallurgist of the company's Pittsburgh district metallurgical division.

Wallace P. Cohoe, consulting chemist and engineer, has been elected president of the Society of Chemical Industry, London, England.

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F. W. Waterman Jr. has been appointed forecast engineer, Carnegie-Illinois Steel Corp., Pittsburgh.

Fred M. Young, president and general manager, Young Radiator Co., Racine, Wis., has been appointed vice



ALFRED MARCHEV

president and member of the board, Western Metals Specialty Mfg. Co., Milwaukee.

--o--Alfred Marchev has been elected president, Republic Aviation Corp., Farmingdale, N. Y., succeeding Ralph S. Damon, resigned.

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John C. Veller has joined the Chicago district sales office, Inland Steel Co., Chicago.

Arthur M. Penhallow has been appointed controller, Osborn Mfg. Co. Cleveland.

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Fred H. Wilhelm has been appointed chief draftsman and assistant to the chief engincer, Thew Shovel Co., Lorain, O.

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E. J. Krause has been named assistant director of service on war products for Buick Motor Co., Flint, Mich.

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M. L. Doelman has been made Buffalo district representative for Modern Equipment Co., Port Washington, Wis. Mr. Doelman is located at 66 Russell avenue, in Buffalo.

J. M. Tucker, formerly vice president and general sales manager, Oliver Farm Equipment Co., Chicago, has been appointed assistant to the vice president and general manager, Massey-Harris Co., Racine, Wis.

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Hugo A. Weissbrodt has resigned as deputy director in charge of the production service division, War Production Board, Detroit, to return to International Harvester Co. for special war work at Chicago headquarters.

Edward I. White, former vice president, McCann Furnace Co., Cleveland,

MEN of INDUSTRY

HARVEY McKENNEY

Who has been appointed manager of alloy

steel sales, Follansbee Steel Corp., Pittsburgh,

as reported in STEEL, July 26, p. 56.

H. J. McMenimen Jr. was elected vice

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Clyde Wyman, previously works manager, Oklahoma Steel Casting Co., Tul-

sa, Okla., has been appointed chief

metallurgist, Burnside Steel Foundry

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Frank J. Schwab, factory equipment

manager, Lempco Products Inc., Bed-

ford, O., have been named vice presi-

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Victor H. Mantz has been appointed assistant to the secretary and treasurer,

Allegheny Ludlum Steel Corp., Pittsburgh. Mr. Mantz will be located at the

company's Brackenridge, Pa., offices.

J. S. Longdon, sales manager, and

Co., Chicago.

dents.

president and member of the board.

has been elected president and treasurer to succeed Harry F. McCann, who died June 7. Other officers elected were: Charles Iten, vice president; C. H. Myers, secretary and general manager; and Charles Lynch, chief engineer.

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George Greeley, formerly secretary of the trust department, First National Bank, Oshkosh, Wis., has been appointed assistant secretary, Wisconsin division, Timken-Detroit Axle Co.

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T. C. Carlsen has been appointed superintendent of parts manufacture, Rockwell plant, Bell & Howell Co., Chicago.

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Charles Hummel has been elected comptroller of Bendix Aviation Corp., South Bend, Ind., to succeed W. H. Houghton, who recently was elected treasurer of the company.

John P. Argyle, vice president, Vierling Steel Works, Chicago, celebrated his eighty-first birthday July 22.

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George R. Murray, works manager, Chambersburg Engineering Co., Chambersburg, Pa., and Edgar S. Hutton, treasurer of the company, have been elected vice presidents. Mr. Hutton has been elected a director as well.

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William E. Lynn has been appointed general sales manager in charge of both domestic and export operations, Standard Cap & Seal Corp., New York. Mr. Lynn has been affiliated with the export shipping department of International

DEWEY C. HARVEY

Who has been named chief plant engineer, Osborn Mfg. Co., Cleveland, noted in STEEL, July 26, p. 56.

Railways of Central America, and also has served as sales director, American Isteg Steel Corp., which was taken over by Wickwire Spencer Steel Co., New York.

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Frank L. Wright, formerly chief metallurgist, Norma-Hoffman Bearings Corp., Stamford, Conn., has been named manager of research. Warren D. Anderson has been appointed assistant chief engineer for the company.

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R. S. Reynolds, president of Reynolds Metals Co., Richmond, Va., has been elected chairman of the board, Richmond Radiator Co., Uniontown, Pa. Henry L. Charlton, vice president and director, Reynolds Metals Co., was named president of Richmond Radiator Co., and

> O., and founder and retired president of the City Trust and Savings Bank of Youngstown, O., died recently in Youngstown.

G. W. Long, 51, vice president, Simmons Machine Tool Corp., Albany, N. Y., and a member of that company for more than 30 years, died July 22 at Lake George, N. Y.

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M. W. McConkey, 52, patent counsel, Bendix Products Co., South Bend, Ind., and president, Hydraulic Brake Co., Detroit, died recently in South Bend.

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William L. Latta, 68, manager of the galvanized sheet sales division, Wheeling Steel Corp., Wheeling, W. Va., died July 24 in that city.

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Clem H. Chuse, 63, secretary, Elliott & Barry Engineering Co., St. Louis, died recently in that city.

OBITUARIES . . .

George A. Gallinger, 64, vice president, Ingersoll-Rand Co., New York, died in Cape Vincent, N. Y., recently. Mr. Gallinger joined the pneumatic tool division, Ingersoll-Rand Co., 35 years ago.

Charles Earl, 74, vice president and general counsel, American Smelting & Refining Co., New York, died recently in Great Neck, L. I.

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F. A. Pope, president, Cleveland Liner Mfg. Co., Cleveland, died recently in that city.

Frank R. Scofield, 84, retired president of the former Lake Erie Iron Co., Cleveland, died in that city July 26.

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G. A. Marr, 77, veteran secretary of the Lake Carriers' Association, Cleveland,

died there July 23. Mr. Marr's career covered the history of shipping on the Great Lakes for the past 49 years.

Frank M. Young, for 19 years a sales representative in Milwaukee for Dodge Mfg. Co., Mishawaka, Ind., died recently in Milwaukee.

Ben E. Swingley, a partner in the Wedd Fire Fighting Equipment Co., Toledo, O., died in that city recently.

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Albert C. Lerman, president, Union Chain & Mfg. Co., Sandusky, O., died there recently.

Edgar F. Collins, 69, retired consulting engineer, General Electric Co., Schenectady, N. Y., died recently in Round Lake, N. Y.

H. W. Grant, 73, vice president of the Struthers Iron & Steel Co., Struthers,

Industry Must Prepare To Shoulder Tremendous Task

Reconversion from wartime to peacetime production necessitates planning now before guns of war have been silenced. . . Huge expansion of physical plant, technological advances, shifts in population and markets intensify transition problem

THE DAY Johnny comes marching home again, this country will face the most difficult industrial readjustment period in its history.

Relationships among regions, among industries and among units within industries will be influenced by the way the adjustment is made.

Transition to civilian goods production will create difficult problems attending employment of the then estimated working force of 56 million persons available in the agricultural, service and industrial groups. That a high level of activity of the nation's sharply expanded industrial facilities must be maintained is clear. And the tremendous task in prospect of providing employment for 56 million persons is indicated by the fact just prior to the war there were only 46 million employed.

The war effort has resulted in the greatest increase in manufacturing plant facilities ever experienced. At the same time technological advances have been made which put a new face on the problem of competition.

The cost of war plant expansion rough-

J. C. SULLIVAN Assistant Editor, STEEL

ly is estimated at half the investment made in manufacturing facilities from 1920 through 1940. The enormous increase in production of certain basic commodities and metals is shown by the wartime peak capacity estimates recently made by the National Industrial Conference Board.

Foresee Vast Ingot Tonnage

For instance, production of alloy steel ingots and castings, which totaled 4,-966,000 net tons in 1940, is expected to reach a peak of about 16 million tons this year. Steel ingot capacity at the close of this year will amount to about 96 million tons with production for the year totaling 92 million tons, against 67 million in 1940.

Aluminum ingot production capacity was only about 300 million pounds at the beginning of 1939. It is expected to reach a war time peak of more than 2 billion pounds. Magnesium output of Industry must provide jobs for an estimated 56 million persons when Johnny comes marching home from the war

13 million pounds in 1940 will seem small indeed, compared with ultimate wartime capacity of between 600 and 725 million pounds.

Other basic metal industries, notably copper and lead, have also been expanded. Production of these metals is limited only to the extent of mine output.

Newly created synthetic rubber industry is scheduled to reach an annual capacity of about 1,100,000 tons by 1944.

When peak war production is attained the aircraft industry's output will be between thirty and forty billion dollars annually, in sharp contrast with 1939 value of \$280 million.

Total ship tonnage built in 1939 of 342,000 tons is dwarfed by that scheduled for this year, close to 20 million tons.

With termination of hostilities, huge volume of industrial capital will be frozen in partly finished work, and partly processed parts and materials. Some estimates run as high as \$100 billion worth of unfinished war contracts. Prompt and equitable termination of war contracts will aid industry to obtain the funds necessary to meet reconversion costs, pay rolls, and bills for new materials and supplies.

Manufacturers have gone far deeper in debt for plant expansion and working capital during this conflict than they did in World War I. Few industries have sufficient surplus to carry them through any prolonged waiting period of war contract settlement as experienced after the last war. Taxes and contract renegotiations have sharply restricted the funds set aside for future use.

Quick disposal of government owned facilities, unfinished products and materials will aid in hastening the plant reconversion and will have an important bearing on competitive relationships within civilian goods fields.

The problem of conversion from a war to a peace economy involves far more than readjusting operating equipment.

Many war plants can be quickly adapted to manufacturing civilian products but geographical location of some presents serious handicaps to their use. Location of many plants has been dictated by considerations of defense, or the availability during the war boom of scarce production factors such as labor or electric power.

Conversion to any large scale manufacturing operations in some instances may be handicapped by the absence of related manufacturing production and specialized marketing services. Yet for certain types of consumer goods and factory supplies, there may be important new markets arising from the rapid local growth of industry in general. It is not at all improbable that situations of this type are likely to be found in California and the Texas Gulfcoast after the war.

Government owned plants to be disposed of are of two types: Those on which private industry has certain options to purchase at the termination of hostilities and those on which there is no such option. In the second group are many of the strictly military type facilities such as smokeless powder and shell loading and certain basic metal producing units, especially in the aluminum and magnesium field. Most of the strictly military facilities have been permanently built and are expected to be held for future use if necessary.

The government appears to have the following choices in the liquidation of these strictly military facilities:

(1) Sale to present managers on terms similar to those granted others under Defense Plant Corp. contracts.

(2) Sale or management contract with a private management not now in the field for the purpose of stimulating competition.

With virtually all projects placed, total cost of new war plants and equipment f r o m June, 1940, through March, 1943, is estimated at \$19.3 billions, of which 78.3 per cent will be met from public funds. Shaded areas represent government proportion. Source: National Industrial Conference Board

August 2, 1943

(3) Sale to present managers with special provisions to insure fair price and marketing policies and maintenance of full productive capacity.

(4) Continuation of present government ownership and private management.

(5) Government ownership and operation.

Must Avoid "Ghost" Towns

Some war plants have required the development of entire new communities, which face the danger of becoming "ghost" towns unless some substitute civilian activity can be provided. The problem is not entirely one of being able to get into actual production on a certain product. It also involves the question whether the product can compete effectively in the open market, because of high operating costs and the manpower problem in those areas distant from large population centers.

Volume and character of industrial output in the postwar period seem likely to be affected by the amount of postponed consumer demand which can be translated into actual purchases; extent of our export trade which ties in with the degree of the responsibility the nation assumes for reconstructing devastated war areas; volume of military supplies needed to meet international obligations; and progress made in new product development.

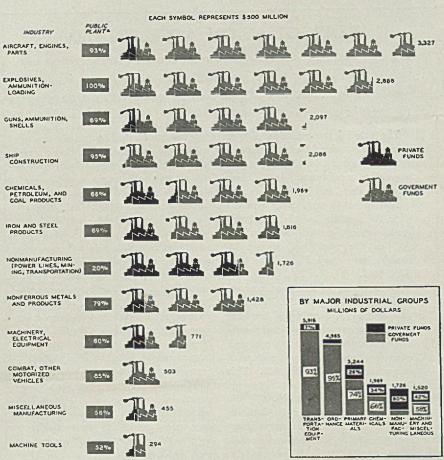
Extent of the deferred demand in the postwar period is expected to be tremendous. In consumers' durable goods alone accumulated shortages are seen reaching an estimated total of \$12 billion. Other estimates include \$3 billion for construction and equipment; for deferred maintenance, \$2.8; public works and maintenance, \$2.6; and for consumers' nondurable goods an additional \$2.5 billion---totaling \$22.9 billion.

Company postwar committees are being urged by the government to begin now to make studies along the following general lines, so as to best determine the position of their companies and that of their industries in the postwar era.

(1) Estimate postwar productive capacity of their plants, of their industry and that of their competitors, and of industry as a whole.

(2) Analyze business conditions following previous wars, particularly World War I, in an effort to see what happened to their own and similar industries.

(3) Research should be made in determining the growth of different industries—their probable output and re-(*Please turn to page* 146)



[&]amp; PUBLIC PLANT COMMITMENTS AS PERCENTAGE OF TOTAL COMMITMENTS

Government Spokesmen Warn of Losses Due to Lagging Schedules

Marked stepup in output necessary in closing months of 1943 if assigned quotas are to be attained, states General Somervell. In some items armed forces are not yet fully equipped

CHICAGO

THAT war material production is lagging so far behind schedule that it fails to match military needs, and may prolong the war, were "sobering and unpleasant" facts revealed to Chicago business men a week ago by two well informed government spokesmen.

At the same time they warned of the grave consequences if over-optimism and industrial strife continue to hamper output for the armed forces.

The two spokesmen were Lt. Gen. Brehon Somervell, chief, Army Service Forces, and C. E. Wilson, executive vice chairman, WPB, who addressed a War Production luncheon, July 23, sponsored by the Chicago Association of Commerce, and attended by 1500.

General Somervell emphasized that to meet assigned quotas of production for this year, 61 per cent of the airplanes scheduled must be built in the last six months; 59.6 per cent of the ordnance; 67.9 per cent of signal corps equipment; 65.1 per cent of engineer equipment; and 68.9 per cent of chemical warfare needs. He listed only quartermaster and medical supply production as up to schedule.

"Armed Forces Not Fully Equipped"

"In some fields our Army has its initial equipment and its future requirements will be for battle losses," the general explained. "However, in the majority of items, we are still not fully equipped. It will be well into 1944 before our troops here and abroad will have equipment both for operations and for training.

"We are building up a large army overseas. We have already shipped more tonnage to North Africa than was shipped for the United States to the A.E.F. in France in the last war."

He recalled that the output of needed

RENEGOTIATION ACCELERATED

War Department Price Adjustment Board reports written or verbal settlements reached with 713 contractors in four weeks ended June 19, 43 per cent as many as in preceding 13 months

The rate of renegotiation of war contracts by the War Department Price Adjustment Board is being substantially accelerated. In the four weeks ending June 19, 1943, written or verbal settlements were reached with 713 war contractors, or 43 per cent as many as the 1658 cases settled in the period of almost 13 months from April 28, 1942 to May 22, 1943.

During May of this year, renegotiations conducted in the War Department by contracting officers and the price adjustment agencies resulted in commitments for elimination of excessive profits in an estimated a mount of \$247,000,000. This brought the total to an estimated amount of \$2,113,000,000. Of this amount, \$895,000,000 represents the recovery of excessive profits realized and \$1,218,000,000 represents price reduction for future deliveries. These readjustments include those made by contracting officers on prime contracts and by War Department price adjustment agencies on deliveries reviewed by them both totaling \$20,600,000,000. One of the prime influences of the renegotiation statute has been on the pricing of new contracts, but this influence is not even approximately measurable and no estimate is included in the reported total of reductions obtained.

As of June 19, a total of 10,741 contracting companies had been assigned for renegotiation by the War Department Price Adjustment Board. Settlements of 2371 represent 22 per cent of this total, while an additional 4567 or 42 per cent were then engaged in renegotiation. It is estimated that the total number of war contractors subject to renegotiation by the War Department is approximately 15,000. equipment was \$300,000,000 behind schedule for the Army in April, May and June. To make up the deficit, General Somerve'l said, production must be greatly stepped up in the last half of the year, at least to the extent of \$100,-000,000 a month. This would be a great help to early victory, while delay would contribute to losses.

Mr. Wilson pointed out that the June production goal was 6^{1/2} billion dol'ars and 6 billion was realized. This, he said, was a "sobering fact", and its truth could not be changed by impressive figures on total output. "As long as war output is short of requirements, we have every cause for worry."

The WPB executives stated that one of the most serious obstacles to the war effort is industrial disputes and disturbances.

The speaker praised the patriotic cooperation shown by managers and labor in more than 2000 of the nation's largest war plants and credited labor-management committees with dealing vigorously and effectively with many difficult problems arising in war plants.

"Whatever reasons may be cited to account for the slackening in the rate of war production," Mr. Wilson concluded, "they are not acceptable reasons. There can be no acceptable reasons in such circumstances."

Small Plants Receive 75% Of Quartermaster Contracts

Small war plants are receiving about 75 per cent of all prime contracts awarded by the Quartermaster Corps, the War Department announces. In addition, small war plants hold about 80 per cent of all Quartermaster Corps subcontracts.

Survey of contracts awarded during January, 1943, showed that 48 per cent went to firms employing less than 100 wage carners and another 26 per cent went to concerns employing from 100 to 500 wage earners, leaving only 26 per cent for companies with more than 500 employes.

This is not a new departure for the Quartermaster Corps, which pioneered in contract distribution among smaller concerns. An analysis of contract awards for 1941 and 1942 discloses that twice as many prime contracts and four times as many subcontracts were held by small war plants as by large plants.

Small war plants received twice as many Quartermaster contracts as plants employing more than 500 in the last two months of 1942.

A branch Quartermaster Corps contract renegotiation unit has been established at 521 Fifth avenue, New York.

MACHINE TOOLS

Brazil Industry Needs Studied

Feasibility of Installing Machine-Rebuilding Plant at Sao Paulo Being Surveyed by C. A. Simmons

BRAZIL, industrially the fastest-growing nation of South America, has been in urgent need of capital equipment since the outbreak of the war. Its leading industrial city, Sao Paulo, is experiencing unemployment during a boom period because its plant machinery is wearing out, with no chance of replacement due to the overwhelming demands for such machinery by the United States and its Allies.

As first step toward helping correct this situation, Brazil is investigating possibilities for establishing a machinery-rebuilding plant in that country. Such a program could be expected to relieve lendlease demand, thus easing the war production schedule of the United States and its Allies.

Charles A. Simmons Sr., president, the Simmons Machine Tool Corp., Albany, N. Y., and a widely known authority on machine-tool practice, left this country by clipper last month for a tenweek South American trip during which he will visit Brazil and other Latin American republics. Survey for a rebuilding plant in Brazil is an important feature of his agenda, but Mr. Simmons will also serve in an advisory capacity for the United States Navy, inspecting arsenals and machine shops at bases in Brazil and elsewhere.

When the defense program was initiated in 1940, Mr. Simmons was chosen to head up the Available Tools Section of the Office of Production Management, later named the War Production Board. He next served in a similar capacity for the Navy's Bureau of Ships, and altogether has spent two and a half years in Washington in an advisory capacity. During his absence the Simmons Machine Tool Corp. continues operation under the management of Charles A. Simmons Jr., vice president and general manager.

Before leaving for Brazil Mr. Simmons was tendered a testimonial dinner by his associates in the Bureau of Ships. Among those who paid tribute to his work were: Capt. Lyle F. Small, U.S.N., assistant chief, Shipbuilding Division; Capt. E. R. Henning, U.S.N., Army-Navy Munitions Board; Capt. R. E. W. Harrison, Bureau of Ships; Col. Haviland Wright, Army Ordnance Department; Howard W. Dunbar, general manager,



Charles A. Simmons Sr., president, Simmons Machine Tool Corp., Albany, N. Y., was guest at a testimonial banquet before taking Clipper to Brazil :ecently to survey that nation's machine-tool needs. Capt. E. R. Henning, Army-Navy Munitions Board, shakes hands with Mr. Simmons as Capt. Lyle F. Small, assistant head, Shipbuilding Division, awaits his turn

Norton Co., Worcester, Mass., and former member of the WPB Tools Section; Frederick W. McIntyre, general manager, Reed-Prentice Corp., Worcester, Mass., who recently returned from Australia as a member of the Lend-Lease Mission.

Contracts for 125 Vessels Placed with 12 Shipyards

Awards for construction of approximately 125 vessels for various federal agencies were announced recently. Types of ships to be built include steel tugs, wooden tugs, cargo vessels, escort aircraft carriers, barges, and derrick lighters

Contracting companies and orders received are as follows:

Standard Shipbuilding Corp., San Pedro, Calif.: seven 150-foot ocean tugs for U. S. Maritime Commission. Hillstrom Shipbuilding Co., North Bend, Oreg.: two diesel-powered wooden tugs for Navy. Klepp Marine Ways, Naview Wark, 204 foot words?

wooden tugs for Navy. Klepp Marine Ways, Rainier, Wash.: 204-foot wooden cargo vessel, to cost \$321,000, for Army Transport Corps. Port Houston Iron Works, Houston, Tex.: 34 diesel-powered 45-foot steel tugs and four 74-foot steel diesel tugs for Army. Sturgeon Bay, Shipbuilding & Dry Dock Co., Sturgeon Bay, Wis.: 14 diesel 176-foot cargo vessels for Army. D. W. Nicholson Corp., San Leandro, Calif.: number of vessels for Army Transport

Service to cost more than \$1.000.000.

Service to cost more than \$1.000.000. Seattle-Tacoma Shipbuilding Corp., Seattle, Wash.: escort aircraft carriers for Navy. J. K. Welding Co., Brooklyn, N. Y.: 11 steel tugs, with 400 horsepower diesel engines, for Army Transportation Corps, and 12 cargo boats of 176-foot length for Army. Marietta Mfg. Co., Point Pleasant, W. Va.: 8 diesel 140-foot sca-going tugs for Army Quartermaster Corps. Spedden Shipbuilding Co., Baltimore: small cargo vessel with 650-horsepower diesel engine for Army Transportation Corps. Levingston

for Army Transportation Corps. Levingston Shipbuilding Co., Orange, Tex.: four 143-foot tugs with 1500-horsepower diesel-electric engines; four 173-foot barges, and two 125-foot self-propelled derrick lighters, all for War Department.

Allen Boat Co., Harvey, Ill.: eight 74-foot tugs powered by 400-horsepower engines, for War Department. Iron Fireman Mfg. Co., Cleveland: 207 triple-expansion marine steam engines for installation in Liberty ships, for Maritime Commission.

Copper-Brazing Furnace Installed in South

An electric roller hearth copper-brazing furnace has been installed in the record time of one month in the Dallas, Tex., plant of Universal Corp. This furnace, needed quickly to meet deadlines on a chemical warfare product, is the first copper-brazing furnace to be installed south of the Mason-Dixon line. Installation was made by General Electric Co. engineers working night and day with Universal Corp. mechanics.

Demobilization Extent Surveyed

Michigan, Connecticut, Washington, Indiana Face Most Severe Situation, Official Estimates Indicate

MICHIGAN, Connecticut, Washington, and Indiana will face the most serious postwar employment situation among all the states when the armed forces and war-production workers have been demobilized, according to estimates just completed by the United States Bureau of Labor Statistics.

Their estimated ratios of demobilized ex-servicemen or war workers for each 100 men employed in the same states in 1940 are: Michigan, 58.5; Connecticut, 48.7; Washington, 45.2; Indiana, 45.0.

The next eight states, confronting a somewhat less severe problem, are: California, 42.0; Maryland, 42.0; Ohio, 40.4; New Jersey, 38.8; Pennsylvania, 37.7; Kansas, 37.6; Utah, 36.1; Rhode Island, 35.6.

In a group of 17 states the effects of demobilization will be much lighter, either because each state had little war industry or because its prewar level of peacetime employment was high. These states are: Delaware, 34.3; Oregon, 33.1; Massachusetts, 31.9; Illinois, 31.8; Wisconsin, 31.4; Maine, 30.2; West Virginia, 30.2; Alabama, 29.2; Oklahoma, 29.1; Virginia, 28.7; New York, 28.4; Missouri, 27.4; New Hampshire, 27.4; Colorado, 26.6; Louisiana, 26.6; Texas, 26.4; Tennessec, 24.7.

The estimates are based upon four assumptions (not predictions): That the war will be ended on all continents by December, 1944, at the peak of the warproduction effort. That the United States will maintain 2,500,000 men under arms during early postwar years. That war production will be speedily curtailed to the level of postwar defense needs. That industrial reconversion and expansion to high levels of civilian production will proceed rapidly, with no delays from financial difficulties or uncertainty of markets. Other figures used in computing the estimates are: Demobilized servicemen, 8,500,000; released workers, slightly over 6,000,000.

Sam Tour & Co. Operating Their Own Laboratories

The metallurgical laboratories established by Sam Tour during the 14 years he has been vice president and chemical and metallurgical engineer in charge of the engineering department of Lucius Pitkin, Inc., located at 45 Fulton street, New York, since June 30 have been operated as the laboratories of Sam Tour & Co. Inc.

Lucius Pitkin, Inc., continues as before as analysts, assayers, chemists, consultants, spectroscopists, weighers and samplers, and shippers representatives catering to the mining and metallurgical industries.

Main office of Lucius Pitkin, Inc. continues at 47 Fulton street, New York. Tam Tour & Co. have taken over the work as consultants, engineers, metallurgists, radiographers, research development and testing laboratories for the clients previously served by the discontinued department of Lucius Pitkin, Inc.

Sam Tour & Co.'s main offices are at 65 Pine street, New York, and its laboratories are at 45 Fulton street. It specializes in the metallurgical, chemical and process engineering fields.

Reports First Drop in Industrial War Employment

Industrial employment declined an estimated 100,000 during May, according to the National Industrial Conference Board, this being the first drop in such employment since the outbreak of the war. Including as employed, men added to the armed forces, however, a new employment peak was attained during the month of 62,400,000 persons.

Fully 7,000,000 more persons were at work or in uniform during May than in the same month of 1942.

Share-the-Plant Drive Launched by WPB

WPB has launched a "share-the-plant" movement to get maximum arms output with a minimum of new additional plant construction. This is a part of the board's broad program designed to hold down further expansion of industrial factories and their equipment while at the same time seeing that all the army and navy requirements are met.

The program calls for quick conversion of plants, left idle as a result of changing armament needs.

They Say: ____

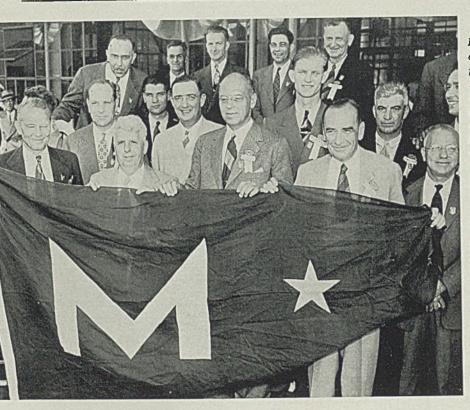
"The several (federal) departments are under the obligation of administering the renegotiation law, and the possibility of amendment does not in any way affect the duty of either department or the contractors to continue renegotiation under existing law."—Under Secretary of Navy James V. Forrestal and Acting Secretary of War Robert P. Patterson, in joint statement July 25.

"There should be a meeting of a few wise and courageous men, representatives of management, finance, farmers, of industrial employes, who would discuss as solemnly as did the men who drew our national Constitution, or the Declaration of Independence, the steps necessary to make our freeenterprise system operate for the security and happiness of all."—Charles E. Wilson, vice chairman, War Production Board, and former president, General Electric Co., in an interview at Washington July 24.

"Production must not be interrupted anywhere for a single precious minute, for our minutes are measured in blood. . . . Every American who places the security and welfare of his nation above all other considerations is perfectly aware that there can be no excuse in the slightest for any work stoppage caused by a strike."—Eric A. Johnston, president, Chamber of Commerce of the United States, in a July 24 radio address.

"An undue amount of absenteeism among workers in warproduction plants was reported over July 4 and could be attributed only to overconfidence. There have been other reports of essential workers looking around for what they call 'permanent jobs after the war,' as though their war jobs were about over. That is a serious mistake."—Robert P. Patterson, Acting Secretary of War, speaking at Chicago on July 24.

"When we as victors lay down our arms in this struggle against the enslavement of the mind and soul of the human family, we take up arms immediately in the great war against starvation, unemployment, and the rigging of the markets of the world."—Vice President Henry A. Wallace in a speech at Detroit, July 25.





Mrs. Anna Roosevelt Boettiger and Capt. Charles J. D'Hooghe of the Western Gear Work's auxiliary military police unit, Seattle, Wash., display (left) the Army Guidon awarded the comany at a recent ceremony

These women welders (below) receive the United States Maritime Commission's "M" award for production for their co-workers at the Union Metal Mfg. Co., Canton, O.

In recognition of outstanding production, Admiral Emory S. Land presented (left) the United States Maritime "M" award to the Air Reduction Co. Inc., Bethlehem, Pa., at a colorful ceremony recently. Left to right, Admiral Land, W. J. Strawn, employe representative, C. S. Munson, company president, and C. E. Adams, company chairman, are shown

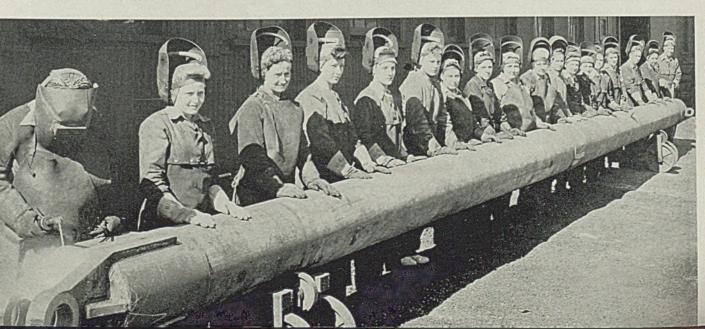
Industrial Firms Cited by Army, Navy

Additional metalworking companies cited to receive the Army-Navy "E" awards for outstanding war production recently include:

Freeport Sulphur Co., Port Sulphur, La. and

Freeport Sulphur Co., Port Sulphur, La. and Freeport, Tex.
Hannifin Mfg. Co., Chicago.
Hercules Powder Co., Hercules, Calif.
Johns-Manville Products Corp., Lompoc, Calif.
Multiplex Mfg. Co., Berwick, Pa.
Orange Screen Co., Maplewood, N. J.
Springfield Buick Co., Springfield, Mass.
Taylor Instrument Co., Rochester, N. Y.
Worthington Mower Co., Stroudsburg, Pa.
L. A. Young Spring & Wire Corp., Trenton, N. J.
Zollner Machine Works, Ft. Wayne, Ind.
Camon Electric Development Co., Los Angeles.
Difco Laboratories Inc., Detroit.
Industrial Metal Fabricators Inc., Chicago.
Metro Tool & Gage Co., Chicago.
National Carbon Co. Jnc., Ningara Falls, N. Y.
Phoenix Tool & Mfg. Co., Chicago.
Republic Aviation Corp., Long Island, N. Y.
Sloan Valve Co., Chicago.
Wiremold Co., West Hartford, Conn.
J. D. Adams Mfg. Con., Indianapolis.
Aeconce Aircroft Corp. Sloan Valve Co., Chicago.
Wiremold Co., West Hartford, Conn.
J. D. Adams Mfg. Co., Indianapolis.
Aeronca Aircraft Corp., Middletown, O.
Ajax Flexible Coupling Co., Westfield, N. Y.
American Type Founders Inc., C. H. Cowdrey
Machine Works Division, Fitchburg, Mass.
Baker Oil Tools Inc., Los Angeles.
Bendix Aviation Corp., Towson, Md.
Detroit Harvester Co., Dura Division, Toledo, O O. C. B. Gentry Co., Gilroy, Calif. The Heil Co., Milwaukee. Jackson-Evans Mfg. Co., Omaha, Nebr.

Silas Mason Co., Shreveport, La. Smith, Drum & Co., Philadelphia. Tennessee Copper Co., Copperhill, Tenn. United Electronics Co., Newark, N. J.



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War Output Expanding Despite Many Handicaps

MIRRORING in part cessation of the coal strike and intensification of efforts to overcome the recent lag in war goods production, latest weekly business barometers indicate moderate upturn in industrial activity is under way. This contrasts with the slight downward tendency of production during June and early July.

Overall production is edging higher despite the diffi-

culties in manufacture attending war program changes dictated by shifting needs at the fighting fronts. These revisions have resulted in complete plant shutdowns in a few instances, and production schedules of many other manufacturers have been delayed by design changes.

Absenteeism, general manpower shortage and scarcity of raw materials are additional factors hindering war output schedules from attaining the month-tomonth gains hoped for earlier this year. Growing "complacency" also is a factor checkmating expansion, but at the same time it is recognized that as production mounts toward the peak it becomes increasingly more difficult to attain projected schedules.

Military requirements for 1943 call for a steady monthly increase in output of war material during the closing months of the year to a rate 50 per cent greater than that in the first six months,

Charles E. Wilson, executive vice chairman, WPB states. Government officials still are hopeful the projected schedule will be achieved.

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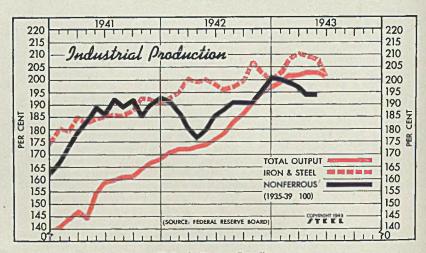
ORDER CUTBACKS—War contract cancellations and order cutbacks, although still relatively light in relation to total contracts on manufacturers' books, are estimated to have already totaled more than cancellations at the close of World War I. Appointment by WPB of several independent committees to review Army and Navy re-

FIGURES THIS WEEK

quirements and to compare them with munition inventories may lead to additional cancellations or trimming of war contracts in the near future.

Policy recently developed by the War department to minimize effects of contract cutbacks or cancellations on plant employes provides that the War Manpower Commission be informed of the changes so that agency may arrange for re-employment of displaced workmen.

JUNE PRODUCTION—Federal Reserve Board's seasonally adjusted index of industrial production declined slightly during June from the peak May level. The June figure of 201 was the lowest recorded since last January,



Federal Reserve Board's

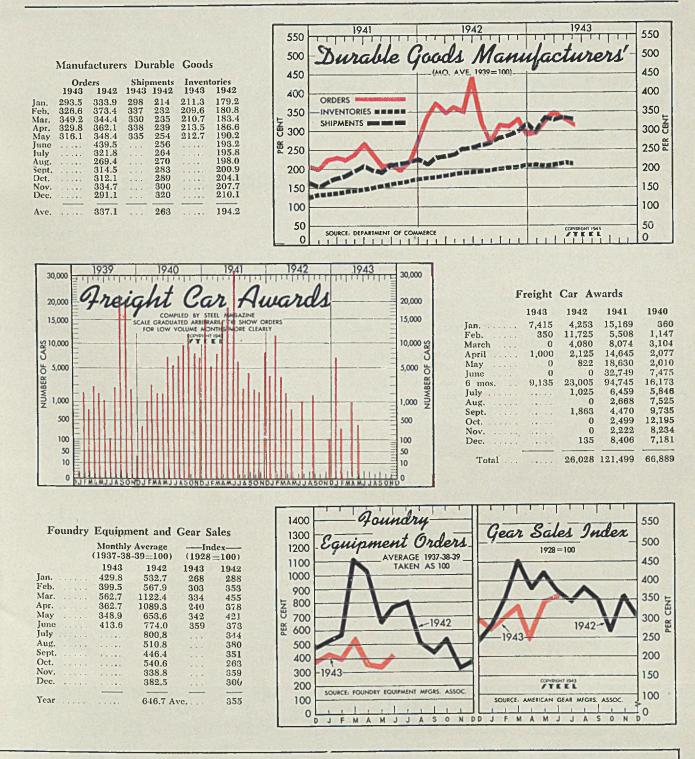
		Fronue	ction indicies			
	Total Pro	oduction	-Iron,	Steel	Non-fe	errous-
	1943	1942	1943	1942	1943	1942
n,	199	171	203	192	200	191
eb		172	208	194	199	187
a. r.		172	210	200	192	181
Dr		173	209	199	194	177
ay		174	208	200	194	180
ne		176	201	198	194	186

but remained 14 per cent above a year ago. Sharp drop in coal output during the month and a temporary curtailment in the production of coke, pig iron and steel offset a moderate increase in operating schedules at plants producing war products in the chemical, rubber and transportation equipment industries.

Finished aircraft production, in terms of airframe weight, was up three per cent in June, while delivery of supplies for the Army ground forces rose one per cent.

INDUSTRY Steel Ingot Output (per cent of capacity) Electric Power Distributed (million kilowatt hours) Bituminous Coal Production (daily av.—1000 tons) Petroleum Production (daily av.—1000 bbls.) Construction Volume (ENR—unit \$1,000,000) Automobile and Truck Output (Ward's—number units) °Dates on reguest.	4,196 1,983 4,119	Prior Week 97.0 4,184 1,850 4,103 104.0 19,485	Month Ago 98.5 4,120 2,025 3,954 53.7 19,185	Year Ago 98.5 3,626 1,857 3,691 148.2 18,260
TRADE Freight Carloadings (unit—1000 cars). Business Failures (Dun & Bradstreet, number). Money in Circulation (in millions of dollars)† Department Store Sales (change from like wk. a year ago)‡ *Preliminary.	50 \$17,706	877 48 \$17,658 +40%	761 60 \$17,154 +29%	856 190 \$12,546 +10%

THE BUSINESS TREND



FINANCE Bank Clearings (Dun & Bradstreet—billions) Federal Gross Debt (billions) Bond Volume, NYSE (millions) Stock Sales, NYSE (thousands) Loans and Investments (millions)† United States Government Obligations Held (millions)† †Member banks, Federal Reserve System.	\$61.8 4,714 \$46,822	Prior Week \$8,906 \$144.1 \$63.7 6,788 \$45,563 \$31,095	Month Ago \$9,058 \$139,7 \$52.4 4,672 \$49,965 \$32,364	Year Ago \$7,269 \$80.9 \$27.0 1,644 \$33,338 \$17,068
PRICES				
STEEL's composite finished steel price average Spot Commodity Index (Moody's, 15 items) [†] Industrial Raw Materials (Bureau of Labor index) [‡] Manufactured Products (Bureau of Labor index) [‡] [†] 1931 = 100; Friday series, [†] 1926 = 100.	244.2	\$56.73 242.1 114.0 99.7	\$56.73 244.1 114.8 100.7	\$56.73 231.2 99.8 98.9

User Report No. 16 on Experience with . . .

NE (National Emergency) ALLOY STEELS

NE Steel Castings vs. Forgings

DUE to suddenly increased production demands on one of our larger size hoists, we were faced with an apparent shortage of alloy steel forgings for transmission gears.

Overcrowded production schedules of the manufacturer regularly supplying us with these forgings didn't seem to allow him to meet this extra demand in time to fill our production requirements. Time was too short to make new dies and place orders with another forge shop. We therefore decided to investigate the possibility of using alloy steel castings to fill the possible gap until a new supply of forgings was on hand.

A local electric steel foundry was consulted. Its management and metallurgical staff agreed to experiment with casting these gear blanks of an alloy steel similar in chemical composition to NE-9437. To do this required making a special heat as no alloys with satisfactory chemical analysis were regularly produced.

A total of five gears were involved with four being distinctly different in shape. Weights varied from 25 to 65 pounds each, totaling approximately 270 pounds per set in the rough. All were to be cut to three-quarter stub tooth form. Outside diameter varied from

By AL ZWALD Chief Engineer Willamette Hyster Co. Portland, Ore.

approximately 6 to $9\frac{1}{2}$ inches and face widths from $1\frac{1}{2}$ to $2\frac{1}{4}$ inches. They were to be heated and oil quenched after machining and then drawn to a hardness of 48 to 54 rockwell C.

The maximum static unit stress on the teeth of the smallest gear is 60,000 pounds as determined by the Lewis formula using a speed factor of 600 divided by (600 + v). Under normal conditions this stress would only be approximately about 5 per cent of the unit's operating time. On over 200 machines in the field that have operated continuously under severe working conditions in redwood, fir and other logging operations, no gear failures have been reported.

Gear steels previously used in these machines with equally successful results were SAE-4140, 4340 and 3140.

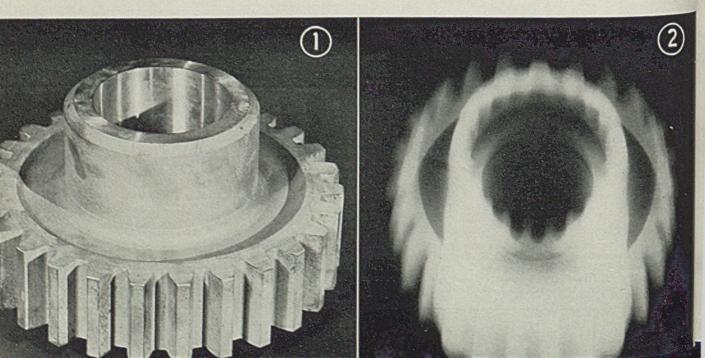
To establish a practical foundry procedure for obtaining flawless homogeneous-castings, these gears were re-designed, making sections as uniform as possible.

Fig. 1—Photo of gear "C" taken in approximately the same position as the radiograph shown in Fig. 2. Outside diameter is 9½ inches, face is 2¼ inches, ³/₄ stub teeth

Fig. 2—Radiograph of gear "C" shown in Fig. 1. Note oil hole from gear root diameter to hub hole; also outline of dental clutch machined inside hub on lower face

Fig. 3—Gear "D" shown in approximately the same position as radiograph figure 4. Outside diameter of large side is 9.166 inches; face 1 13/16 inches; ¾ stub teeth. Outside diameter of small side is 7.833 inches; face 1½ inches; ¾-inch stub teeth

Fig. 4—Radiograph of gear in Fig. 3. Note shrinkage area (approximately 34-inch diameter) about 32-inch below identification letter "D". Gear is cast steel made for experimental purposes to determine best possible foundry practice



Special pattern equipment was made and experimented with to get a high grade product. The most difficult job was a bevel pinion 6 inches outside diameter cast integral with the drive shaft which was 2¾ outside diameter by 14 inches long (finish sizes). A fully cored mold was used for this part. The other four were cast in dried sand molds. Gates and risers were made large to insure proper feeding of hot metal and eliminate shrinking faults.

Experimental castings were then made using a somewhat lower grade of alloy steel regularly made at this foundry. These were machined complete and heat treated to check their soundness and obtain an approximate comparison of hardening ability and size growth due to heat treatment.

Radiographic examination for possible internal flaws showed a shrinkage area just below the root diameter on the large size of the cluster gear. Larger risers corrected this on subsequent castings. No internal flaws were found in the four remaining parts.

Enough data had thus been gained to warrant making up a heat of the special alloy steel intended for these gears. The capacity of the first electric furnace used was $2\frac{1}{2}$ tons. Due to the large risers, the proportion in weight of castings produced to hot metal poured was 45 per cent.

The chemical analysis of this heat checked as follows: Carbon 0.39, manganese 1.04, sulphur 0.048, phosphorus 0.04, nickel 0.54, chromium 0.49, molybdenum 0.28.

Cloverleaf type test bars cast and heat treated in approximately 1¹/4-inch squares and rounds were used in machining tensile and impact test bars. The physical properties obtained are shown in Table I when the work was quenched in water from 1550 degrees Fahr. and drawn, as For information on development of NE steels and their properties, see STEEL, Feb. 9, 1942, p. 70; March 16, p. 72; June 8, p. 66; June 15, p. 66; July 13, p. 80; July 20, p. 86; Aug. 3, p. 70; Aug. 17, p. 40; Aug. 31, p. 41 and 76; Sept. 7, p. 78; Oct. 19, p. 66; Nov. 9, p. 96; Dec. 28, p. 27; Jan. 25, 1943, p. 84; Feb. 22, p. 102; March 1, p. 94; March 8, p. 90; March 22, p. 78; March 29, p. 76; April 5, p. 116 and 118.

For reports from users of NE steels, see Nov. 16, 1942, p. 106; Nov. 23, p. 90; Nov. 30, p. 62; Dec. 7, p. 112; Dec. 14, p. 99; Dec. 21, p. 70; Jan. 11, 1943, p. 60; Jan. 18, p. 66; Feb. 1, p. 100; March 8, p. 109; March 15, p. 96; March 29, p. 72; April 26, p. 84; June 7, p. 106; June 14, p. 98; June 21, p. 92; July 26, p. 88.

For latest revised listing of NE ALLOY steels, see March 8, 1943, p. 90.

For details of WD (War Department) steels and complete listing, see Feb. 8, 1943, p. 80.

For STEEL's latest *Handbook on NE Steels* and the NE Steel Selector, address Readers' Service department, Penton building, Cleveland. Price \$1.00 per set.

	TABLE	I—Physical	Properties of	Cast NE-	9437		
Draw Temp. Degree F.	Tensile Strength P.S.I.	Yield Point P.S.I.	% Elong. In Z	% Red. of Area	Brinell Hardness	Izod Impact	
800	180800	167950	6.5	10	293	13.5-14-13.5	
900	164900	144750	10.5	15	277	19.5-20-20	
1000	147900	131750	13.5	30	262	25-25.5-25.5	
1100	140000	122250	17	33	248	35-35.5-34.5	
1200	117350	100200	21.5	39	228	47-48-47	
1300	110600	92850	23	46	207	50.5-50-49	

TABLE H-Results of Tension Tests

Specimen No.	Tensile Strength P.S.I.	Yield Point P.S.I.	% Elong.	% Red.	Brinell
1	171000	164000	8	14	340
2		154000	12.5	22.4	340
3		158000	12.5	26.5	332

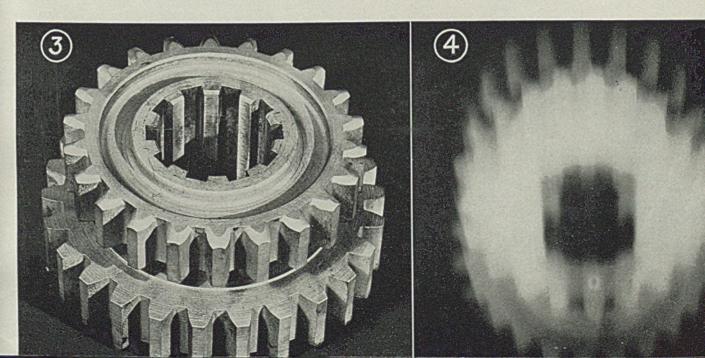
indicated, 4 hours.

These compare quite favorably with available figures from an eastern rolling mill on one heat of NE-9442 steel which checked as follows: Carbon 0.40, manganese 1.18, silicon 0.24, nickel 0.40, chromium 0.40, molybdenum 0.18.

After quenching in oil from 1510 de-

grees Fahr. and tempering at 1100 degrees Fahr., physical property tests of 1¼-inch square specimens showed a tensile strength of 141,000 pounds per square inch, yield-point of 126,500 pounds per square inch, elongation of 18.5 per cent, reduction in area of 57.3 per cent, hard-

(Please turn to Page 130)



THREE HUNDRED years ago last Christmas, a three-pound infant made his entry into the world and trembled for some hours on the brink of eternity. Such a common event would have no particular significance for us now, but for the fact that the boy was destined to give clear expression to Galileo's thinking about motion and so to become the founder of a system of mechanics. In particular, he established a relation amongst force, mass and acceleration which enables us to predict the effects on gun mount and ship structure, when naval shells leave on their mission.

Perhaps the sharpest impression we have of the nature of force arrives via the muscles of the body, and anyone who has fired a shoulder arm is aware—and, in the case of a novice, sometimes painfully aware—of the rearward thrust of the butt when the gun is fired. This rearward movement of the gun is termed "recoil" and the distance the gun travels is known as the "length of the recoil".

If gun and projectile were out in space, remote from any gravitational field and were perfectly free to move, on firing, the shell would move in a straight line in one direction and the barrel along the same axial line in the opposite direction. Neglecting, for the moment, the existence of the powder charge, we observe that the pressure producing motion of the projectile, is exactly equal at all times to the force accelerating the gun and acts over the same interval of time. Hence the final velocities of projectile and gun would be inversely proportional to their masses, and both would continue to move indefinitely until other forces changed their state. If, in practice, a gun is so mounted as to be free to move in a horizontal direction (the influence of gravity being thereby eliminated) we speak of the movement as "free recoil".

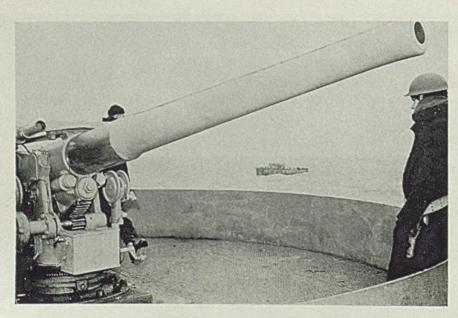
The effect of the powder charge (both burned and unburned) being now considered, we note that the same principle will hold and, the resistance of the air in the barrel being neglected, the momentum of the gun will be equal to the sum of the momenta of the projectile and charge, so long as the several parts of the system are associated.

It should also be observed that the velocity of the shell

and the velocity of the charge are not equal, the assumption commonly made being that the velocity of the center of mass of the latter is one-half that of the shell. While this relationship enables us to determine the velocity of free recoil at the instant the shell leaves the gun, the continuing expansion of the gases increases the rearward velocity of the gun by some 40 to 45 per cent.

In all cases of free recoil, no force whatsoever is transmitted to the mount, but eventually, of course, the gun must be brought to rest and returned to its "inbattery" position. If, on the other hand, no provision were made for recoil, the full force of the rearward thrust of the explosion, less the friction between shell and barrel, would be transmitted by the mount to the ship's structure, necessitating extremely heavy and cumbersome arrangements entirely unsuited to use aboard ship and not well adapted to land service, since this thrust may amount to several thousand tons in the case of large caliber guns.

Clearly some compromise is in order, which will take account of the ability of the ship's structure to bear recoil thrust and of the practical limitations on barbette dimensions. In the case of minor caliber weapons of high elevation,





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

> the longer the recoil, the higher must be the trunnions in order that the breech may clear the deck. Thus the large guns of the battleship recoil through a length of only three calibers (caliber refers to diameter of gun bore), while those of the destroyer, with its lighter structure, require a length of six or more calibers.

> Assuming that the resistance to recoil is to be constant throughout the rearward movement of the gun, our next concern is with some type of brake which will maintain this resistance constant and transform the work done against it into heat. In considering this problem, it will be apparent that the device must have a high capacity for absorbing heat and hence a liquid brake is the obvious choice. But the liquid selected will have to have a low freezing point and preferably a fairly constant viscosity over a wide range of temperature. Certain oils, and mixtures of glycerine and water meet these specifications quite well.

If, further, work is to be absorbed by causing liquid flow through orifices, we must know rather precisely the characteristics of the motion of recoil, in order that the area of these orifices may be varied in such wise that the resistance to flow remains sensibly constant. At the commencement of the stroke the velocity of the recoiling gun is zero. It then rises, reaches a maximum and, if the brake has been correctly designed, diminishes smoothly to zero at the limit of recoil.

Thus a full knowledge of the pressure

Fig. 1. (Left)—Merchantmen use this type gun. Slide in which gun moves in recoil and counter-recoil is cylindrical steel casting, fitted with bronze front and rear liners. Beneath slide may be seen circular brackets which support recoil and counter-recoil cylinders. Elevating arc and pinion are also visible. Gear train driving elevating pinion embodies friction disks that prevent injury to operator when gun jumps

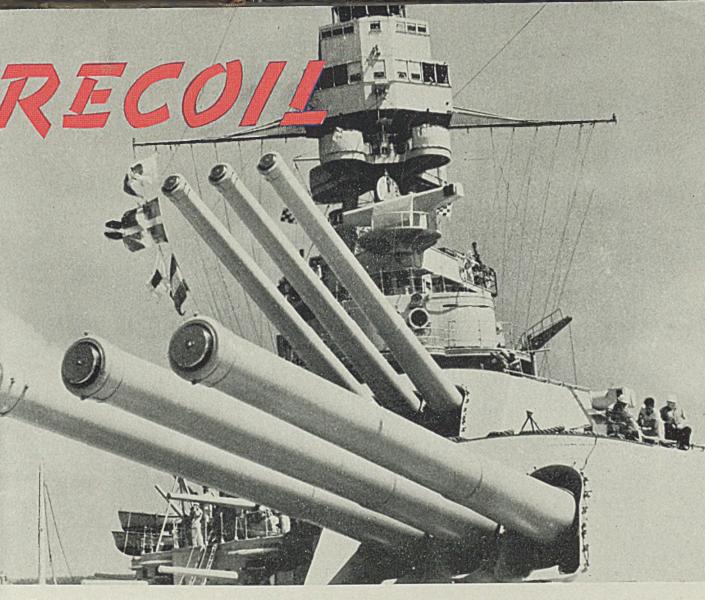
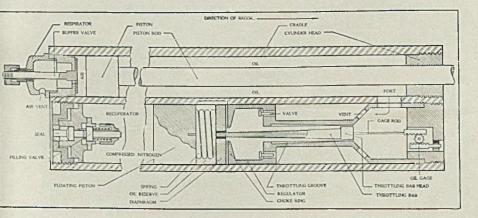


Fig. 2. (Above)—The six forward guns of the U. S. S. PENNSYLVANIA are fitted with the type of hydro-pneumatic system described in the text. Two cylinders are used per gun and are mounted on top of the slide. Air pressure is maintained at 1800 pounds per square inch, rising to about 2700 at point of maximum travel during recoil. Ships with similar guns may use other recoil systems. Six 14-inch guns on the main forward battery of U.S.S. CALIFONNIA, for instance, use spring-pneumatic counter-recoil system, consisting of four tubes, two above slide and two below, with recoil cylinder below and between lower pair of tubes. End of piston is fastened to lug on gun yoke, while cylinder is mounted on slide. During recoil, air and spring are compressed, assisting return to battery positions. Official U.S. Navy photos

Fig. 3. (Below)—Recoil system for French 75-millimeter gun. Courtesy John Wiley & Sons



neutralizing the inertia force acting on the shell and the way in which this varies, together with the frictional forces opposing recoil, the extent of the gravity component and the thrust of the counterrecoil mechanism will be essential.

Among the other dynamical considerations which govern the design of the recoil brake is the necessity for centering the line of action of the resistance as nearly as possible on the axis of the gun barrel. This is necessary in order to diminish the "jump" of the gun between the instant of decision to fire and the moment the shell leaves the muzzle. Anyone who has fired a submachine gun is aware of the tendency to "climb." This is readily interpreted if we consider the system of forces acting on the gun and note that the force producing recoil and the resistance provided by the body of the operator, are not, in general, directly opposed but form a couple tending to raise the muzzle.

The same effect is noticeable in the case of a pistol, except that in semiautomatic fire, an opportunity is afforded to bring the sights back on the target. (But it should not be inferred from this that "jump" appreciably impairs the accuracy of small arms fire, since the angular movement between the squeeze on the trigger and the departure of the bullet is extremely small, the greater part of the upward rotation of the barrel taking place after the bullet has left the gun).

So far as the requirements of recoil are concerned, these may be met by the use of a piston-cylinder arrangement, the cylinder being usually mounted on the slide and the piston moving with the gun. Traversing each recoil cylinder from one end to the other are two or three rods of variable diameter which pass through holes in the piston. Thus, as the action proceeds, each annular orifice increases as the velocity of recoil increases and diminishes in the latter part of the stroke as the rearward movement of the gun subsides. This end can also be attained by cutting grooves of variable width in the wall of the recoil cylinder but perhaps less advantageously since, if the action is not satisfactory, another set of rods may readily be substituted while, in the case of grooves, adjustment is less easily made.

For a previous description of recoil mechanisms, see STEEL, July 28, 1941, p. 52.

If all of the energy of the recoil stroke were transformed into heat, none would be available for returning the gun to battery. Hence some provision in the form of coil springs, compressed air, liquid pressure, or the like must be made in order that a portion of this energy may be stored during the recoil stroke. Coupled with this major function, counterrecoil mechanisms must be capable of holding the gun in battery in readiness to fire.

In the simplest arrangement a series of springs in pairs (one within the other) may be incorporated in the recoil cylinder, but more often the counter-recoil elements are separate units. Springs have the disadvantage of being subject to breakage and permanent set, while air tends to leak past packings and must be constantly replenished.

This latter difficulty may be overcome by packing of special design, incorporat-

Fig. 4—The Bofors 40-millimeter twin-mount anti-aircraft gun. These guns characteristically have a wedge-type breech block which is automatically opened and locked. Device is rigidly installed on gun, can be continuously filled by insertion of successive clips. Empty cases are ejected to rear, carried around to front of gun by a chute. Firing is controlled by a foot lever for both single shot and continuous fire ing a ring of opposed U-leathers, between which liquid is introduced at a pressure which is always in excess of the air pressure in the counter-recoil cylinder. This is rather ingeniously accomplished by means of a separate differential cylinder, whose plunger is driven by air supplied by the counter-recoil cylinders. Since the packing is always kept moist and there is a greater tendency for liquid to leak in rather than for air to leak out, pressures of the order of 1800 pounds per square inch may be used in the counterrecoil cylinders-a figure which may rise during recoil to half as much again. Two such counter-recoil cylinders are commonly used per gun, the cylinders being secured to the slide and the plungers moving with the gun.

The French Seventy-Five

The recoil system of the famous 75millimeter French field gun merits particular notice. This was mounted in the gun cradle, a forging, through which two long holes were bored. In the upper, a piston and piston rod were mounted, the latter being attached to the gun lug. See diagram Fig. 3. In action, the recoiling gun drew the piston to the rear, forcing oil from the upper to the lower cylinder through a large port. Within the lower cylinder, a light forging in the form of a hollow double ended piston with reduced connecting section, was mounted.

The oil flowed into the breech end of this hollow forging and thence through vents into the annular space between the central section and the wall of the lower (recuperator) cylinder.

By way of non-return valves, it next found its way into the other hollow end and escaped by way of the annular space between the "throttling bar" and the choke ring, as shown in Fig. 3. The pressure of the oil forced the diaphragm forward, compressing the spring and thus further compressing the nitrogen in the muzzle end of the recuperator to some 3400 pounds per square inch. Thus the energy of recoil was largely dissipated in overcoming the resistance to the flow of oil and in compressing the nitrogen. As the action proceeded, the throttling bar gradually increased this resistance by reducing the area of the annular space between choke ring and bar, thus bringing the moving parts gently to rest at the limit of recoil.

During the return stroke, the valves seated, leaving the throttling grooves surrounding the throttling bar as the only means of escape for the oil. These grooves were so designed as finally to close this avenue entirely, thus returning the gun to the firing position with a minimum of shock, a process assisted by air, escaping slowly through one or more vents in the buffer valve mounted in the forward end of the upper cylinder.

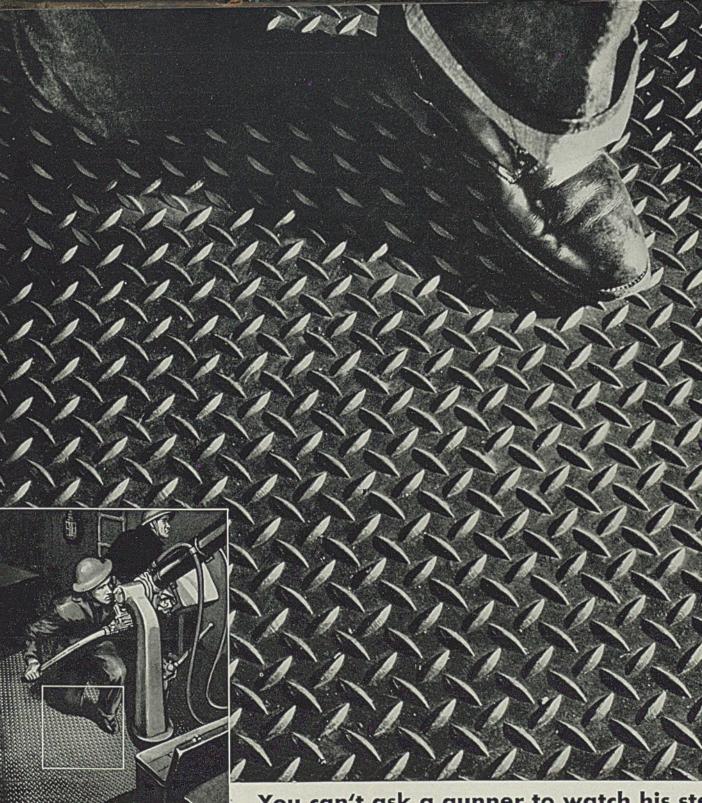
A consideration of this excellent design will indicate that the nitrogen leakage must have been practically nil. Should oil leak, it will be apparent that the floating piston will move breechward, pushing the gage rod and causing withdrawal of the gage.

Duplicate Specification Sheets Simplify Orders

All dimensions, fittings, etc. for single and double sling chains are easily and accurately recorded for orders and estimates on duplicate specification sheets, such as those developed by S. G. Taylor Chain Co., Hammond, Ind.

The forms provide simple drawings with spaces for fill-ins, and are made in duplicate, one each for purchaser and salesman. Details of measurement and fitting are quickly covered, eliminating misunderstanding and errors.





You can't ask a gunner to watch his sto

Uncle Sam braces gun crews for battle on "A.W." Rolled Steel Floor Plate. Gua against dangerous slipping and falling accidents. "A.W." Floor Plate protects m essential in the war effort wherever they may be-in war production plants, reeries, power plants; in tanks, troop-carrying trucks and on shipboard. Tough wear will not damage or impair it. Ends floor troubles for good. Write for fold

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Manufacturers Expand Use of

N E STEELS in AIRCRAFT

THE OPERATING COMMITTEE on aircraft materials conservation, representing the Army Air Forces, the Navy Bureau of Aeronautics, and the Aircraft Resources Control Office, Aircraft Production Board, declares that with aircraft use now requiring 35 per cent of the total chromium and nickel consumed for steel alloying, the remaining program of conversion to NE steels must be carried out aggressively. This is particularly necessary because of the continued acceleration in aircraft production which, unless substitutions are made, will push the 35 per cent figure fairly close to 45 in the near future.

Use NE Steels for Air Frames

The use of NE steels has gained substantially in the manufacture of airframes. Recently the Curtiss-Wright Corp. reported: "AN-S-14 (NE-8630) is in use as an alternate for AN-QQ-S-684 (4130) steel and AN-S-16 (NE-8740) for AD-QQ-S-752 (4140). These steels are used interchangeably even on welded assemblies." Lockheed Aircraft Corp. reports: "Test results indicate that AN-S-12 (8630) and AN-T-33 types have satisfactory properties and no difficulties were encountered in weld tests which included flash welding. Impact tests on welding tubing are now in progress. For the present, stocks are segregated but NE-8630 tubing, bar stock and forgings are used interchangeably with AN-OO-S-684 (4130) and AN-QQ-S-685 and may be substituted on purchase orders." These are but two cases that illustrate the progress being made in using NE steels in airframe construction.

The biggest use of alloy steel in the aircraft industry, however, is in the engines, and while substantial progress has been made here much remains to be done. Naturally, reliable performance is the first thing demanded of an aircraft engine, so that substitutions cannot be made overnight. A large amount of "type testing", in which parts have to run for a certain number of hours without failure, is necessary—and this takes time.

A report by the Wright Aeronautical Corp. recently mentioned the adoption of AN-S-14 (NE-8630) steel in place of AN-QQ-S-684 (4130) steel and the revision of 300 drawings. The report also indicated that the "crankcase and rocker arms made from AN-S-16 (NE-8740) are now under test. All new designs specify NE steels except when model tests are involved. The NE steels are considered equivalent or superior to previous compositions in physical properties and machineability." Some of the other aircraft engine manufacturers have made similar substitutions; Pratt & Whitney Aircraft Division is one of the companies that has effected such substitutions on a sizable scale and this will be augmented when results of type testing now in process are analyzed.

Industry Uses Other Substitutes

Contractors in the aircraft program are expected to do all they can to utilize NE steels successfully as substitutes for alloy steels they now are using. Any questions that they may have concerning specific substitutions may be addressed to the Army Air Forces, Materiel Command, Wright Field, Dayton, O., or the Navy Bureau of Aeronautics, Washington, D. C.

In addition to the campaign to substitute NE steels for alloy steels, many other significant substitutions have been worked out in the aircraft industry. Windshield bands, various supports, bushings, fittings, cover assemblies and bulkheads formerly made of Inconel and Monel are now made of steel and suitably treated for protection against corrosion. Strut tubes, nameplates, strainers, brackets and various other parts including castings which were made from critical aluminum alloys now are made of steel. Aluminum savings effected during the past 12 months by such substitutions are estimated to exceed 80,000,000 pounds.

Much steel has been conserved in the aircraft program through standardization and simplification, by using fewer test samples, increasing allowances for impurities and wider use of welded tubing, open-hearth steel and hot-drum steel.

Directive No. 7 on alternate materials for corrosion-resisting steel cable terminals contributed to conservation by approving the use of alternate steels in place of stainless steel for swaged terminals. A directive now under study will reduce further the use of stainless steel in aircraft. Directive No. 12 approved three steels for all types of bolts, nut and studs for aircraft work. The latter directive has relieved a situation in which the various engine manufacturers asked the bolt producers to furnish bolts in many types of steel which made the production and inventory problem very difficult. Now no bolts, nuts and studs are held uselessly in stock.

Another drive that has helped to save great quantities of critical materials in the aircraft program is the development of improved manufacturing methods which have caused a progressive decline in the amount of scrap produced in this industry; a larger percentage of the metal going into aircraft plants is coming out in the form of finished airplanes. This is due to elimination of inefficient methods of metal cutting, shearing, blanking, routing and stamping. Many items that were made of extruded sections now are rolled; parts formerly cast of critical materials are now stamped from less critical materials; items made from solid bar stock on screw machines are replaced with items made by more economical means such as stampings, castings, tubing, powder metallurgy, composites of welded tubing and forgings; and certain parts fabricated from solid bar stock with excessive borings made from tubing.

The effect of these improvements has been a saving in critical materials, a saving in man hours and machine hours, and a saving in dollars.

Revised Production Methods

One example of an improved manufacturing method is the production by one manufacturer of exhaust nipples. This record is as follows:

Material formerly used-Stainless steel solid bar and tubing

Material now used-Stainless steel sheets

Method formerly used-Machined

Method now used-Stamped

Material saved-91% of bar stock; 65% of tubing

Previous cost-\$3.00 each

New cost-\$1.65 each

Savings in one order-\$660,000

The record of improved production and conservation of materials of another aircraft component is as follows:

Material formerly used—Stainless steel bar stock (critical)

Material now used—Carbon steel strip (less-critical)

Method formerly used-Machining

Method now used-Drawing	and di	rilling
	Old	New
	Lbs.	Lbs.
Material required for producti	on	
(1000)	. 285	62.5
Finished Product Weight	. 47	47.1
Material Loss-Scrap	238	15.4
Per Cent Scrap Produced 8	3.5% 2	24.6

How to get your galvanizing FASTER and cut out round-about rail hauls. Situated in Send your materials to PITTSBURGH HANLON-GREGORY GALVANIZING COMPANY right in the Middle of the nation's fastest steel center and. THE WORLD'S LARGEST ALVANIZING PLANT IOB

Heat Treating

TANK

TRACK

COMPONENTS

AS A RESULT of several metallurgical meetings on tank track components, the Tank Production Committee, working with the Office of Chief of Ordnance, Geneva, Ill., has issued the following recommendations:

Tank Track Pins: Steel should be either WD-8750 or WD-4060 (for information on complete listing of WD steels see STEEL Feb. 8, 1943, p. 80). If WD-8750 should not be available, WD-4060 can be used if it is obtainable.

Total depth of decarburization on cold rolled annealed bars or hot rolled annealed bars should not exceed 0.015inch per side. This 0.015-inch decarburization is removed by turning or grinding. To determine depth of decarburization, remove 0.015-inch from each side in the form of chips. These chips for WD-8750 should analyze not less than 0.40 per cent carbon and on WD-4060 not less than 0.55 per cent carbon.

Maximum total decarburization on pin tubing should not exceed 0.005-inch as determined by the above procedure.

Seams, laps, folds and so forth should not exceed a depth of 0.010-inch on coldrolled and hot-rolled annealed bars and 0.006-inch on tubing.

New sizes of cold drawn bars and tubing that became standard on all purchase orders beginning with May deliveries are: For light pins—tubing, 1.015-inch plus 0.010 minus 0.000; cold drawn bars, 1.019-inch to 1.025 for light pins. For medium pins—tubing, 1.265-inch plus 0.010 minus 0.000; cold drawn bars, 1.269-inch to 1.275 for medium pins; hot rolled bars, to allow minimum 0.010inch stock removal each side or 0.02 inch on the diameter.

For control of heat treatment or r jection, hardness checks are made a a wafer or cross section cut through the base of the inner radius. This surface shall be prepared so hardness and m crostructure are not affected by cuto. The wafer must be parallel with the base. Hardness obtained on the cro section must be within that specified a a depth of %-inch from the surface Any method or percentage of sample may be used for spot checking provide such checking will control results en pected on samples prepared as above.

In heat treatment of tank track pine the following factors are emphasized:

-Quenching temperature for WD 8750 and WD-4060 shall be 1500 to 1550 degrees Fahr.

---Minimum time at temperature is lo to 45 minutes regardless of time required to reach the hardening temperature.

-Pins machined prior to heat treat ment must not be decarburized during hardening.

-Oil-quench pins vertically or roll horizontally into quenching medium to minimize warpage.

--Method of oil quenching and construction of quench tank must eliminate interference during quenching by having ample circulation and turbulence to produce a uniform hardness of approximately 53 rockwell C minimum on any surface of the pin properly prepared for hardness checking.

-Quenching oil temperature shall be 100 to 130 degrees Fahr. using paraffin base oils with wetting agents added.

-Quench tank should have a variable speed conveyor for control and time quenching. Preferred stock removal temperature is 250 to 350 degrees Fahr. Stock should not fall below 180 degrees Fahr. after quenching and before tempering.

--Stock should be tempered 1 hour minimum at a minimum temperature of 850 degrees Fahr. for the 40 to 46 rockwell C hardness range for 4063 steel only; 1 hour minimum at 1000 degrees Fahr. for the 34 to 40 rockwell C range for 4063 steel only.

Ball Peening: An improved machining surface on the wedge slot and a full %-inch fillet, blended to the rest of the cut surface of the pin, will improve fatigue life. Ball peening will improve the life of the pin in all cases, it is believed.

Tank Track End Connectors: Obviously the ideal steel structure will not be the same for all machining operations or for all kinds of equipment—a somewhat different structure being pre-

(Please turn to Page 131)

/TEEL



One purpose ... the IMPROVEMENT of Metals

Shifter yoke formerly made in several pieces now forged in one piece, provides a stronger and more dependable part.

by Forging

942 East 64th Street

There is ample evidence, among those whom it is our privilege to serve, that forgings assure and sustain a degree of performance, which ultimately results in a persistent preference for the product or equipment that embodies them. The beneficial influence of forgings, upon the sale of your product during the post-victory period, may be obtained from the broad experience our forging engineers offer you.

CLEVELAND,

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FORGINGS

DROP

ΟH

Burn Your Coal IN THE FIREBOX

the coal pile

With huge piles of soft coal stored against winter's demands, upper view, means of guarding against spontaneous combustion are more important than ever before

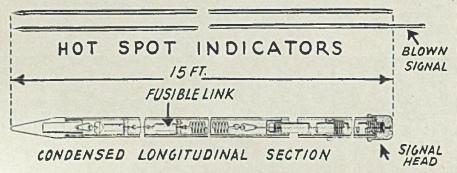
Pipes for applying carbon dioxide in form of dry ice, note lower view, can be made from 3-inch diameter pipe in 15-foot lengths. One end is cut and welded to a point with tip faced with Stellite or similar material to aid penetration into the pile. A set of 3%-inch holes 6 inches from the point and another set 18 inches from the point allow escape of gas to smother fire when 50 pounds of dry ice are inserted and top cap screwed tightly in place

OVER eighty million tons of soft coal are often stored at one time. This amount is approximately twice the quantity in storage a year ago. Such huge storage piles have been built up at the insistent request of the government in order to guard against delays in transportation as the war effort increases throughout the nation.

Ordinarily, industrial coal users keep just enough coal in storage to take care of current needs. This is piled in such a way that there is little danger from spontaneous heating. However, with unprecedented amounts of coal sought for storage, the conditions of such storage are immeasureably altered.

The hazards of spontaneous heating, resulting in combustion, are constantly increasing and large coal users are still being urged by the government to store even greater quantities. Fires resulting from spontaneous combustion in such coal piles are not imaginary bogies. Every day, more and more serious fires of this kind crackle into the headlines.

Hot spot indicators have fuses which indicate dangerous temperatures by operating indicator at top of rod as shown here. Signal is seen 300 feet away



During and after the last war, when similar conditions prevailed, coal was also stored in great piles. At that time special equipment was perfected which provided positive warning of dangerous temperatures developing in the coal piles well in advance of actual ignition. This equipment, known as "hot spot indicators", consists of automatic signaling devices that warn of dangerous temperatures before the coal pile begins to burn.

The protection of the coal pile is accomplished by installing these hot spot indicators in the soft coal on 20-foot centers. The indicators are each 15 feet long and thus, every spot on the coal pile where heating might occur is within a 10-foot radius of an indicator. When the temperature at any spot reaches 150 degrees Fahr., a fuse within the indicator melts, and a strong spring forces the signal head upward, so that it may be seen above the top of the indicator at a distance of several hundred feet.

It is an established fact that when bituminous coal reaches the critical tem-

(Please turn to Page 143)

TEAMMATES ? VICTORY? The man or woman who takes an unexcused day off from his war job . . . to go fishing, or shopping, or visiting . . . is making it just that much tougher for somebody's son or brother on the battle from Every hour of every American's work is needed to produce the su plies it takes to exterminate those fiends our boys are fighting. ALWAYS remember this—There are NO

DAYS OFF when you're facing the Axis!

Note to our customers and friends — If you want your employees to see this message on Absenteeism, we can furnish it in poster form, 18" x 24", for posting on your bulletin boards. Address your request to The Cooper-Bessemer Corporation, Mount Vernon, Ohio, or Grove City, Pa.

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ARE TAKING THIS WAR SERIOUSLY

SOUTH BEND LATHES

With grim determination thousands of American women are doing their best to fill men's shoes. Eagerly they bend their shoulders to wartime tasks—for no sacrifice is too great if it hastens the return of their men from the fighting fronts.

In hundreds of vital war plants, women are operating South Bend Lathes with surprising results. On all kinds of jobs, they have kept up production and maintained established standards of precision. In some factories whole batteries of South Bend Lathes are humming under the guidance of feminine hands.

Since World War I, women operators have preferred South Bend Lathes. Their nimble

9" swing, South Bend Engine Lathe

fingers find the convenient controls well suite to their sensitive touch. They like the full enclosed design. And, most of all, they appreciate the ease of operation that prevent fatigue and makes the workday seem shorte

South Bend Engine Lathes and Toolroo Lathes are made in five sizes: 9" to 16" swing with 3' to 12' bed lengths. The Turret Late are made with 9" and 10" swings. Write for Catalog 100C which describes all sizes and types of South Bend Lathes.

BUY WAR BONDS



SOUTN BEND LATHE WORKS

Lathe Builders for 36 Year SOUTH BEND, INDIANI

BRUSHING WHEELS

.... break bottlenecks in weld joint preparation and weld cleaning

PRESSURE of war production and the shortage of manpower are giving industry a growing appreciation of the power-driven brushing wheel. Used in accordance with sound engineering applications, it is eliminating some of the most tedious and time-consuming jobs in all industry. New applications of the brushing wheel are continually being found, relieving bottlenecks and freeing men and women for more productive effort.

In the metalworking industries, one of the tightest bottlenecks being relieved by the brushing wheel is that of the burring of metal parts. Brushing wheels, too, are being used in rapidly increasing numbers to prepare metal for welding, to remove weld and heat scale, to radius sharp corners, and blend surfaces for the relief of stress concentration points on machined parts.

Many striking examples of these accomplishments may be found in the record files of Osborn Mfg. Co., Cleveland, producer of industrial brushes. These records have been accumulating rapidly since the United States entered the war, and since that time the Osborn company has made a thorough brushing analysis in more than 30 major industries

Industries chiefly to feel the beneficial effect of the brushing wheel are shipbuilding and aviation plane manufacturers as well as engine builders. In one airplane engine parts factory alone, on one day's visit, a technical representative of Osborn found 20 im-

portant operations that brushing wheels were able to speed up appreciably.

Many potential users of these powerdriven brushes still have only a rudimentary idea of their function. To many people a rotary brush is still some sort of a wire wheel driven on a flexible

Fig. 1-(Upper view)-Disk center wire sections are designed for safe, rapid and efficient operation on modern high speed

required, such as the weld shown here Fig. 2-(Lower view)-Treated Tampico section brush, made of fiber obtained from a Mexican plant resembling cactus, is one of most useful brushes in aviation industry

equipment and portable tools where extra-heavy brushing is

shaft or grinder head to scratch paint or rust off metal.

But the needs of industry have given rise to the creation of hundreds of varieties of these wheels, ranging in size from a wheel as small as the end of your little finger for precision instruments, to one 22 feet long used for brushing nap on rug. The wheels have many shapes --- some are radial, others are cups and end brushes.

The specification of brushing wheels for particular jobs is usually an engineering task. Several important factors should be taken into consideration. Some of these are the size of the wheel required, the speed with which the brush is run. If the brush is made of wire, the coarseness of the wire is an important consideration; if the brush is made of fiber, then its flexibility and its ability to hold abrasive are vital. The length of trim of the brush and its ability to remain cool are often vital.

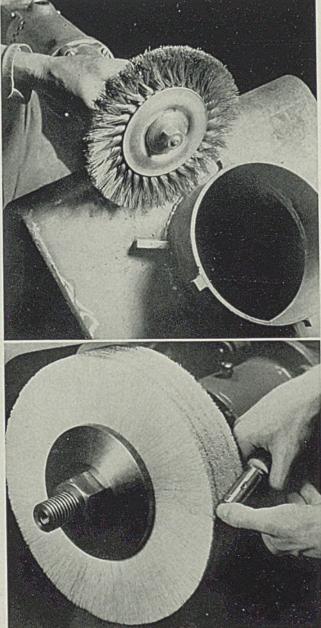
The techniques of applying the brush to the work are carefully worked out, such as the speed at which it is driven, the pressure against the work, and the angle at which it is held.

One of the important bottlenecks in the shipbuilding industry before the application of the brushing wheel was the removal of rust, grease, corrosion and scale from the edges of flat steel sheets preparatory to welding. Before the introduction of brushing wheels, many shipyards were hand brushing or grinding the edges of the metal. Hand brushing was obviously time consuming, while the grinding removed more metal than necessary and was not uniformly effective.

It was recommended that the shipbuilders use two 8inch disk center section brushing wheels, made of 0.016-inch wire and placed

side by side on a shaft driven by an air tool at 4500 revolutions per minute. Not only was there a marked reduction in time, but the brushes did a perfect and uniform job of cleaning, and speeded up subsequent welding operations.

Another time-consuming job was the



Vjax Solution





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SS AEROPLANE BUFFALO DIV.

For flat or curved sheets up to largest sizes . . . rivets, bay sections and fuselage structures, stampings, forgings, and structural shapes . . . Ajax furnaces now have a record in the aircraft industry without a parallel

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WHY U.S. AVIATION INDUSTRIES STANDARDIZE ON AJAX FURNACES

The method by which heat is imparted to aluminum alloys is the most important single factor determining physical properties during solution heat treatment and annealing. Molten salt is the fastest heating medium known, eliminating grain growth. A salt film likewise eliminates oxidation and retards air chill on transfer to the quench. Moreover, treating in salt imparts definite corrosion-resistant properties.

The entire aviation industry is aware of this, and Ajax Electric Salt Bath Furnaces are its choice today, not only for treating aluminum, but for all exacting processes in the 350 to 2400° temperature range. (REPRESENTATIVE USERS SHOWN HAVE NOT ONE BUT MANY TYPES OF AJAX FUR-NACES, AMONG THEM THE LARGEST SALT BATHS EVER INSTALLED.)

NEUTRAL HARDENING ALLOY STEEL PARTS

The exclusive Ajax self-heating, self-circulating electrode principle insures even heat transfer at all points. This, with critical temperature control always to within 5° with no overshooting, eliminates distortion. Salt baths do prevent decarburization and 'atmospheric' reactions by sealing off all atmosphere, especially important when hardening alloy steel parts such as cylinder sleeves, gears, engine, supercharger, and propeller components, ordnance, wing hinges, bearings . . .

CARBURIZING AND CYANIDE HARDENING From armor plate with deepest case to smallest cyanided wearing parts, Ajax furnaces are used by the scores in the aviation industries.

HIGH SPEED STEEL TOOLS AND DIES FOR MACHINING

Specific reasons why the country's high production plants use Ajax-Hultgren furnaces are: The method eliminates scaling, oxidation, decarburization, or other surface defects when treating either the molybdenum, tungsten or cobalt types of steel. Moreover, the life of tools hardened in an Ajax furnace is increased 25 to 300 per cent over previously conventional means.

MAINTENANCE COSTS AT THE VANISHING POINT

Ajax salt bath furnaces show a lower overall operating cost than gas or oil-fired equipment. Hundreds of these furnaces are in use for heat treating aluminum — reports show no electrode or pot failure in 7 years! Maintenance costs, always low, are now at the vanishing point. GET CATALOG 107-A OR BULLETIN 110 FOR DETAILS.

AJAX ELECTRIC CO., INC., FRANKFORD AVE. AT DELAWARE AVE., PHILA. 23, PA.



COMPANIES:

AJAX ELECTROTHERMIC CORPORATION, Ajax-Northrup High Frequency Induction Furnaces AJAX ELECTRIC FURNACE CORPORATION, Ajax-Wyatt Induction Furnaces for Melting AJAX ENGINEERING CORPORATION, Ajax-Tama-Wyatt Aluminum Melting Induction Furnaces

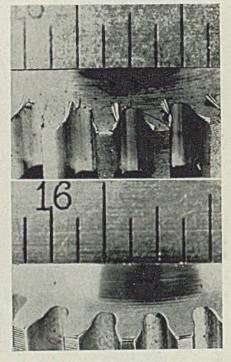


Fig. 3-Small spur gear sections greatly enlarged. Above are shown nicks and burrs before brushing. Note how these have been removed in lower view, sharp edges being rounded off smoothly

brushing of areas of steel plates from which scale had been partially removed by blow torches. The process of cleaning off the deflamed surfaces was speeded up 100 per cent when a doublerow cup brush was adopted.

Designed to give exceptionally long service when used with heavy-duty highspeed tools, the cup is 6 inches in diameter containing 0.020-inch special analysis wire, and is operated on an air tool at 3000 to 4200 revolutions per minute, with the speed regulated by valve on the tool. See Fig. 4.

As an illustration of how important it is that brushing techniques be worked out carefully, a shipyard where an Osborn brushing analysis was made had been using a single-row brushing wheel containing 0.035-inch wire. Although the wire was only a few sizes too heavy, 110

MATERIAL	OPERATION	PREVIOUS METHOD	BRUSHING WHEEL FORMULA	RESULT
Inside pipe ends	Remove scale before and after welding	Grinding with small wheels	Two-inch diameter; Ringlock section Brushing wheel .014 S.A. wire; %-inch arbor hole; small air tool; 20,000 revolutions per minute	100 per cent increase in speed; im- proved results
Steel tubing	Remove burrs from ends	Hand operation	Eight-inch diameter; Disc Center Section wheel; .014 wire; 1¼-inch arbor hole; polishing jack at 3000 revo- lutions per minute	Uniform re- sults; 100 per cent increase in speed; frac- tures prevented
Sheet metal	Remove burrs from drill holes	Each hole done separately with special burring tool	Richl section; three-inch diameter, portable electric tool; 2750 revolutions per minute; face of brush passed over several holes at once	Definite in- crease in speed depending on number of holes in sheet
Alclad sheets of various shapes	Removal of burrs after routing	Shects held individually against tapered spindle covered with emery cloth	Master Wheel; eight-inch diameter; .0095 wire; ½- inch arbor hole; 3000 revo- lutions per minute; as many as 12 sheets at one time	Very definite increase in speed
Small aluminum castings	Removal of burrs and small millouts	Hand scraping; filing and emery cloth	Monitor Section; 12-inch diameter; .008 wire; 1¼- inch arbor hole	50 per cent speed increase: results uni- form; scratch- ing prevented
Aluminum castings	Remove burrs from small recesses	Hand scraping	Ringlock Section; two-inch diameter; .0118 wire; ½- inch arbor hole	Desired finish is uniform; speed-up is very material
Duralumin sheets	Removal of burrs from edges	Hand V knife	Monitor section; ¹ / ₂ -inch diameter; .008 wire; 1 ¹ / ₄ - inch arbor hole; 3000 revo- lutions per minute on floor stand grinder; two or more sheets at a time	Burrs removed without mar- ring or scratch- ing metal; 100 per cent speed increase
Pressed fiber material	Removal of flashing	Hand filing	Riehl Section; six-inch diameter; .004 wire; ½-inch arbor hole; 3000 revolutions per minute on bench grinder	500 per cent speed increase
Welded seams in narrow, out of the way pieces	Removal of rust and welding scale	Hand wire brushing	Cup brush; 3½-inch diame- ter; .020 S.A. wire; ½-inch arbor hole; electric or air tool; 2700 revolutions per minute	Speed increase 500 to 1000 per cent. Removal is more thorough
Various metal objects in machine shop	General clean- ing, polishing, removal of rust and other for- eign matter	Hand brushing, sandpapering, etc.	Master wheel; 15-inch di- ameter; .0118 wire; 1750 revolutions per minute; standard polishing jack	Brush flexible enough to do good cleaning job without excessive scratching; time saving very definite

TABLE I-Typical Brushing Applications in Welding and Other Work

it left blue heat marks on the metal. The difficulty was removed immediately by a slight reduction in the size of the wire.

Most difficult of the weld cleaning jobs occur when the welds are situated

in the bottoms of extremely narrow grooves or in corners formed by three mutually perpendicular plates.

The cleaning of built-up welds in narrow grooves was greatly expedited by (Please turn to Page 134)

Fig. 4—This double-row cup brush is highly effective in cleaning flat surface welds. It is 6 inches in diameter, has a 3/8-inch arbor hole



STABILIZED CRANE LAYOUT NUM HEAT TREATING DEPARTMENT ENTRAL MANUFACTURING CORPORATION CONNERSVILLE, INDIANA

SPEED in handling is a primary requisite when heat treating parts by the salt bath method. A Cleveland Tramrail stabilized crane at the American Central Manufacturing Corporation, Connersville, Indiana, provides the speed necessary for the successful treatment of aluminum parts and sheets prior to forming, for airplane wings that they manufacture for dive bombers and other aircraft.

ROON

As illustrated in the photograph and diagram, the parts and sheets are soaked in a sodium nitrate bath held at 920 degrees Fahrenheit for varying times depending upon the metal thickness. For aluminum sheets .040-inch thick this time is 20 minutes. Then,

STABILIZED CRANE PROVIDES SPEED NECESSARY FOR SALT BATH HEAT TREATING

> by means of the stabilized crane the parts are quenched in two cold water tanks and delivered to a point just outside of a refrigerator room. The operator takes them from the basket and quickly places them into this room where the temperature is kept at approximately zero Fahrenheit. The total time from the hot tank to storing in the cold room must be kept to four minutes or less, to prevent the parts from hardening prematurely.

The Cleveland Tramrail stabilized crane is particularly advantageous for this work as well as for anodizing, chromodizing and other tank operations, because it will raise and lower the load quickly without swing. The patented hoisting rope arrangement is such that loads can be elevated as firmly and precisely as though in an elevator shaft.



Triple Life

SPECIAL FIREBRICK for Severe Operating Conditions

In many furnaces, particularly those which operate at high temperatures and at high production rates, B&W 80 Firebrick outlast first quality fireclay brick three to one. This means that B&W 80s enable furnaces to be operated continuously, without interruption to production, for three times the normal campaign and with one-third of the time out for repairs and rebuilding. The cost-delivered and installed—is much less on a service-time basis.

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- PLASTICS
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112

STEEL COKE OVEN DOORS

Fabricating

By HENRY A. IMMISCH Master Mechanic Columbia Steel Co. Ironton, Utah

BECAUSE OF the limited operations at the Ironton plant, Ironton, Utah, of the Columbia Steel Co., which originally included a 600-ton blast furnace and two batteries of by-product coke ovens, a separate welding department never has been deemed necessary. Therefore, the welding which has to be done at this plant has become a side function of the mechanical department. At present the welding equipment consists of three electric welding machines, and several sets of oxyacetylene welding torches.

The cast iron coke oven door seems prone to warp and crack under the high degree of heat to which it is subjected. In many instances it became necessary to remove the cast iron doors, straighten them by cold working, and then fill the cracks by welding. Because of the constantly increasing amount of repairs and excessive cost necessary to maintain the doors in a satisfactory operating condition, the management decided to purchase a considerable number of new coke oven doors. First we experimented with a pair of steel welded coke oven doors and decided to install them. After observing these doors closely for several months, keeping a record of their service qualifications such as warpage, cracking, etc., it was found that the steel doors did not have a tendency to warp thus reducing the breaking, cracking, and repairing that was found prominent in the cast iron doors. The steel doors also were lighter and constructed so as to provide greater heat radiation. was for these reasons that the management decided to purchase welded steel doors in preference to the present cast iron doors.

The local company which quoted \$188 per door for each of the two trial doors purchased, experienced considerable trouble in the manufacture of them. The final price was raised to \$198 per door. Reports from the welders participating in the construction of the trial doors stated that they encountered numerous difficulties in that they were unable to keep the doors from warping.

In February, 1941, price inquiries for 48 oven doors were sent to three different companies; the following proposals and quotations were received:

A local concern quoted \$4800, job site on 24 pusher side steel electric welded coke oven doors.

A second company quoted \$250 each pusher side door, f.o.b., Los Angeles, and \$270 each coke side door, f.o.b., Los Angeles.

A third company quoted on the 24 coke side doors \$3240. f.o.b.. Johnstown. Pa., and on 24 pusher side doors \$3480, f.o.b., Johnstown, Pa.

Management, however, decided to make the doors at the plant. A study showed that the undertaking would necessitate the full time services of a boilermaker and two electric welders. The mechanical crew at our plant is for maintenance work only; hence, additional help was sought from other sources. A boilermaker was hired but no experienced electric welders could be found.

Coincidentally, an instructor of an electric welding class recommended one of his students, who at that time had about 500 electric welding class hours to his credit. The majority of these class-hours had been spent on a 300ampere electric welding machine. This student welder was employed. An employe from the yard department was advanced to the mechanical department as boilermaker helper. These three men made up the foundation of the crew.

During the interim of the ordering and receiving of the materials for the construction of the doors, considerable thought was given to the procedure which should be followed. Consultation was held with the three men, explaining the blueprints of the construction of the doors, and making the method or procedure clearly understood. Particular caution was taken to avoid the difficulties which had been experienced

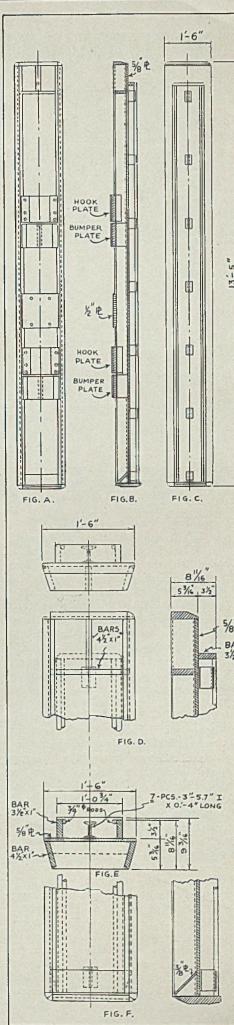
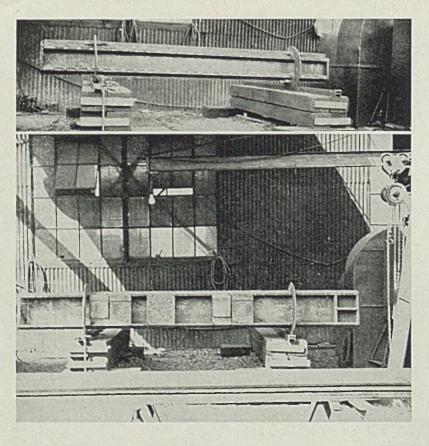


Fig. 1-General arrangement and enlarged sections of welded steel door

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From a paper submitted to the James F. Lincoln Arc Welding Foundation in its \$200,000 industrial progress award program for reports, advances and improvements made by applications of arc welding in design, fabrication, construction and maintenance.



by the welders who had worked on the two trial doors ordered from the local concern. With these difficulties clearly in mind construction of the new doors started.

The 1 x 3^{1/2}-inch bars which came in 20 foot lengths were cut as shown on Fig. 1-E; the 34-inch round bars were cut to lengths which were welded to the 1 x 3½-inch bars. Expecting minor difficulties during this procedure, one of the bars was completed to determine the amount of warpage. The 1 x 31/2inch bar warped 2½ inches flatwise and %-inch edgewise, forming almost a perfect radius. Knowing that it was impossible to stop this warpage when the 34-inch rod was welded to it, the next 1 x 3½-inch bar was cold bent to 2½ inches and %-inch, before the next bar was welded. This procedure greatly improved the warping condition, but the cold bend was a little too much. A third bar was tried with a 214-inch bend flat-wise and the same 7/8-inch bend edgewise. When the 34-inch round bar was welded to this bar it was almost straight; the little warp that was still in the bar was easily straightened. This procedure was followed on the rest of the bars for the 48 doors.

Two 1 x 4½-inch bars which came in 20-foot lengths and the $\frac{5}{3}$ -inch plates which came in various widths were cut to the proper length and size by an acetylene cutting machine. These $\frac{5}{3}$ inch plates were of various sizes, 3 feet by 12 inches, 4 feet by 15 inches, and 6 feet by S0 inches. The S-inch I-beams

were cut to 4-inch lengths as shown on Fig. 1-C. The number plate, bumper plates, and hook plates were then cut from the 5's-inch plates. Having the material cut for the construction of one door, the assembling of the door was started. Two steel saw horses were situated in a level position as shown in the foreground of Fig. 2. The 5s-inch plate was placed on these horses, laid out for dimensions, centerline, etc. The 1 x 3¹/₂-inch bars were clamped to the 5/s-inch plate with thumb clamps and tack welded into place; this part of the door was then turned over the 1 x 4½-inch bars, number plates, and hook plates, and bumper plates were also tack welded into place. After the door was completely tacked together it was ready for the welding process.

As these doors weighed 1435 pounds and 1675 pounds for the pusher side and coke side respectively, a device was planned whereby they could be handled with the minimum amount of trouble. Outside the machine shop there is a chain block and a small jib crane (Fig. 3) suitable for handling the doors; thus the cost of installing any additional hoisting devices was eliminated. A set-up was arranged so that a desirable position for welding could be obtained and the procedure followed is the whole crux of the job. Two circular 3/s-inch plates, 22 inches diameter, were obtained for the pusher side door which is 16 inches in width. From the center of these circular plates the shape of the door was cut out, thus allowing the

Fig. 2. (Left, above)—Door in the process of assembly

Fig. 3. (Below)—Steel wedges were used to hold plate against door

> plates to slip over each end of the door. With the use of steel wedges the plate was wedged tight against the door as shown in Fig. 3. The width of the coke side doors was 18 inches; so that another set of plates were required for these doors.

> Blocks and railroad ties were set and spaced to conform with the distance between the circular plates which had been placed over the ends of the door. Two pieces of 3-inch I-beam of sufficient length to allow complete turn of the %-inch circular plates were used to act as a track or guide, making the manipulation of the door easy and also making it convenient for two or more welders to be working at the same time.

Operation of the welding setup proved that two welders could work simultaneously and with success. The procedure involved starting in the center of the door-welding toward the ends in the "step-weld" method-that is, to weld for 2 inches, then leave a 6-inch space, and then weld for 2 inches againworking on both sides of the door at the same time. By this arrangement the doors could be welded without warping and without clamping the door to a massive face plate, thus allowing the expansion and contraction to take care of itself. To carry out this procedure another student welder who had about 500 class hours to his credit was employed.

Welders Enthusiastic

At the completion of the first door the welder who was first hired became so enthusiastic over the success obtained with the unique welding arrangement and the ease with which the heavy doors were handled that he immediately began investigating the various methods which other concerns were using in fabricating these doors. He found that the method just described for welding and handling the doors, namely, that of inserting the ends of the door into the center of a circular plate and placing such on a track so as to provide a complete revolution of the door, as well as enabling two welders to work simultaneously, one welding on the inside of the bottom I x 41/2-inch bar, was more efficient than any other method now in use.

With the two welders working so successfully together, and the simple device for handling the doors operating far beyond expectation, attention was

(Please turn to Page 138)

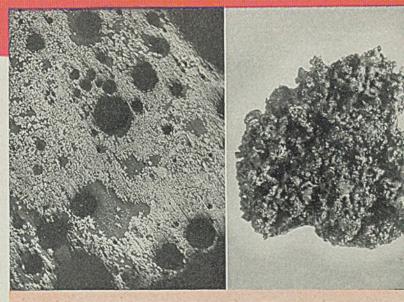
McKee Engineering assures a plant where you can make sinter with Correct Physical Properties

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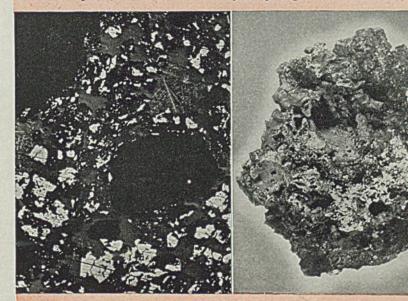
Long experience in the field of beneficiated materials for blast-furnace use, as well as in bast-furnace operations, enables McKee engineers to determine correct plant design for producing the exact type of sinter required for your particular operation.

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IDEAL BLAST-FURNACE SINTER. Microscopic cross section of sinter (100 times enlarged) shows uniform cell structure which provides maximum surface for gas contact.



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ASTM

Committees Report

IMPORTANT NEW STANDARDS

A LARGE NUMBER of members of Committee A-1 on Steel have been extremely active in the National Emergency Steel Specification Project (NESS). Based on the work of several NESS Technical Advisory Coamittees, WPB issued a general Limitation Order L 211 prohibiting the production, fabrication, delivery, acceptance or use of any material except as covered in the schedules appended to the order from time to time. Up to May 15, ten such schedules have been approved, including: Concrete Reinforcement Steel; Steel Wheels and Tires; Barbed Wire, Wire Fence, Poultry Netting and Poultry Flooring; Structural Steel Shapes; Steel Axles and Forgings (Railroad and Transit Services); Mechanical Steel Tubing; Rails and Track Accessories; Carbon Steel Plates; Oil Country Tubular Goods; Water Well Tubular Products.

Seven Specifications Issued

Seven complete emergency specifications issued include ES-21 on carbonsteel and alloy-steel forgings for magnetic retaining rings for turbine generators; ES-22 on alloy-steel forgings for nonmagnetic coil retaining rings for turbine generators; ES-23 on carbon-steel forgings for rings for main reduction gears; ES-24 on carbon-steel and alloysteel forgings for pinious or main reduction gears; ES-25 on earbon-steel and alloy-steel forgings for turbine generator rotors and shafts; ES-26 on carbon-steel and alloy-steel forgings for turbine rotors and shafts; ES-27 on carbon-steel and alloy-steel forgings for turbine backet wheels.

One of the perplexing problems in connection with these specifications was simplification of chemical composition. There were quite a large number of grades in use and a limited number was desirable to expedite tomage and simplify steel making, forging and fabricating problems. This achievement in the specifications represents an outstanding accomplishment. To achieve the conservation of critical elements most effectively, chemical ranges are set up for some of the products—erase figures being subject to agreement between producer and consumer. These turbine parts MANY IMPORTANT actions on standards and results of research investigations featured the 1943 annual meeting of the American Society for Testing Materials held in Pittsburgh recently. See story in STEEL, July 5, p. 67 for information on attendance, awards made.

A measure of accomplishments in standards work is represented by the number of new specifications and tests approved at the meeting, which this year number about 50, comparing favorably with 1941 and 1942. On top of this, there has been constant work throughout the year on emergency specifications and provisions issued from week to week.

These numerous emergency specifications are a direct contribution to winning the war for they assure more effective use of available materials. Co-operating closely with ASTM committees were other organizations and government bodies, particularly the Army, Navy and WPB. Many ASTM specifications and tests are incorporated in limitation orders.

Because of the significance of many of these new specifications, some of their most important points are highlighted here for the busy technician who may not have time to examine them in more detail. —The Editors

so extremely important in ships and other work, need considerable alloying elements in many cases in order to prevent excessive wear and to produce the required combination of strength and ductility. A list of Emergency Alternate Provisions will be found in Table I.

The Emergency Provisions and Specifications for Carbon-Steel Axles, EA-A 21, increase availability of acid open-hearth steel by permitting a maximum phosphorus of 0.055 per cent for acid steel and 0.03 per cent for basic steel.

The provisions applying to the carbonsteel forgings for general industrial use, EA-A285, establish Class A as a carburizing steel providing a definite carbon content and deleting any physical requirements for this class. It provides for heavy forgings over 20 inches in solid diameter or thickness.

Provisions in EA-A 237 on alloy-steel forgings also establish physical requirements for Class B forgings of large size.

The rather extensive provisions in the specification EA-A 236 for carbon-steel forgings for locomotives and cars, provide for use of Class A as a carburizing steel, modify phosphorus and sulfur content of certain classes and provide two considerably higher strength classes of materials in quenched-and-tempered condition designated Class H and I. These higher strength forgings were considered very essential by a number of railroads so that it would not be necessary for them to re-design and re-balance certain parts which perhaps could not be obtained in alloy steels. Other changes were made to expedite production. EA-A 236a merely extends the scope of emergency Class H material to be applicable for locomotive and tender axles.

In EA-A 238 for alloy-steel forgings for locomotives and cars, phosphorus and sulphur content of acid open-hearth steel was raised.

Raise Sulphur Limit

The emergency provisions in four specifications on steel wheels permit sulphur content of acid steel to be as high as 0.06 per cent as compared with the present basic steel top of 0.05 per cent. The additional provisions in the wheels for electric railway service give requirements for spun steel wheels and as a service include the tables of dimensions of standard wheel designs part of the WPB Limitation Order L 211.

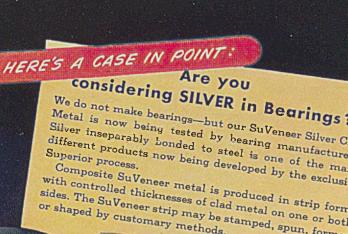
Steel Castings: Emergency alternate provisions, EA-A 148a, for alloy steel castings for structural purposes were established to concentrate production of six classes, which a very extensive survey of the industry indicated could be produced in reasonably large quantities. Two of the so-called regular grades, I and 2 of Class A, were retained and the other four are emergency grades.

Pipe and Tubing: In this field the



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sides. The SuVeneer strip may be stamped, spun, formed or shaped by customary methods.



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TEI

numerous emergency alternate provisions were developed in the NESS Technical Advisory Committee on Tubular Steel Products.

An outstanding standardization achievement is the establishment of a master list of some 18 different compositions of carbon and alloy steels for pressure tubes-an important reduction from the number of existing standard grades. Then by use of emergency alternate provisions production can now be concentrated on steels with these chemical requirements. Primarily affected are tubular products in the boiler and superheater tubes field, still tubes, and heat exchanger tubes. A number of revised chemical requirements are justified to keep analyses in line with the scrap situation, others are intended to conserve molybdenum and other elements.

Boiler and Superheater Tubes: The inclusion of "ASTM Specification Number" in the marking clause in A 83 and A 178 results from the desire of the Boiler Code Committee that this number be given and although there has been some objection from the production standpoint, manufacturers have expressed willingness to go along with this change during this period as an emergency.

Complete Grades by Steps

In Specifications A 213 (alloy boiler tubes) a widely used standard, two new emergency classes TE 7 and TE 9 (7 and 9 per cent chromium) complete a series of grades by steps and enable the producer and consumer to effect most easily conservation of alloying elements.

Still Tubes for Refinery Service: The change in molybdenum requirements is to conserve this extremely critical alloy. The transfer of the chromium-molybdenum type from Specifications A 188 to Specifications A 200 concentrates requirements for alloy-steel tubes in the one specification with six grades which the producers and consumers agree are essential.

Heat Exchanger and Condenser Tubes: The notes on hydrostatic test requirements added in Specification A 179 and A 214 follow the pattern used in other ASTM steel specifications providing for considerably higher hydrostatic testing when the material is to be used under more rigorous conditions than normally would be the case. Material conforming to these two specifications is used in all new extraction feedwater heaters, which operate at pressures considerably above 1000 pounds per square inch.

Pipe Specifications: Certain of the emergency provisions in the seven specifications of this group are to make them more suitable during the emergency for use for water main pipe and water service. These specifications are being rec-

ommended to the WPB for incorporation in the list of so-called master steel specifications.

The provisions concerning wall thickness were a distinct compromise between two quite different practices with respect to pipe thicknesses, namely, the use in the western United States and Pacific coast area with its very light walls, and the Eastern practice, where considerably heavier walls are employed. For similar reasons references are being added to corrosion problems and coatings, and reference is to be made to the American Water Works Association requirements on protective coatings.

Specifications A 139 are widely used in connection with oil pipe lines, and the note being added in Section 14 of EA-A 139 referring to API thread standards is very important. The Emergency provisions in EA-A 139a were set up to cover pipe sizes down to 4 inches in diameter (present size limited to 8 inches but not including 30 inches) and also to bring the requirements on elongation value in line with changes made as a regular feature in the Specifications A 53 and A 106-these elongation values being set up according to wall thickness of the material.

The provisions in EA-A 53a widely used for general pipe standard were desirable in order to provide standardized requirements for a Grade C material which is used for water well pipe and is incorporated in Schedule 10 of WPB Order L 211. The NESS Technical Advisory Committee, in recommending Specifications A 53, could not otherwise include Grade C, and to simplify the mechanics this provision was established.

Committee A-1 on Steel reported approval of "Tentative Specification for Heat-Treated Carbon-Steel Bolting Ma-(Please turn to Page 140) ...

TABLE I-Partial List of Emergency Alternate Provisions

TABLE I-Partial List of Emergency Alternate Trovisions		
FORGINGS	Issue	
EA—A 21, Carbon-Steel Axles for Cars and Tenders (A 21—36) Oc EA—A 235, Carbon-Steel Forgings for General Industrial Use (A 235—42) Jan. EA—A 236, Carbon-Steel Forgings for Locomotives and Cars (A 236—42) Aug. EA—A 236, Carbon-Steel Forgings for Locomotives and Cars (A 236—42) Aug. EA—A 237, Alloy-Steel Forgings for Cocomotives and Cars (A 236—42) Ma EA—A 237, Alloy-Steel Forgings for Locomotives and Cars (A 236—42) Jan. EA—A 238, Alloy-Steel Forgings for Locomotives and Cars (A 238—42) Oc	12, y 8, 30,	1942 1943 1943
WHEELS		
EA—A 25, Wrought Steel Wheels for Electric Railway Service (A 25—41) June EA—A 25a, Wrought Steel Wheels for Electric Railway Service (A 25—41) Aug. EA—A 57, Multiple-Wear Wrought Steel Wheels (A 57—39) June EA—A 186, One-Wear and Two-Wear Wroucht Steel Wheels (A 186—39) June EA—A 244, Heat-Treated Wrought Steel Wheels (A 244—42) June	24, 22, 22,	1942 1942 1942
CASTINGS		
EA-A 148a, Alloy-Steel Castings for Structural Purposes (A 148-42) April	27,	1943
PIPE AND TUBING		
Boiler and Superheater Tubes		
EA-A 83 Lap-Welded and Seamless Steel and Lap-Welded Iron Boiler Tubes		
(A DO 40)	18,	1942
EA-A 178 Electric-Resistance-Welded Steel and Open-Hearth Iron Boiler Tubes (A 178-40)	18.	1942
EA-A 192 Scamless Steel Boiler Tubes for High-Pressure Service (A 192-40) Aug	18,	1942
Tuber (A 900-49)	18,	1942
EA-A 213 Seamless Alloy-Steel Boiler and Superheater Tubes (A 213-42) Aug EA-A 226 Electric-Resistance-Welded Steel Boiler and Superheater Tubes for High-Pressure Service (A 226-40) Aug		
EA-A 249 Atomic-Hydrogen-Arc-Welded and Electric-Resistance-Welded Alloy- Steel Boiler and Superheater Tubes (A 249-42)		
EA-A 250 Electric-Resistance-Welded Carbon-Molybdenum Alloy Steel Boiler and Superheater Tubes (A 250-41 T)		
Still Tubes for Refinery Service		
EA-A 161 Seamless Low-Carbon and Carbon-Molybdenum Steel Still Tubes for Refinery Service (A 161-40)	. 18,	1942
EA-A 200 Seamless Intermediate Alloy-Steel Still Tubes for Refinery Service (A 200-40)	18	1049
(A 200-40)		1010
EA-A 179 Seamless Cold-Drawn Low-Carbon Steel Heat-Exchanger and Con-		
denser Tubes (A 179–42) EA—A 199 Seamless Cold-Drawn Intermediate Alloy-Steel Heat-Exchanger and	. 18,	1942
Condenser Tubes (A 199-40)	18,	1942
(A 214-42) Aug	18,	1942
Pipe	-	10.15
EA-A 53 Welded and Seamless Steel Pipe (A 53-42)		
EA-A 134 Electric-Fusion-Welded Steel Pipe (Sizes 30 in. and Over) (A 134-42) Aug		
EA-A 135 Electric-Resistance-Welded Steel Pipe (A 135-42)Aug		
EA-A 139 Electric-Fusion-Welded Steel Pipe (Size 8 in. to but not Including	-	1.0.10
30 in.) (A 139-42)	18,	1942

EA-A 139a Electric-Fusion-Welded Steel Pipe (Size 8 in. to but not Including

INDUSTRIAL EQUIPMENT_

Cleaning Machine

L. & R. Mfg. Co., 54 Clinton street, Newark, N. J., is offering a new precision cleaning machine especially suitable to meet cleaning requirements in the electronics field. Dull, greasy, oil stained units emerge from the machine bone dry, and ready for the assembly line, according to the company.

Upon snapping on the thermostatic switch of the unit, a surging centrifugal motion of the basket is produced with speeds varying from high to low. The



cleaner is agitated by a powerful, aircooled fractional horsepower motor. Its work basket is 2¼ inches in diameter by 5% inches inside diameter.

Safety Handle Wheel

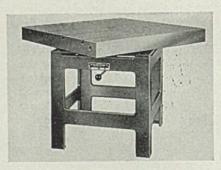
Gibbons Mfg. Co., Worcester, Mass., is offering a new safety handle wheel especially suitable for rapid traverse machines. It is said to prevent catching of operators clothes while wheel is in motion.

The wheel, keyed to the shaft, also allows adjustments without the use of the safety handle. According to the company, safety handle wheels can be made to replace any type of handle wheel or crank now in use.

Turn Table

Challenge Machinery Co., Grand Haven, Mich., reports the availability of a new turn table for progressive mounting of two or more units at one time and for continuous production. It also is useful to enlarge radial drill capacity and for all work where turning of the table aids manufacturing operations.

The table is furnished in two standard sizes— 30×30 -inch surface, 3 inches



thick and 42 x 42-inch surface, 4 inches thick—each surface plate having four Tslots machined from the solid.

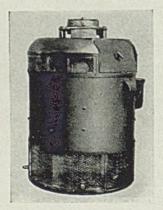
Turn tables are made in two different models—one mounted on a cast iron stand, or a low base for use on machine beds. The stand model is 34 inches high while the drill base model is 9 inches high.

A single motion locking lever locks the table to the stand securely. A special rim lock is provided on the lowbase model.

Vertical Motors

General Electric Co., Schenectady, N. Y., recently introduced a new line of direct-current vertical motors ranging from 40 to 200 horsepower at 1750 revolutions per minute, and in equivalent ratings at other speeds.

Motors in the line are furnished for both constant and adjustable speeds, and are designed for low-thrust, solid-shaft applications on pumps and machine tools. They are of drip-proof, protected con-



struction, providing complete protection from dripping liquids and falling objects.

Fittings on both the upper and lower bearings simplify lubrication, and provision for the escape of excessive grease reduces the possibility of over-lubrication. A special bearing housing prevents grease from entering the motor. The cast-iron conduit box can be arranged for bringing the leads in at the top, bottom or either side. Two handhole covers, removable without the use of tools, permit quick and easy inspection of the commutator end brushes.

Safety Goggle

Watchemoket Optical Co., Providence, R. I., is offering a new, general utility industrial safety goggle which features Plexiglas for lenses. The goggle is said to fit directly over prescription glasses its full frame giving added protection



against injury from sides, top and bottom.

Lenses can be removed easily for cleaning or replacement. Frame is reinforced with metal clip at bridge; and is amply ventilated to prevent fogging. Weight of the goggle is only 1% ounces.

Low-Lift Truck

Baker Industrial Truck Division, Baker-Raulang Co., Cleveland, announces a new type E-2, 4000-pound low-lift truck designed to give longer hours of uninterrupted operation. It also features greater safety of operation by giving the operator better vision.

The truck, according to the company, is built on a 66-inch wheelbase and the overall length, including the operator's guard, is 123³/₄ inches. This permits rigit angle turns in aisles 67 inches wide, it is said.

The battery box has been increased in size to $32 \times 39\frac{1}{2}$ inches, providing space for enough additional battery capacity. The front top corner of the battery compartment is chamfered to aid vision. In addition, the cover on the battery compartment is of the sliding type, and is

FINE DISSTON STEELS of ordnance quality

For Aircraft Parts—This standard alloy steel for airplane parts is produced in Disston electric furnaces by modern tool steel practice to exceptionally high standards of quality. Depend on Disston for steels of superior cleanliness and soundness in this classification.

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This standard alloy steel of gun quality is made to Disston tool steel standards under precise control in

> electric furnaces. High grade raw materials, experienced personnel and up-to-date facilities are combined to produce thoroughly satisfactory steel of this type.

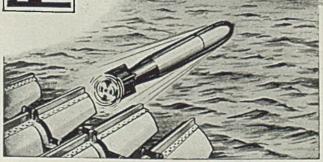
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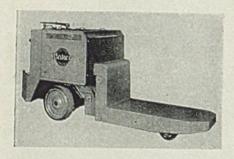






equipped with handles in place of hand holes.

All controls, together with lift motor and pump, are in a convenient control panel. The travel brake which is located just below the control panel is ad-

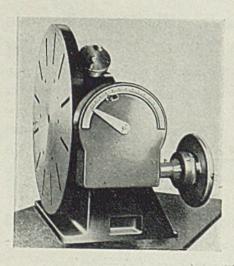


justed by a single hex nut. The truck also includes such standard features as the Baker travel motor, a duplex compensating suspension which eliminates all sliding contacts between the power axle and frame and an improved hydraulic lift system.

Measuring Device

Machine Products Corp., Detroit, is introducing a new instrument for measuring large castings for radial motors. It also is used for measuring other large objects such as fixtures, patterns or fabricated parts. Called the Rotab, the instrument has a 36-inch circular table on which the work may be clamped.

Without disturbing the original clamping, an inspector can measure all the angles on the work. By means of geared turning wheels the table of the unit can be rotated to any degree and to any angle from the vertical position to the horizontal and then 30 degrees below



in the opposite direction. Dials showing degree and minute graduations register the angle of setting.

A 10-inch sine bar is provided on the instrument for use in cases where greater accuracy is required. After the table is set it may be securely locked in a fixed position—radial or angular. It may also be disengaged to rotate freely by hand.

In addition to its function as a measuring device, the unit lends itself as a holding fixture for boring mill setups, it is said. An auxiliary table, 18% inches in diameter, is provided as a substitute for the 36-inch plate if needed for smaller work. The overall height of the unit, from top of table when in horizontal position, is 27% inches. The base measures 20% x 27% inches.

Lifting Magnet

Stearns Magnetic Mfg. Co., Milwaukee, announces a complete line of lifting magnets for loading and unloading, moving of large quantities of material quickly and for eliminating hand labor on difficult and dangerous operations.

Features of the units in the line include renewable pole shoes of alloy steel;



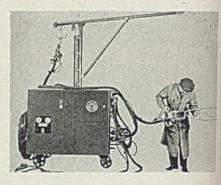
ribbed coil shield; unicoil construction; excellent heat dissipation.

Leads and terminals are fully protected against damage and shock and are readily accessible for inspection without disturbing the insulation. Windings are vacuum impregnated to eliminate possibility of electrical trouble and are waterproof.

Repair Cart

Progressive Welder Co., Detroit, is now offering a self-contained field-repair cart for repair spot-welding of steel parts on the spot, as on airfields, for example. Equipped with an electronic timer and a wide selection of both air-operated and manual "tong" type guns, it is capable of doing just about any kind of a spot welding job on stainless and other light-gage steels, it is said.

Refrigeration of transformers, cables and guns eliminates the need for external water connections, the condensor in the "Frostrode" refrigerating unit being air cooled. The refrigerant in turn circulates a low temperature coolant through transformer, cables and guns. Thus the only connection necessary to the repair cart is a power lead. Since the cart is provided with long cables, the connection can be made in a hangar or elsewhere. The cables are of



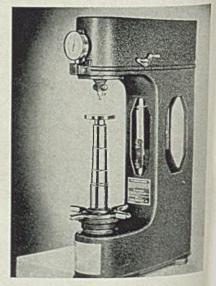
the concentric kickless type. Guns are so designed that a large variety of differently shaped electrodes may be mounted in them.

Hardness Tester

Clark Instrument Inc., Dearborn, Mich., announces an improved hardness tester for rockwell testing. Offered in three models, US8, US12 and US16, it is said to embody a number of features contributing to accuracy of measurement and speed of operation.

Among these are a frictionless spindle which provides a correct minor load at all times: Zero drag trip which eliminates friction or drag on the loading beam insuring consistent accuracy of the major load; a dial indicator adjustment affording a convenient, simple means of maintaining accuracy of readings; and in minor load adjustment.

Other features of the instrument are



fully enclosed elevating screw with sellubricating oil reservoir, and an adjustable steady rest. The instrument is supplied complete with diamond cone penetrates and steel ball penetrators for rockwel



TUBING...

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Tubing plays a vital part in the equipment of the Army and Navy. From the manufacture of tubing for such peace-time products as automotive parts, metal furniture, lawn mowers, vacuum cleaners and similar items, our plants have been converted to all-out production of tubing for ...

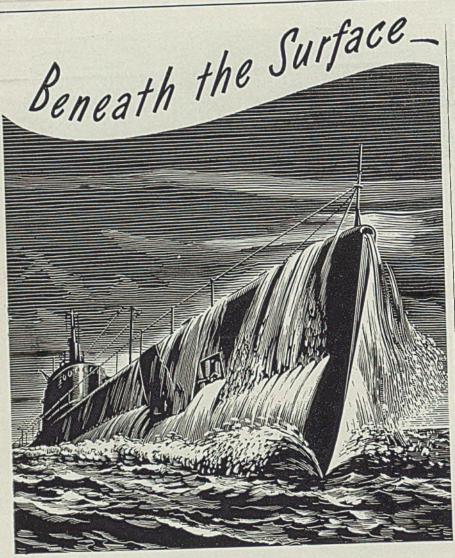
TANK TREADSSMOKE SHELLSTENT POLESSTEERING COLUMNSTIE RODSPORTABLE PIPE LINESFRAGMENTATION BOMBSINCENDIARY AND UTILITY BOMBS

We are also making Shell Forgings for 75 mm. Army guns and 3-inch Navy Antiaircraft guns . . . doing everything we can to speed the day when the Axis surrenders unconditionally.

Speed Unconditional Surrender

BUY WAR BONDS THE STANDARD TUBE CO. Detroit Michigan Welded Tybing Steel Forgings

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



go STANDARD forgings and castings

ARMY E ***

And, beneath

the surface of these Standard steel products lie the hidden qualities on which the men who man the subs depend.

Acid open hearth steel, rigidly controlled through every phase of manufacture, imparts to Standard forgings the high physical properties that mean long service life in peacetime industry and may mean life itself in time of war.



-INDUSIKIAL LAU

testing on C scale, B scale, and most other standard rockwell scales. Three anvils are included: a standard 3⁴/₈-inch anvil for large flat bearing surface work; a spot anvil for most standard size pieces and for use with test blocks; and a V anvil for testing cylindrical parts.

Indicating Meters

Pittsburgh Equitable Meter Co., 400 North Lexington avenue, Pittsburgh, announces its EMCO flow indicating me-



ters, calibrated to read in litres of oxygen per minute for measuring the rate of flow of oxygen gas. It is said to provide instantaneous readings and require neither calculations nor application of correction factors.

The meter operates by the principle of a floating piston whose positioning is actuated by the flow of gas through an orifice of variable area.

The piston is lifted by the incoming gas until its weight balances the pressure loss through the orifice area. At the point of balance the flow rate may be read directly from the pointer.

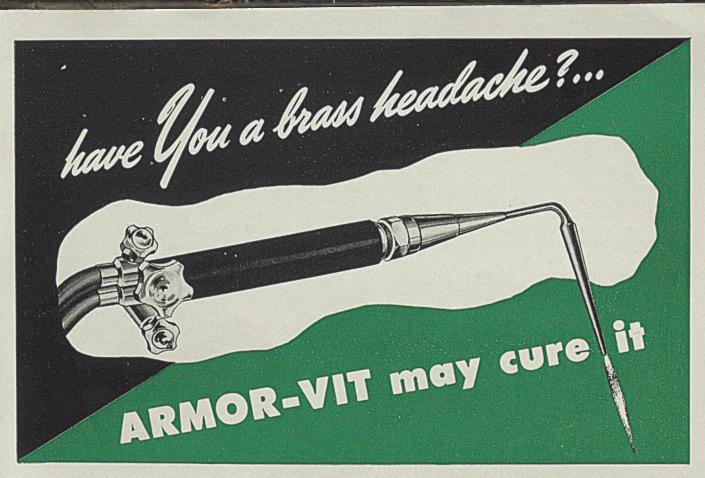
The unit is compact, light in weight and easy to transport in a fitted earing case. Four sizes of these meters are being offered to record maximum flow rates of 2,5,10 and 150 litres per minute, respectively.

Spinning Lathe

Ferracute Machine Co., Bridgeton, N. J., announces a new model spinning lathe which is said to be safer to operate due to its design—the enclosing of mod moving parts. It has a single lever cortrol of clutch and brake for instantaneous starting and stopping.

A 5-horsepower motor is used to pro-

FORGINGS . CASTINGS . WELDLESS RINGS . STEEL WHEELS



PEARL HARBOR and priorities put many manufacturers behind the 8-ball. It became next to impossible to get brass (and other critical metals)—even for vitally needed equipment—whether torches or tanks. But many manufacturers have cured their brass headaches by turning to **ARMOR-VIT. ARMOR-VIT** is such a remarkable coating for metal it gives iron or steel many of the vital resistance properties of the scarce metals.

ARMOR-VIT is a new and revolutionary metal finish which is amazingly resistant to rust, corrosion, impact, heat, abrasion, scratch, acids, alkalis, thermal shock, weather, salt spray, or other elements. Being priority-free, it might readily make it possible for you to substitute iron or steel in your product for the more critical metals such as zinc, brass, copper, chromium, cadmium, tin, etc.,—yet actually improve the resistance and wearing qualities such metals possess.

Investigate this remarkable finish. It is applied by spraying, then cured through a heat cycle starting at 250° and ending at 700° F.

ARMOR-VIT is ceramic in nature, and there is no relationship or comparison between ARMOR-VIT and porcelain enamel, paint, lacquer, or synthetic finishes. It is non-volatile; non-explosive. The coating is only 1/1000th of an inch in thickness—so it goes farther and lasts longer. There is an accredited ARMOR-VIT applicator convenient to your plant. Write for full details.



ARMOR-VIT DIVISION CHICAGO VITREOUS ENAMEL PRODUCT CO. Cicero, Mlinois

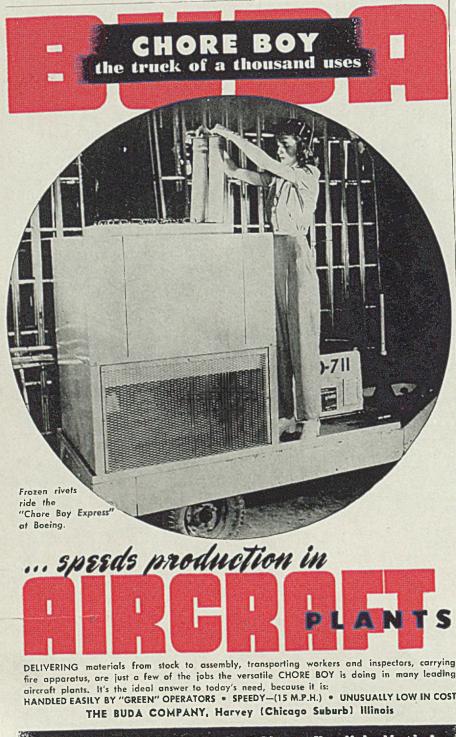
HIGHLY RESISTANT TO RUST CORROSION, HEAT, IMPACT, ABRASION, SCRATCH, ACID, ALKALIES vide ample power for high-speed starting and to maintain proper working speeds.

The motor has two speeds, selected by push-buttons on the motor-control panel. By use of the variable-speed adjustment, the low motor speed permits infinite selection between 200 and 500 revolutions per minute.

The high motor speed is infinitely adjustable between 400 and 1000 revolutions per minute. Higher speed range is available if desired. The motor is enclosed in a ventilated compartment. The motor-starter, providing protection from overheating of motor winding, is built-in. Air is employed to move the tailstock

spindle. One spindle-operating lever, conveniently located for right-hand control, is moved toward the work, and the spindle travels forward. Further movement, in the same direction, locks the spindle firmly. Movement of the lever away from the work unclamps the spindle and causes it to withdraw.

Maximum travel of the spindle is 12 inches and it can be set to any length within this range. Speed of positioning spindle is adjusted by means of a control valve. Use of tapered headstock spindle



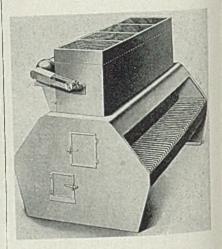
with a corresponding taper in the face plate offers a firm, true-center mounting. The two members are keyed and are held in place by a spanner nut. This provides quick removal of the face plate when desired, yet the members remain rigidly locked together while work is being done. Headstock spindle is hollow (%-inch bore) with standard No. 3 Morse taper for fitting center, drills or other tools.

Ventilated Bench

Claude B. Schneible Co., 3953 Laurence avenue, Chicago, reports a new multi-wash ventilated work bench for removing dust during bench operations such as grinding, filing, clipping, buffing, cleaning and polishing of iron, steel, aluminum, magnesium etc. Operators are thoroughly protected against dust and fumes created by the operations.

The bench, offered in single and double-side models, is made in any one of four arrangements. One of the double type, which accommodates workers on either side, is shown in the illustration. The two working surfaces of this bench are 10 feet long by 30 inches wide.

Space under the grates is closed by a dust hopper, which slopes to a longitu-



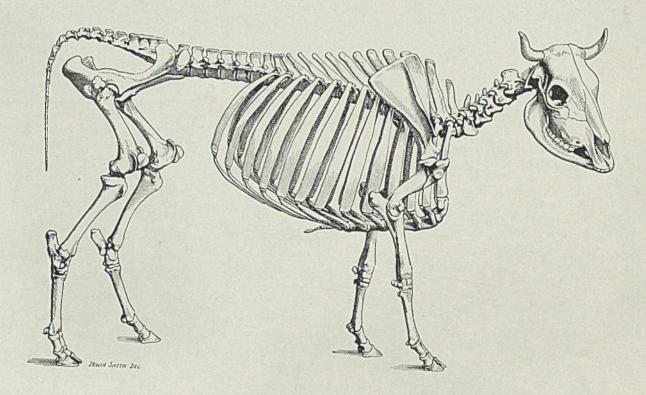
dinal center tank. Air is drawn from the room and over the work by motordriven fans, located in the top of the air-washing section.

Dust particles from the operation are impelled against a set wall in the back of the bench or the wet panel below the grate and washed downward into the tank below. They also are picked up by the indrawn air and carried downward through the grates into the dust chamber, where they are impinged on the wet surfaces.

Removal of the dust is accomplished by washing the air in multi-wash collector units located within the bench. Cleansed air is discharged back into the workroom through a safety filter. Solids are flushed from the collectors and discharged into a settling tank. Water, of

write <u>now</u> for the Buda "Chore Boy" bulletin:

THE SKELETON OF A GREAT IDEA



Only 47% of a steer is edible meat. The rest is bones, gristle and other inedible materials.

In the past, meat has been brought to market in carcass form. Countless tons of inedible bones and surplus fat have been transported countless miles...by railroad, ships and trucks. An enormous waste of energy and shipping space!

Today, to save precious shipping space, meat is being shipped to our armed forces abroad de-boned and de-fatted. The skeletons of the steers are being left home.

The U-boats made this change necessary. Modern, high-efficiency refrigeration made it possible.

Steaks and other de-boned cuts of meat are now pressed into compact blocks and refrigerated at low temperatures. Dependable refrigeration equipment has been provided by General Electric for this purpose.

To meet unusual war needs, enormous strides have been made in the development of General Electric industrial refrigeration and air conditioning.

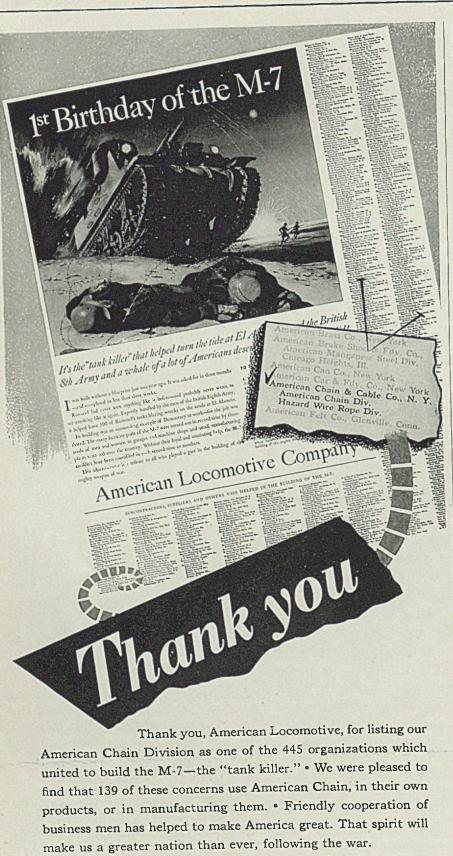
Equipment is more efficient, more compact, more flexible. When the war ends, these improvements will be applied to peacetime uses and made available to all.

T BUY WAR BONDS

General Electric Company, Air Conditioning and Commercial Refrigeration Divisions, Section 438, Bloomfield, New Jersey.

Air Conditioning by **GENERAL** BELECTRIC

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INDUSTRIAL EQUIPMENT

or other liquid used as the cleaning medium is circulated by a vertical centrifugal pump, and may be used over and over again.

For magnesium operations, oil-preferably having a flash point of 490 degrees, a fire point of 500 degrees, and Saybolt viscosity of 6 seconds at 100 degrees Fahr.-may be used.

Centering Tool

Whitcomb Mfg. Co., 476 Eighth street, Troy, N. Y., recently placed on the market a new tool for centering round bars preliminary to machining on centers. Called the Quick-center, this tool is said to meet the need for a device that would remove the centering operation from lathes and allow inexperienced operators to center bars quickly, easily and accurately.

The machine is operated by placing the work on its V-block and turning a



handwheel until the work is held securely between a rising V-block and a lowering button. When tight, the work is in line with the center line of the spindle and the hand lever advances the center drill to the work. The operator moves only the handwheel and the lever, it is said.

The unit is equipped with a ¼-horsepower motor and has speeds of 700, 1300 and 2300 revolutions per minute adjusted by a 3-step V-belt sheave. The machine will center round bars from ½ inch to 3 inches in diameter within 0.005-inch.

"Let me tell you about these Murex "Hot Rods' for mild steel"

Murex Type F and Type FHP are my choice for horizontal and flat fillet welding, deep groove work, cover beads and other downhand work. I find both electrodes alike in performance and quality of the weld metalexcept that the spiral winding of asbestos yarn on Type F makes it possible to bend the rod without injuring the coating when I have to weld in hard-to-get-at places.

"I use Fillex mostly for horizontal fillets. The weld metal forms well up the vertical leg and it's easy to turn out fillets of equal leg dimensions at high speed and without undercutting.

"All of these rods will take plenty of heat and have good penetration. The welds are smooth, and, as you can see from the table below, have good physical properties. The slag is very easy to remove.

"I find the new M & T Murex Electrode Chart a big help. It tells you when to use each Murex electrode, gives its physical properties and illustrates six ways of improving welding practice. You can get a copy by writing Metal & Thermit or asking your distributor."

					- Carlor		TENSILE ST	RENGTH	DEPOSIT	Floods 1
	1		FICATION	Current	POLAR	Fillet Welds	As .	Stress Relieved (p.s.i.)	Welded %	Relievee 96
ELI	AUREA A	NS- STM Color O Conting	Color On Tip	A. C.	Welds		62,000 to	to		30 to 36
T		6020 Brown and -6030		or D.C.	Reverse	Straight	62,000	60,000	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 30 to 36
TI		E-6020 and E-6030		A. C. or D. C.	Revers	+	69,000	00 60,00 to	00 25 to	30 30 to 33
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				-	and the					

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Specialists in welding for nearly 40 years. Manufacturers of Murex Electrodes for arc welding and of Thermit for repair and fabrication of heavy parts.



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The Stainless Equipment Your Customers Need Will be Lowered in Cost by the Use of IngAclad Stainless-Clad Steel

> When Peace comes, this Borg-Warner Product, proved by more than 10 years in actual service, will again be ready to serve you and your customers, as it is today serving so many wartime needs.

Sharply Reduces Material Cost Yet Gives Perfect Stainless Protection on the Side that is Used!

20% Statility & OS So the state of th The contact side of IngAclad is fine quality genuine stainless. The cost is naturally much lower because the stainless cladding of each sheet or plate of IngAclad is bonded to a backing of mild steel approximately 4 times the gauge of the stainless metal. Any given gauge of IngAclad, therefore, reduces by 80% the requirement of vital alloys while giving the finest noncorroding service.

IngAclad is easily fabricated by the same equipment used for mild steel. It meets a wide range of requirements in the Process Industries and is the only Stainless-Clad Steel with a record of more than 10 years in actual service. Our Engineers will be glad to discuss your fabricating problems and to cooperate with you. As pro-ducers of both Solid Stainless and Stainless-Clad Steel, we are in a position to recommend the most economical and practical material for any requirement without prejudice and without obligation.

Write for Free Manual on IngAclad Welding Procedure

INGERSOLL STEEL & DISC DIVISION BORG-WARNER CORPORATION 310 South Michigan Avenue • Chicago, Illinois Plants: Chicago, Ill., New Castle, Ind., Kalamazoo, Mich.



Report 16 on NE Steels

(Continued from Page 95)

ness of 277 brinell and 59 Izod impact value.

As was expected, the ductility of the rolled steel was higher. However, the castings can be judged as satisfactory in this respect.

Independently from the laboratory tests shown on the cast steel heat, additional tensile test specimens were machined and heat treated as follows: Rough turn 14-inch bars to 1 inch diameter, heat to 1550 degrees Fahr., quench in oil, draw at 1000 degrees Fahr., 11/2 hours for specimen No. 1, 4 hours for specimens Nos. 2 and 3, finish machine to standard tensile test bar.

The tempering time of 4 hours improved the ductility as shown on bars Nos. 2 and 3 in Table II with but negligible loss in hardness.

Machining of the cast gear blanks progressed well with good results reported by the shop as to cutting qualities, feeds and speeds. Out of 14 castings, we had no rejections due to quality of the material. From 0.010 to 0.020inch stock was sufficient for the finish grind operations after heat treatment.

Electric Furnace Treated

Heat treating was done in an electric furnace to the following specifications: Quench in oil from 1550 degrees Fahr., temper at 400 to 425 degrees Fahr. (4 hours). Hardness readings averaged 52 rockwell C about 1/16-inch from the tooth flank near the pitch line to 49 at the root diameter as compared to 53 and 50 rockwell respectively on gears made from forgings.

Average growth in outside diameter due to heat treatment on a 91/2-inch diameter gear was recorded as 0.005-inch on the limited number of castings on hand as against 0.008-inch on SAE-4140 and 0.010-inch on SAE-3140, value obtained from several hundred gears made from forging stock.

The supply of forgings has improved in the last few weeks to such an extent to take care of our production requirements, giving us an opportunity to test two hoists, equipped with the heat-treated cast steel gears under actual working conditions. These have now been in operation for about 10 weeks without failure or undue indication of wear.

An analysis of costs showed the castings to be about 10 per cent higher than forgings (disregarding pattern or die equipment) and the finished gears about 15 per cent above the finished product made from forgings. Of course these figures might vary considerably if a

We Also Produce INGERSOLL **Solid Stainless** Steel

larger number of heats and castings had been checked. However, with the proper care in controlling the chemical properties, and foundry molding and pouring practice, a good uniform casting should be obtainable.

Making such steel castings by the centrifugal process would undoubtedly produce a more homogeneous and refined product. The beneficial effect of improved metal flow lines and working of the fibers produced in rolling and forging will be lost but might be offset to some extent with scientific developments in the art of casting alloy steels.

We are confident that under similar loads, working conditions, similar size and shape of parts as described herein, cast alloy steel gears, heat treated to the proper hardness can be used successfully, particularly where production quantities do not warrant the expense of making forging dies.

Tank Components

(Continued from Page 102)

ferable for drilling than for milling operations for instance. In trying to arrive at the best all around steel specifically for end connections, it is felt that a structure which is basically lamellar pearlite with a minimum amount of spheroidizing is desirable.

It must be kept in mind that the hardness of the part is no direct criterion of the structure. On the other hand, if the structure is correct, the hardness will range between 179 and 207 brinell. All hardness readings should be taken through a cross-section of the part to avoid such errors as might result from decarburization or incomplete transformation at the core.

Procedures: In considering annealing procedures to arrive at a part with the hardness range of 179 to 207 brinell, which is largely lamellar pearlite with a minimum amount of spheroidizing, it was concluded that no single method would work for all types of equipment. Accompanying curves illustrate some cycles that have proved satisfactory.

Such curves vary greatly with the loading of the furnace, rate of firing, mass of the furnace, etc. In this connection, it is suggested that considerable care be taken not to overload a furnace to the extent that a non-uniform heat might be obtained within a given load.

The curves shown are plotted for WD-1345 steel. While it is felt that the transformations are more easily obtainable on WD-9445 steel than on WD-1345 steel, it is suggested that the same practice be followed for both so as to eliminate necessity for segregating forgings and the confusion that might result.

Hardening and Quenching End Con-



For Increased Production and Efficiency

Another forward step in providing faster, safer, and better movement of material has been made by Baker Trucks. This new Low-Lift model, designated as Type E-3, is of 6000 lb. capacity. The improvements consist of hydraulic lift, increased battery capacity permitting longer continuous operation, chamfered front top corner of battery compartment improving driver's visibility, operator's guard integral with frame for greater strength and safety, and other features which provide increased efficiency and easier maintenance ... The new improved design is also available in 4000 lb. capacity (Type E-2). Write for complete information.

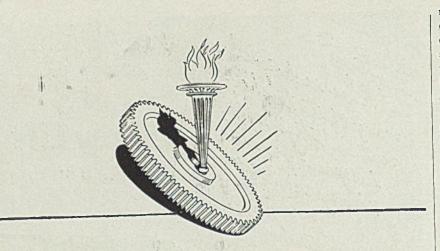
NEW Baker Low-Lift Truck has these advantages:

- 1 Hydraulic lift system proved by expe-rience in other Baker Trucks, provid-ing positive control of hoisting and lowering.
- 2 Larger battery box (32" x 39½") per-mitting enough additional battery ca-pacity so that trucks can be operated continuously for longer shifts.
- 3 Streamlined design of battery compart-ment providing greater visibility for operator.
- 4 Sliding type battery cover equipped with handles for faster servicing.
- Operator's guard built integral with frame for greater strength and safety and improved appearance. 5
- 6 Handy compartment for carrying tow-ing chain, pinch bar, or other tools.
- 7 Controls in a conveniently accessible panel providing easy maintenance.
- Alloy-steel trailing axle firmly anchor-ed to frame, wheels steering on anti-friction bearings. Box-section frame to withstand strains and minimize 8 maintenance.
- 9 Singlehexnut for adjusting travel brake located where it can be easily reached.
- Standard Baker-built travel motor, and 10 exclusive Baker Duplex-Compensat-ing Suspension for smoother running and longer life.

BAKER INDUSTRIAL TRUCK DIVISION of the Baker-Raulang Company 2167 WEST 25th STREET CLEVELAND, OHIO

In Canada: Railway and Power Engineering Corporation, Ltd.





BUSINESS MUST BE FREE-FOR FREE PEOPLE

★ We in this country have enjoyed the "Four Freedoms" for so long that perhaps we forget the existence of these Freedoms —and their maintenance through the years—has been largely the economic result of a Free Enterprise System.

When business is free to plan ahead, to dare, and to risk with faith in the future—with faith in the possibility of a reasonable profit, all the people benefit! When the imagination and inventive genius of industry can forge ahead with new production methods, develop new products, and invade new markets—then mass employment and the Four Freedoms are assured.

Free Enterprise, spurred on by the Profit Motive, and operating under our traditional American Way of Life, has constantly raised the living standards of millions, created new jobs, kept wages and salaries rising, and cut the cost to the consumer of goods produced.

No dictator ever arose in a healthy, prosperous civilian economy. None ever will. Only industrial stagnation breeds those unhealthy forces of discontent that alone lead men to the destruction of their own Four Freedoms.

Industrial progress promotes Freedom, when industry in turn is free of hampering government regimentation. Government must *encourage* industrial progress, not handicap its development. Repression is foreign to the conception of free people. And, because appreciation comes only from knowledge and understanding, we in Industry must explain these benefits of Free Enterprise to those who may not understand them today.



Compressors - Air Hoists - Air Cylinders

nectors: Considerable variation in hardening practices results from types of equipment, loading practices, firing rates and the like. Also hardening practice varies for different steels. However, the following general recommendations will serve as a guide.

Hardness of a forging as quenched and before draw should be a minimum of 477 brinell—the so-called 80 per cent martensitic hardness. This hardness should exist at the center of any cross-section and therefore the test must be made in a cutaway section in determining proper practice. If this minimum hardness has not been obtained, empirical work must be done to determine the necessary change in methods.

Salient Points on Quenching

Quenching oil should be maintained at a uniform temperature. This temperature should be selected by the heat treater for whatever oil is in use. The viscosity curve for the oil should be obtained from the supplier and the temperature to be used, in order to obtain the highest cooling rate, should be within the range of the two sharp changes in curvature of the curve. In general, an oil ranging from 80 to 100 saybolt seconds viscosity at 100 degrees Fahr. should prove satisfactory.

It should be noted that all hardness checks on end connections must be taken beneath any scale or decarburized area that may result from processing.

The following procedure has been found satisfactory for hardening WD-1345 end connections:

-Heat to 1550 degrees Fahr. and hold at heat for 30 to 45 minutes.

-Quench in oil immediately at the oil temperature giving maximum cooling rate.

-Draw at 950 degrees Fahr. for 1

It must be appreciated that these treatments would have to be modified depending upon whether salt bath, open hearth, muffled box type or other types of furnaces are used. General procedure should be as follows:

Harden to a minimum of 477 brinell at the core and then draw to the specified range of 331 to 375, varying the time and temperature as required to obtain an even hardness throughout a section of the machined forging.

Machining Procedures: Generally when machining WD-1345 or comparable steel, it is necessary to decrease the revolutions per minute and accordingly the surface feet per minute. However, the feed can be increased to compensate for slower surface speed so as to obtain approximately the same machined production.

FORVICTORY

Failure to consistently sharpen machin-

ing tools uniformly and frequently can cause trouble. Cases of drills jamming in holes and breaking off in forgings were believed caused by leading edges of the drill being worn down to a taper due to infrequent sharpening. For those making their own tools, it is suggested that a less acute angle on the entering point of drill improves drilling results. It would be well to carry on some experimental work of this type to alleviate any difficulties.

Revision of Steel Analyses: The question of decreasing the carbon content is largely one of ability to meet the physical requirements of the Ordnance Department with lower carbon steel. In any event, a change in the carbon content alone would not alter materially the necessity for annealing all forgings prior to machining.

General Conclusions: All WD-9445 or WD-1345 steel end connectors, end plates or wedges should be annealed by a suitable treatment to obtain a metal in the hardness range of 179 to 207 brinell with a lamellar pearlitic structure and with a minimum amount of spheroidization.

Forgings should be coded by the forging companies with some marking to indicate the type of steel used, so that they can be properly segregated for variation in heat-treating practice.

Allis-Chalmers Publishes 1942 Annual Review

Allis-Chalmers Mfg. Co., Milwaukee, reports once again it has issued its annual review of Allis-Chalmers engineering progress—the 1942 edition.

Smaller, but as complete as last year's, the annual contains some 212 drawings and photographs in addition to a much condensed text. The publication was published with the approval of the Army, Navy, Army Air Forces and the Maritime Commission.

Company Museums, How To Make and Manage

Company Museums, by Laurence Vail Coleman; cloth, 173 pages, 6 x 9 inches; published by the American Association of Museums, Washington, for \$2.50.

The author's purpose is to show the nature and usefulness of company museums and to aid those who have such museums to manage. Purpose of most of these collections is for business reference and public relations. An appendix contains descriptions of 80 such museums in the United States and three in Canada. The volume is of great interest to companies and officers having such collections.

Tough and a file commandos, given those jobs that require "the best!"---



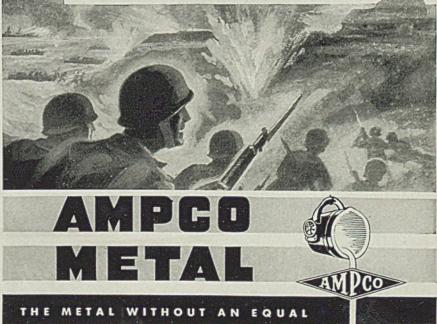
For those assignments where service conditions are known to be unusually severe, or where they carry the unknown "Xvalue" of stress that cannot be exactly figured, British Commandos and American Rangers are chosen in warfare. For those same assignments in war equipment, Ampco Metal is the usual choice of design or operating engineers.

This special bronze alloy, like those

special shock troops, has established a splendid reputation for delivering more than is expected of it. For a combination of high strength, exceptional life through resistance to wear, high fatigue strength, and general all-around versatile performance, Ampco Metal is without equal in the bronze alloy field. It plays a part in the construction of most aircraft, heavy ordnance, heavy machinery and machine tools. . . . Put Ampco Metal to service in your equipment where parts are failing, and gain the satisfaction of solving a difficult metal problem.

Ask for "File 41" — Engineering Data Sheets that give case histories and technical data.... It's free.

AMPCO METAL, INC., Milwaukee 4, Wis.





Brushing Wheels

(Continued from Page 110)

the application of a disk center section brushing wheel, 6 inches in diameter and %-inch thick, with a ½-inch arbor hole. The 0.029-inch wire in this brush is twisted into tufts. The brush is run at 4000 to 6000 revolutions per minute on an electric or air tool.

Because of the bulkheading, shipbuilders are confronted by many welded corners that are difficult to reach by ordinary weld cleaning methods. For this purpose a heavy-duty end brush is being used with singular success. The heavy wire in this brush is ostensibly an extension of the shaft. Run on a portable air or electric tool at 4200 revolutions per minute, and held at an angle of 45 degrees to the work, the wire ends bite hard and rapidly into the weld seale.

To remove slag from flat surface welds, the Osborn technical men prescribed a double-row cup brush, 6 inches in diameter with a %-inch arbor hole. The brush contains 0.035-inch special analysis wire.

Stress Concentration Points Eliminated

Although the removal of burrs is highly essential in every metal working plant, it is most important in the airplane industry. Removal of burrs is required for practically everything that goes into an airplane, whose parts are either stamped, sawed, routed or machined. For practically every one of these operations a power brush can be specified.

Brushing wheels are being applied to ailerons, gun turrets, landing gears, panel assemblies, instruments, plumbing and electrical equipment, propeller, wing tips and self-sealing gasoline tanks. They are used to roughen the surface of each laminated sheet of rubber going into the tanks, in order to increase the cohesion.

By rounding corners, blending surfaces and removing burrs and tool marks on highly stressed parts, brushing wheels eliminate stress concentration points where dangerous fractures may originate and possibly lead a plane to disaster. On a crankshaft alone there may be as many as 158 possible locations for points of stress concentration.

In addition to increasing the resistance of highly stressed parts to fracture, brushing wheels are helping airplane engine builders achieve closer tolerance and construct airplanes with greater operating efficiency. Certain brushing wheels enhance the workability of precisely machined parts, by improving their friction characteristic even to the point of preparing surfaces to hold lubrication.

One of the most meticulous jobs in