Billions of small steel cartridge cases, and each must pass 334 kinds of inspection. Page 126

STEEL

The Magazine of Metalworking and Metalproducing

SEPTEMBER 20, 1943

Volume 113 — *Number 12*

Published by The Penton Publishing Co., Penton Bldg., Cleveland 13, Ohio. E. L. Shaner, President and Treasurer; G. O. Hays, Vice President; F. G. Steinebach, Secretary.

Member, Audit Bureau of Circulations; Associated Business Papers, Inc., and National Publishers' Association.

Published every Monday. Subscription in the United States and possessions, Canada, Mexico, Cuba, Central and South America, one year $6; two years $10; all other countries, one year $12. Single copies (current issues) 25c.

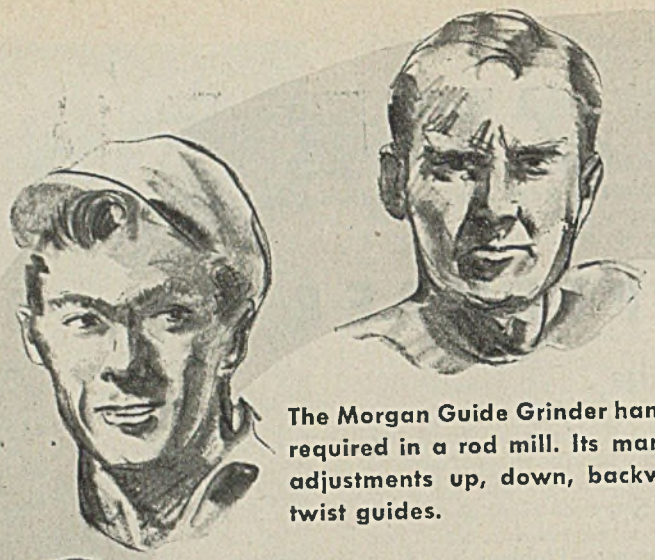
Entered as second class matter at the postoffice at Cleveland, under the Act of March 3, 1879.

NEWS

TECHNICAL

FEATURES

MARKETS



We "save a mile a minute" with the Morgan Guide Grinder. For it takes about a mile of rod to "work in" a set of guides unless they're ground properly. And a mile of grooved section is a high price to pay — these days.

The Morgan Guide Grinder handles guides of all types and sizes required in a rod mill. Its manual and automatic controls give adjustments up, down, backward, forward — for straight or twist guides.

And the machine is compact and self-contained — you can set it down anywhere and it's ready for work.

It's a good investment.

MORGAN GUIDE GRINDER

MORGAN CONSTRUCTION COMPANY, WORCESTER, MASS.

STEEL
September 20, 1943

Regimentation Dulls Initiative

Whenever an agency of the federal government undertakes to draft regulations for controlling the activities of private enterprises or individuals, it runs headlong into the fact that the two principals involved must of necessity view the relationship from diametrically opposed angles.

The supervisory or regulatory agency of the government must be guided by rules which apply to average conditions or which can be complied with by a majority of the companies or individuals involved. It has to abide by rules which are sufficiently general in character to apply to large numbers of companies or persons. It hates to make exceptions to its general rules.

On the other hand, the companies or individuals subject to these regulations must consider them primarily from the viewpoint of self-interest. The more energetically a company or individual has strived to create a position of security through ability, initiative and ingenuity, the more difficult it is for that company or individual to adapt its or his activities to rules designed for the general run of companies or individuals.

In short, the more distinctive or the more specialized the activities of an enterprise, the more it is penalized by regulations of general character. In other words, regimentation penalizes initiative.

We believe this can be proved by numerous cases of regulation by government. Many years ago, when the Interstate Commerce Commission first laid down safety standards for railroads, the standards adopted, while much higher than those prevailing on most roads, were quite below the standards existing on the six or eight leading railroads. The net result, after several decades, has been to raise the average safety performance on all railroads by a gratifying margin. However, one wonders what would have happened if the initiative of the leaders had not been curbed and if others had gradually emulated their example.

Price control, wage and hour regulations, renegotiation, securities exchange regulations and all of the other forms of regimentation now practiced tend to pull down the leaders to the average of the herd. In some cases they lift the average of all, but in doing so they definitely curb the initiative of those who are above-average in ethics, standards, efficiency, etc.

Everybody knows that a certain amount of regimentation is unavoidable. Much of it is particularly necessary in wartime.

But inasmuch as regimentation definitely dulls initiative, isn't every bit of unnecessary regimentation a detriment to the nation's future?

WHY THE SCRAP DRIVE? The pending intensified drive for scrap is triply justified. If everything had progressed according to expectation, there would have been no need for a special effort.

But consider these unexpected developments: First, the late opening of the navigation season on the Great Lakes, plus other factors, has cut the tonnage of iron ore delivered to lower lake ports. Secondly, the coal strike impaired coke production and forced an inopportune increase in the consumption of scrap. Thirdly, unavoidable delays in the program of blast furnace expansion has set back the expected output of pig iron.

All three of these developments have acted to place a heavier burden upon scrap. The suppliers of scrap under the orthodox system of collection have done an exceedingly good job. But the total net result is not quite enough scrap to give the nation an adequate factor of safety for the coming winter months.

To make doubly sure we will not be caught short,

(OVER)

a drive has been scheduled for Oct. 1 to Nov. 15 to intensify the effort to collect scrap. The steel industry's own plan is to be given a thorough trial. The obvious procedure is for everybody to back this plan so effectively that the more drastic measures contemplated by government agencies will not be necessary. —p. 108

° ° °

JOBS FOR EX-SERVICEMEN: One hears conflicting reports regarding the rehabilitatio of men who are mustered out of military service because of disabilities suffered in battle or for other reasons.

Here and there throughout the nation newspapers have carried stories which give the impression that the honorably discharged servicemen are experiencing difficulty in finding jobs. At the same time there is abundant evidence that hundreds of these men are finding jobs in industry and are doing good work on the production front.

We do not know how to account for this apparently contradictory evidence unless it is that the organization for rehabilitation is working better in some districts than in others. Perhaps in some localities so many government agencies are mixing into the problem that the returning soldiers and sailors are overwhelmed by red tape.

Industrial employers will do well to look into this situation carefully. Delays in the placement of honorably discharged servicemen—regardless of the real reasons—usually reflect upon industry. Try to find out if anything is wrong locally. If there is bungling, strive to correct it. —p. 99

° ° °

ENGINEERS SWAP IDEAS: One of the important events of the approaching fall convention season is the Annual Engineering Conference of the Association of Iron and Steel Engineers to be held in Pittsburgh, Sept. 28-30. This meeting, like most others held in wartime, will afford an opportunity to interested technicians to exchange ideas pertaining to war production problems.

A. I. S. E. is the primary technical forum of the specialists who engineer the equipment for the iron and steel industry. This war has presented a tremendous challenge to these men. They have met it with courage, ability and ingenuity.

At the approaching conference these iron and steel engineers will compare notes on the "know how" they have employed in meeting this wartime challenge. The discussion should be enlightening and constructive to everybody who has a stake in the physical plant for making iron and steel. —p. 139

MANPOWER HEADACHE: Manpower continues to be the nation's No. 1 internal problem. Congressmen, returning from recess, are debating the political issue of drafting pre-Pearl Harbor fathers, but the overall problem is much more comprehensive than this. The pertinent point is how to allocate competent man-hours most effectively.

One school of thought advocates a longer trial of expedients. Members of this school hope that the drastic measures being taken to solve the West Coast manpower situation will be effective enough to prove that compulsory service legislation on a nation-wide scale is unnecessary. Bernard Baruch, adviser to Economic Stabilizer Byrnes, supports this view.

Others, discouraged by results to date, advocate a job allotment law as the only practical means of utilizing manpower effectively. Recently the President has thrown his influence toward this solution of the problem.

Until the present known waste in manpower is eliminated—particularly that on government payrolls—Baruch has the better argument. —p. 83

° ° °

AGAINST RENEGOTIATION: Those who listened to the debate on renegotiation of war contracts at hearings before the House Ways and Means Committee concluded that committee members are far from satisfied with the present law and with the manner in which it is being administered. Some of them would prefer a revenue law that drains off excessive profits to any conceivable form of renegotiation.

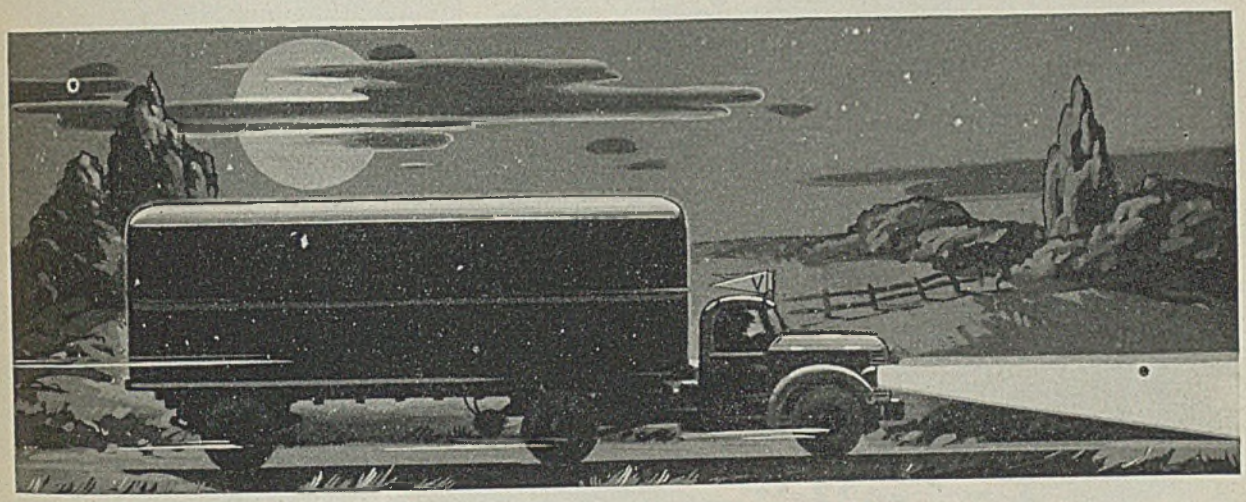
This more critical attitude toward renegotiation on the part of legislators can be attributed to two factors. First, congressmen checked with constituents at home during the recent recess and became more familiar with the objections voiced by war contractors. Secondly, the testimony of war contractors at hearings is beginning to win converts.

If the lawmakers can get far enough away from technicalities and details to view the subject of renegotiation in broad perspective, they will be forced to conclude that it is detrimental and that it renders no service which could not be performed better by sensible contract negotiation and sound tax laws. —p. 90

E. L. Shaner

EDITOR-IN-CHIEF

RYERSON STEEL RACES ACROSS COUNTRY



10 Tons of Sheets Delivered 700 Miles in 30 Hours 20 Minutes

It is 4:10 P.M.—a truck with ten tons of sheet steel pulls away from the Ryerson Chicago plant. In a Western war factory 700 miles away, important production for Army invasion equipment is waiting.

Flying the ODT "Emergency Flags" with special permission to travel at 60 miles an hour, the shipment arrives the next day at 11:30 P.M.—just 30 hours and 20 minutes after the order was dispatched.

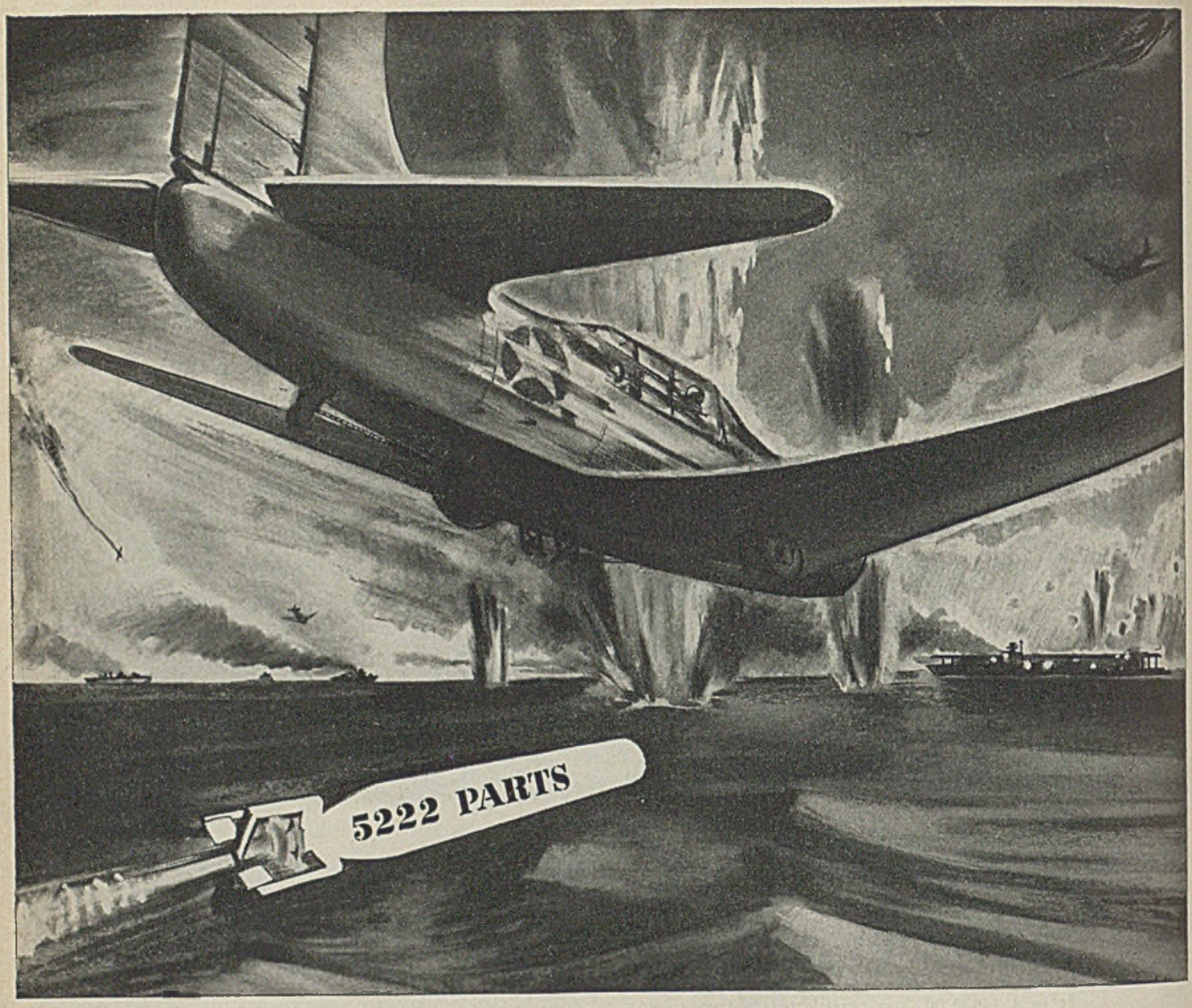
Two significant facts: The sheets so urgently needed were in Ryerson stock for immediate shipment. And Ryerson facilities and service measured up to the emergency.

Unusual? No! This order is only one of many Ryerson emergency shipments that are preventing production shut-downs in these critical times. Every day, Ryerson skill and experience are expediting deliveries of vital steel.

Next time you need steel in a hurry, whether it is sheets, plates, bars or beams—we urge you to call the nearest of the ten Ryerson Steel-Service plants. Whatever you require, you'll get prompt, effective cooperation.

Joseph T. Ryerson & Son, Inc., Steel-Service plants at: Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.

RYERSON STEEL-SERVICE



5222 CHANCES TO MISS A KAGA

Talk about "living costs"? Think of the cost of killing Kaga carriers at historic Midway.

Fifteen torpedo bombers . . . against thirty fighter planes and the anti-aircraft fire of five ships . . . through lead and deadly water spouts . . . went in to strike that Kaga down!

One pilot lived. His plane, the fifteenth—before it fell—let loose the last white-nosed torpedo at the flank of death . . . the one that found its mark!

The cost . . . fifteen of fifteen planes and twenty-nine of thirty men. Such casualties have not occurred again—for faster, more maneuverable planes now do torpedo work—but that one gallant action may have saved America.

Fifteen tries, with sudden death the penalty for failing and succeeding both. How tragic if *one defective part among that last torpedo's 5222* had made the venture fail.

Our part is small, we know.

Yet here at R B & W, making millions of bolts and nuts each day to fasten parts our armed forces, our war industries use, we also know that *every part, even the smallest, counts.*

We say, "If our individual skills and the full use of our special manufacturing processes can prevent a single Allied fighter from dying in vain . . . if the extra care we are giving our work can bring victory a day or hour closer . . . then we are repaid many times over." Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, N. Y.

* * * *

If you, too, are making "bits and parts" for war equipment which your workers never see in action, this story of gallantry at Midway is available as a *poster* for your plant, free of advertising—and, of course, free of charge.

RB&W *Making strong the things that make America strong*

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY

Problem No. 1 On Home Front

Failure of Washington agencies to co-operate assailed by Baruch in urging drastic revisions to close growing gaps in labor supply. . . West Coast experiment being watched closely

BERNARD M. BARUCH
. . . Washington agencies fail to work as a team

SHORTAGES in manpower are edging nearer the crisis stage—on a national scale—week by week. Figuratively speaking there is only one apple left in the barrel and war industry, the armed services and agriculture are grasping for it.

The problem is scheduled to receive plenty of attention from Congress. Bungling by the War Manpower Commission and its associated agencies will be bitterly criticized. The Austin-Wadsworth National War Service Act or some similar labor draft bill will come up for serious consideration. Retention of more than 3,000,000 civilian employes in federal government service probably will be investigated.

Manpower supply until comparatively recently has been a problem only in localities where war contracts were concentrated and nationally was not a matter of great concern. At the beginning of the rearmament program, 9,000,000 were unemployed; few women were working in metalworking factories; youthpower had not been drawn upon to any great extent.

Today the list of unemployed has dwindled to about a million; some 5,000,000 women are estimated to have gone into industry; boys and girls of high school age have been contributing much to the war effort during vacation months, but now are returning to school.

The manpower problem moves into No. 1 position on the war front at home—ahead of new plant construction, which was licked some months ago, and materials supply, which now is under fair control.

Not only is the national labor supply inadequate for the task at hand, but the problem is made more critical by acute labor shortages in munitions production centers—shortages which admittedly are holding production below schedules.

Approximately 4,000,000 more persons must be added to the armed services and war industries by next July, according to estimates by manpower officials and the Army and Navy. These accretions are expected to be achieved as follows: Transfer from nonmunitions industries, 2,600,000; transfers from farms, 100,000; decrease in unemployment, 200,000; net increase in total labor force, 1,100,000.

Construction workers will supply a considerable number to be transferred to munitions industries. Other possibilities are the 4,000,000 women under 45 and without children under 16, who are not now employed. Still others will come from oldsters who return from retirement or who postpone plans for retiring and from youths who reach working age.

However, viewed from any angle the manpower supply is short and will continue that way until the end of the war. Congressional, administration and industrial leaders are generally agreed that drastic alterations in the whole system of handling what manpower is available are necessary.

Baruch Makes Report

This is substantiated in a report to James F. Byrnes, War Mobilization director, by Bernard M. Baruch, his chief adviser. Mr. Baruch, it is understood, believes that proper handling of manpower under the present system is impossible because of the failure of agencies in Washington to work as a team.

Mr. Baruch has recommended that steps be taken at once to decentralize administration of civilian manpower and to place it as much as possible on a community basis. He also advocates that the production program be resurveyed in light of the labor supply, that draft deferments be continued in critical industries and that where necessary men now in service be furloughed back to their civilian jobs. Above all, he intimates that action be substituted for the studies, questionnaires, investigations and conflicting statements by federal manpower officials, which have confused everyone.

Also emphasized was the necessity for increasing the efficiency of war workers now on the job. Wage incentive plans were suggested as one means for accomplishing this end.

Right now the labor shortages in the shipyards and aircraft plants on the West Coast are receiving most attention and institution of a controlled hiring plan there (STEEL, Sept. 15, p. 66) is being closely watched. If successful, the plan will be extended to other critical labor areas.

Situation in other districts, as surveyed by STEEL's editors:

DETROIT: Common labor is still the critical bottleneck in this area. Latest studies by the WMC indicate openings for 18,000 working people, of which women can handle 5000 jobs. In the second highest priority (2A) of unfilled openings, those where help is needed to avoid interruptions to production, there were in August 5100 unfilled openings, of which 4500 were for male help. In the last ten days this figure has nearly doubled, reflecting important increases in demand, from plants apparently undertaking new work. Approximately 50 per cent of these openings could be filled by unskilled labor.

Foundries, forge shops and steel mills are the three classifications experiencing the most difficulty in obtaining help.

Total industrial employment in the greater Detroit area is given by the WMC as follows:

July 1	756,800
Aug. 1	765,300
Sept. 1	773,500

Percentage of women out of this total is steadily trending higher, the figure for July 1 being 26.5 per cent and the estimate for Sept. 1 being 29 per cent. While total employment is mounting,

and the expected peak, according to employers' estimates, is 838,000 by year-end, there are actually fewer men now working than there were six months ago, principally because of inroads of Selective Service. In July, for example, there were 1800 fewer men at work than in June.

BUFFALO: Manpower reservoir has practically dried up at a time when 37,000 to 40,000 additional workers are needed, and local WMC committee is planning for greater utilization of present laborers and an increased transfer of persons engaged in nonessential industries.

With the possibility of hiring male help "virtually nil," WMC Director Joseph D. Canty says efforts are being made to attract additional women into industry. Even the reserve of womanpower is low. Mr. Canty reports between 47 to 50 per cent of present industrial workers in the Buffalo-Niagara area are women.

Because heavy industries like it, the Controlled Referral Plan for hiring male labor through the USES has become established for the duration, and is being copied in other areas, notably the West Coast.

Special emphasis is being placed on fuller utilization of available help. For example, the Buffalo Arms Co., refused a place on the labor priorities list, is meeting a WPB request for a 25 per cent increase in gun output with no additional help. Some workers are operating two or three machines at once.

CLEVELAND: Despite order cut-backs and cancellations in recent months, the problem of supplying war plants in the Fifth WMC region with the necessary manpower is becoming so acute that tighter controls over hiring of employes appears inescapable.

The labor shortage in this region, which covers Ohio, Michigan and Kentucky, is felt most acutely in the ferrous and nonferrous foundries, forging shops, and in certain new aluminum and magnesium plants.

Sharp increase in the employment of women is shown in the following table. While the total employment in the three states rose about one-third in the period since May, 1942, through July this year, the number of women employed in the same plants rose nearly 150 per cent.

Employment Trend

	Total	Women	Per Cent Women
May, 1942	1,833,625	268,910	14.7
May, 1943	2,444,290	609,172	25.0
July, 1943	2,520,590	669,860	26.6
Nov., 1943 est.	2,723,127	810,833	29.8

Survey of 1188 manufacturers in Ohio shows total employment numbered 1,210,000 on July 1, of which 28 per cent were women. These manufacturers estimate they will need 91,000 additional employes by Jan. 1.

Number of negroes employed is increasing steadily, although this source of labor for war plants is said to be largely untapped. They are being employed mostly in steel and nonferrous foundries, mines, steelworks and the aircraft industry. Employment of negroes in the larger industrial areas represents 6.5 per cent of the total employment, against 3 to 4 per cent formerly.

PITTSBURGH: Demand for labor, both skilled and unskilled, exceeds the supply which comes to the plant gates and asks for employment but does not exceed the supply as estimated by the United States Employment Service. This is due to two factors: USES records are cumbersome and not up to date; much potential labor as catalogued by USES is not available for employment because it consists in part of men and women who have left the district for jobs in other territories and in part of persons who have taken jobs in nondefense companies.

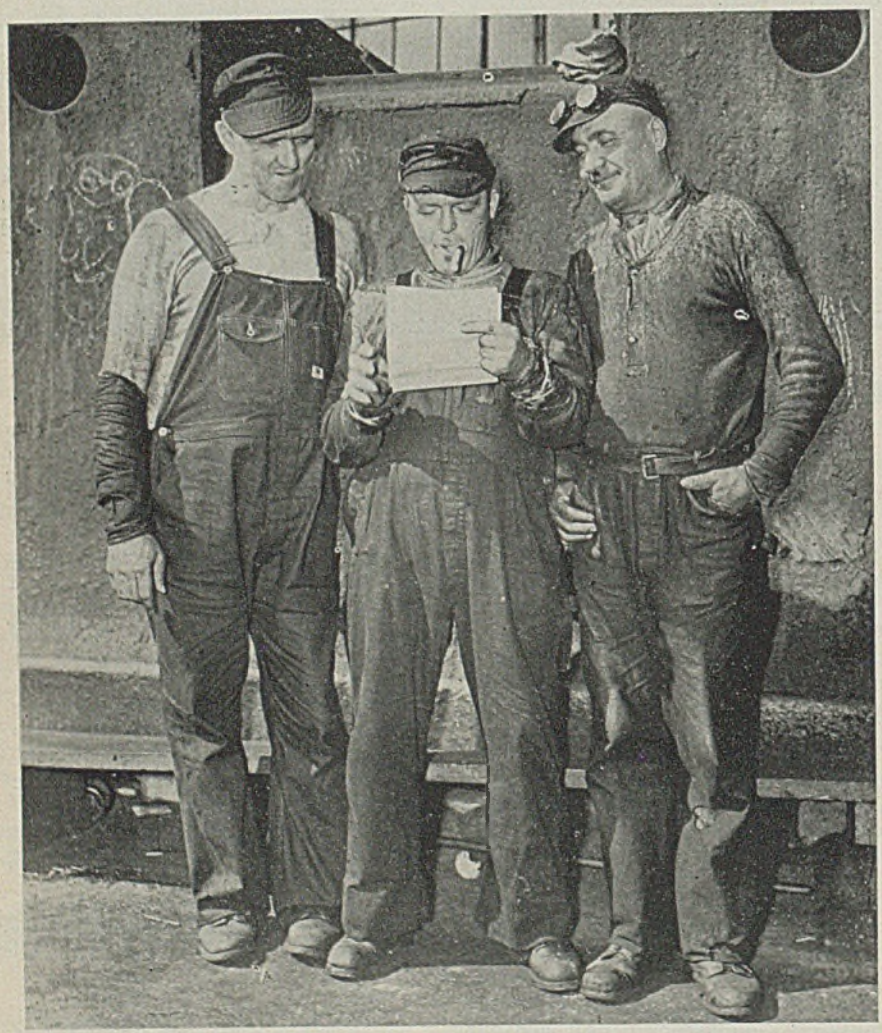
Actual number of workers applying for jobs runs from approximately 300 per week in one of the largest companies to practically none in many smaller plants. A large steel producer has immediate need for more than 1500 people and a substantial volume to man new facilities which recently have begun operations or are under construction.

In general, the steel industry here is hiring both men and women as they appear. Applicants run approximately 60 per cent men and 40 per cent women. Percentage of women hired now is slightly higher than that of men. Some 400 types of jobs in the steel industry have been opened to women, and one concern reports women now comprise 13 per cent of its labor contingent.

CHICAGO: No optimism can be expressed concerning the manpower situation in the iron, steel and metalworking industry in this area.

Representatives of steelmakers recently conferred with WMC and Selective Service officials at which time the mills cited past records in steel production, outlined labor losses and inability to obtain replacements, and made clear that future operations will decline in the face of continuing loss of manpower.

During the first eight months of 1943, steel plants are estimated to have lost about 26,000 employes. If this rate continues, loss for the year will be 38,000, or a turnover of 55 per cent. Bulk of the loss has been in common labor, which is unable to claim occupational deferment. Wherever possible, labor has been up-



Between shifts on the big 25,000-pound steam hammers on which they forge bomber engine crankshafts at Buick Motor Division, Flint, Mich., these forgemen figure out their income tax declarations—and they run into substantial figures

graded to fill vacancies, but mills have about reached the limit of their capacity to train new workers. And it is generally regarded that they have gone about as far as possible to utilize women.

WMC recently has received a promise from Selective Service that common labor will be considered for deferment on the basis of replaceability, rather than skill, and this, if carried out, offers some hope.

Dean William H. Spencer, regional director of WMC, Chicago, announces foundries in Illinois, Indiana and Wisconsin will need 13,000 new workers this month if they are to reach and maintain peak production of war materiel.

One steelmaker, which has just started a new battery of coke ovens, states that it has not been able to employ a full complement of operators and is obliged to work available men exceptionally long hours. Blowing in of a new blast furnace soon will bring with it a similar problem.

Aluminum Co. of America, which recently started its new sheet rolling mill in McCook, Ill., is experiencing considerable difficulty in obtaining a sufficient number of workers to expand operations as installation of equipment is completed. During the summer, it employed a large number of high school boys, but these were lost with the opening of school. In an effort to obtain sufficient workers, the company is attempting to engage 200 to 300 people for a four-hour part-time swing shift.

Under the plan, employed white collar workers, professional men, housewives and others will be taken. The company also will be able to use all farm workers who apply for full-time jobs after harvest.

Some other metalworking plants also are seeking temporary farm workers, but find the four-hour shift impractical because of the skilled nature of their operations. Generally, the labor shortage situation has not developed to the point where the four-hour shift is used widely, but it probably is the next step. This might be the forerunner of the "half-shift" plan, in which two workers team up to divide a full shift. So far it has gained no recognition here, as it has in the East, but this is a good possibility for the future.

NEW YORK: Severe shortage of skilled workers continues in this district, particulary in northern New Jersey. In Newark and adjacent communities, 50,000 additional workers will be re-

sales average about 25 per cent for essential civilian supply with the balance going into the direct war effort. For those warehouses handling specialty steels the percentage of sales for direct

ritory, but how it was used, and where to get tonnage in a hurry. This made it necessary for the distributor to carry a large inventory of small quantities of many seldom-used items, along with

...ice of Price Administration.

This action was taken in amendment 8 to revised price regulation No. 41 and will become effective at an unnamed date later in the month. It constitutes

...Newt increases granted to the steel

months ago organized a community manpower mobilization committee. One of the first measures taken was to induce manufacturers to voluntarily place their operating schedules on a 48-hour week, where it had not already been done. The committee now has more than 30 war job headquarters scattered throughout the Newark industrial area and is making a particular drive for women employes as they appear in most stable supply.

While New York city proper is not a scarce labor area, there nevertheless is a shortage of skilled workmen, which is reflected in the shipyards and machine shops and metal fabricating plants. There is still a scarcity of welders, sheet metal workers and electricians, in particular. Women are being employed extensively in the electrical equipment and light ordnance plants. At two of these plants, 80 per cent of the skilled workers are now women, and at two others, 50 per cent.

CINCINNATI: A tapering in needs of machine tool manufacturers has provided a measure of relief from the labor shortage in this area. The shortage, however, is still present.

The foundry situation is spotty. Some foundries, both ferrous and nonferrous, need more help badly, and at the same time other gray iron foundries show slackening tendencies, even to cutting of payrolls.

Steel mills adopted a 48-hour week as one means of maintaining production, but still face the task of holding adequate forces of common labor.

BIRMINGHAM, ALA.: This steel and coal district is moderately short on both common and skilled workers, a situation which has been aggravated by recruiting by shipbuilding and other high-pay war industries in Mobile, Pascagoula, Miss., and Tampa, Fla., and other centers.

Several thousand more coal miners are needed.

■ UNION TAXES SOLDIERS FOR VOLUNTEER WORK

TRENTON, N. J.—Soldiers who volunteered to work in south Jersey canneries to help save the tomato crop had to pay 25 cents a week union dues to the Meat and Cannery Workers Union-AFL.

° ° °

■ FEDERAL SPENDING TO TOTAL $188 BILLION IN 1943

WASHINGTON—Commerce Department estimates this year's national expenditures at an unprecedented rate of $188,000,000,000. By year's end the annual rate will soar to $200,000,000,000.

° ° °

■ COAL SUPPLIES LOW AT YOUNGSTOWN

YOUNGSTOWN, O.—Steel producers report coal supplies are sufficient only for a few days to a week. Normally producers carry from four to five weeks' supply.

° ° °

■ LIVING COSTS DROP 0.5 PER CENT IN AUGUST

WASHINGTON—Living costs declined 0.5 per cent during August, according to Secretary of Labor Perkins.

° ° °

■ GOVERNMENT TO REDISTRIBUTE USED MACHINERY

WASHINGTON—A billion dollars worth of used government-owned machinery and equipment, now idle, will be redistributed for productive use by WPB. Inventories of 55,000 types are being filed with regional WPB offices for disposal to qualified users.

° ° °

■ WYMAN HEADS WPB IRON ORE SECTION

WASHINGTON—C. L. Wyman, Butler Bros., Cleveland, has been appointed chief of the War Production Board's iron ore section. F. B. Hyder, Los Angeles, will be assistant chief.

° ° °

■ SENATOR GEORGE PREDICTS $5 BILLION NEW TAXES

WASHINGTON—New taxes enacted this year will amount to between $3 and $5 billion, despite the Treasury's demand for $12 billion, according to Sen. Walter F. George, of the Senate Finance Committee.

° ° °

■ SHORTAGE OF ACCOUNTANTS ANTICIPATED

WASHINGTON—Acute shortage of accountants to handle contract cutbacks and cancellation and a swelling volume of "V" loans is anticipated.

° ° °

■ STEEL EXPANSION TO BE COMPLETED BY APRIL

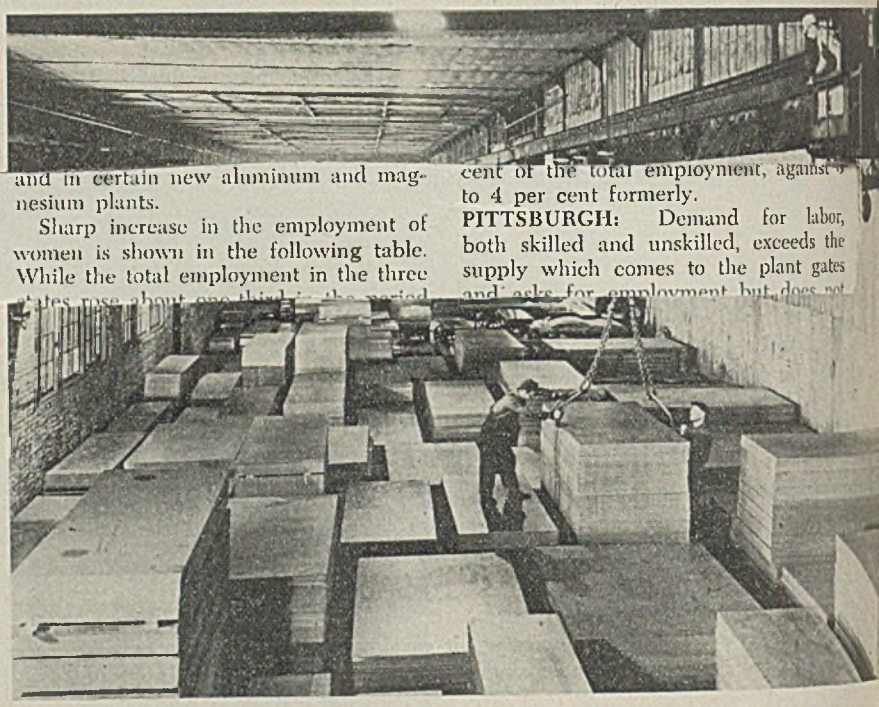
WASHINGTON—Steel expansion program will be completed by next March or April, if it is not placed behind the gasoline and rubber programs, according to WPB Steel Division officials.

Inventory Position Improves

Distributors' stocks gain in quantity and number of items carried with mill deliveries up and turnover rapid. . . Demand for prompt shipments heavy. . . Some products scarce with war needs absorbing bulk of tonnage

By J. C. SULLIVAN
Assistant Editor, STEEL

STEEL warehouse distributors' inventories have improved substantially during recent months. Stocks, both in quantity and number of items carried, have gained markedly with improved deliveries from the mills and more rapid turnover.



Heavy hot-rolled sheet section of a midwestern steel distributor's warehouse, showing wide variety of lengths and widths needed to meet substantially increased war demands. Distributors' stocks of all items are well above a year ago

Inventories Up in Second Quarter

Survey covering 95 per cent of the warehouse industry shows the group received less than 75 per cent of quotas from the mills last year. Inventories declined steadily throughout the first nine months of 1942 and then turned upward during the final quarter. In the first quarter this year distributors received substantial mill tonnages. A further rise in inventories of about 5 per cent occurred in second quarter, bringing inventory status for the group to 60 per cent above that recorded on June 30, 1942. Currently, sales and receipts are about balanced.

With few exceptions, notably plates and sheets, the monthly warehouse load directive on mill books directly reflects sales out of distributors' stocks. There is no guarantee that the mills will roll for delivery to the warehouses all the sizes requested on a particular product. Rolling of plates on continuous mills, for instance, serves to make sheets scarce. However, the mills are meeting delivery requests much better than a few months back, though normal mill relationships with distributors have been altered somewhat under CMP. Frequently warehouses must find new sources of supply, because the warehouse load directive is not made in accordance with normal distribution of warehouse tonnage among the mills.

A helpful factor in the present improved supply situation is that mills can make immediate shipment to warehouses of over-runs. Distributors also are permitted to replace steel they have sold up to 150 per cent of their base quotas. Warehousemen also are not limited in the purchase of idle or excess inventories.

When steel was extremely scarce during 1942, purchasers extended their search for needed items to specialty or casual outlets, to brokers, agents, and even scrap dealers. Instead of sending their inquiries only to those warehouses that had served them satisfactorily for years, buyers frantically scattered their requirements, and although stocks of established warehouses have been replenished, buying habits developed a year ago persist.

Some distributors report the 60-day inventory ruling for steel consumers under CMP has resulted in a moderate decline in purchasing. However, in a number of instances, consumers, with stocks already on a 60-day basis, have been forced to rely on distributors for prompt shipment of needed items when their mill supplier failed to meet promised deliveries.

Demand for prompt steel deliveries of warehouses is still heavy. Particularly heavy pressure is being felt in plates, cold-rolled strip, cold-drawn bars and hot-rolled sheets.

NE Steel Stocks Greater

Stocks of "National Emergency" steels carried by distributors have increased substantially since the first of the year. Supply of these steels currently is greater than demand. Declining machine tool production is said to be an important factor in the easier supply of these steels. However, the aircraft industry continues to absorb moderate quantities. In the case of one aircraft builder in the East, it is reported that seven NE steels are now serving the purpose of twice that many high-alloy steels formerly used.

Recent sweeping changes in order

M-21-b-2 will permit merchant trade steel product warehouses to reorder for stock replacement after Oct. 1 all material sold in accordance with CMP regulation No. 4, including deliveries to farmers. To assure that each warehouse receives consideration on mill schedules, the order will be supplemented by warehouse load directives for most product groups. Under the amended order there is no top limit to the amount of any merchant trade product which a warehouse can handle during a given period, other than the limitation that every order placed after Oct. 1 must be backed by a record of previous deliveries from stock equal to the tonnage ordered. Dealers may now replace all material sold since April 1 that has not been previously replaced.

It is estimated that steel distributors' sales average about 25 per cent for essential civilian supply with the balance going into the direct war effort. For those warehouses handling specialty steels the percentage of sales for direct war production is said to be over 90 per cent.

Shortage of Manpower Acute

Manpower problem in the steel warehouse industry remains acute and no improvement is in sight. One large distributor reports handling 50 per cent more tonnage than a year ago with about 50 per cent fewer employes.

Distributors say new zone prices are working out satisfactorily. Prices have been established for ten areas; lists for the remaining six areas will be put into effect shortly. Under the zone price setup it is believed both warehouse sellers and consumers will be able to determine maximum delivered prices more precisely and easily.

To facilitate handling orders under zone price regulations, steel distributors in some areas have published lists containing delivered prices on all items for all points within their zones.

Steel tonnage distributed through warehouses this year is expected to be substantially greater than in 1942 because of better mill deliveries. The warehouses dropped from first to third place as an outlet for finished steel last year. Ten per cent of total steel tonnage was distributed through warehouses in 1942, compared with 14.7 per cent the preceding year when the distributors held first place. Last year shipbuilding and construction industries topped the warehouses but indications are 1943 will see the distributors moving into second position as an outlet for steel.

Even in normal times, steel warehousemen had the complicated job of not only knowing every type of steel being used in the consuming industries in their territory, but how it was used, and where to get tonnage in a hurry. This made it necessary for the distributor to carry a large inventory of small quantities of many seldom-used items, along with the usual stock of standard products.

Today the distributors face the dual problem of giving even more specialized service to consumers and at the same time striving to cut distribution costs.

Among important questions being given serious consideration by steel distributors are:

What simplified and improved methods, learned during the war, can be passed on to peacetime manufacturers?

What permanent changes in steel analyses will result from wartime experience? What of the future of the "National Emergency" steels? Distributors believe these steels are here to stay.

Many more special services are being given to steel buyers by the warehouses today than formerly was thought feasible, and the trend in this direction is gaining momentum, particularly in the matter of metallurgical and engineering service.

Revise Steel Casting Prices

Locomotive list with some exceptions to be increased 21 per cent by OPA to spur production

MAXIMUM prices on all railroad locomotive steel castings, with the exception of main frames, superheater headers, gears and gear casings, have been increased 21 per cent above those listed in the "Comprehensive Report of the Steel Founders' Society of America for the Third Quarter of 1941," by the Office of Price Administration.

This action was taken in amendment 8 to revised price regulation No. 41 and will become effective at an unnamed date later in the month. It constitutes the first increases granted to the steel castings industry since November, 1941.

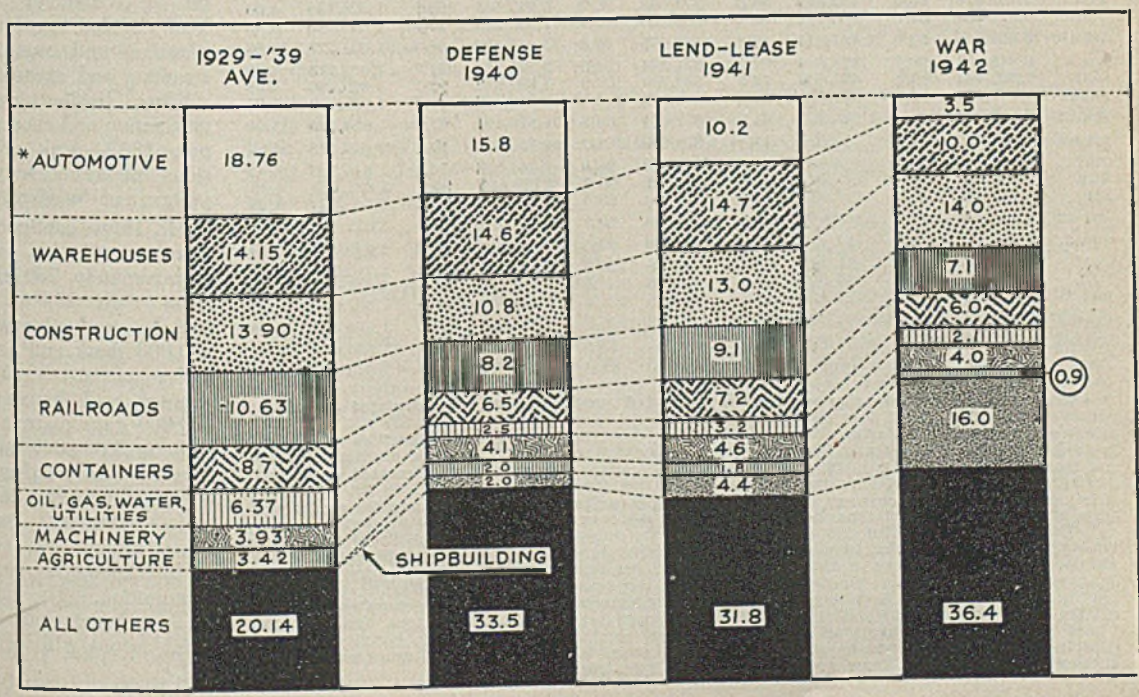
Increases in prices were made to spur expansion in production of locomotive castings to meet current record schedule of 4000 new locomotives in 1944 for military, lend-lease and domestic needs.

OPA Denies Increases

OPA denied increases sought for ceilings on railroad specialty castings, except for two limited changes. Upward adjustments will apply to 82 classifications of castings.

Increases in prices of railroad specialties amount to about 10 per cent in bolster prices and 11 per cent for rigid yokes. Certain extras may be added for side frames and bolsters.

The definition of "steel castings" is revised to eliminate overlapping with price regulations.



Steel warehouses dropped from first to third place as an outlet for finished steel in 1942. Distributors expect to move into second position this year

Dominion Doubles Steel Output

Wartime expansion boosts rated capacity to about 3,250,000 ingot tons annually. . . Supply short with year's requirements placed at 5,000,000 tons

TORONTO, ONT.

PRODUCTION of steel in Canada this year will double that of 1939, according to the Department of Munitions and Supply, but it warns steel still is in short supply and cannot be released for nonessential purposes.

With recent additions to mill capacity, Canada now has rated steel capacity of approximately 3,250,000 tons of ingots per year. By the end of 1943, Canadian mills will be producing ingots at a rate of more than 3,000,000 tons per year, compared with 1,500,000 tons in 1939.

Due to rapid expansion of production facilities, coupled with rigid restrictions on use of steel for nonessential purposes, Canada has been successful in avoiding a single serious interruption of munitions output because of steel shortage. Particularly impressive has been expansion in alloy steels for guns, armor plate and tools. Canada's output of alloy steels now is five times greater than in 1939.

Big plate mills brought into production at Hamilton and Sydney will help increase the 1943 plate output to nearly 300,000 tons above the 1939 output. Most of the output of these mills is going into production of ships.

For the year 1943 Canada's steel requirements are estimated at approximately 5,000,000 ingot tons, of which more than 3,000,000 tons will come from domestic mills. This represents a considerable improvement over the Canadian prewar steel position when the Dominion relied on the United States for one-half its supply. Now, despite the vast increase in consumption only about one-third comes from the United States.

In the expansion of the Canadian steel industry, two of the largest blast furnaces in the British Empire have been constructed, one by Algoma Steel Corp. Ltd., at Sault Ste. Marie, the other by the Steel Co. of Canada Ltd., Hamilton. Dominion Steel & Coal Corp. Ltd., Sydney, also completed a new blast furnace this year. Canada's pig iron production is at the rate of 2,500,000 tons a year, nearly four times as great as in 1939.

C. D. Howe, Minister of Munitions and Supply, reviewing Canada's industrial activity in the four years of war, recently stated that 1,100,000 workers now are turning out munitions at the rate of $55,000,000 a week. Since Sept. 9, 1939, the expenditures in the Dominion for war construction and production have amounted to $6,500,000,000. More than $800,000,000 has gone into new factories, land sites and machinery and from these and other plants have come munitions valued at almost $5,000,000,000. Mr. Howe stated 1943 was the year of "peak production" and said that in the year ended Sept. 1, expenditures on war construction and production totaled $3,094,000,000.

Referring to the more than $800,000,000 spent on new plants and equipment in the first four war years, Mr. Howe said: "The Dominion has undergone an industrial transformation which, under normal circumstances, could not have taken place in less than 25 years."

Program Divided Into Periods

Canada's large war expansion program dates from June, 1940, when this country was called upon to replace equipment Britain had been forced to abandon on the beaches of Dunkirk, Mr. Howe stated. From that time the war effort on the Canadian industrial front has been divided into four periods: 1940—planning and organization; 1941—construction and expansion of industrial facilities; 1942—bringing facilities into production and constantly increasing output; 1943—peak production and revisions made necessary by the changing pattern of warfare.

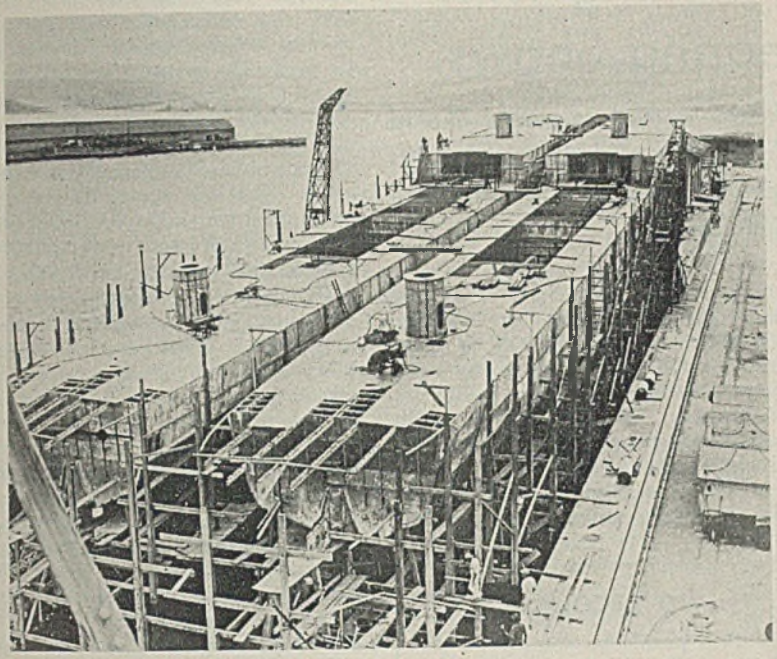
Mr. Howe continued: "By the end of this year Canada will have launched approximately 750 ships and delivered more than 10,000 aircraft. Military vehicles production will have passed the 600,000 mark and armored fighting vehicles output the 35,000 level. The country will have turned out nearly 100,000 guns, barrels and mountings, as well as 1,000,000 small arms. It will have manufactured more than 1,000,000 tons of explosives and war chemicals; some 60,000,000 complete rounds of heavy ammunition and well in excess of 3,000,000,000 rounds of small arms ammunition. The total dollar value of the instruments and communications material output will be nearing $300,000,000.

U. S. STEEL INGOT STATISTICS

	Estimated Production—All Companies								Calculated weekly production, all companies Net tons	Number of weeks in mo.
	—Open Hearth—		—Bessemer—		—Electric—		—Total—			
	Net tons	Per cent of capac.	Net tons	Per cent of capac.	Net tons	Per cent of capac.	Net tons	Per cent of capac.		
Based on reports by companies which in 1942 made 98.3% of the open hearth, 100% of the bessemer and 87.6% of the electric ingot and steel for castings production										
1943										
Jan.	6,576,589	97.8	478,058	85.9	369,395	95.4	7,424,042	96.8	1,675,856	4.43
Feb.	6,033,674	99.3	447,843	89.1	344,532	98.6	6,826,049	98.5	1,706,512	4.00
March	6,785,295	100.9	503,673	90.5	381,219	98.5	7,670,187	100.0	1,731,419	4.43
1st qtr	19,395,558	99.3	1,429,574	88.4	1,095,146	97.5	21,920,278	98.4	1,704,532	12.86
April	6,509,812	99.9	481,810	89.4	382,532	102.1	7,374,154	99.3	1,718,917	4.29
May	6,664,298	99.1	483,024	86.8	398,057	102.9	7,545,379	98.4	1,703,246	4.43
June	6,188,857	95.0	453,399	84.1	384,645	102.6	7,027,101	94.6	1,638,019	4.29
2nd qtr	19,362,967	98.0	1,418,433	86.7	1,165,234	102.5	21,946,634	97.4	1,686,905	13.01
1st hlf	38,758,525	98.7	2,848,007	87.6	2,260,380	100.0	43,866,912	97.9	1,695,667	25.87
July	6,516,387	96.2	466,288	90.6	393,342	94.0	7,376,017	95.7	1,668,782	4.42
Aug.	6,669,944	98.3	484,957	94.0	407,224	97.1	7,562,125	97.9	1,707,026	4.43
Based on reports by companies which in 1942 made 98.3% of the open hearth, 100% of the bessemer and 87.6% of the electric ingot and steel for castings production										
1942										
Jan.	6,322,215	95.3	490,874	86.0	299,017	94.2	7,112,106	94.5	1,605,442	4.43
Feb.	5,785,918	96.6	453,549	88.0	273,068	95.2	6,512,535	95.9	1,628,134	4.00
March	6,572,930	99.0	493,191	86.4	325,990	102.7	7,392,111	98.2	1,668,648	4.43
1st qtr	18,681,063	97.0	1,437,614	86.7	898,075	97.4	21,016,752	96.2	1,634,273	12.86
April	6,345,133	98.7	454,834	82.2	321,324	104.5	7,121,291	97.7	1,659,975	4.29
May	6,595,440	99.4	453,938	79.5	333,200	104.9	7,382,578	98.1	1,666,496	4.43
June	6,239,674	97.1	452,528	81.8	323,100	105.1	7,015,302	96.3	1,635,269	4.29
2nd qtr	19,180,247	98.4	1,361,300	81.2	977,624	104.8	21,519,171	97.4	1,654,049	13.01
1st hlf	37,861,310	97.7	2,798,914	83.9	1,875,699	101.1	42,535,923	96.8	1,644,218	25.87
July	6,345,315	95.7	453,686	79.6	345,957	96.6	7,144,958	94.5	1,616,506	4.42
Aug	6,414,637	96.5	467,293	81.8	345,725	96.3	7,227,655	95.4	1,631,525	4.43
Sept.	6,286,855	97.9	437,961	79.4	332,703	95.9	7,057,519	96.4	1,648,953	4.28
3rd qtr	19,046,807	96.7	1,358,940	80.3	1,024,385	96.3	21,430,132	95.4	1,632,150	13.13
9 mos.	56,908,117	97.3	4,157,854	82.7	2,900,084	99.4	63,966,055	96.3	1,640,155	39.00
Oct.	6,750,829	101.5	461,897	80.9	366,788	102.2	7,579,514	100.0	1,710,951	4.43
Nov.	6,371,750	99.0	458,469	82.9	349,593	100.5	7,179,812	97.8	1,673,616	4.29
Dec.	6,471,261	97.6	475,204	83.4	358,075	100.0	7,304,540	96.6	1,652,611	4.42
4th qtr	19,593,840	99.4	1,395,570	82.4	1,074,456	100.9	22,063,866	98.2	1,679,137	13.14
2nd hlf	38,640,647	98.0	2,754,510	81.3	2,098,841	98.6	43,493,998	96.8	1,655,653	26.27
Total	76,501,957	97.9	5,553,424	82.6	3,974,540	99.8	86,029,921	96.8	1,649,979	52.14

The percentages of capacity operated in the first 6 months of 1942 are calculated on weekly capacities of 1,498,029 net tons open hearth, 128,911 net tons bessemer and 71,682 net tons electric ingots and steel for castings, total 1,698,622 net tons; based on annual capacities as of Jan. 1, 1942, as follows: Open hearth 78,107,260 net tons, bessemer 6,721,400 net tons, electric 3,737,5 0 net tons. Beginning July 1, 1942, the percentages of capacity operated are calculated on weekly capacities of 1,500,714 net tons open hearth, 128,911 net tons bessemer and 81,049 net tons electric ingots and steel for castings, total 1,710,674 net tons; based on annual capacities as follows: Open hearth 78,247,230 net tons, bessemer 6,721,400 net tons, electric 4,225,890 net tons.

The percentages of capacity operated in first six months of 1943 are calculated on weekly capacities of 1,518,621 net tons open hearth, 125,681 net tons bessemer and 87,360 net tons electric ingots and steel for castings, total 1,731,662 net tons; based on annual capacities as of January 1, 1943 as follows: Open hearth 79,180,880 net tons, bessemer 6,553,000 net tons, electric 4,554,980 net tons. Beginning July 1, 1943, the percentages of capacity operated are calculated on weekly capacities of 1,531,789 net tons open hearth, 116,494 net tons bessemer and 94,667 net tons electric ingots and steel for castings, total 1,742,950 net tons; based on annual capacities as follows: Open hearth 79,867,450 net tons, bessemer 6,074,000 net tons, electric 4,935,960 net tons. Data from American Iron and Steel Institute.



SOUTH AMERICAN CO-OPERATION: Brazil's navy is performing a valiant task against enemy submarines in the south Atlantic. Pictured above are two destroyers being built in a shipyard "somewhere in Brazil"

Will Iron Ore Goal Be Reached?

Lake shippers say weather conditions to decide issue. Heavy movement scheduled over remainder of season. Stocks at lower lake ports under year ago

WEATHER conditions late this fall will be the chief factor deciding whether iron ore shippers will be able to attain the revised 1943 ore movement goal of 86,500,000 gross tons.

Fears of lake shippers that a serious manpower shortage would develop this fall with the return of some 1000 youths to school have been alleviated. Robert C. Goodwin, regional director, Fifth WMC region, states labor is available through the Recruitment and Manning Organization of the War Shipping Administration to replace these youths.

By the close of September, 14 of 16 new maritime vessels will be in service on the lakes, an addition of three during the month.

Substantial increase over a year ago in grain shipments is estimated to have cut the ore movement this season by 1,500,000 gross tons. Through August ore shipments aggregated 52.3 million tons. Schedules call for a movement of over 13 million tons this month, 12 million in October, 9.5 million in November and close to one million in December.

All lake ore carriers will operate to the end of the season under a pooling arrangement among the shippers to facilitate the building up of mill ore stocks.

Stocks of ore at lower lake ports and furnaces currently are about 4 million tons below a year ago. It is estimated if the present season shipment goal is reached, stocks on May 1 next year will represent a comparatively safe margin of between 40 and 50 days' supply.

Bureau of Mines reports total output of iron ore from domestic mines was 16,055,081 short tons during July, increase of 10 per cent over June. Mine stocks at the end of July amounted to 7,498,483 short tons, compared with 8,630,107 at close of preceding month, decrease of 13 per cent.

Ruling on Steel Forging Sales Clarified by WPB

Steel forgings sold by a warehouse are controlled materials only when "in the form and shape of controlled materials," regardless of whether they were produced by a steel producer or a forging shop. This constitutes a revision in an earlier interpretation of direction 25 to CMP regulation No. 1, issued by the War Production Board.

The interpretation means, for example, that controlled materials such as rounds or squares, when forged to shape, are controlled materials if made by a producer or if sold by a warehouse, but are class A products if made by a forger.

Steel Reporting Forms To Be Cut

War Production Board plans to reduce to minimum reports required from industry

DETERMINED effort to simplify and reduce to a minimum report forms required of the steel industry has been announced by John T. Whiting, director, War Production Board Steel Division. In line with this purpose to co-ordinate and make the maximum use of all essential reports, the functions and scope of the Control Branch of the division have been considerably increased.

Included in the Control Branch is a Research and Review Section which will constantly review the need and usage by the Steel Division of all reports now being received. It will study the possibilities of simplifying, and where possible, eliminating any reporting that may not be found of sufficient value to warrant the effort expended by the steel industry. All current reporting will be reviewed as quickly as possible. Greater use will be made of basic reports such as capacity and production reports, production directive reports, and shipment and past-due order reports so as to obtain from them as much information as is practicable and keep to a minimum all special reports except those that may be found necessary for handling emergency situations.

Steel Corp. Shipments Up Slightly in August

August shipments of finished steel products by subsidiaries of the United States Steel Corp. totaled 1,704,289 net tons, an increase of 43,527 tons over the July volume.

Since February of this year shipments were also below the like 1941 monthly total, but topped that record in August, 1940 by a substantial margin.

U. S. STEEL SHIPMENTS

(Inter-company shipments not included)
Net Tons

	1943	1942	1941	1940
Jan.	1,685,992	1,738,893	1,682,454	1,145,592
Feb.	1,691,592	1,616,587	1,548,451	1,009,256
Mar.	1,772,397	1,780,938	1,720,366	931,905
Apr.	1,630,828	1,758,894	1,687,674	907,904
May	1,706,543	1,834,127	1,745,295	1,084,057
June	1,552,663	1,774,068	1,668,637	1,209,684
July	1,660,762	1,765,749	1,666,667	1,296,887
Aug.	1,704,289	1,788,650	1,753,665	1,455,604
8 mos	13,405,067	14,057,906	13,473,209	9,040,889
Sept.	.....	1,703,570	1,664,227	1,392,838
Oct.	.....	1,787,501	1,851,279	1,572,408
Nov.	.....	1,665,545	1,624,186	1,425,352
Dec.	.....	1,849,635	1,846,036	1,544,623
Total	.....	21,064,157	20,458,937	14,976,110
Adjustment	.....	*449,020	*42,333	†37,639
Total	.....	20,615,137	20,416,604	15,013,749

†Increase. *Decrease.

Law Not in Good Standing with Congress, House Hearing Shows

Questions fired at witnesses indicate legislators would like to repeal act if way can be found to drain off excessive profits now recovered under it. . . . Committee members apprehensive over manner in which law is administered

WHEN the House Ways and Means Committee started its hearings on the Contracts Renegotiation act on Sept. 9, Chairman Robert L. Doughton (Dem., North Carolina) revealed the study of the renegotiation law was only a preliminary in an approach on drafting a new law to raise the twelve billions, or some part thereof, of the additional revenue requested by the administration.

It was indicated by Chairman Doughton and by the nature of the questions asked by committee members that the Contracts Renegotiation act is not considered a good measure as it now stands. It was shown that the Ways and Means Committee would like to repeal this law, provided it could find some way of drafting a revenue law that would automatically drain off excessive profits now recovered under the renegotiation act.

The hearings on the renegotiation law were devoted to the observations and recommendations of two groups, the renegotiators and renegotiated contractors. Among renegotiators testifying were Maurice Karker, chairman, War Department Price Adjustment Board; Kenneth H. Rockey, chairman, Navy Price Adjustment Board; John R. Paull, member, Maritime Commission Price Adjustment Board; Jesse H. Jones, Secretary of Commerce; Randolph E. Paul, general counsel, Treasury Department.

Question Administration of Act

In their examination of the renegotiators, it was shown that practically every member of the Ways and Means Committee feels a certain degree of apprehension over the Contracts Renegotiation act and the manner in which it is administered. Chief concern was over the arbitrary power the procurement agencies have in forcing contractors to accept renegotiation and committee members indicated they are not at all sure whether contractors have any right to appeal. Several expressed the opinion that it is a nominal right only, that "you can't fight the government" without inviting reprisals.

Pressed on this point, Mr. Karker admitted that the Contracts Renegotiation act is "dangerous and un-American" but in his opinion it was a necessary wartime measure to prevent profiteering that would result in future scandals and in the passage of laws further hampering industry and, in the end, killing the last vestiges of the American free enterprise system.

He declared that to his knowledge there have been no threats of reprisal against contractors who do not like their renegotiation settlements. When committee members told him about cases which their constituents have brought to their attention, he admitted there might be some exceptions but that he knew of no such instances and that it was the policy of all the price adjustment boards to make no reprisal threats. It was clear the committee members did not obtain adequate assurance on this point.

NO RECOURSE

"Five people on the Price Adjustment Board have the power at their whim to destroy any industry in the United States. They have already laid the groundwork for such destruction in many cases. There is no recourse in their decision. Such powers have never before been given to any group of men in the history of the United States. The fundamental principle of our republic—recourse to the courts for justice—has been eliminated."—J. F. Lincoln, president, the Lincoln Electric Co., Cleveland, in testimony before the subcommittee of the House Committee on Ways and Means conducting hearings on amendments or repeal of the renegotiation law.

One of the recommendations of the renegotiators was that renegotiation be applied on contracts involving $500,000 or more instead of $100,000 or more as at present. Such a change would reduce the administrative load 16 or 17 per cent. Also, companies having dealings of $10,000 a week do not have adequate accounting systems and legal staffs and hence renegotiation procedure requires an undue amount of time of men who might better expend their energies in war production.

There was considerable skepticism among committee members over the question as to whether the renegotiators are right in ruling that taxes are not costs. On this point the renegotiators took a firm attitude that renegotiation would not be possible if they were to consider profits after taxes instead of before taxes.

Committee members asked many questions as to whether it would be possible to set up a standard renegotiation procedure. They got nowhere in this direction; the renegotiators held that each case must be considered individually on its particular merits. They held that it was a matter of examining each contractor's capital structure, his costs, his salary and dividend history and then make an adjustment based on sound business judgment. The best answer the committee could get came in the form of an invitation by Mr. Karker for the committee itself to handle one of the renegotiations.

One of the beneficial things about renegotiation, the renegotiators testified, is that it has given the procurement officers a wealth of knowledge about manufacturing costs, so that they are better able to set prices that cover costs and allow a reasonable profit. For this reason, they said, there will be fewer cases of renegotiation in connection with 1943 profits. However, in their opinion, the renegotiation act will be necessary as a procurement tool as long as hostilities last and for some time thereafter. However, they recommended the act be amended to expire by limitation at the end of the calendar year next following that in which hostilities cease, instead of the present limitation of three years after the end of the war.

Seek Renegotiation of Losses

Several committee members talked of the need for amending the act to permit renegotiation of losses as well as profits. The renegotiators held that losses should not be recompensed in the case of contracts obtained by competitive bidding. They held, however, that a provision to restore losses, plus a fair profit of around 2 per cent, would be helpful. About 6 to 7 per cent of all the contractors so far have taken losses. Objection to making up losses after competitive bidding was based on the fear that such a provision would lead many contractors to put in low bids in order to get a contract and later apply for additional compensation, thus creating a headache for the procurement agencies.

A number of committee members asked whether it was necessary to renegotiate in the case of standard products. The renegotiators declared this is necessary. They explained that many manufacturers of standard products have had their business multiplied many times and despite the price ceilings they are making exorbitant profits which must be taken care of by renegotiation. Again, in this phase of the inquiry, the committee got nowhere in attempting to establish a definition of the term "excessive profits." It is a different matter in each particular case, the renegotiators held.

An inference by one of the renegotiators to the effect that the "alertness" of American businessmen will enable them to accumulate sufficient financial reserves for the postwar changeover despite the renegotiation process drew some resentment from committee members. Representatives John D. Dingell (Dem. Mich.)

and Harold Knutson (Rep., Minn.) felt that it takes a lot more than "alertness" to replenish a depleted treasury and that "alertness without funds means nothing."

Many of the questions had to do with this subject of setting up reserves for the postwar period. The renegotiators held that under the statute they are not allowed to take postwar angles into consideration at all, and that their sole responsibility is to see to it that no new millionaires are created by this war. The questions under this subject indicated a disposition on the part of committee members to feel that this question of postwar financial reserves is one that will have to be taken care of by general tax law and by a law to authorize government guaranteed bank loans.

Chairman Doughton at one point asked this significant question: "Mr. Karker, relative to the question of renegotiation and recovering excessive profits, if Congress should in its discretion, as has been proposed by some people, impose an excess-profits tax of 100 per cent, what would be left to properly renegotiate?" Mr. Karker said the answer was one word —"nothing."

Delay Making Settlements

Several of the committee members expressed the feeling that there is unnecessary delay in making cash settlements in cases involving idle plants which were built as a result of "bad judgment."

Representative Charles S. Dewey (Rep., Ill.) proposed that the Defense Plant Corp. be encouraged to terminate contracts "rapidly and surely, to replenish capital funds of contracting companies and leave the companies in a better position to go ahead—I should think it would be worth while taking the chance of making one or two mistakes."

That the lightning is likely to strike many contractors who have not yet come up for renegotiation was indicated by testimony that it is difficult to identify all the cases that should be renegotiated. With the aid of the Treasury, the War Production Board and the procurement officials some 5000 cases have been settled and some 8000 cases are in process. New cases are coming up all the time; it is difficult to locate them because the number of contracts placed is so large. Of all contracts reviewed about 40 per cent have been found not to yield excessive profits. The remaining 60 per cent have been renegotiated. Only about 10 per cent of the contractors actively fight renegotiation. Most of them wince but are willing to take the medicine. Few welcome renegotiation.

A number of committee members wanted assurance that the renegotiation process does not cause contractors to use extravagant manufacturing measures in order to mark up their costs. The renegotiators made it clear that they make it a point to allow larger profits as rewards to low-cost producers; they decidedly did not believe that renegotiation lowers efficiency. Incidentally, the renegotiators expressed the opinion that they are handling a very hot potato and that before long they will be called on the carpet and accused of allowing too liberal profits.

A question by Representative A. Sidney Camp (Dem., Ga.) brought out the fact that because of the renegotiation act many contractors working for the government are permitted to earn less profit than is earned by manufacturers working on similar civilian products. Specifically, allusion was made to the textile industry where all mills are going to capacity, some working for the government and some on civilian goods. The law was referred to as unfair in this respect; some textile mills because of renegotiation earn two to four times more than others.

Mr. Rockey was asked by Representative Donald H. McLean (Rep., N. J.), after certain instances of companies protesting against renegotiation had been aired: "The point I want to make and emphasize—and I hope that you can agree with me—is that the application of the renegotiation act by the Navy Department is evidence of the integrity and capacity of American industry and their patriotic devotion to the war effort; is that a fair statement?" Mr. Rockey answered in the affirmative.

After extensive questioning of Mr. Rockey, Representative Bertrand W. Gearhart (Rep., Calif.) said he shortly would propose an amendment to broaden the scope of the activities of the various price adjustment boards. Under this amendment they no longer would be mere components in the procurement departments of their respective agencies but would be neutralized and be the representatives of contractors as well as of their agencies; they, in effect, would arbitrate differences of opinion between the government and its contractors.

Told Law Is Constitutional

The renegotiators have been told, they said, that the Contracts Renegotiation act is constitutional. They have encouraged some contractors to take their cases into court but so far none of them has taken such action.

During the examination of Jesse Jones whose Reconstruction Finance Corp. now is engaged in organizing to apply renegotiation to contracts of the Metals Reserve Co., Defense Supplies Corp., Defense Plant Corp. and Rubber Reserve Co., Mr. Jones said he would like to have an interpretation by Congress of the provision exempting raw materials from renegotiation. The other price adjustment boards, Mr. Jones pointed out, have ruled that metals in the ingot stage are exempt from renegotiation. He thinks this is in error because the law exempts "the products of a mine, oil or gas well, or other mineral or natural deposit, or timber, which has not been processed, refined or treated beyond the first form or state suitable for industrial use."

Mr. Jones warned the committee that while many large contractors have accumulated great [illegible] result of war profits, there are thousands of small manufacturers "that have been blown up four or five times their usual productive capacities to do war work that have a big reconversion problem and are not in a situation, either as to past earnings or capital structure, to get sufficient earnings to set up reserves." This is a problem squarely up to Congress, he said.

The renegotiators recommended an amendment to "make clear that the authorization of 20 per cent special amortization which has been permitted on those facilities purchased by the investment of private capital for war production purposes is and should be allowed as an element of cost of production, and that no residual property right exists in government because of that authorization and because of that special amortization." They also would like an amendment whereby "recalcitrant" contractors would be forced to accept terms voluntarily accepted by other contractors without their consent. They also believe the law law should guarantee the right of recalcitrant contractors to appeal to courts.

"Power To Destroy Industry"

"Five people on the Price Adjustment Board have the power at their whim to destroy any industry in the United States," declared J. F. Lincoln, president, Lincoln Electric Co., Cleveland, testifying before the committee.

"As now administered by the board," said Mr. Lincoln, "the law penalizes efficiency and rewards inefficiency.

"Renegotiation boards have claimed a saving of four billion dollars," he said. "This is a gross deception because all but four hundred million dollars has already been captured by the present tax law. Even if the amount claimed by the boards had been recovered it has been lost many times over by the inefficiency forced on industry by renegotiation."

Mr. Lincoln said the renegotiation law should be amended; that any reason for it has long since disappeared. He suggested an amendment to the law which would exclude many products from renegotiation, pointing out that the war services, in placing contracts, should long since have had sufficient information to make a just and fair price and he maintained that only by such a policy will efficiency be rewarded and inefficiency punished.

F. N. Bard, chairman, Committee on Renegotiation of Government Contracts, Illinois Manufacturers' Association, Chicago, also appeared before the Committee. He said a proper solution of the renegotiation problems will go a long way toward improving the procurement of war material, and solving the economic problems of industries.

Mr. Bard held the contract renegotiation act has definitely outlived its usefulness, pointing out that procurement officers understand their purchasing problems and manufacturers have had cost experience, making the law unnecessary.

Conservation Pushed

CONSERVATION of raw materials is being pushed with increased vigor as winter months approach. Take the case of coal. Here a tight supply situation is expected to continue because of the heavy consumption in war production and the fact considerable tonnage has been lost this year through work stoppages at the mines. Every effort will be made to make up for lost production. For example, the campaign to get home owners to burn less fuel by keeping their house temperatures at lower levels will be pressed. By this means alone, it is expected 20,000,000 tons of coal will be saved annually. Last year's saving in manufactured gas is expected to be repeated this year. In addition to saving materials the conservation program is aimed at effecting a vast saving in manpower.

Manpower Source

A large manufacturer has contacted the Army Selective Service in relation to employing crippled soldiers as they are released by the Army. The personnel manager of this corporation reports its war production experience has revealed that cripples on the average have turned in a better performance on precision work than other workers. Not many disabled soldiers yet have recuperated to the stage where they can go to work; most of them still are in hospitals.

Cutback in Ships?

There is considerable speculation in informed quarters as to how soon the merchant shipbuilding program will begin to be cut back. We now have a large number of ships, the submarine menace has been gotten under a fair measure of control, and the news dispatches prove that we are doing a wonderful job of supplying food and weapons to overseas destinations. It seems a safe bet that the effort to push the deadweight tonnage output of merchant ships to continually new high levels should abate in the near future. In the meantime, however, there is no letup; the Maritime Commission continues to demand more plate tonnage than can be produced.

Efficiency Sought

The Army continually is checking and rechecking on efficiency of its many complex operations. Brig. Gen. Julian S. Hatcher, chief of the Field Service Division of the Ordnance Department, Army Service Forces, reports results of a time-check of the travels of a battery of anti-aircraft artillery, complete with vehicles, spare parts, cleaning equipment, fire control directors with their multiplicity of watch-like mechanisms and 16,000 component parts, telescopes and range finders with precision glass parts, and ammunition with adjustable fuzes. On its route across the country and over the ocean it went through temperature changes from 10 below zero to 110 above; it had to be ready for instant service on arrival in the combat zone. Total elapsed time from the manufacturer's plant, through the Ordnance Field Service Depot, into the hands of the troops and until the first shell was fired was 23 days, 4 hours and 20 minutes.

Statistics

Some new Army statistics give a good explanation as to why we are using up materials so rapidly in this war. Production of artillery ammunition today is approximately 18,000,000 rounds per month compared with 2,700,000 rounds a month in 1918. The number of machine guns now produced each month is more than triple the monthly maximum of 22,000 in 1918. Approximately 1,778,000,000 rounds of small arms ammunition now are produced monthly, compared with the top monthly 1918 rate of 278,000,000 rounds. . . . Motor and combat vehicles operated by the Ordnance Department, Army Service Forces, if combined in a single column, would encircle the earth at the equator!

SHORTLIVED

Roadbuilding machinery manufacturers will be under an increasingly heavy demand load from the armed forces as the tempo of the United Nations' attack is stepped up. Most of the equipment of this type produced is being shipped abroad and not much of it is expected to be returned to this country.

One of the main reasons for this is the rapidity with which this machinery loses its usefulness in combat zones. Sand storms, aerial bombing and harsh emergency conditions soon bring it to a condition that does not admit of repairs. Average life of cranes and shovels used in the North African campaign was 21 days while tractors had an average life of only 11 days.

Because of the increasing number of areas where such equipment is required the outlook is that production will be stepped up further in 1944.

Regarding War Prisoners

AFL labor unions in a number of cases have protested actual or proposed disposition of war prisoners by the War Department. Prisoners are paid 80 cents a day plus food, clothing and shelter. The labor unions do not want prisoners to work alongside American workers, as was to have been the case in utilizing prisoners as right-of-way laborers on railroads.

Action Handbook

Community Action for Postwar Jobs and Profits is the title of a 32-page booklet compiled by the Department of Commerce. It is based, not on theory, but on actual accomplishments in 487 communities in all parts of the country which successfully embarked on such programs before the need for postwar preparations became imperative. Secretary Jesse Jones refers to it as an "action handbook." Copies have been sent to local chambers of commerce throughout the United States; they also may be had at field offices of the Department of Commerce. Mr. Jones declares that it is the duty of every community that has not already done so to formulate a postwar plan to provide widespread employment, and has placed the department's field offices at the disposal of such communities.

Aluminum Complaint

Aluminum consumers complain the position of the WPB Aluminum and Magnesium Division in refusing to release aluminum for other than war requirements is altogether too drastic. One spokesman complains that whereas the aluminum ingot stockpile now is well over 100,000,000 pounds, a request for 4000 pounds was turned down even after it had been explained that this small quantity would suffice to carry out an experimental program aimed at creating new jobs in the postwar period.

Clarification

At his press conference recently, President Roosevelt disowned the statement in his latest lend-lease report to Congress that "the United States wants no new war debts to jeopardize the coming peace; victory and a secure peace are the only coin in which we can be repaid." He was at Quebec when the report was printed and hence was unable to check it. He explained that the borrowing nations will repay as far as they can, but that does not mean that they will be called upon to pay in dollars. There are other means of repayment, he said.

Pricing Guide

To enable all procurement officers to benefit by accumulated experiences, the Army Service Forces has developed a manual of procedure entitled *Pricing in War Contracts*. It does not supplant or modify War Department procurement regulations or procurement instructions issued by the Army Air Forces or any of the technical services of the Army Service Forces. It contains suggestions intended as a general guide to ways of obtaining fair and reasonable prices under all circumstances. In it, procurement officers are instructed to "buy what is needed at close prices—i. e., at prices neither high or low enough to discourage increased production and operating efficiency, but rather at fair and reasonable prices calculated to encourage both."

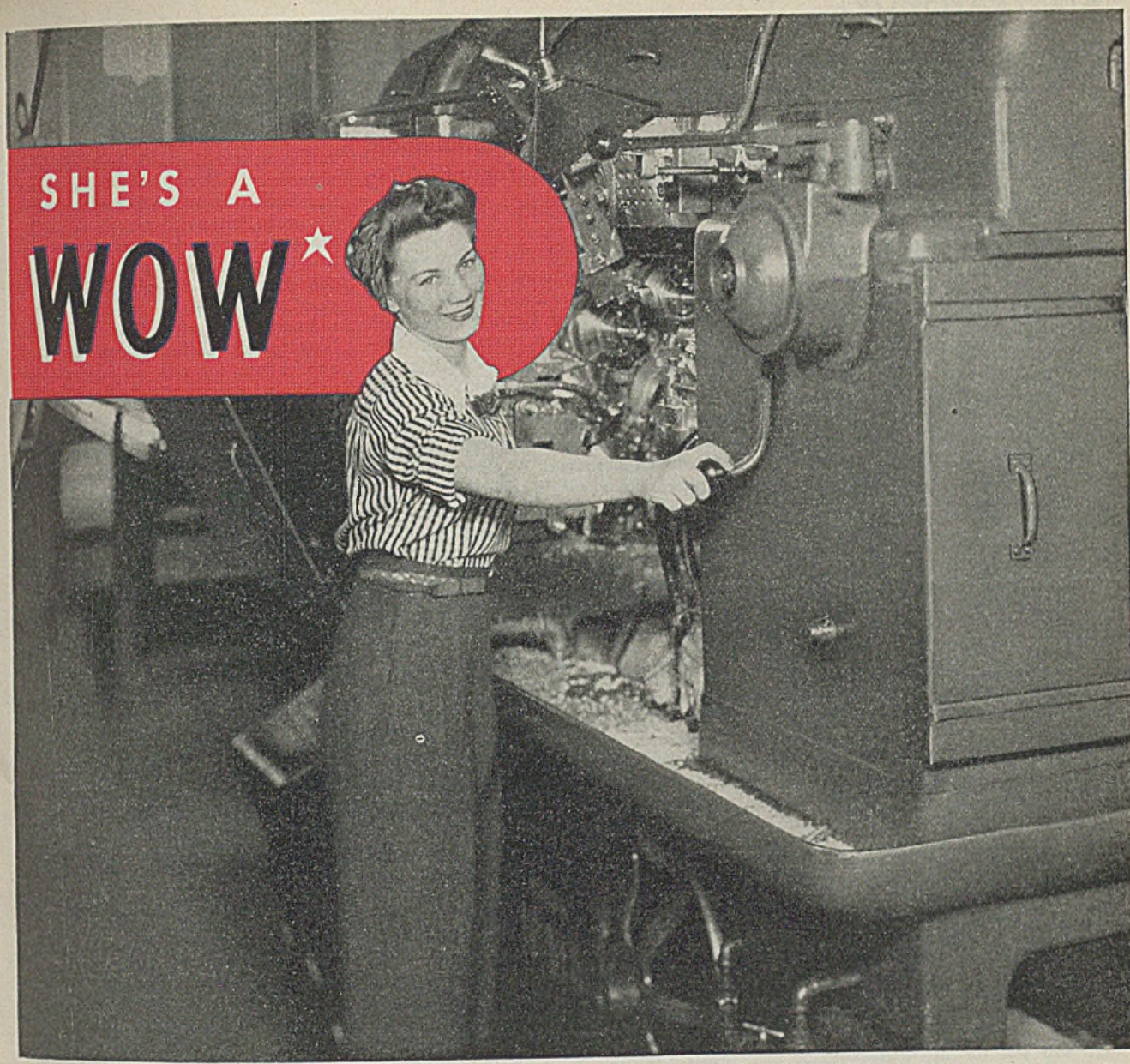


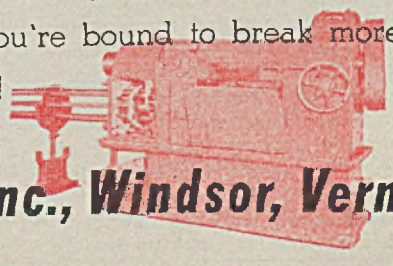
PHOTO COURTESY THE HOSDREG CO., INC., HUNTINGTON, INDIANA

SHE'S GINNY CLOSE—21 years old—95 pounds—married—member of the 10% Club—she's a WOW*. In fact she's the smallest multiple spindle automatic lathe operator in the world.

But she holds a more important record—2286 shells produced in 8 hours with the help of her 8-spindle Conomatic. She does her own tool setting, loads the machine with stock, beats the boys at their own game, then takes care of her six room house, and feeds 100 chickens and a farmer husband.

The Hosdreg Company is pretty proud of Ginny, with her cheerful attitude and happy smile—and also proud of their Conomatics, with their easy operating features and outstanding production capabilities. Get a WOW like Ginny and a Conomatic on the job, and you're bound to break more than one record!

*Woman Ordnance Worker



CONE Automatic Machine Company, Inc., Windsor, Vermont

Small Cities Seeking Service

Hearings scheduled for the fall by the Civil Aeronautics Board to take up problem of developing program for providing smaller communities with air facilities

MANUFACTURERS of materials and parts for the aircraft industry will be interested in a series of public hearings to be held this fall by the Civil Aeronautics Board.

Numerous air-minded congressmen from rural areas have been complaining that our present commercial airlines serve only the large cities and neglect the small cities and towns. The hearings will be aimed at developing a national program for providing air facilities to the small cities. The board defines the term "small cities" as communities of approximately 5000 or slightly more in population.

One of the questions to be raised is: What type of airplane will be required for this traffic? In its preliminary studies the board feels that the large planes used in trunk air lanes are too expensive to operate for servicing small cities. This traffic will best be served by smaller, single-engine machines with gross weight not above 10,000 pounds, having stalling speed of not more than 55 miles per hour, requiring not more than 1500 feet landing space.

The board's studies prove that it is the operating cost rather than the capital investment that must be considered primarily. In 1941 capital cost amounted to only about 8 per cent of the average capacity ton-mile cost of the aircraft carrier industry. The problem confronting engineers interested in designing planes to be used in traffic between small cities is not so much to produce a plane that will sell for the least amount of money but which will have operating and maintenance advantages. A plane having a one-man crew, for example, would get good consideration.

Another question to be raised is: Should the inter-small-city traffic be turned over to the existing trunk lines or should it be placed in the hands of new companies organized on a basis of community interest? The board finds a number of angles involved here. A considerable function of the inter-small-city lines would be to feed passengers and cargo to trunk systems. Too, the trunk line operators have accumulated a vast amount of experience that should be utilized in solving the many problems that will come up in organizing the smaller lines. The board also is inclined to believe that full consideration should be given to the small city viewpoint, that the idea of inter-community competition has its merits, also that new faces and new blood should find their way into the growing business of air transport. The answer to this question will have a bearing on the matter of marketing aircraft after the war.

Another question to come up is: To what extent should the "pick-up" type of air service be employed in serving small cities with mail and express cargo? About the time of Pearl Harbor such a system was placed in operation in Delaware, New York, Ohio, Pennsylvania, West Virginia and Kentucky, and has been operating with marked success. Using a patented pick-up device, its pound-miles of mail carried during the last year showed an increase of 88 per cent and its express poundage increased 162 per cent. The question as to extending the areas of pick-up service is particularly pertinent in view of the fact that many congressmen have been inquiring into the feasibility of having first class mail delivered by air, also the possibility of air delivery of all mail.

Numerous Flights, Airports Needed

Another question whose answer would have a bearing on the number of planes to be required for inter-small city service is: How many daily landings and take-offs would be required to render adequate service to small cities? The board believes that when a business man flies to another community in the morning he should be able to fly back in the afternoon. It also favors a late evening flight to pick up mail.

Another question that will require exploration is the creation of the required number of airports. Although we have 3000 classified airports this still is 1000 short of the 4000 airports considered prior to the war as constituting our immediate needs. With the growing popularity of air transport of passengers and cargo the sights will have to be raised and to set them accurately the needs of the small cities will have to be determined.

The extent to which the government would have to finance this proposed inter-small-city air traffic also is to be explored; it is felt that federal assistance would be essential to organize such traffic on a nation-wide basis. Such assistance would not have to be on any vast scale. L. Welch Pogue, the board's chairman, estimated roughly that a 50,000-mile expansion of pick-up services offering one round trip a day would cost the government "possibly $18,000,000 a year".

Immediately after Pearl Harbor the board postponed further consideration of applications for new air services, with certain minor exceptions. Recently it restored all these applications to its active calendar and has been accepting new applications for consideration. The new applications run into large numbers and include not only many proposed extensions in the domestic trunk lines and new international air routes, but also many services to small communities. There are 29 applications seeking authority to provide local and feeder service to communities in the 48 states and the District of Columbia. Nine of these applicants propose to provide local service through the use of helicopters. There are on file at least 26 applications involving the use of various pick-up devices.

The board is impressed with the helicopter, not only on the basis of its low cost performance, but with its great popularity. One of the most recent applications for a permit would result in the use of helicopters over 78 routes, covering 49,103 miles and serving 1043 cities. The board is studying the helicopter, saying its full significance cannot yet be measured.

Mr. Pogue expresses the belief that new discoveries and improved designs will continue to reduce operating cost in the air. He warns "we should not be blind to the fact that the potential traffic possibilities which we are now able to appraise may be found in the reality of the future to have been underestimated for a nation whose economy will be changed and attuned to the tempo of the speed of air transportation."

Critical Valve Shortage Being Relieved Through Subcontracting

VALVE shortage, rendered acute because of heavy demands for ships of all types, and for synthetic rubber and high-octane gasoline plants, has been greatly relieved of late through widespread subcontracting of valve parts.

The valve supply still is a problem that causes delays but the pinch will be removed entirely over the next few months. There still is some difficulty in getting steel castings such as sternframes.

Other factors in the merchant shipbuilding program have been pretty well ironed out and it now is hoped production in 1943 will be slightly more than 20,000,000 deadweight tons.

As a result of extensive subcontracting the Maritime Commission is getting turbine and gear drives for the new Victory ships into production. The first Victory keel is to be laid at an East Coast yard in November and thereafter Victory ships gradually will take the place of Liberty ships. From now on demand for reciprocating engine drives will taper off.

The Victory ship, with its speed of 15

knots, will move more cargo in a given period and also will not have to waste time in waiting for convoys. In addition it will be able to carry 400 tons more cargo instead of utilizing that amount of ballast now required to keep the top-heavy Liberty ships on even keel.

To raise the production of negro shipyard workers, now far on the low side, colored leaders have been asked to undertake the job of raising morale among these workers by reminding them that they now have an opportunity to gain greater prestige as citizens by putting their backs into the war program.

By far the biggest difficulty in the merchant shipbuilding program is the huge labor turnover and a large amount of absenteeism. It is hoped that the record in this respect may be improved as a consequence of a "community leadership" campaign which the War Manpower Commission is launching.

Labor Remains Bottleneck

Capacity of existing shipyards and ship component plants now is estimated to be in the neighborhood of 25,000,000 deadweight tons annually. Labor and material bottlenecks will effectually prevent actual production from getting anywhere near this capacity figure.

Adoption of wage incentive systems has raised production at some yards of late. One 20-way yard, which turned out 18 ships last month will turn out 22 this month as result of an incentive system. At most yards, however, both labor and managements are opposed to the idea of an incentive system so that much remains to be done along this line to get fuller utilization of labor and of facilities.

Maritime Commission is making an approach on another objective—that of moving other work out of shipbuilding communities so as to make more labor available to the shipyards. This problem is another that comes within the scope of the WMC "community leadership" drive. As this goal is reached the work to be removed to other communities should provide many opportunities to small plants that hitherto have had difficulty in keeping busy.

ANOTHER WAR MYSTERY

Reluctance of Maritime Commission to discuss its concrete shipbuilding program in detail gives rise to speculation as to exact status of the undertaking

ONE of the war mysteries to date has been the continued reluctance of the Maritime Commission to discuss its concrete shipbuilding program, other than brief statements in which Admiral Emory S. Land, its chairman, admitted he had no enthusiasm for concrete ships and that they were being built purely as "a matter of insurance for people that could build them but could not build steel ships."

Recently the commission quietly canceled contracts for 32 concrete vessels, leaving 33 still to be completed; a considerable shrinkage from the 115 on the schedule last February. . . . Recently the *Washington Times Herald* published the text of a telegram sent to the White House on July 26, 1941, by Hugh E. MacBeth, chairman of the Negro National Concrete Ship Construction Committee, Los Angeles, petitioning the President for creation of a big concrete ship program to employ colored people and thus prove to the dictator nations "this nation is truly democratic." Fifteen days later Admiral Land called a conference at Long Beach, Calif., and that was the first move in setting up the concrete ship program.

The *Times Herald* story quoted the following letter, written on April 9, 1942, by the assistant director of the U. S. Office of Education, on official stationery, and addressed to Harry Hopkins: "Probably due to your efforts, the Maritime Commission authorized the construction of 100 concrete barges of 8000 tons deadweight capacity some months ago". . . . Other mistakes of the armed forces are rumored as attributable to White House requests but it is difficult to round up the salient facts as the *Times Herald* seems to have done in this case.

Initial Truck and Trailer Programs for 1944 Approved

Initial truck and trailer programs for 1944, permitting output of 22,859 medium and 10,993 heavy trucks, and 14,067 trailers, have been approved by the War Production Board. A majority of these units is scheduled to roll off the production lines in the first six months of next year.

Programs for additional production will be authorized at a later date, should the conditions with respect to the production of components warrant.

Of the heavy trucks, 5282 will range from 16,000 to 21,999 pounds gross vehicle weight; 630 from 22,000 to 26,999 pounds; and 5081 from 27,000 pounds and over. Of the 5081 trucks in the heaviest classification, 3424 remain to be authorized formally for production in the immediate future.

ODT Approves Plan for Pooling Carbon Black Cars

Office of Defense Transportation has approved a plan for the pooling of all privately owned covered hopper cars used in the carbon black transportation service.

NEW FOUNDRY: Steel castings will be produced for the Navy and Maritime Commission at this new foundry, operated by Columbia Steel Co. near Pittsburg, Calif. It was built by Columbia Steel for the DPC at a cost of more than $6,000,000. The new installation is one of the largest in the country

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

CMP ALLOTMENTS: Manufacturers of class A products have the right to ask for allotments from their customers for the quarter in which the allotments are needed to obtain delivery of controlled materials. If the manufacturer is asking for an allotment to replace inventory of controlled materials which he will use in the manufacture of the class A product, he may ask for it in the quarter for which the order is placed or for any of the next three quarters.

Manufacturers do not have to accept orders for such products unless their requests for allotments, within the specified time limits, are complied with. Manufacturers, however, must not ask for allotments for quarters in which they cannot accept delivery of controlled materials because of inventory limitations.

A manufacturer of class A products must fill orders out of excess stock, if the size of his inventory prohibits acceptance of delivery of controlled materials. Nevertheless, a manufacturer may insist on an allotment before accepting an order for a class A product, if the quarter for which he is seeking the allotment is within the time limit permitted by the above direction.

CONTROLLED MATERIAL REPLACEMENTS: In cases where controlled material is lost or stolen in transit, it must be replaced by the person with whom the order for it was placed, without requiring a new allotment. The replacement order should be treated by a producer in the same way a replacement order for defective controlled material is treated under the terms of direction No. 16 to CMP regulation No. 1. Generally, this means that the replacement order takes preference over all other orders.

Warehouses must give a replacement order preference over all other orders in the absence of specific instructions to the contrary. However, if a warehouse is unable to fill a replacement order immediately, the customer may, if he desires, and without further charge to his allotment account, cancel the order with the warehouse and place a new authorized controlled material order with another warehouse which can make delivery immediately.

MATERIAL ALLOTMENT RETURNS: If a secondary consumer of controlled materials is required by the terms of CMP regulation No. 1 to return allotment of controlled materials to the person from whom he received it, and it is impracticable for him to do so, he may make the return to the claimant agency whose symbol appears on the allotment, or to the War Production Board if the allotment bears one of the WPB symbols. Occasions may arise when it is impractical for a secondary consumer of controlled materials to return allotments to the person from whom he received them, if he is making the same product for a number of customers and has received allotments from all of them for the item.

CMP ALTERNATIVES: Manufacturers of class A products operating under CMP may, instead of making allotments to their suppliers, follow any one of four alternative procedures, if their suppliers consent. Such a manufacturer may use any one of the following alternatives:

(1) He may sell the material to his supplier from his own inventory; (2) may furnish the material to his supplier on toll or processing agreement, retaining title in himself; (3) may place an authorized controlled material order for delivery to himself and trans-ship the material to his supplier, either by sale or under toll or processing agreement; (4) may place an authorized material order for delivery directly to his supplier.

In none of these cases does the customer make an allotment, and the supplier does not have to keep any allotment records. The supplier must, however, keep records to show that he is using the material for the purpose for which it was received.

Customers furnishing the material must include it in their own requirements in applying for allotments in the same way as if they were going to allot it. He may not furnish controlled material to his suppliers except under conditions where he would be able to make an allotment under the terms of CMP regulation No. 1. Consequently, the alternative procedures may not be used to make allotments to producers of class B products, unless special permission to do so is obtained from WPB, since under paragraph (g) of CMP regulation No. 1 consumers may not make allotments of class B products manufacturers. Class B product producers ordinarily receive their allotments from WPB.

INDEX OF ORDER REVISIONS

CMP REGULATIONS

COPPER WIRE: A new CMP regulation, No. 9, permits retailers, electricians, radio repairmen and others who sell copper wire to the general public to purchase limited quantities and sell it to the public without restriction. Any retailer or repairman may order up to $100 worth of copper wire for delivery during any calendar quarter. If he needs more, he may determine the dollar value of the copper wire he sold as a retailer or used as a repairman during 1941 and he may buy in any calendar quarter ⅛ of this amount. In selling wire under this regulation, retailers need not pay any attention to any preference rating other than AAA or a farmer's certificate under priorities regulation No. 19.

Purchases may be made up to individual quotas by placing on orders the following certification: "CMP allotment symbol V-3. The undersigned certifies subject to the criminal penalties of section 35(A) of the U. S. Criminal Code, that he is a retailer or repairman entitled under CMP regulation No. 9 to buy the copper wire covered by this order."

Retailers and repairmen may buy copper wire from other retailers or repairmen without certifications or other formalities. They may not use the procedure established under this regulation to obtain copper wire in excess of inventory limits established. Retailers are requested not to sell to persons who may buy it under other CMP procedures.

Three million pounds of copper per quarter have been earmarked for this program. (CMP No. 9)

L ORDERS

VISES: Schedule VI to order L-216 reduces types and sizes of vises which may be manufactured from about 165 to about 40. It provides for elimination of heavier types, a reduction in number of intermediate sizes, and curtailment of types for so-called special uses. It eliminates copper jaw caps by providing that no person shall perform any manufacturing operations upon or sell any jaw caps for vises made of any metal other than lead or lead-base alloy. An exception is made for jaw caps or vises substantially fabricated before Sept. 7, 1943. Types of vises which may be manufactured without restriction include the following: pipe vises (chain, hinged or open jaw and open size); riggers' (splicing) vises; patternmakers' vises; saw vises; machine vises for mounting on drill presses, milling machines, etc.; tools commonly called vises (such as hinged jaw, hand, pin and lineman's vises) which do not have the characteristics of a bench-mounted vise. Types of vises which may be manufactured only in specified weights and sizes are listed. (L-216)

SPOT WELDING ELECTRODES: A new order, L-318, restricts use of certain critical materials in manufacture of spot welding electrodes and establishes simplification and standardization practices. Fitting ends for spot welding electrodes must be machined for specified sizes, except when the buyer certifies that the electrodes are needed for use in pulsation welding. Manufacture of straight spot welding electrodes is limited to overall lengths and maximum diameters as specified in schedule A.

Use of tungsten, molybdenum and metallic mixtures containing these metals is prohibited, except in electrode facings and inserts. Use of copper-base alloys of cadmium, chrome, beryllium-cobalt and beryllium-nickel is permitted only to the extent specified in schedule B of the order. The order is effective Oct. 7 but materials in producers' hands on Sept. 7 are exempt from the restrictions on use of critical materials. (L-318)

M ORDERS

CALCIUM SILICON: Order which allocated calcium silicon, used in treatment and refining of certain steels has been revoked by the Steel Division. (M-20-a)

CADMIUM: Military exemption of cadmium has been limited to those uses required by prime contracts. Certain other changes have been made in lists A and B of the original order. (M-65-a)

MERCURY: Use of mercury for preparations for film developing, treating of green lumber, preparation of vermilion, manufacture of wall switches, wood preservation, thermometers and marine anti-fouling paint is now permitted but restricted to certain percentages of the base period totals. Use of mercury for agricultural uses, health supplies, safety and technical equipment is now unrestricted compared with the previous limit of 100% of the base period total. Other products in list "B", such as mercuric fulminate for blasting caps, mercury for industrial and scientific thermometers have their current percentages increased to 200% of the base period total. (M-78)

PRIORITIES REGULATIONS

FROZEN SCHEDULES: Parts of a product which is subject to a frozen schedule are subject to the schedule if the parts as well as the entire product are made by the same producer. This ruling applies also to parts of a component. A producer may not interfere with a production, delivery, or shipping schedule of products, component of products or parts of either when the products or components are subject to frozen schedules, unless WPB specifically grants the producer permission to do so through issuance of an amendment to the frozen schedule. (PR No. 18)

PRICE REGULATIONS

COIL AND FLAT BEDSPRINGS: Ceiling prices for five types of metal frame bedsprings have been established at levels ranging from

$8.50 to $12 at the retail level. Jobbers and wholesalers determine their ceilings by adding to the manufacturer's current maximum price the same amount which they added in March, 1942, to that particular manufacturer's price. (No. 213)

PRESSURE VESSELS: Specific prices for 1300 sizes and combinations of used pressure vessels and used enclosed atmospheric pressure vessels (cylindrical tanks made of black steel) have been established, effective Sept. 27. Maximum prices reflect generally the March 31, 1942, level and continue the price level set previously by formula under regulation No. 136 (Machines and Parts and Services). New pressure vessels, new enclosed atmospheric pressure vessels and new open vessels remain under maximums prescribed in regulation No. 136.

Ceilings for "reconditioned and guaranteed" vessels, regardless of age, are based upon 85% of maximum prices for sale of the vessel when new. Maximums for used vessels that cannot qualify as reconditioned and guaranteed are based upon 55% of the ceiling for the vessel when new.

Regulation does not apply to shop fabricated and field erected vessels, high pressure cylinders (which have a water capacity of 1000 pounds or less and are used for storing liquids or gases at pressures up to 3000 pounds per square inch), range boilers or expansion tanks (vessels which have a capacity of 192 gallons or less and are made of metal 12 B.W. gage or less), domestic above ground fuel oil storage tanks, and vessels lined with materials such as glass or vitreous enamel.

Maximum price for a reconditioned vessel not specifically listed in the regulation's price tables is 85% of the ceiling for the nearest equivalent new vessel or, if the alternative depreciation method is used, the price determined by depreciating the maximum price for the nearest equivalent new vessel by 4% a year. Top price for all other vessels is 55% of the ceiling for the nearest new vessel or the price determined by applying the 4% per year depreciation rate to the price of the vessel when new, but not to exceed 80% of the maximum price for the vessel when new. (No. 465)

Export Control Modified By OEW, Effective Oct. 1

Important modifications in United States export control, to simplify procedures and allow greater freedom in commercial export operations, will be put into effect on Oct. 1, Leo T. Crowley, director, Office of Economic Warfare, has announced.

In general, the simplified plan will remove from United States export control all commodities in free supply. A statement of cargo availability (shipping space application) will still be required, however. Individual export license and foreign import requirement controls will be retained only for goods which are subject to War Production Board allotment, quota, allocation or release.

Percentages of Items for Civilian Use Designated

War Production Board has issued a directive designating percentages of specified items for distribution to civilian consumers. The directive specifies, however, that manufacturers may not disregard preference ratings or WPB regulations in attaining percentages assigned for civilian production, without authorization of WPB.

Price Schedules Are Amended To Conform with Taft Amendment

AMENDMENT of 250 price regulations to show conformity with the Taft amendment to the Emergency Price Control Act of 1942, relating to use of standards in fixing prices was announced last week by Office of Price Administration. There are now 444 price regulations in effect.

The Taft amendment permits ceiling prices to be fixed by reference to standards or specifications already in general use in the trade or required by other government agencies, but prohibits further "standardization" of any commodity by OPA unless the administrator finds that there is no practicable alternative for securing effective price control.

Among the 57 regulations necessitating the use of standards which were found to require an express determination by the administrator that no practicable alternative exists for securing effective price control are those covering second-hand machine tools, iron and steel scrap, and basic refractory products.

A series of supplementary orders, effective as of Sept. 11, have been issued which amend the preamble of various regulations. The following regulations are a few which contain standards previously adopted by the trade and the preamble of these price regulations are being amended to indicate this: Nos. 80, lithopone; 98, titanium pigments; 354, copper sulphate; 341, used commercial motor vehicles; 96, domestic fuel oil storage tanks; 272, cast-iron boilers and radiation; 3, zinc scrap materials and secondary slab zinc; 8, metal scrap, etc. (nickel, monel metal, copper-nickel); 12, brass mill scrap; 15, copper; 69, primary lead; 81, primary slab zinc; 126, fluorspar; 138, ferromanganese and manganese alloys and metal; 166, zinc oxides; 198, imports of silver bullion; 202, brass and bronze alloy ingot and shot; 248, manganese ores; 258, chrome ores; 309, platinum group metals and their products; 314, magnesium and magnesium alloy ingot; 405, ferrochromium and chromium metal; 6, iron and steel products; 10, pig iron; 41, steel castings; 42, used steel drums, pails and containers; 46, relaying rail, relaying girder rail and used track accessories; 49, resale of iron and steel products; 113, iron ore produced in Minnesota, Wisconsin and Michigan; 147, bolts, nuts, screws and rivets; 159, fabricated concrete reinforcing bars; 214, high alloy castings; 310, reusable structural steel shapes, plates and castings.

Standards previously required by action of other government agencies are contained in regulations, including the following: Nos. 85, new passenger automobiles; 100, cast iron soil pipe and fittings.

Regulations in which standards were used previously in the trade or were required by another government agency include the following: Nos. 317, locks and lock sets; 413, hinges and butt hinges; 2, aluminum scrap and secondary aluminum ingot; 350, packers' tin cans.

The following include a few of the regulations which were amended by adding to their preambles that the administrator has determined that no practicable alternative exists for securing effective price control, even though the standards are not those adopted by the trade or prescribed by some other government agency: Nos. 180, color pigments; 1, second hand tools; 136, machines and parts and machinery services; 416, basic refractory brick; 17, pig tin; 20, copper scrap and copper-alloy scrap; 70, lead scrap materials, secondary lead, and primary and secondary antimonial lead; 302, magnesium scrap and remelt magnesium ingot; 379, tool steel scrap; 4, iron and steel scrap; 230, reusable iron and steel pipe and used structural pipe; 411, reusable steel storage tanks (field assembled).

Opposes Change in Army Tire Chain Classification

Recommendation that Army ordnance tire chains be continued as a class "B" product instead of being made an "A" product has been made by the Welded and Weldless Chain Manufacturers Industry and the Non-Skid Chain Industry Advisory committees. Classification of Army ordnance tire chains as a class "A" product is scheduled to become effective Jan. 1, 1944.

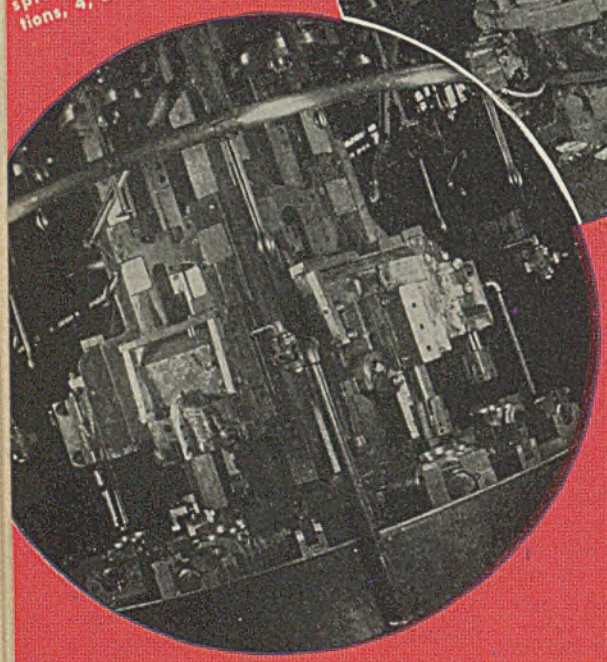
For the purpose of screening orders for ¾-inch steel chain and to supply the more essential requirements, the Tools Division of WPB will ask the industry to report each month its unfilled orders for 9/16, ⅝ and ¾-inch chain on form WPB-3001. WPB representatives said that ¾-inch chain was being specified in an exceptionally large number of orders, and wire rope could be substituted for chain in many cases with a distinct saving in carbon steel.

New Numbers for Pig Iron Report Forms Issued by WPB

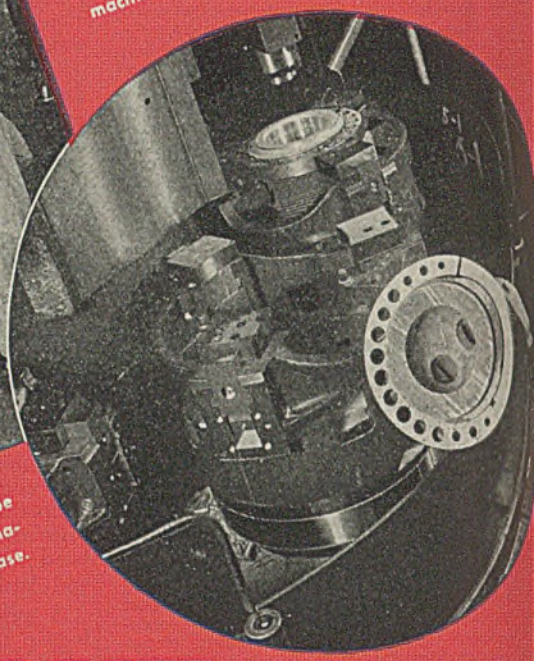
War Production Board has incorporated into the original preference order M-19 the new numbers of forms to be used in reporting and making allocations of pig iron. "Pig iron" has been redefined in the simplified order to bring it into harmony with the definition used by Office of Price Administration. There are no changes in the substance of the original order.

Close-up of 16" 6-spindle Type "D" Mult-Au-Matic machining cylinder head.

16" 6-spindle Type "D" Mult-Au-Matic machining spider. Close-up of stations, 4, 5, and 6.



Bullard 8" 6-spindle Type "D" Mult-Au-Matic machining transmission case.



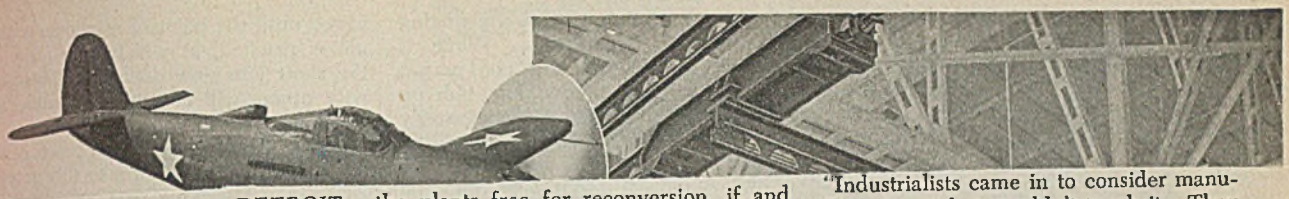
...ANY CHUCKING JO WITHIN CAPACIT

These photographs very largely tell their own story. Each shows one of the war-time tasks on which the Mult-Au-Matic is saving precious minutes . . . making the most of manpower, floor space, and versatility in the machine.

One important fact the pictures tell is the quick adaptability of the Mult-Au-Matic. The amazing time reductions Bullard machines accomplish under stress of war are quickly available to owners of Mult-Au-Matics when the war is won.

THE BULLARD COMPANY

BRIDGEPORT, CONNECTICUT



DETROIT

THE next few years look particularly bright for manufacturers' representatives and district sales offices in this territory. Not that the past few have been at all dull, but there has been some concern expressed over the effect of the transitional period from war to peace. If present indications mean anything, suppliers are going to have to redouble their efforts to keep the flow of materials and parts moving into the motor plants.

Most plans for resumption of automobile production foresee a limitless market for cars, with buyers gobbling them up just as fast as the plants can turn them out. Percentagewise, a 50 per cent increase over the peak peacetime production rate is being talked. This is of course entirely dependent on the ability of suppliers and subcontractors to meet such an ambitious rate. At the moment, some plant executives are calling in their suppliers and, after explaining reconversion plans, are attempting to ascertain the possibility of such schedules being met. And they are not having much luck in getting any positive answers.

Chevrolet likely will be the first of the General Motors divisions to be reconverted and back into car production. There have been some expressions that the changeover may possibly be started by the end of this year, and certainly by spring of next year. However, a serious setback in the Mediterranean military campaign could knock these optimistic ideas into a cocked hat.

Big Three To Reconvert Swiftly

The other two members of the Big Three—Ford and Plymouth—likely will not be far behind their competitor if the time appears ripe for reconversion. The remainder of the industry probably will be breathing hard on the trail of the three principal mass producers.

The delaying effect of navy contracts on car builders has been a topic of conversation. Reasoning is that manufacturers with navy contracts may be forced to drop behind their competitors with army contracts if the German phase of the war is concluded before the Japanese, since the latter seems predestined to be primarily a naval show. However, fears on this score are largely groundless when it is considered that those plants busy on naval contracts have concentrated the work largely in new buildings or in plants which have been outmoded for car manufacture. Pontiac, for example, has centered its naval gun and torpedo work in such plants, while Hudson's navy production is principally in the new naval arsenal, leaving automotive sections of the plants free for reconversion, if and when. Packard is in the same position.

This situation is probably just happenstance, since it is doubtful if advance planning 18 months ago could have foreseen the denouement of the war as it now appears. But it largely scotches fears that continuing navy contracts might interfere with reconversion of some auto builders once the European phase of the war terminates.

Secretary of the Treasury Henry Morgenthau limped around the Packard plant here recently on the occasion of a visit in connection with a War Bond rally in Detroit, a knee ailment requiring his use of a cane. In a meeting with Packard executives after touring the plant, he told of early negotiations which led to the building of the British Rolls-Royce engine in this country. Back in 1940, he said, he interested himself in trying to get the Rolls-Royce plans and consulted with Arthur Purvis, head of the British Purchasing Commission, who in turn dealt with Lord Beaverbrook on the matter.

Rolls-Royce sent the plans, blueprints of everything they had in the works, but no one could locate them on this side until they were discovered finally in the vaults of the Bank of Montreal. Securely locked in a strongbox, the contents of which were unknown to anyone at the bank, the plans finally were delivered under secret service escort to Wright Field and unrolled for inspection. It "Industrialists came in to consider manufacturing it, but wouldn't touch it. They said it couldn't be built in volume, that it was too complicated and intricate."

The secretary may be a little hazy on his recollections, so just to set the record straight it should be pointed out that Ford originally agreed to build the Rolls-Royce and in fact began work with a staff of British Rolls-Royce engineers who set up offices here in the General Motors building. After preliminary studies, Ford dropped the job, for reasons best known to himself, but certainly not because it was "too complicated and intricate." At any rate soon after, Packard became interested in the project and after months of "blood, sweat and tears" expended in the effort of translating British blueprints into understandable American terms, got the engine into production.

GM To Acquire Yellow Truck

Yellow Truck & Coach Mfg. Co. has announced approval by its stockholders of a plan for reorganization providing for the acquisition by General Motors of the property and assets of Yellow Truck in exchange for GM common stock. Better than 99 per cent of the preferred stockholders and 97 per cent of class B and common stockholders approved the agreement. Closing date has been adjourned to Sept. 30 from Sept. 11, and beginning Oct. 4 stockholders will be entitled to exchange their stock for GM common. As far as operations of the company are concerned, the change means virtually nothing, as Yellow Truck has long been considered one of the divisions of General Motors, supplying large numbers of military trucks to the armed forces, including the amphibious heavy truck or "duck" as it is called, and other models of 4x4 and 6x6 trucks. The division also has substantial orders for metropolitan buses which in the months ahead will account for an increasing share of production.

Recent message from C. E. Wilson, president of General Motors, to the corporation's employes throughout the country, emphasizes a point which is pertinent to men and women, especially newer employes, working in all war plants. He points out that "it is the personal responsibility of every man and woman to understand his job, particularly as to its quality requirements, and to see to it that his or her work meets these requirements. This is especially true in assembly and fabrication work, which is difficult or impossible to control completely by inspection, and where reliance must be placed on the personal integrity and ability of those doing the work."

Continuing, Mr. Wilson observes,

REHABILITATION

Mustered out of service because of disabilities suffered in battle, veterans of World War II are finding new careers in industry. More than forty war veterans have been adapted so far to the work of a former automobile body manufacturing plant, now converted to war production.

Trained for jobs entirely different from either peacetime or wartime pursuits, honorably discharged men are making good as production workers in various parts of the automotive industry.

Long before the war automobile builders successfully employed handicapped workers. Under wartime conditions many employers are finding new ways to employ so-called "unemployables," setting the stage for the rehabilitation of war veterans.

Close-up of 16" 6-spindle Type "D" Mult-Au-Matic lining cylinder head.

before any changes are made they must be approved by the proper government authorities as none of us has the right, nor can we assume the responsibility, of making such changes."

His remarks bear on the general tightening up of inspection routine in most war plants, the aftermath of the disastrous Truman investigation of the Wright Aeronautical plant in Ohio, but they point to a further significant phase of plant operations—those instances where inspection is impossible and where the integrity and skill of the workman must be inherent. Failures on this score would be bound to show up in battle performance of equipment, and so far as anyone knows officially there has been no laxity proved, but a word of caution is distinctly in order.

Continual shifting of the pattern of war production still is evident. Trade sources, for example, report that a major portion of shell production at the Oldsmobile plant in Lansing has been transferred elsewhere, probably to Kansas City and Janesville, Wis., Chevrolet plants which Olds is operating, while a new ordnance project, involving some sheet metal work, has been instigun for shipboard installation, and is also built at the Hudson Naval Ordnance plant here.

Ford Producing Malleable

Ford Motor Co., faced with a bottleneck in supplies of malleable iron castings for use in trucks, has begun manufacture of malleable in its own foundries. The so-called "new steel foundry" at the Rouge plant is the center of this work, metal being melted in electric furnaces and then given the malleableizing heat treatment in batteries of furnaces originally installed for armor plate heat treatment. Cycle is reported as 15 hours at 1700 degrees, followed by air cool for 15 minutes to 1000-1100 degrees; then reheat to 1400 degrees for 6 hours and cool to 1150 at a rate of 50 degrees per hour, and finally a water quench. Carbon runs around 2.25 per cent, silicon 1.50.

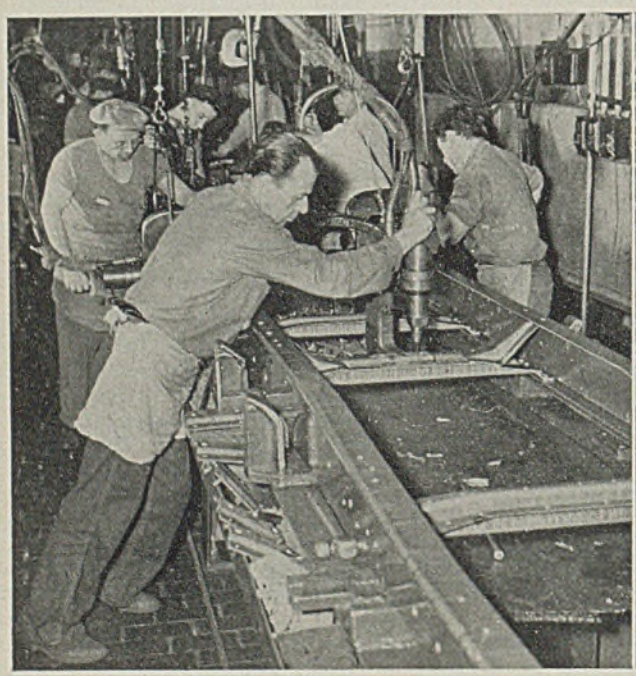
Accentuation of heavy truck production, both military and civilian but principally the former, is resulting in pressure on supplies of malleable iron castings, additional sources for which are few and far between. Albion Malleable Iron Co., one local source, is giving con-

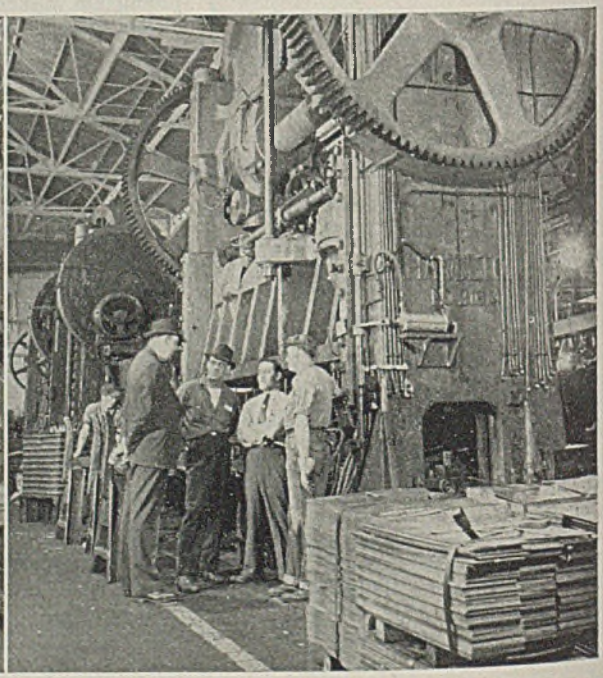
by plants in Flint and Detroit in the form of attractive wages. Complaints to the War Manpower Commission on this score have proved futile.

A favorable note on tank production, which has been hitting the skids in this area for the past six months, comes from the Fisher tank arsenal where production for the first six months of this year is reported as 30 per cent higher than for the last quarter of 1942. Both the M-4 medium tank and the M-10 tank destroyer come off the lines at this plant near Flint, which will be a dandy for the postwar planners to dispose of, along with Chrysler's huge tank arsenal.

Concan Ordnance Co. May Direct Redstone Arsenal

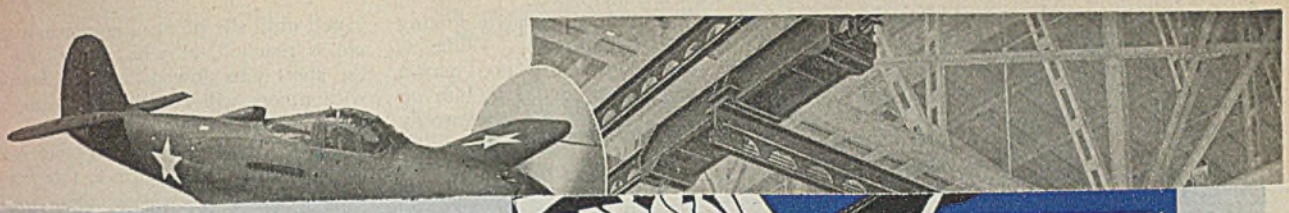
Negotiations leading to an arrangement under which Concan Ordnance Co., subsidiary of Continental Can Co. Inc., will operate the Redstone Arsenal, Huntsville, Ala., are under way with the War Department, Frank J. O'Brien, executive vice president, Continental Can Co. Inc., recently announced. General manager will be Price R. Reid.





INCENTIVE PLAN WORKS: Twenty per cent improvement in both production and workmen's wages has been the experience at the Ecorse, Mich., frame plant of Murray Corp. of America since institution of a carefully planned incentive system. At left is shown the progressive frame line where standards have been set by time studies at individual work stations and are related to the number of approved frames off the end of the line, a normal repair crew being allowed in the standard. Right view shows a consultation in the press department between union steward, time study steward, standards man and workman, the normal procedure in force for the settling of production standard disputes

(See STEEL, Sept. 13, p. 79)



VICKERS HYDROMOTIVE CONTROLS Help Conserve Cutting Tools

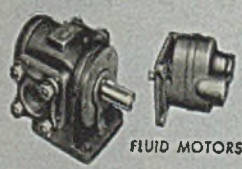
Tool breakage and excessive tool wear is costly and annoying at any time . . . but it is extremely serious in war time. This wastage of tools has assumed such proportions that the War Production Board has launched a program of tool conservation.

Longer tool life and greater tool efficiency can be designed into many machines simply by equipping them with Vickers Hydromotive Controls. With Vickers equipment you can provide the exactly correct speeds and feeds for each tool and job. Feed rates are infinitely variable; exceptionally accurate adjustment is possible by simply turning a dial; set feeds and speeds are maintained regardless of variations in work resistance; adjustments can be made during cycle. While cutting, the tool is always protected against abuse due to overload by automatic hydraulic pressure limitation. Any desired control sequence can be set up and made as automatic as expedient. Controls can be interlocked so that it is impossible to do the job wrong—impossible to jam and break tools. Exact load limitations can be applied so the machine cannot be overloaded.

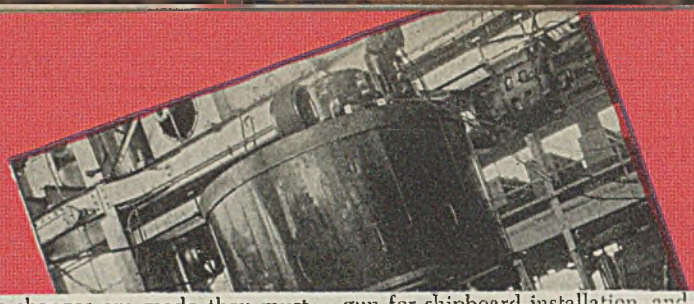
Vickers Application Engineers are available to discuss the many opportunities for improved machine controls.

VICKERS *Incorporated* • **1480 OAKMAN BLVD.** • **DETROIT 32, MICHIGAN**

Application Engineering Offices: CHICAGO • CLEVELAND • DETROIT • LOS ANGELES • NEWARK • ROCKFORD • TULSA • WORCESTER



Representative of More than 5,000 Standardized Vickers Units for Every Hydraulic Power and Control Function



Close-up of 16" 6-spindle Type "D" Mult-Au-Matic boring cylinder head.

before any changes are made they must

SOME production experts of the aircraft industry said it couldn't be done—the Lockheed P-38 fighter, with its twin booms, its two Allison engines, its two superchargers, its intricate cooling system, could never be built on a mechanized assembly line.

But just eight days after plant engineers went to work in July, changing over to a master assembly scheme conceived and designed by the manufacturing engineering department, the P-38s were rolling down a continuously moving assembly line on a schedule that within 60 days will double the daily output of the old line.

Airplanes are carried down the floor on a chain powered by variable-speed drives obtained on a rental basis for the duration from the Southern California Division of General Motors.

The mechanized lines, of which there are three in the final assembly hangar, move slowly but steadily, 4 inches per minute at present, with a faster tempo to be attained as soon as workmen have

gun for shipboard installation and is also

become thoroughly familiar with what to them is an entirely new problem—the necessity of getting a given job done before the plane passes on beyond their work station.

The three lines are consecutive as to the order of work to be done, rather than each turning out airplanes independently of the other two. The planes move down one line, shuttle back in the opposite direction on the second, and the third carries them again the length of the building and out the door.

Moving Conveyor Lines

Similar continuously moving conveyor lines are now being set up for several of the subassemblies of the airplane, and another mechanized line will carry the two Allison engines to the point on the main line where they are attached to the airplane.

Actual operation of the main assembly line is simple, with a minimum of working parts and simplicity of design for both operation and maintenance. The

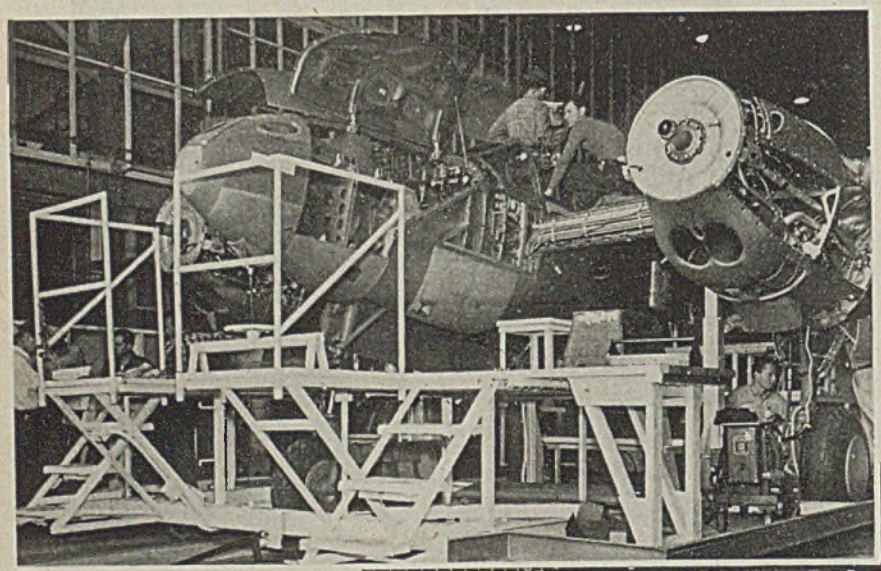
by plants in Flint and Detroit

the end of the line, at which time a warning bell is sounded, notifying workmen that ship is about in position for transfer to the adjacent line. The men assigned then disconnect utility lines, disconnect the forward ship in the line, push it forward into transfer position and make the transfer. Immediately all lines and couplings are re-connected and the line continues in normal manner.

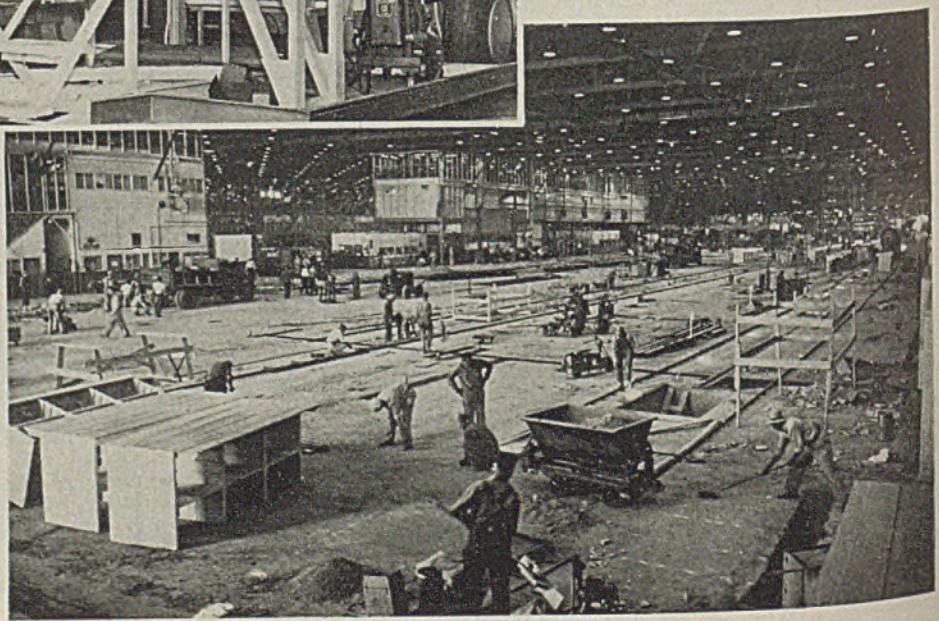
Stock racks lettered from A to K extend parallel to the moving lines, and each is divided into "top" and "bottom". Longitudinally each row is identified by "foot marks" corresponding to painted markers along each side of the assembly line indicating, in feet, the distance from the start of the line. The start of each of the three lines is indicated as "0", with the distance from the starting point indicated throughout the length of each line, progressing in the direction of travel of the ships. Numerals are placed every 5 feet.

Stock kits are made up from feeder racks which are in numerical order of part and are then placed in the "hold" rack which is the rack built under and above the stationary side work stands. Left and right hand kits are placed accordingly.

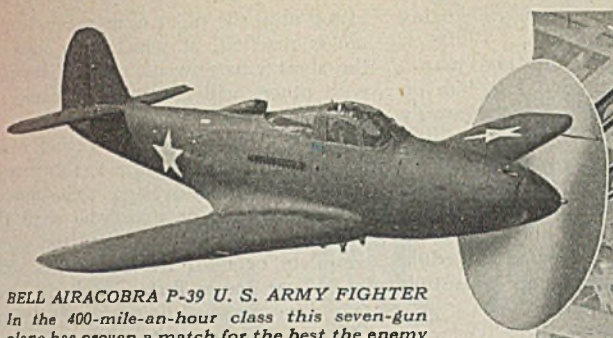
There are no stationized work areas, but group leaders are given assignment



On a new mechanized assembly line, left, P-38 fighters are carried on movable stands which are hooked together like freight cars, and the lead stand coupled by a bar to a floor chain which pulls the entire line forward at minimum speed of 4 inches a minute. Utility lines are connected to each stand



Final assembly hangar at Lockheed plant, right, was completely stripped before installation of conveyors. Eight days later the installation was completed, photo showing the plant midway in the job. In the interval, assembly operations were moved outdoors

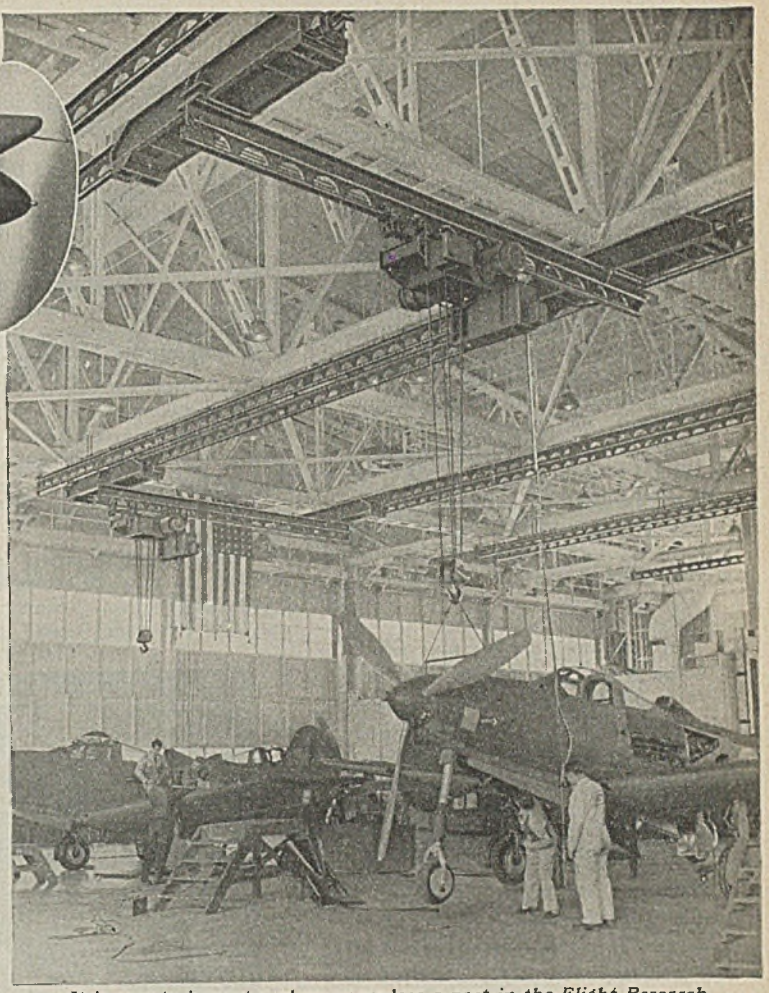


BELL AIRACOBRA P-39 U. S. ARMY FIGHTER
In the 400-mile-an-hour class this seven-gun plane has proven a match for the best the enemy have had to offer at all fighting fronts. It has a 37 mm. cannon firing through the hollow propeller hub. On each side of the cannon in the fuselage are 50 calibre machine guns that shoot through the propeller. Two 30 calibre machine guns are on each wing.

SPEEDS BELL AIRACOBRA PRODUCTION

with

CLEVELAND TRAMRAIL



It is easy to inspect a plane or replace a part in the Flight Research Building, because the entire floor area is covered with Cleveland Tramrail Transfer Bridges. Loads up to five tons are handled with the push-button-operated hoists.

Like the ships they build, the whole Bell organization is efficiently coordinated and their plants arranged for production of Airacobras at the highest speed possible. Cleveland Tramrail plays an important part in this work at their ultra-modern plant in the State of New York.

The pictures show some of the equipment in the Flight Research Department where the planes are thoroughly checked after the flight test. This building is equipped with a number of two-track runways on each of which is a 5-ton Cleveland Tramrail interlocking transfer bridge. Any or all of the bridges may be interlocked at one time, permitting the transfer of the carriers from one to the other. It is an easy matter to replace a propeller or motor, or to lift and move a complete plane.

Materials handling is also made easy in the Receiving, Shipping, Modification Sheet Storage and Dope Storage Departments with Cleveland Tramrail overhead equipment.

GET THIS BOOK!
BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy.

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
1125 EAST 283RD ST. WICKLIFFE, OHIO.

CLEVELAND TRAMRAIL

OVERHEAD MATERIALS HANDLING EQUIPMENT

sheets with personnel requirements, kits required and the starting point designated by a co-ordinate point in reference to the main beam of the ship. If a workman's job is scheduled to start, let us assume, at the 36-foot mark (referred to as F/M 36) it means that when the main beam of the ship passes that point this workman will start his job regardless of the foot mark of his own work area. One person could be on empennage, another on nose, and still others on beams but all on that particular ship would start, if they were scheduled to start simultaneously, when the main beam of the ship reached F/M 36.

The assignment sheet also shows a finish point, which means that when the main beam passes that point the job should be complete.

Many kits formerly used have been broken up into smaller units to make possible the use of kits now established on the increased schedules, without the serious problem of continuously changing kits, jobs and assignments. While it may have been logical for one person or a team to perform one long job on past schedules, it would not necessarily be logical to do so on higher schedules, with a moving line. In general the individual jobs have been confined to the work which could be done within the passing of one ship if the line were to be run at the highest expected schedule with present man assignments consisting of a combination of such jobs.

Assignments May Be Adjusted

It was recognized at once that this would mean that some operators would be working on several small jobs instead of one long job, with remainder of the broken-up jobs being carried over into the next stations. This will be done only so long as the schedule is low enough to warrant doubling up of jobs. As the schedule increases to the point where the present assignments cannot be carried out, the assignments will then be adjusted until the point of maximum schedule is reached, at which time many of the short jobs now done in combination with others will constitute an entire assignment.

Certain jobs, however, cannot easily be broken up to conform to this general rule. Consequently, on these special jobs, the crew, or man who starts the job, will ride the ship until the job is complete or until the end of his shift, whichever comes first. Duplicate crews take care of succeeding ships. At the end of a shift the next crews take over wherever the former crews may be, and carry the jobs on to completion. In all assignments, if the end of the shift comes before the assignment is completed, the incoming shift crew takes over the unfinished assignments and completes them, so that the regular cycle is not interrupted. Special pick-up men do all make-up and rework at the earliest possible moment.

The changeover to this new line, dur-

(*Please turn to page* 176)

Three moving lines are now filled, below, planes coming down the line at the right, then being shunted over to the center line where they receive wings and engines, and finally are transferred to the line at the left where they travel the length of the building a third time and are completed except for painting. Note stock racks adjoining the lines. Crane picks up the completed P-38, right, while a tractor pulls away the conveyor stand and transfers it to the start of the line

Announcing

IRIDITE

The New, Super-thin, easy-to-apply coating that protects zinc and cadmium surfaces against corrosion

Here is a new chemical coating that is unusually simple in application and low in cost. When *Iridite* is applied it is "soaked up" by the plated metal . . . becomes integral with it. That's why *Iridite* cannot chip or flake off.

Caused by a chemical reaction with the metal itself, *Iridite* is uniform, opaque and olive drab in color . . . matching the familiar shade used by the armed forces for camouflage.

Although *Iridite* gives remarkable protection against corrosion from all ordinary means, it is so thin that it does not "pile up" to alter the dimensions of the part. Delicately machined and closely articulated parts can be protected by *Iridite* without affecting their use or operation. In addition, after it has been applied the flexibility of *Iridite* permits parts to be bent, twisted, or formed without chipping, flaking or affecting the protective qualities of the *Iridite* coating.

The *Iridite* process greatly increases the field of usefulness of zinc and cadmium as protective coatings.

HOW IRIDITE IS USED

Plated parts are protected by the *Iridite* process by simply dipping them in the *Iridite* solution from 10 to 60 seconds, and rinsing in hot water immediately afterwards. Hot water is preferred in order to facilitate drying. The drying of the water from the part may be done by compressed air or by whatever other means are available. As soon as the part is dry it can be handled and shipped.

The only equipment needed are an acid-proof container for *Iridite* solution and a container for the hot water rinse. The *Iridite* solution is used at a temperature of from 75° to 100° F. depending on individual requirements.

The *Iridite* process can be applied to plated parts of any type or size, except in containers for edible products.

If you manufacture parts that are exposed to weather or to corrosion (except containers for food), you should send, immediately, for full details on the *Iridite* process. Better still, send us a part for *Iridite* coating, and test it any way you like. And, if your proposed use of *Iridite* requires an inspection of your production lines, our technical representative is at your service.

PROOF OF IRIDITE'S RESISTANCE TO CORROSION

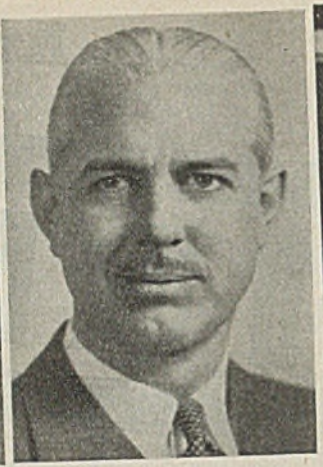
Part at left was zinc plated and Iridite coated, then subjected to intermittent dip in warm 4% salt water solution for 220 hrs. No corrosion. Under identical conditions zinc plated part at right, without Iridite protection, shows heavy corrosion.

RHEEM RESEARCH PRODUCTS, INC.

Subsidiary of RHEEM MANUFACTURING CO., 1209 E. 25th St., Baltimore, Md.

MEN of INDUSTRY

ROBERT H. McCRACKEN



R. C. GRIFFITH

WILLIAM L. SCHRADER

Robert H. McCracken has been appointed manager of combined sales, Boston office, Lukens Steel Co. and its subsidiaries, By-Products Steel Corp. and Lukenweld Inc., Coatesville, Pa. Previously Mr. McCracken had served as assistant general sales manager, Central Iron & Steel Co., Harrisburg, Pa. **H. G. Austin** has been named assistant manager of combined sales of Lukens in Boston.

—o—

Robert G. Glass, former assistant manager of operations, Chicago district, Carnegie-Illinois Steel Corp., has been elected a director and vice president and manager of operations, Geneva Steel Co., new subsidiary of United States Steel Corp. in Utah. Mr. Glass first entered the service of United States Steel subsidiaries in 1912 when he became a member of the inspection department of Illinois Steel Co. Later he was advanced to assistant manager of the inspection department; in 1936 he became assistant to the manager of operations in the Chicago district, and in 1941 he was made assistant district manager of operations.

—o—

Gwilym A. Price has resigned as president of the Peoples-Pittsburgh Trust Co. to become vice president in charge of settlement of war contracts, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Mr. Price will continue as a member of the board of directors of the Pittsburgh bank.

—o—

Floyd H. Stroup has been appointed metallurgical engineer, Ohio Ferro-Alloys Corp., Canton, O. Mr. Stroup formerly was connected with Central Steel Co. and Republic Steel Corp., Massillon, O.; Timken Steel & Tube Co., Canton, O.; Copperweld Steel Co., Warren, O.; and Follansbee Steel Corp., Pittsburgh.

—o—

J. J. Topolinski, former superintendent, Skilsaw Inc., Chicago, has been appointed works manager, succeeding **L. E. Parker,** vice president, resigned. Mr. Topolinski has been associated with Skilsaw 11 years.

—o—

Frank R. Dedrick, medical and safety director, Bullard Co., Bridgeport, Conn., has been nominated as a member of the engineering committee of the Automotive and Machine Shop section, National Safety Council, for a period of one year.

—o—

W. W. Rose, executive vice president, Gray Iron Founders' Society, has announced the following candidates for three-year term posts on the board of directors, to be filled at the association's annual meeting, Oct. 5-6, in Cincinnati: **C. R. Culling,** president, Carondelet Foundry Co., St. Louis; **Ronald E. Kucher,** vice president, Olympic Foundry Co., Seattle; **S. C. Mefford,** treasurer, Auburn Foundry Inc., Auburn, Ind.; **R. D. Phelps,** president, Francis & Nygren Foundry Co., Chicago; **Edward L. Roth,** president, Motor Castings Co., Milwaukee; and **Walter L. Seelbach,** vice president and general manager, Forest City Foundries Co., Cleveland.

—o—

R. C. Griffith has become affiliated with the Denison Engineering Co., Columbus, O., as manager of engineering and research. Formerly, Mr. Griffith had been associated with Vickers Inc., Detroit.

—o—

C. Malcolm Allen has been appointed to the technical staff of Battelle Memorial Institute, Columbus, O. Prior to joining the Battelle staff, Mr. Allen was associated with the Liquid Cooled Engine division, Aviation Corp., Toledo, O.

—o—

G. V. Kullgren, previously associated with the Industrial Engineering division of General Electric Co., Schenectady, N. Y., has joined the Akron, O., office staff of Farrel-Birmingham Co. Inc., Ansonia, Conn.

—o—

Frank Jones has become affiliated with Metal Parts Corp., Racine, Wis., as foundry superintendent. Mr. Jones had retired in 1937 following eight years as foundry superintendent, Gorham Mfg. Co., Providence, R. I.

—o—

M. B. Wyman, manager of the district engineering and service department, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has received his company's highest honor, the Order of Merit, for outstanding work on the war production program.

—o—

Frederick Baker has joined Blaw-Knox Co., Pittsburgh, as assistant treasurer.

—o—

Charles A. Petri has been appointed advertising manager, Falk Corp., Milwaukee, succeeding **Ralph H. Deihl,** who has joined the Army Air Forces. Before becoming associated with Falk Corp., Mr. Petri was national sales promotion manager for Red Star Yeast & Products Co., Milwaukee, and for 7 years before that he was associated with the advertising department of Harley-Davidson Motor Co., Milwaukee.

—o—

William L. Schrader, production assistant to Vice President R. G. Kellett, Kellett Aircraft Corp., Philadelphia, has been appointed general factory manager. Mr. Schrader continues his duties as assistant to the executive vice president. Prior to joining Kellett, Mr. Schrader had been factory manager, P. R. Mallory & Co. Inc., Indianapolis.

—o—

Walter H. Gardner, general sales manager, Keystone Steel & Wire Co., Peoria, Ill., has been appointed chairman of the Committee for Economic Development for the northern section of Illinois, Chicago excluded.

—o—

C. W. Haseltine, secretary-treasurer, Mack Trucks Inc., Long Island city, New York, has been appointed a vice president.

—o—

Herman Greenwood, former vice president, United States Steel Export Co., New York, has been elected vice president in charge of the International division, Carrier Corp., Syracuse, N. Y.

—o—

Armin L. Nevers has been appointed technical representative in Wisconsin for Osborn Mfg. Co., Cleveland.

—o—

Louis Polk, president of the Sheffield Corp., Dayton, O., was chairman of the finance committee which recently raised more than $38,000 for the Army Air Forces Aid Society in Dayton.

—o—

Richard L. Kopp, formerly affiliated with Republic Steel Corp., pipe sales department, Cleveland and Youngstown, O., has joined the sales division of Sawhill Mfg. Co., Sharon, Pa.

—o—

Norman M. White has been appointed district operating manager in Dallas, Tex., for Graybar Electric Co., New York. He is succeeded as St. Louis district

STEEL

E. B. ANDERSON

R. L. McILVAINE

operating manager by J. R. Ernest, former assistant to the general service manager at Graybar headquarters in New York.

—o—

E. B. Anderson has been appointed manager, Manufacturing division, Airplane Mfg. & Supply Corp., North Hollywood, Calif.

—o—

John A. Longacre recently retired as manager of the Norristown, Pa., American Equipment division of the Pittsburgh Screw & Bolt Corp., Pittsburgh. In the news item announcing appointment of Mr. Longacre's successor, Malcolm G. Kirk, published in STEEL, page 86, Sept. 6, it was erroneously implied that Mr. Longacre had died. The fact is Mr. Longacre simply retired after having capably filled the post as manager at Norristown for many years. STEEL regrets the error.

—o—

Thomas D. Williams has been appointed superintendent of construction, American Steel & Wire Co., Cleveland, and James McCulloch has been named assistant superintendent of construction.

—o—

Carl O. Voltz, formerly associated with Columbia Tool Steel Co., Chicago Heights, Ill., has joined the sales department of Ziv Steel & Wire Co., Chicago.

—o—

Lester B. Knight, vice president and sales manager, National Engineering Co., Chicago, has resigned to accept appointment as lieutenant commander, United States Navy. He is assigned to the Bureau of Ships, Washington, to supervise naval foundry facilities. Mr. Knight had been associated with the company 13 years, rising from field engineer to the posts he relinquished. Robert L. McIlvaine, manager of engineering sales, who joined the company in 1941 with a broad background in foundry experience, will assume Mr. Knight's former duties.

—o—

Arthur A. Brandt, former sales manager for radio and television receivers, General Electric Co., Schenectady, N. Y., has been named general sales manager, electronics department. Other appointments in the GE electronics department are: George W. Henyan, assistant to the vice president in charge of the department, and V. M. Lucas, manager of the government division. B. F. Ilsley has been appointed assistant manager of sales in the newly-formed Oakland, Calif., works section of General Electric's Wire & Cable division. J. S. Overstreet has been named assistant manager of sales, cable section, Schenectady, and J. J. Curtin has been made assistant manager of sales for the company's magnet wire section in Ft. Wayne, Ind.

OBITUARIES . . .

George Jones, president, Ace Mfg. Corp., Philadelphia, died in that city Sept. 6.

—o—

David Grimes, 47, vice president in charge of engineering, Philco Corp., Philadelphia, was killed in an airplane crash in Northern Ireland Sept. 4 while on an assignment for the Navy. Mr. Grimes had engaged in extensive radio research during his lifetime.

—o—

Dr. Max von der Porten, 64, one of the leading figures in the aluminum industry in pre-Nazi Germany, died Sept. 6 in New York.

—o—

Paul Hoffman, 61, former chief engineer and later consultant at the Phillipsburg, N. J. plant of Ingersoll Rand Co., died Sept. 11 in Easton, Pa.

—o—

Harold A. Heldt, 43, head of the Lincoln Foundry Co., Merrill, Wis., died recently in that city.

—o—

William E. Jewell, 73, who retired in 1940 as superintendent, Inland Steel Co., Indiana Harbor, Ind., died there Sept. 10 after a year's illness. Mr. Jewell, whose father founded the old Chicago Rolling Mill Co., had been in the steel business since boyhood, and was associated with Inland Steel 33 years. He was a past chairman of the Chicago chapter, American Institute of Mining and Metallurgical Engineers.

—o—

John Gardner, 67, expert in ship construction and repair, and chief engineer, Todd Shipyards Corp., New York, from 1925 until his retirement in 1941, died Sept. 11 in Red Bank, N. J.

—o—

Mahlon E. Simpson, chairman of the Resources Protection Board, WPB, Washington, died recently of a heart attack. Mr. Simpson also was assistant deputy vice chairman for production under Vice Chairman Hiland G. Batcheller.

—o—

John E. Shearer, 55, superintendent, Parkersburg, W. Va., plant, Penn Metal Co. Inc., died in Parkersburg Sept. 3. Before joining Penn Metal Co. in 1930, Mr. Shearer had been superintendent of the Northwestern Expanded Metal Co., Jeannette, Pa.

—o—

E. J. Berggren, 80, oldest and last survivor of the Edison pioneers, died Sept. 9 in Schenectady, N. Y. In 1880 Mr. Berggren became bookkeeper for Thomas A. Edison in his laboratory at Menlo Park, N. J., and at the time the Edison interests were merged into the General Electric Co., Schenectady, Mr. Berggren was chief accountant, which position he retained until 1910. He then became secretary-treasurer of Thomas A. Edison Inc., Orange, N. J. Fourteen years later he entered the insurance field, retiring a few years ago.

—o—

George K. Chrismer, 54, treasurer, Easy Washing Machine Co., Syracuse, N. Y., and a founder of the Controllers' Institute of America, died in Syracuse Sept. 7.

—o—

Charles E. Magill, 50, manager, Extrusion and Architectural Products division, Aluminum Co. of America, Pittsburgh, died there Sept. 8.

—o—

Charles A. Barth, 55, president, Superior Sheet Metal Co., Indianapolis, died there recently. Mr. Barth had been associated with his company 39 years.

—o—

J. J. Walsh, 80, who is said to have invented the first self-starter to be used on Ford automobiles, died in Elizabeth, N. J. Sept. 11.

—o—

Frank W. Thacker, 66, chairman of the board, Heintz Mfg. Co., Philadelphia, died there Sept. 2.

—o—

Philip G. Waterman, 37, lubrication engineer, Carnegie-Illinois Steel Corp., Pittsburgh, died Sept. 8 while on a business trip to Chicago.

Fall Campaign Necessitated by Three Unexpected Developments

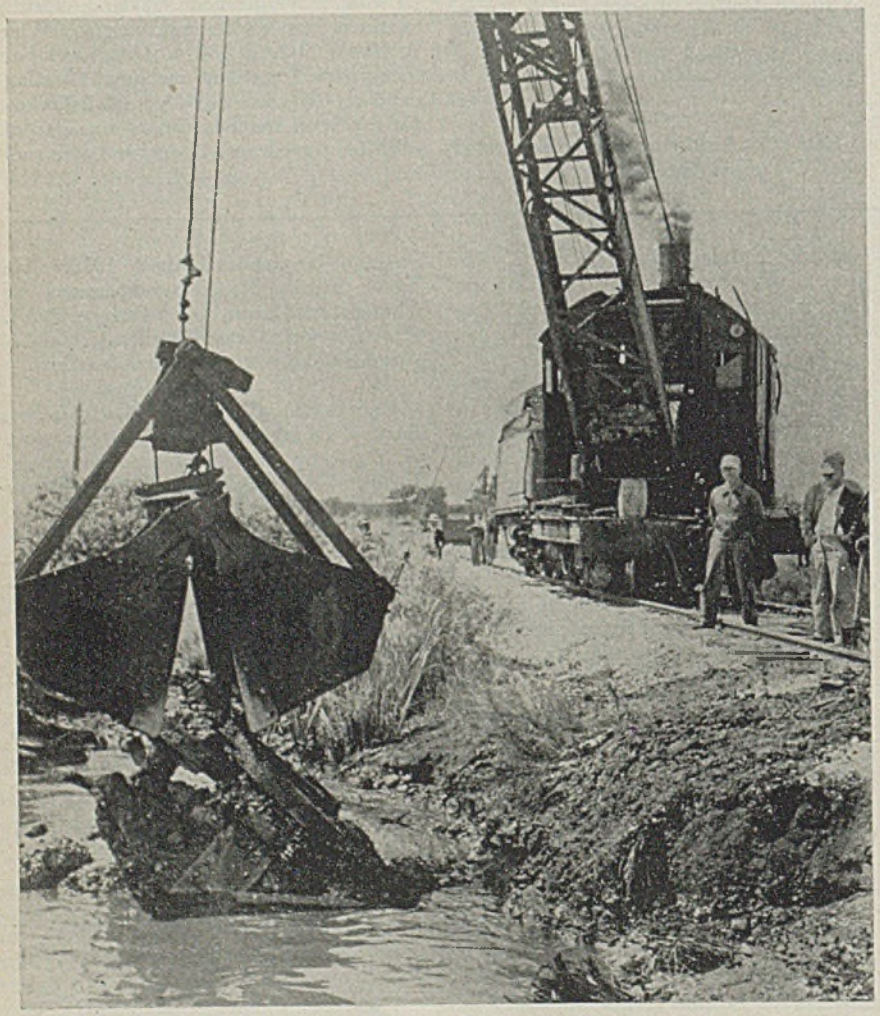
Late opening of lake shipping season, coal strike and lag in blast furnace construction program threaten sufficiency of iron and steel scrap supply. 15,000,000 net tons of purchased material needed in second half

BEHIND the decision to launch another scrap iron and steel campaign this fall (STEEL, Sept. 6, p. 76) is an interesting story which deserves a place in the record.

Up to early summer no 1943 drive was contemplated. The idea began to take form only after a number of developments appeared to threaten the supply of available metallics during the winter and spring months ahead. The first was the unusually late opening of the navigation season on the lakes. The second was the coal strike that cut pig iron production. The third was the falling behind original schedule of the program for the construction of blast furnaces.

In the early months this year the steel companies generally had what were considered to be substantial inventories of scrap. On the basis of reports from the industry, the War Production Board's Steel Division estimated requirements of purchased scrap for the first half of 1943 would come to between 11 and 12 million net tons.

To be on the safe side, the WPB Salvage Division set a collection goal of 13,000,000 net tons. Actually collections and consumption in the first half totaled approximately 13,400,000 net tons.



Cache of pig iron and steel from two freight cars is salvaged from a swamp near Glenbeulah, Wis., where they have lain since a railroad wreck 22 years ago. Here a crane brings to the surface a set of trucks from one of the cars located 10 feet below the surface of the mire. NEA photo

NEW SALVAGE HEAD

Herbert M. Faust, Philadelphia, has been appointed director of the War Production Board's salvage division. Mr. Faust, advertising manager for the Curtis Publishing Co., succeeds Paul C. Cabot, Boston, who resigned recently because of ill health.

As director of the salvage division, Mr. Faust heads an organization of nearly a thousand government employes, and more than 16,000 volunteer salvage committees throughout the country, embracing the activities of more than 500,000 volunteer workers.

On the basis of a Steel Division estimate that purchased scrap requirements will be approximately 14,000,000 net tons in the second half of 1943, the Salvage Division, again to be on the safe side, has estimated a quota of 15,000,000 net tons, and that is the target at which this fall's drive is aimed.

In order to conduct a successful salvage operation and more especially in order to be consistent in requesting cooperation of the public in intensified drives, a ready market for scrap must be maintained regardless of the position of any individual mill.

So that such a market would be assured, WPB worked out a plan whereby the government through an agency of the Reconstruction Finance Corp would buy iron and steel scrap and hold this until it was needed by the individual scrap consumers.

Steel Industry Has Own Plan

The steel industry requested an opportunity to sponsor its own plan and accordingly worked out a method whereby all open-hearth prepared scrap can be readily marketed regardless of where it occurs within the continental limits of the United States.

The details of the plan for government purchase have been worked out and this plan can be put into effect on a moment's notice. However, the steel industry plan has been entirely satisfactory up to the present time, and as long as all scrap moves through this medium, government need not inject itself further into the business of the steel companies.

Through the steel industry plan a substantial tonnage of scrap accumulated in North and South Dakota has been moved to various consumers in the Chicago district, and under this same plan arrangements are now being made to move material from Montana by dividing it among a number of different mills, each taking part in the tonnage at a cost of approximately $8 to $10 over OPA ceiling price.

At a meeting of a committee of the consumers, held late in August, full cooperation was pledged in connection with the coming drive, which will be an "all-

out" affair, supported by the WPB.

A pilot drive recently conducted in Kansas City indicates that no large tonnage of household scrap can be expected, but whatever is collected can be put to efficient use if it is properly sorted and prepared.

This leads to another innovation in the coming drive.

Last year emphasis was placed on making money by selling scrap—with the proceeds from the sale of donated scrap usually going to Red Cross or relief funds. That worked hardship to the dealers who in many cases patriotically paid more for scrap than they could collect from the customer. This year emphasis will be placed on getting material into the hands of the dealer, or into storage places where the dealers can withdraw the scrap in an orderly way and thus make efficient use of their labor and facilities.

Sellers of scrap this year will be kept informed about the prices they can expect to receive. They will be informed that household scrap should bring $8 to $10 a ton less at dealers' yards than No. 1 heavy melting steel. They will be advised that rural scrap as a rule brings $5 to $8 less a ton at dealers' yards than No. 1 melting steel.

A novel feature of this year's drive will be the setting up of "Victory" scrap banks in all communities.

Managers Familiar with Drive

The Salvage Division had all its regional managers in Washington recently and all angles of the drive were explained to them.

Different parts of the drive are laid out in a timetable. Farmers, for example, will not be asked to collect scrap until they have their crops in. Industrial scrap committees number about 650. There are some 16,000 general salvage committees. There are some 74,000 salvage managers in industrial plants.

Of the 15,000,000 tons sought in the second half, 9,800,000 net tons are to be industrial scrap. The second half quota for automobile scrap is 800,000 net tons, compared with first half production of around 900,000. "Jallopy parades" will be organized in an effort to meet this goal.

Current estimates are that battlefield scrap shortly will be imported at the rate of 20,000 to 25,000 net tons a month. The Army will release this scrap only after Army inspectors have gone over it to remove explosives as well as usable parts.

View of Things To Come

Chief, Division of Heat and Power, National Bureau of Standards, comments on manufacturing trends. . . Bases opinions on maintenance of free enterprise system

AMONG manufacturers, engineers and scientists, the opinions of Dr. Hobart C. Dickinson, chief of the Division of Heat and Power, National Bureau of Standards, are highly respected. He has just gone on record with his latest comments on future manufacturing trends, as reported by Frank Connor in *Domestic Commerce*, monthly publication of the Department of Commerce.

True automobile mileage economy will not be approached, he says, until a real torque transformer is developed. The present automobile is good but the transmission is an apology. What is needed is universal torque transformer. It would enable present cars to make up to 50 miles or better on a gallon of gasoline, a very important consideration in view of the rapid depletion of our petroleum reserves.

Dr. Dickinson points out that a decision soon will be reached as to whether consumers of fuel oil shall continue to use about half of our petroleum for heating purposes. We will have to turn to other sources of liquid fuel, notably coal and oil shale and lignite.

He believes the airplane will be developed greatly in the immediate future but does not look for revolutionary changes in aircraft engines unless a switch is made to a wholly different power plant like rocket propulsion or the turbine.

He looks for a lot of private flying but not on as large a scale as the aircraft industry would like for the reason that the safety factor will be far below that of commercially operated airliners. Also because airplanes must be operated from a field. He makes an exception of the helicopter type of plane which he says may develop in a big way for convenient short-distance transportation.

He sees diminished use of oil-heating equipment in residences ahead, because of the petroleum situation. The present trend in the direction of gas home-heating will not be continued indefinitely for two reasons. Generating equipment for producing gas is expensive and since the product is used for heating only half of the year, the overhead cost on this equipment is high. The other reason is that natural gas is bound up with petroleum and may not always be available. Dr. Dickinson suggests two needs: Gas producing machinery involving much less capital investment and the development of new kinds of heating. Radiant heating from ceilings could be more efficient, and would eliminate pipes and radiators from the rooms. This type of heating and its potentialities should be studied more thoroughly.

In the field of air conditioning and air cooling "we should get wise to ourselves", said Dr. Dickinson. While a lot has been done for large units, a lot could be done to fit average individual homes.

"For example," he said, "a refrigerating machine run backwards could utilize the condenser for heating. Such a unit, electrically operated, could be made about 300 per cent efficient compared with direct heat from electricity. It would be necessary only to change a couple of valves to put the refrigerating machine in reverse.

Suggests Redesigning Equipment

"This is a thermodynamic prospect. To date it has not been considered practicable from an engineering standpoint, owing to the cost factor. No practicable design yet has been developed. But it is a very definite prospect and one that should receive serious attention. As a matter of fact, present-day individual room heaters possess many of the elements. Many of them could be moderately redesigned to heat as well as to cool the room as weather conditions required."

He sees ahead a vast increase in the use of quick-freeze and cold storage locker food facilities.

Dr. Dickinson's view of things to come are based on the assumption that the United States will maintain a really competitive system of free enterprise. No form of managed economy has ever produced luxuries and conveniences for the masses of the people, only for the few, which does not induce production.

LOUISVILLE AFL UNIONS LIFT RAILS

Sixteen hundred tons of steel scrap will be salvaged by removal of five miles of abandoned street car rails in Louisville, Ky.

Labor for the project, which started Sunday, May 12, and which will continue for four week ends, is being supplied gratis by the Louisville American Federation of Labor unions.

Equipment necessary to remove the rails will be supplied by local contractors and the city. AFL members agreed with War Production Board salvage officials to supply the labor free when it was determined no person or corporation would make any profit on the project.

U. S. Steel To Buy $100,000,000 in War Bonds

United States Steel Corp. and its subsidiary companies are planning to purchase government securities amounting to $100,000,000 during the third War Loan Drive.

Subscription will be allocated in various amounts for credit to the districts in the United States in which the corporation operates. The corporation and its subsidiaries purchased $30,000,000 of securities in the second War Loan Drive.

Bristol Co., Waterbury, Conn., receives the "E". Left to right: Congressman Joseph E. Talbot; Comdr. E. N. Parker; Howard H. Bristol, president; W. H. Roberts, employe; Capt. G. O. Waterling

After presentation to Brown Instrument Co. Left to right: Capt. Roy W. Bruner; J. Abbot, union; Lt. Col. Robert Allen; E. B. Evleth, vice president

Production Awards Granted To More Industrial Plants

Additional metalworking and metal-producing plants have been honored with production awards by the Maritime Commission, Army, and Navy. They are:

Bendix Aviation Corp., Owosso, Mich.
Callite Tungsten Corp., Union City, N. J.
Carboloy Co. Inc., Detroit.
Chicago Transformer Corp., Chicago.
Chromium Corp. of America, Cleveland.
Dellenbarger Machine Co., Philadelphia.
Douglas Aircraft Co. Inc., Long Beach, Calif.
LaSalle Steel Co., Hammond, Ind.
Link Belt Co., Chicago.
New England Brass Co., Taunton, Mass.
Scientific Radio Products Co., Council Bluffs, Iowa.
Surrey Engineering Co., Long Island, N. Y.
Thomas Truck & Caster Co., Keokuk, Iowa.
Fort Pitt Steel Casting Co., McKeesport, Pa., awarded gold star for "M" pennant.
Wyckoff Drawn Steel Co., plants at Ambridge, Pa., and Chicago, won fifth award.
Mercer Tube & Mfg. Co., Sharon, Pa., awarded first gold star for Maritime "M" pennant.
Edward Valve & Mfg. Co. Inc., East Chicago, Ind., awarded additional gold star.
Jones & Laughlin Steel Corp., Aliquippa, Pa., Works, awarded white star for Army-Navy pennant.

Philip L. Bannan, president, Pacific Gear & Tool Works, San Francisco, presents "E" pins to representative group of employes

C. S. Anderson, president, Belle City Malleable Iron and Racine Steel Castings Co., delivers acceptance speech at Army-Navy presentation at Racine, Wis.

Top Executives Sought by Army

Commissions offered industrialists accepted for service administering affairs in occupied territory

APPLICATIONS are being accepted from men with extensive administrative and technical experience for consideration for appointment as commissioned officers in the Army of the United States, administering affairs of the Allied Military Government in Occupied Territory.

Men with broad executive background in the iron and steel industry and other allied industries may be qualified to apply for an Army assignment in this important work.

The armed forces do not wish to cripple war industries by enlisting services of many key civilian personnel. The Army, however, is anxious to obtain the services of ranking industrialists who can be spared to help in the job of rehabilitation of not only the industries, but the governmental and social structure of territories which have been torn down by several years of war. Top-notch men are needed.

Military administration of occupied territory presents a challenge to America which must be answered by obtaining the services of the best men available.

Specialists in raw materials, natural resources, production of metals, industrial personnel administrators, and executives, if qualified, will be considered for commissioned service. Men from 38-50 with college education and some foreign language background, with at least five years broad experience in the above categories, will be considered.

Men with administrative experience in the fields of Public Welfare, Safety and Finance, also are urgently needed by the Army.

The Army Corps of Engineers has an immediate need of experienced superintendents of highway construction and highway equipment maintenance engineers. Qualified men up to 48 years of age are being considered for commissions. A few men under 38 may be qualified.

All inquiries should be registered with the nearest United States Army Officer Procurement Office, or with Officer Procurement Service, Washington.

BRIEFS . . .

John S. Barnes Corp., Rockford, Ill., announces opening of an eastern sales office at 250 West Fifty-seventh street, New York city, under the supervision of E. C. Hawkins. Henry G. Hoss, Indianapolis, has been appointed sales representative in Indiana.

—o—

Sam Tour & Co. Inc., New York city, announce that Sam Tour has resigned as director of research work at Frankford Arsenal Laboratory to devote his full energies to the newly formed Sam Tour & Co. Inc.

—o—

Elastic Stop Nut Corp. of America, Union, N. J., announces a new retirement plan providing automatic pensions at the age of 65 for the company's 5000 employes with all costs borne by the company.

—o—

Ohio Crankshaft Co., Cleveland, has appointed Rudel Machinery Inc., New York city, and Swind Machinery Co., Philadelphia, special agents for distributing Tocco process induction equipment.

—o—

Hercules Powder Co., Wilmington, Del., announces establishment of a sales research division to investigate new markets for its chemical products and to study the needs of industries served by it. Dr. John H. Long will direct the new division.

—o—

Frederic B. Stevens Inc., Detroit, has published a new catalog illustrating and describing its automatic and semi-automatic plating equipment.

—o—

American Institute of Steel Construction, New York city, announces it has suspended the students' annual bridge design competition until after the war.

—o—

Edward Valve & Mfg. Co. Inc., East Chicago, Ind., announces appointment of Dunbar Engineering Co., New York city, as sales representative in Connecticut and W. E. Bowler, Philadelphia, as sales representative for the Reading, Pa., territory, effective Sept. 1.

—o—

Davenport Machine & Foundry Co., Davenport, Iowa, announces completion of a brick and steel building as an addition to its plant.

—o—

C. O. Bartlett & Snow Co., Cleveland, announce appointment of Martell & Ferree, Philadelphia, as sales representative in Delaware, southern New Jersey, and eastern Pennsylvania.

—o—

American Can Co., New York city, is now producing one of the newest life saving units, a waterproof blanket can for use by castaways at sea. The can holds three blankets and may be used for water storage and other emergency purposes.

They Say:

"We have our natural resources, our factories and machines, and our industrial techniques. We haven't time and can't afford to take the productive energy to do much about increasing them. What we must do is to produce more with what we have. And that's up to the workingman. It's up to management to use every minute of every man's day where it will be most effective in turning out the goods that we must have."—**Frederick C. Crawford**, president, National Association of Manufacturers.

° ° °

"The postwar years will be an era of low-cost transportation, and this problem is one of the principal keys to all our postwar planning. If we use our heads and manage things right it will be a time of almost incredible achievement and advancement."—**Henry J. Kaiser**, West Coast industrialist.

° ° °

"The need for more coal is critical at this time when we are straining to attain the greatest possible output of arms and military supplies to hasten the winning of the war. The necessity for shipping coal for the use of our armed forces places an additional strain upon our coal supply at a time when we can least afford it. The coal supply situation is bad. We can expect it to get still worse before it gets better."—**Harold L. Ickes**, Coal Mines Administrator and Secretary of Interior.

° ° °

"Men now in service in the defense of their country will not submit to being kicked about when they come back to work by irresponsible and injudicious labor leaders. The courage of these men has seldom been equalled and it has never been exceeded. They will display the same courage on their domestic problems. Their right to work, it is logical to assume, is not going to be impeded by irresponsible labor racketeers."—**Henry H. Heimann**, executive-manager, National Association of Credit Men.

° ° °

"Intelligent and advance planning demand trustworthy statistical information. Fragmentary and unreliable data means catch-as-can planning, added costs, production loss, and waste of manpower."—**Whipple Jacobs**, president, Belden Mfg. Co., Chicago.

Suggests Formula for Speedy Settlement of Terminations

Industrialist advances plan embodying man-hour treatment of overhead as approach to tremendous economic problem seen when "V" day arrives. . . Principles advanced largely are clarifications of existing practices

By MAXWELL R. BERRY
President, The Electric Products Co., Cleveland

AT THE end of February, 1943, the uncompleted war commitments of the federal government aggregated more than a year's normal peacetime national income or almost two years total war production volume and it is not unreasonable to assume that such may still be true when "V" day arrives.

It is this stupendous backlog of business which will be, in varying degrees, subject to cancellation. No economic problem of such magnitude has ever faced this or any other people.

All the resources and credit reserves of industry must be organized in advance to prevent that sudden deflationary trend which drives credit into hiding and fills the ranks of unemployment.

Either the federal government must quickly find a way to throw off those shackles of cancellation and thus free the enormous natural resources of industry or else government must solve the problem largely unaided.

Industry's position today is none too healthy when her balance sheet is examined. Ratios of quick assets to quick liabilities for successful industries are probably at an all time low. Cash and receivables will not be sufficient to meet current payables and accrued income tax payments. The one hope and real possibility therefore reposes in converting that one remaining item of inventory assets into cash and doing it before the other asset items have dragged bottom. It will cost our national economy but little to keep up the momentum of business by using its own resources whereas to finance a depression would prove thrice as costly.

Speed in the settlement of terminated contracts at war's end is postwar opportunity No. 1. No other can approach it in immediate economic importance.

A solution cannot depend, as many think, merely upon good will on both sides, for this is already present in abundance both in government and in industry. Both parties zealously desire such an immediate resumption of peaceful pursuits when the war has been won. Good will is, however, impotent where no useful yardsticks of interpretation are available.

In all the contract termination instructions of government bureaus, one seeks in vain to find aught but generalities. "Full and reasonable compensation for costs, liabilities and commitments" is about as detailed an expression as can be found and, even then, no two contracting officers interpret it alike.

Our first need is for a more mathematical explanation of "reasonable compensation" and, in addition, speed in the decision and payment. Nothing could so quickly solve the latter as legislation which will authorize the advance payment of 75 per cent of the cancellation charge within thirty days from the receipt of an invoice in approved form. For the remaining portion, we must look to a clear cut common understanding of the meaning of "reasonable compensation" or, to be more exact, a proper cost-profit formula.

Fundamental Contract Components

The following components will be found in practically every government industrial contract at the time of cancellation:

A. Raw or semifinished materials purchased or used from inventory, including any fair cancellation charges for undelivered materials which the suppliers cannot divert to other immediate uses. The sum of these costs constitute the "material cost" of any contract.

B. Productive labor expended on any contract up to a period of time reasonably required to adjust production schedules under restricted and controlled war conditions. The sum of such items constitute "Labor Cost" on any contract.

C. Overhead costs incurred or assumed, calculated on an overall total average business volume basis and accumulating for a period ahead sufficient to substitute other equivalent production or to adjust expenses proportional to the remaining volume if no substitutions can be made.

D. An expected profit proportional to the percentage of completion of the contract at the time of cancellation as determined by the proportion which "A", "B" and "C" costs above bear to the similar total estimated costs of the entire contract.

E. Any costs of outside fully fabricated assemblies produced by subcontractors. Where no profit is added to these items, their total must be deducted from the total average volume of "C" above before determining average overhead percentage costs.

F. Costs of storage, handling and interest charges on all materials not disposed of by the buyer within thirty days after date of cancellation.

As a suggested illustration, let us assume that an actual contract had been based on the following original cost estimate:

Material cost ..... of contract price	30c per dollar
Labor cost ..... of contract price	15c per dollar
Overhead cost .... of contract price	40c per dollar
Profit ..... of contract price	10c per dollar
Outside fabricated assemblies ..... of contract price	5c per dollar

And let us assume, at the time of cancellation of such a contract, the following expenditures made or assumed:

Material provided ..... completed	80%
Labor provided ..... completed	60%
Overhead provided ..... completed	80%
Outside Assemblies ..... completed	100%

With the two above assumptions, the percentage of completion of such an order would then be calculated as:

Material cost .. 80% of 30c or	24c per dollar of contract price
Labor cost .. 60% of 15c or	9c per dollar of contract price
Overhead cost 80% of 40c or	32c per dollar of contract price
Total expenditures at cancellation..... of contract price	65c per dollar
If contract is completed, similar costs will be.... of contract price	85c per dollar

Percentage of completion at cancellation....65c ÷ 85c = 76.5%.

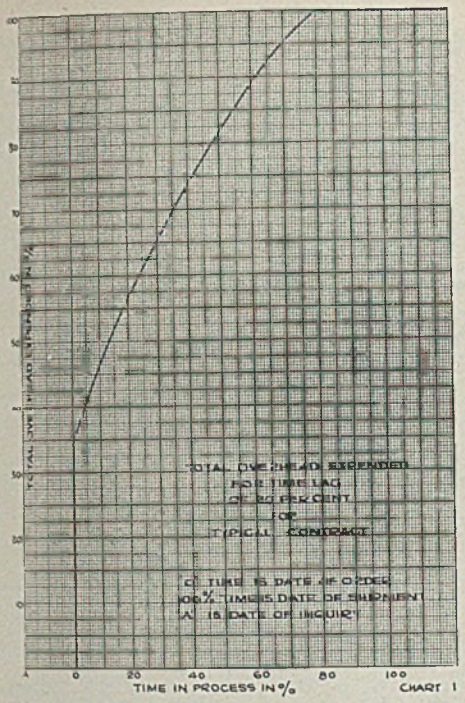
Allowable profit....76.5% of 10c or 7.65c per dollar of contract price.

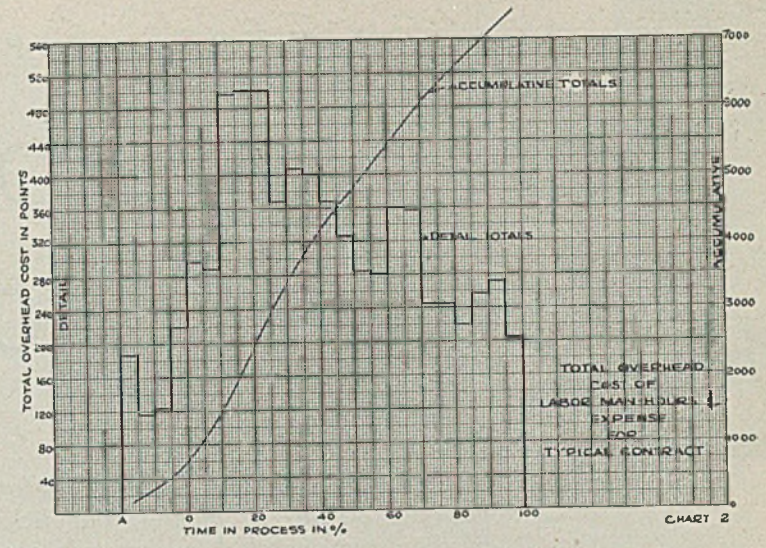
These calculations now provide all of the needed data for calculating a proper total cancellation charge:

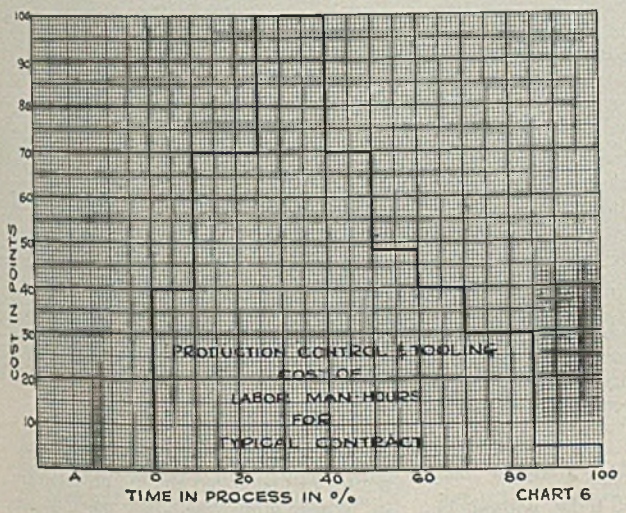
Charge for materials ..... per dollar of contract price	24c
Charge for labor ..... per dollar of contract price	9c
Charge for overhead ..... per dollar of contract price	32c
Charge for profit ..... per dollar of contract price	7.65c
Charge for outside assemblies ..... per dollar of contract price	5c
Total cancellation charge ..... per dollar of contract price	77.65c

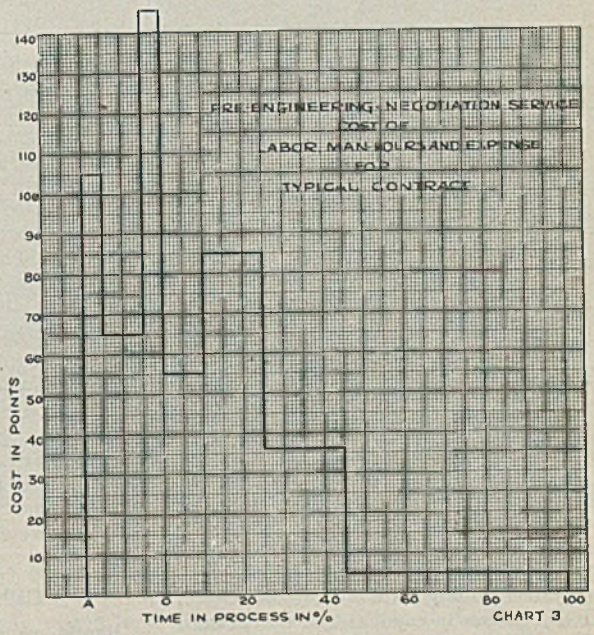
This total may be subject to adjustments for such additional charges as justifiable and approved sales commissions together with credits for materials

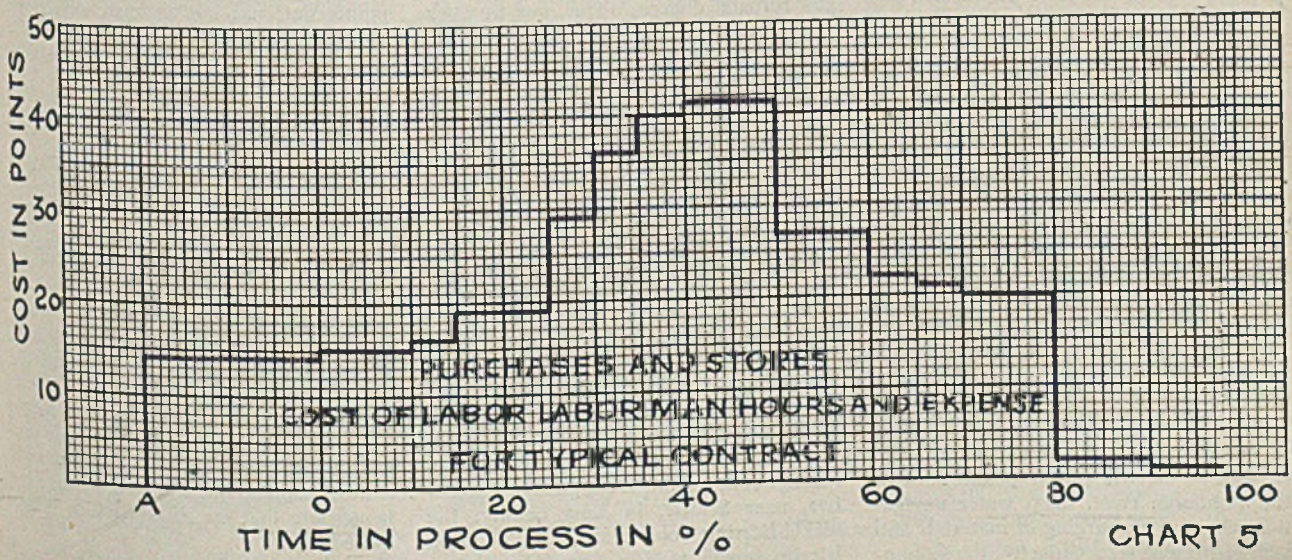
(*Please turn to Page* 177)


TOTAL OVERHEAD EXPENDED
FOR TIME LAG
OF 90 PERCENT
FOR
TYPICAL CONTRACT
C TIME IS DATE OF ORDER
100% TIME IS DATE OF SHIPMENT
A IS DATE OF INQUIRY
TIME IN PROCESS IN %
CHART 1


ACCUMULATIVE TOTALS
DETAIL TOTALS
TOTAL OVERHEAD COST IN POINTS
DETAIL
ACCUMULATIVE
TOTAL OVERHEAD
COST OF
LABOR MAN HOURS &
EXPENSE
FOR
TYPICAL CONTRACT
TIME IN PROCESS IN %
CHART 2


PRODUCTION CONTROL & TOOLING
COST OF
LABOR MAN HOURS
FOR
TYPICAL CONTRACT
COST IN POINTS
TIME IN PROCESS IN %
CHART 6


PRE-ENGINEERING-NEGOTIATION SERVICE
COST OF
LABOR MAN HOURS AND EXPENSE
FOR
TYPICAL CONTRACT
COST IN POINTS
TIME IN PROCESS IN %
CHART 3


PURCHASES AND STORES
COST OF LABOR LABOR MAN HOURS AND EXPENSE
FOR TYPICAL CONTRACT
COST IN POINTS
TIME IN PROCESS IN %
CHART 5

ORES KEY TO STEEL'S FUTURE IN NORTHWEST

Deposits plentiful but scattered. Many present difficult and costly problems in mining, beneficiating, or in metallurgy. Further study needed to ascertain economic feasibility of new plants

By JOHN D. KNOX
Steel Plant Editor

IF a new steel plant were laid down in the Pacific Northwest, that plant would be in a position to compete in a 2,000,000-ton market annually throughout the entire West, as well as in the noncontiguous territories of Alaska, Hawaii, the Philippines, and the export market accessible to the Pacific Coast. This fact is reflected in a survey made just before this country entered the war by Raymond M. Miller, senior industrial engineer, market development section, Bonneville Power Administration, Portland, Oreg.

Since the United States began to supply its Allies with armaments, ships and miscellaneous steel products, and with the new Kaiser plant at Fontana, Calif., the 65,000-ton plant of the Oregon Electric Steel Rolling Mills at Portland, Oreg., and increases in capacities of the western plants of the Columbia Steel Co. and the Bethlehem Steel Co., the margin between present West Coast steel production and the 2,000,000-ton peacetime market has been narrowed.

Nevertheless, Mr. Miller points out that sheet and tin plate capacity in the West still is inadequate as is the capacity for pipe and tubes, and probably will continue to be so unless steps are taken to remedy the situation.

No one knows the extent in the postwar period of peacetime steel requirements or of increased export markets in the Pacific area. Some hold that the Orient market will open up and that West Coast producers will be the chief suppliers. If so, steel will be one of the main items in demand.

Because of proximity to coking coals in Washington and the large iron ore area, as well as electric power possibilities of the Columbia river, deep water navigation, cheap river barging of materials and lack of present steel capacity, the Columbia river and Tacoma areas appear to present a most favorable economical picture for a substantial steel plant operation, the report concludes.

Published information pertaining to iron ores in Washington is inadequate according to Carl Zapffe, manager, iron ore properties, Northern Pacific railroad, Brainerd, Minn.

Recorded information has become much too commonly misinformation when offered as being representative of raw material required by an iron and steel industry in the Pacific Northwest. When those ores first were examined and described in reports, the examination occurred in times when a steel industry was not being considered, and its physical and metallurgical specifications as to ores were not heeded in the observations made.

Calls for Field Study

Rarely are ores used today without being given some kind of preliminary treatment and rarely is only one ore used in the furnace charge. The ores in question are no exception to this; in fact, the entire question of a Northwest steel industry hinges on that very thing. All Northwest ores should be given a new field study and subjected to comprehensive sampling, and thereby enable consulting metallurgists to work with truthful and reliable facts and factors.

Ores that need be studied are: (1) The Coos Bay magnetitic and chromiferous sands, and the Scappoose lateritic high-phosphorus ores, in Oregon; (2) the McGowan titaniferous-magnetite sands at the mouth of Columbia river; the manganiferous iron-bearing quartzitic schists near Hamilton, in Skagit county; the indurated ferruginous slates, of Whatcom county; the pyrrhotite pyrite of Snohomish county; the Denny-Guye magnetite, near Seattle, in King county; the nickel-bearing chromiferous, indurated laterite, north of Cle Elum, in Kittitas county; and the sulphur-bearing magnetites of Okanogan county; all these are in Washington; and (3) possibly the copper-bearing Kassaan ore of Alaska.

A section of downtown business district of Tacoma, Wash. Mt. Ranier is shown in background

Every one of these ores, Mr. Zapffe points out, has one or more objections about it that introduces costly and difficult problems in mining, or in beneficiation, or in metallurgy.

First rank in choice goes to the Okanogan county magnetite deposits. The Scappoose area, when fully explored should present a large tonnage. The Cle Elum deposits will rank among the largest. The Snohomish county pyrite deposit, when fully drilled, likely will be listed among the big reserves.

Roasted Snohomish county pyrite-residue is in a class by itself; being low in gangue minerals and void of deleterious elements, it enables making the best of quality steel. The Okanogan magnetite deposit is a natural high-grade ore except that parts of it contain sulphur and a little copper, but it would be easy to beneficiate that ore, if preparation is required.

Scappoose ore is of fine grain, pulveru-

lent and becomes dusty; is high in moisture in ignition losses and in phosphorus; it is suitable for making ordinary foundry metal.

Cle Elum ore has a dense structure associated with an unfavorable mineralogical composition, preventing beneficiation except by thermal reduction. The iron content is low and the slag volume high. Phosphorus and sulphur are ideally low, but presence of chromium and nickel are obstacles rather than benefits. Mining and delivery costs are high.

Coos Bay and McGowan ores are titanium-bearing magnetite sands. The Coos Bay sands contain chromite. The Alaska ore contains copper, and transportation is uncertain.

A new smelting industry needs to control one large suitable deposit and obtain a tieup for acquisition of small tonnages of other ores. In determining such acquisition the physical structure of ores is as important a factor as is chemical composition, and as to both it must be representative of large tonnages.

Serious thought has been given to the reduction of Northwest ores. In one case a state lease was acquired on 160 acres near Everett, Wash., containing a pyrite deposit. It could be easily mined, and explorations have shown not less than 1,750,000 tons of pyrite concentrates recoverable after a proposed flotation process. The idea was to roast the pyrite and recover the sulphur dioxide formed; then concentrate it, and in liquid form sell it to the pulp and paper plants of the Puget Sound region.

Lower Cost Claimed

Because the sulphur gas would be made near the pulp mills, claim was made that it can be delivered at a much lower cost than when made from sulphur flour purchased in Louisiana and Texas. However, the pyrite "residue" is mainly an oxide of iron. It is relatively free of sulphur and is void of phosphorus, lead, zinc, arsenic, copper and titanium, and, therefore, is most desirable as a source-material for making steel. Therefore, this residue becomes an ideal and a cheap melting-stock for a steel plant.

The Tysland-Hole continuous 3-electrode closed-top furnace has found wide application in Norway, Italy, and Japan, and more recently has had a successful introduction in Finland. In this country there has been no need for adopting electric smelting in places where pig iron and steel were already being made in huge quantities by other methods. In the Northwest, however, the situation is believed to be peculiarly suitable for its adoption and in preference to other methods. Using a pyrite residue is a case in point and a T/H furnace was designed for it.

Although volumes and weights of a charge used in an electric furnace are different than those of a blast furnace, and though operating the former does not require a hot blast, it remains common to both types that the charge must be nicely sized and porous. In both the blast and electric smelting furnaces, gases are generated and escape for them must be provided. In an electric furnace the products of combustion form at the ignited end of the electrode and are confined in a closed furnace and need be drawn off by suction, passing out through orifices in the furnace wall.

Not requiring blast, an electric furnace

can operate on ores of smaller sizes and the problem of fines is thus lessened substantially. Pulverulent ores, like the Scappoose ore, find a use provided lumpier ores are mixed with them. Of course, it may always prove better to nodulize any fines. Then, too, this spent-gas is exceptionally rich in carbon monoxide, which gives it much value for burning in other units in the plant, such as a nodulizing kiln.

The product from electric smelting is a high-carbon pig iron. If a high-phosphorus ore is used, then the pig iron made is usable not for steel but for ordinary foundry iron. This product, nevertheless, can be heated a second time in a bessemer converter to decarburize it, and then be treated a third time in an electric refining furnace, after which it emerges as a high-quality steel. Each such stage adds to costs, for which reason the practice might not always be permissible.

The preceding is only a sketch outline, but it suffices to describe a start made using a natural ore in a furnace. Using pyrite residue, which is low in phosphorus, would not alter the flow sheet but would be beneficial from the standpoint of cost and the quality of the metal made. The presence of certain other elements affect cost still more, and the others at the same time influence and affect adversely the quality of the metal made. At the high temperatures quickly possible in an electric furnace, sulphur goes into the gases and into the slag and does not get into the metal.

Titanium is not welcome because part of it will always remain in the metal (this eliminates the Coos Bay and McGowan concentrates).

Most of the manganese present remains in the metal. If basic pig iron is to be made, it should contain 4 to 6 per cent manganese and, therefore, some manganese obtained from another ore-source may have to be added.

Most of the chromium goes into the metal and thus yields a special pig iron. Nickel does the same, but its significance in foundry iron has not been studied. This involves such ores as the Cle Elum ores, but in the case of the Cle Elum ore the unusually big slag volume is likely to make the smelting cost too high, to which can be added a high mining and trucking cost.

Using the pyrite residue was mapped most skillfully. The plan was to build the electric furnace in Bellingham, Wash., financed by a few men now in the pulp and paper industry aided by an RFC loan. That association of men was intended to assure sale of the sulphur dioxide. The economics of it point definitely to the need of selling the dioxide gas. Several versions have been given why the plan did not go into effect; important to know now is only the fact that the sulphur-dioxide gas was not sold and that the WPB gave no priorities on the steel plant requirements.

OSWEGO FURNACE

This old stone stack, which made the first iron on the Pacific Coast, was located 8 miles north of Portland, Oreg., in Clackamas county. It was owned by the Oregon Iron Co. and used limonite ore. It began operations Aug. 24, 1867, making 6 tons of iron a day. This stack was 32 feet high, 34 feet square at base, 26 feet square at top and had a hearth diameter of 10 feet. The furnace cost $126,000. About 2½ tons of ore were required per ton of pig. Iron sold at $25 and $30 a ton.

Available ores for this type of furnace must be mixed to dilute high phosphorus, or to raise the iron content, or to raise the manganese, and to improve the structure, all of which necessitates having several deposits of ore on tap at all times.

Sponge Iron Is Considered

Still another plan proposed for the reduction of Northwest ores involves first making a sponge iron of ores by the indirect methods. A vertical cylindrical furnace like a Herreschoff roasting furnace is used. To reduce the ore in it a blau-gas is made; or, if available, a furnace gas rich in carbon monoxide is purchased. The gas is circulated counter-current in the reduction furnace, which is said to operate at a low temperature. Low-temperature is emphasized. At a temperature of 500 degrees Cent. the Minnesota Experiment Station has made magnetic oxides from nonmagnetic oxides.

At a temperature of 900 degrees Cent., so it is known generally, the metallic mineral of the ore still does not melt but gives up all its oxygen (to the carbon-monoxide gas) and leaves the metal enveloped in the sponge-like but unchanged associated gangue minerals. In this way the ore may be said to have been beneficiated by a thermal process. The iron content is raised a little, and, next, by subjecting the ground sponge to magnetic separation, the gangue can be lessed and the iron content can be raised to 90 per cent. It is necessary to briquette this concentrate, and by the proposed continuous method is produced a pressed slab which is metallic in appearance.

Claim is made that at the low temperature of about 700 to 730 degrees Cent. the metal can also be formed, and that it does not then absorb any of the impurities in the ore. It does not seem that it could give up any impurities either, although it is claimed that phosphorus is lost to the gangue and takes iron with it. It may do so under special conditions, but probably not always. Ores having arsenic, copper, lead or zinc, are not desired; those containing chromium, nickel and titanium are looked upon with disfavor. These exceptions put the Alaskan, Cle Elum, Coos Bay and McGowan properties on the undesirable list. For physical reasons the Scappoose ores are barred.

How Material Is Used

Briquettes become the melting stock for use in an electric furnace, the pig iron product of which is to be refined in three small electric furnaces. To the briquettes must be added lumpy ores to supply the gangue needed to produce the required slag volume to operate the furnaces properly and purify the pig metal successfully. For this step, it is said, ores low in phosphorus, sulphur and copper must be used. That restricts the application of several ores previously listed.

The engineer back of the project feels that it is not safe to make only pig iron. He advocates making tool steel because it has a preferred market at all times and brings a better price, insuring a profit in almost any year. We may grant that smelting in an electric furnace yields pig iron, but it has been proved by others that it can be decarburized in another pot and refined to high-quality steel. Claim is made by that same engineer that the composition of the briquettes can be controlled and that they may be used in the market to compete with high-quality scrap steel, which is a matter he regards highly. Further proposal includes mixing electric furnace pig iron with low-phosphorus scrap and briquettes for use in an electric refining furnace to make high-quality steel.

For the blau-gas to be used in the treatment oven, he proposed to use a unit which the Tacoma Gas Co. will discard when it buys coke oven gas from the new coking plant of Wilkeson Products Co., situated on the Tacoma flats. The new unit comprises a battery of 17 Curran-Knowles ovens designed for an

annual coking capacity of 75,000 tons. Output of the ovens will be taken by the various manufacturers of light metals and ferroalloys in the state of Washington.

Scappoose ore originally was used in tests but for physical reasons it since has been eliminated. Cle Elum ores are regarded as undesirable until at some later date when a plant is in operation. Pyrite residue is highly regarded, but it is out of consideration until arrangements first can be made to sell the sulphur gas. This residue being a rich ore, it is stated, would require additions of poorer ores to provide adequate slag volume; but let it be noted that such additional ores that are prescribed must be free of phosphorus, sulphur and copper (which bars not only Scappoose and Alaskan ores but even some of the Washington ores).

Later the idea was conceived of combining the major objective just described with T/H furnace. That flow sheet outlines as follows:

Converted Into Sponge Iron

Begin with using the rich pyrite-residue and convert it in the patented oven to sponge iron, at the rate of 100 tons per day. In an electric smelting furnace it is proposed to use ore plus briquettes and make 100 tons of pig iron. Ores advocated for this dilution step are the Chelan county low-iron high-silica ores. A mixture of 80 per cent briquettes and 20 per cent of this pig iron serves as the charge for a 10 or 15-ton electric refining furnace, making the high-quality steel desired, and using the left-over pig iron for selling to foundries or open-hearth plants.

First weakness of this plan is that it begins with a product (residue) that is not now available and is dependent on selling a gas.

Next the residue is calculated to be purchased at $1.50 per ton when others set it up at $4. Finally, it includes using the Chelan county ore, which is typical Cle Elum ore but highly siliceous and of a kind which previously had been ruled out for chemical reasons (chromium and nickel contents).

The foregoing shows the changes in views by experts as their knowledge about the available ores became extended. It shows an increasing raw materials problem, an increasing complexity of process, and with each new scheme an expansion of plant facilities is involved.

After grasping the full import of the fundamentals of the plan an attempt was made to fit the northeastern ores into the setup. In the so-called Neutral-Aztec property (Magnetic Mine) in Okanogan county, is a big tonnage of magnetite with a high-iron content, a low-phosphorus content and presumably a possibly suitable sulphur-copper content. Some brown ores occur not far away. In a T/H furnace a nominal content of sulphur in the ore would be inconsequential. Proximity to the Coulee dam power-line and the possibility of future river-transportation for the ore to the dam, are important factors to heed. Coke required could perhaps be purchased from the Tacoma plant or the Canadian ovens at Michel. Limestone is abundant locally. These things suggest that smelting ore in eastern Washington (if not shipping the ore westward to Tacoma) is deserving of careful appraisal.

The metal products would be the same as have been mentioned. The Spokane area has not many foundries to absorb all the pig iron, nor does it need the tool steels that could be made; wherefore the metal products, so it seems at this moment, would have to be shipped to the Puget Sound region.

The reserve tonnage of Cle Elum ores is adequate, but the cost to mine is high. When crushed to 8 mesh the physical structure is good for a melting product. The ores cannot be beneficiated to lower their exceptionally high contents of silica plus alumina. One metallurgist did not regard the ores difficult to smelt but granted that cost would rise due to large gangue-content and consequent slag volume; and he believed that the chromium and nickel in the ore would remain partly in the metal and yield a special pig iron,—for which a market, however, would have to be developed.

Another authority regarded Cle Elum village as a favorable site because there it would enable buying the required coal (Roslyn coal) at the lowest cost. He thought it might be advisable to smelt even the Okanogan ores at Cle Elum rather than do it near Spokane.

So little reliable data are available for those northwest Washington iron ores that they could not have been given the metallurgical appraisal they deserve for a contemplated steel industry. Neither have their economic values been calculated. Other iron ores in the state seem to have been so tested, and every one has been found enmeshed in some unfavorable if not impracticable conditions. Attention and thought should be given to this, the biggest reserve of the best ores the state possesses. It may be that the economics in using these northeast ores may yet prove to be unfavorable; but if they are, that fact should be ascertained and disclosed.

Tacoma Good Location

If a new industry is to be started in the Puget Sound region, according to Mr. Zapffe, the advantage of having coke and gas nearby necessarily favors a plant site on the Tacoma flats. That area is also a good location as to marketing as well as an assembly point for many raw materials. If one single ore comes nearest to fulfilling requirements, it is clearly the pyrite residue. However, if the owners of the deposit cannot make certain the sale of the sulphur gas, this deposit is not likely to play a major role for a long time. The whole problem is variable and it is intricate to master, the more so because several ores must be produced simultaneously. Producing ores at the same time in several localities has not been fully considered in its practical and its economical aspects; ore has ever been presented merely as "available deposits."

Much may yet be heard about the ores in northwestern Washington. If so, it will be because they are very low in phosphorus; and being magnetite, it suggests that treatment process is solved in advance.

(This article is sixth of a series. The seventh will appear next week.)

MAGNETIC MINE

This ore mine in Okanogan county, Wash., is a quarry. At floor level a cross-cut opening may be seen going into hillside, and in so doing, it penetrates about 50 feet of garnet and epidote interspersed with gobs of magnesite, which would need magnetic concentration. In 1942 the mine was commandeered and made to ship 12,000 tons to the Pacific Coast for use as ballast in Kaiser's ships; weight was wanted and the only specification was 200 pound per cubic foot

Output Ceiling Imminent Though Indicators Rise

ALTHOUGH overshadowed by a manpower shortage so critical it may be the key factor in preventing further increases in war goods output, industry and business again posted higher figures for the latest weekly period. Steel ingot output rose a half point; bituminous coal production, automobile and truck output, and revenue freight carloadings all attained higher levels. Petroleum production again raised its weekly figure.

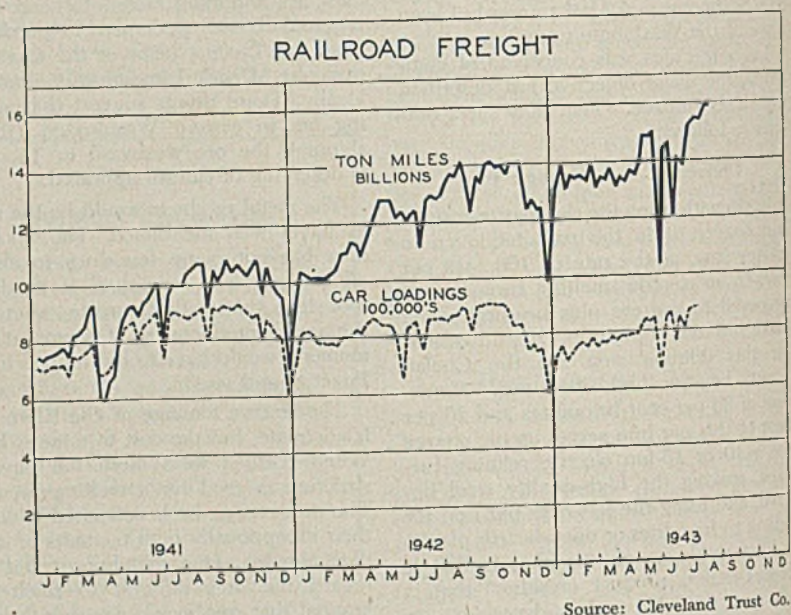
MANPOWER—With 2,000,000 additional war workers needed by next summer, and output of West Coast aircraft plants already curtailed by labor scarcity, various projects have been undertaken to channel men and women into plane factories most handicapped by shortage of help. The "Buffalo plan" of centralized hiring is being established in the principal Pacific Coast cities; draft deferments for aircraft workers in that area have been extended; the Boeing plant's starting wage has been substantially increased. Deferments are also being sought for workers in eastern plane plants, to forestall a similar shortage.

RAILROAD FREIGHT—In spite of heavy schedules, worn equipment, and depleted operating forces, the railroads have increased their capacity sufficiently to load and haul the growing volume of war freight without critical delay. If rail lines reach their saturation point during the seasonal peak period this fall, delivery of some war materiel may be seriously restricted later this year.

The accompanying chart shows that the number of railroad carloadings remained at a fairly constant level during the past 2½ years. The solid line, representing ton miles in billions, reflects heavier carloading and increasingly lengthened hauls. Average haul for a ton of freight in 1941 was about 387 miles; in 1942 it was approximately 450 miles, and this year the average has risen to about 475 miles.

Only in recent weeks has appeared first evidence that American railroads might be approaching maximum freight capacity. During August, cars of export freight (except coal and grain) handled through U. S. ports set a record of 135,622, or 60 per cent more cars than for the same month in 1942. The Eastern Railroads Operating Committee reports rail lines handling through the port of New York an all-time record load of export freight, 50 per cent higher than for 1942, with freight traffic moving freely. The recent series of main-line wrecks, attributed to inadequate manpower, excessively used rolling stock, and the strain of unduly heavy schedules, is the first warning that the railroads' operating pace may have hit ceiling.

STEEL PRODUCTION AND SHIPMENTS—Output of both pig iron and steel ingots dropped in June as a result of the coal strike, but recovered the following month, and the August ingot figure is second only to that of March for the year. Plate output increased in July, but slipped somewhat for August. Finished steel shipments for August showed a substantial increase.



Source: Cleveland Trust Co.

STEEL EMPLOYMENT—Steel company payrolls in July rose to the highest level attained in this war, primarily as a result of longer hours at overtime rates. Number of employes, which had been dropping consistently, for July hit a wartime low of 627,000.

FIGURES THIS WEEK

INDUSTRY	Latest Period*	Prior Week	Month Ago	Year Ago
Steel Ingot Output (per cent of capacity)	99.5	99.0	98.0	98.0
Electric Power Distributed (million kilowatt hours)	4,229	4,350	4,227	3,673
Bituminous Coal Production (daily av.—1000 tons)	2,015	2,013	1,983	1,908
Petroleum Production (daily av.—1000 bbls.)	4,353	4,235	4,133	3,902
Construction Volume (ENR—unit $1,000,000)	$36.6	$61.6	$41.2	$97.3
Automobile and Truck Output (Ward's—number units)	18,860	15,350	19,900	19,605

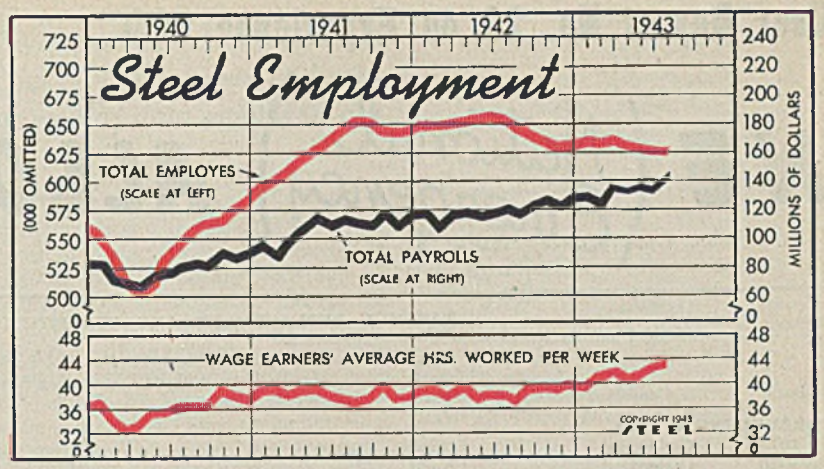
* Dates on request.

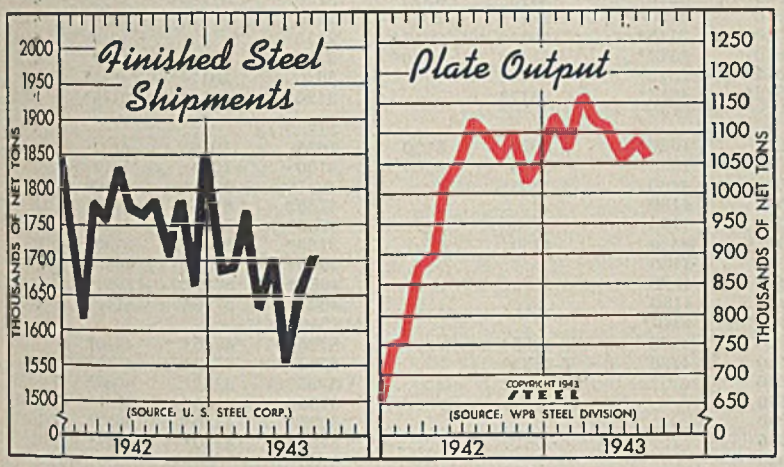
TRADE				
Freight Carloadings (unit—1000 cars)	901†	897	886	888
Business Failures (Dun & Bradstreet, number)	24	26	48	120
Money in Circulation (in millions of dollars)‡	$18,740	$18,571	$17,799	$13,389
Department Store Sales (change from like week a year ago)‡	+1%	+14%	+11%	−13%

† Preliminary. ‡Federal Reserve Board.

Steel Employment

	Employes—Number (000 omitted)		Total Payrolls (Unit—$1,000,000)	
	1943	1942	1943	1942
Jan.	637	651	129.7	118.8
Feb.	635	651	122.8	108.5
Mar.	637	653	136.8	117.0
Apr.	634	654	133.3	118.5
May	632	656	137.4	117.4
June	631	659	136.2	118.0
July	627	655	142.8	120.7
Aug.	...	647	.....	118.7
Sept.	...	641	.....	124.8
Oct.	...	635	.....	126.6
Nov.	...	632	.....	122.8
Dec.	...	633	.....	129.3





Steel Shipments†—Plate Production‡

(Unit 1000 Net Tons)

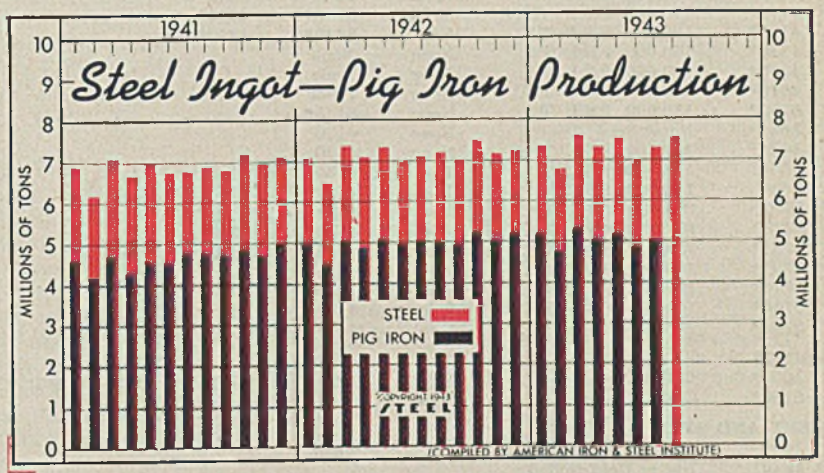
	Shipments		Plate Output	
	1943	1942	1943	1942
Jan.	1685.9	1738.9	1135.4	754.5
Feb.	1691.6	1616.6	1072.0	758.7
Mar.	1772.4	1780.9	1167.7	878.7
Apr.	1630.8	1758.9	1121.0	895.9
May	1706.5	1834.1	1114.9	1012.2
June	1552.7	1774.1	1059.3	1050.9
July	1661.0	1765.7	1089.0	1124.1
Aug.	1704.5	1788.6	1061.0	1097.9
Sept.	.....	1703.6	.....	1061.8
Oct.	.....	1787.5	.....	1101.4
Nov.	.....	1665.5	.....	1013.6
Dec.	.....	1849.6	.....	1060.0
Total	.....	21,064.2	.....	11,809.7

†U. S. Steel Corp. ‡War Production Board

Iron, Steel Production

(Net tons—000 omitted)

	Steel Ingots		Pig Iron	
	1943	1942	1943	1942
Jan.	7,424	7,112	5,194	4,983
Feb.	6,826	6,512	4,766	4,500
Mar.	7,670	7,392	5,314	5,055
Apr.	7,374	7,122	5,035	4,896
May	7,545	7,382	5,173	5,073
June	7,027	7,022	4,836	4,935
July	7,376	7,148	5,023	5,051
Aug.	7,562	7,233	.....	5,009
Sept.	.....	7,067	.....	4,937
Oct.	.....	7,584	.....	5,236
Nov.	.....	7,184	.....	5,083
Dec.	.....	7,303	.....	5,201
Total	.....	86,061	.....	59,959



FINANCE

	Latest Period*	Prior Week	Month Ago	Year Ago
Bank Clearings (Dun & Bradstreet—billions)	$6,552	$7,740	$7,936	$5,075
Federal Gross Debt (billions)	$148.3	$148.0	$144.8	$86.2
Bond Volume, NYSE (millions)	$29.2	$30.4	$70.1	$51.0
Stocks Sales, NYSE (thousands)	3,292	2,579	8,162	1,599
Loans and Investments (millions)†	$46,739	$46,719	$46,612	$34,457
United States Government Obligations Held (millions)†	$34,100	$34,209	$32,510	$20,580

† Member banks, Federal Reserve System.

PRICES

STEEL's composite finished steel price average	$56.73	$56.73	$56.73	$56.73
Spot Commodity Index (Moody's, 15 items)†	247.5	246.8	243.8	231.7
Industrial Raw Materials (Bureau of Labor index)‡	112.3	112.8	113.3	101.2
Manufactured Products (Bureau of Labor index)‡	100.0	100.0	99.8	99.2

† 1931 = 100; Friday series. ‡ 1926 = 100.

User Report No. 20 on Experience with

NE (National Emergency) ALLOY STEELS

TABLE I—REPLACEMENT AND SUBSTITUTION CHART

Specified on Drawing: Basic	Condition of Steel	Max. Thickness of Section	Replacements—Listed in Order of Preference May Be Used Without Engineering Approval. First	Second	Third	Fourth	Substitutions—Listed in Order of Preference, Engineering Approval Must Be Obtained Before Use. First	Second	Third	Fourth
CARBURIZING STEELS										
1015	Carburized	None	1020	.....	8620	4615*	2115*	3115*	3120*	4620*
1020	Carburized	None	.....	.....	8620	4615*	4620*	3115*	3120*	1015
2317 2315)*	Carburized	None	8620	3312*	2515*	4815*	3120*	3115*	2115*	4615*
3115*	Carburized	None	8620	3120*	2317*	2515*	2115*	.....	1020	4615*
3120*	Carburized	None	8620	3115*	2515*	2317*	2115*	.....	1020	4615*
4615*	Carburized	None	8620	2317*	3115*	3120*	2115*	.....	1020	4620*
4620*	Carburized	None	3312*	2515*	4815*	.....	8620	2317*	4615*	.
8620	Carburized	None	3312*	4815*	2317*	.....	3120*	3115*	2115*	1020
BAR, ROD AND FORGINGS										
1020	As Rolled (CR or CD)	None	1025	1035*	8620	8630	1015	1010	4130	....
1025	55 000 P.S I. T.S.	None	1020	1035*	8620	8630	4130	1015	1010	....
1035*	100 000 P.S.I. T.S.	1 in.	8630	4130	T-1335*	.....	4037*	8735*	2330*	....
T-1335*	125.000 P.S.I. T.S.	1 in.	8630	4130	.....	.....	8735*	8740*	4140*	....
T-1335*	150 000 P.S.I. T.S.	1 in.	8630	4130	.....	.....	8735*	8740*	4140*	....
2330*	Normalized	None	4037*	8630	4130	.....	3130*	8735*	8740*	....
2330*	100 000 P.S I. T.S.	1 in.	8630	4130	.....	.....	1035*	T-1335*	4037*	8735*
2330*	125.000 P.S.I. T.S.	1 in.	8630	4130	.....	.....	4037*	8735*	8740*	4140*
2330*	150 000 P.S.I. T.S.	1 in.	8630	4130	.....	.....	4037*	8735*	8740*	4140*
3250*	150,000 P.S.I. T.S.	None	3245*	4340*	.....	.....	3240*	.....	.....	....
4037*	125.000 P.S I. T.S.	¾ in.	8630	4130	T-1335*	.....	8735*	8740*	4140*	....
4037*	150,000 P.S.I. T.S.	¾ in.	8630	4130	T-1335*	.....	8735*	8740*	4140*	....
4130	Normalized	None	8630	.....	.....	.....	8735*	4140*	4037*	T-1335*
4130	100,000 P.S.I. T.S.	None	8630	.....	.....	.....	8735*	4140*	4037*	T-1335*
4130	125 000 P.S.I. T.S.	1 in.	8630	.....	.....	.....	8735*	4140*	4037*	T-1335*
4130	150.000 P.S.I. T.S.	1 in.	8630	.....	.....	.....	8735*	4140*	4037*	...
4130	180 000 P.S.I. T.S.	¾ in.	8630	.....	.....	.....	8735*	.....	.....	....
4140*	125.000 P.S.I. T.S.	1½ in.	8740*	4340*	.....	.....	3140*	.....	.....	....
4140*	150 000 P.S.I. T.S.	1½ in.	8740*	4340*	.....	.....	3140*	.....	.....	....
4140*	180 000 P.S.I. T.S.	1½ in.	8740*	4340*	.....	.....	3140*	.....	.....	....
4340*	150 000 P.S.I. T.S.	None	None	.....	.....	.....	4140*	8740*	4130	....
4340*	180 000 P.S.I. T.S.	None	None	.....	.....	.....	8740*	4130	.....	....
4340*	200 000 P.S.I. T.S.	None	None	.....	.....	.....	None	.....	.....	....
6150*	180 000 P.S.I. T.S.	None	6145*	.....	.....	.....	4340*	.....	.....	....
8630	Normalized	None	4130	.....	.....	.....	8735*	4140*	4037*	T-1335*
8630	100 000 P.S I. T.S.	None	4130	.....	.....	.....	8735*	4140*	4037*	T-1335*
8630	125 000 P.S I. T.S.	1 in.	4130	.....	.....	.....	8735*	4140*	4037*	T-1335*
8630	150 000 P.S.I. T.S.	1 in.	4130	.....	.....	.....	8735*	4140*	4037*	T-8735*
8630	180.000 P.S.I. T.S.	¾ in.	4130	.....	.....	.....	8735*	.....	.....	....
8735*	125 000 P S I. T.S.	1½ in.	4140*	4340*	.....	.....	None	.....	.....	....
8735*	150.000 P.S.I. T.S.	1¼ in.	4140*	4340*	.....	.....	None	.....	.....	....
8735*	180 000 P.S I. T.S.	1¼ in.	4340*	.....	.....	.....	None	.....	.....	....
8740*	125,000 P.S I. T.S.	1½ in.	4140*	4340*	.....	.....	None	.....	.....	....
8740*	150 000 P.S I. T.S.	1½ in.	4140*	4340*	.....	.....	None	.....	.....	....
8740*	180,000 P.S.I. T.S.	1½ in.	4340*	....	.....	.....	None	.....	.....	....
SPRINGS										
1045*	C40-45	⅛ in.	1090*	1085*	1066* (X1065)	....	.....	.....	.....	....
6150*	C40-45	None	6145*	.....	.....	.....	1095*	music wire	.....	....
SHEET AND STRIP										
1010	For Deep Drawing	.....	None	...	.....	.....	None	.....	.....	....
1020	Hot or Cold Rolled 50.000 P.S.I. T.S.	.....	1025	8630	4130	....	1015	1010	.....	....
4130	Annealed	.....	8630	.....	.....	.....	8735*	1025	1020	....
4130	Normalized	.....	8630	.....	.....	.....	8735*	1025	1020	....
4130	125.000 P.S.I. T.S.	.....	8630	.....	.....	.....	8735*	.....	.....	....
4130	150,000 P.S.I. T.S.	.....	8630	.....	.....	.....	8735*	.....	.....	....
4130	180 000 P.S.I. T.S.	.....	8630	.....	.....	.....	8735*	.....	.....	....
8630	Annea'ed	.....	4130	.....	.....	.....	8735*	1025	1020	....
8630	Normalized	.....	4130	.....	.....	.....	8735*	1025	1020	....
8630	125 000 P.S.I. T.S.	.....	4130	.....	.....	.....	8735*	.....	.....	....
8630	150 000 P.S.I. T.S.	.....	4130	.....	.....	.....	8735*	.....	.....	....
8630	180,000 P.S.I. T.S.	.....	4130	.....	.....	.....	8735*	.....	.....	....
TUBING										
1025	Cold Drawn	.....	8630	4130	.....	.....	8735*	.....	.....	....
4130	Normalized	.....	8630	.....	.....	.....	8735*	1025	.....	....
4130	125,000 P.S.I. T.S.	.....	8630	.....	.....	.....	8735*	.....	.....	....
4130	150 000 P.S.I. T.S.	.....	8630	.....	.....	.....	8735*	.....	.....	....
4130	180.000 P.S.I. T.S.	.....	8630	.....	.....	.....	8735*	.....	.....	....
8630	Normalized	.....	4130	.....	.....	.....	8735*	1025	.....	....
8630	125.000 P.S.I. T.S.	.....	4130	.....	.....	.....	8735*	.....	.....	....
8630	150.000 P.S.I. T.S.	.....	4130	.....	.....	.....	8735*	.....	.....	....
8630	180,000 P.S.I. T.S.	.....	4130	.....	.....	.....	8735*	.....	.....	....

*Steels so marked must not be welded.

Aircraft manufacturer develops systematic replacement and substitution scheme by standardizing on replacement and substitute steels. Details of scheme as well as data employed are presented here

By W. J. PIERCE
Materials Design Engineer
Glenn L. Martin Co.
Baltimore

HEREIN is result of an endeavor to outline experience and the procedure followed at Glenn L. Martin Co. when replacing basic steels with the newer NE (National Emergency) steels.

When the conservation program for alloy steels was placed before us the first question that arose was how were we going to cope with this situation when we had so many drawings affected. It would be an everlasting program of changing if we attempted to change all the drawings. Therefore, after much deliberation we compiled a "Steel Replacement & Substitution Chart" which could be used by all of our subcontractors as well as our own manufacturing departments. This chart was approved and signed by all personnel responsible for material, including the Army and the Navy.

Avoids Drawing Changes

"The Steel Replacement & Substitution Chart" is almost identical with Table I here. Note it is comprised of three columns, namely: "basic steels", "replacement steels" and "substitute steels".

The basic steels are the specified steels that appear on the drawings, steels that were considered standard up to this time.

The replacement steels are those that can be used interchangeably with the basic steels without further checking.

The substitute steels are those that may be used to replace the basic steels after they have been approved by our Materials Control Group for the function or purpose intended.

Appearing under both the replacement and substitution columns are anywhere from one to four steels that may be used under the conditions mentioned above.

In Table II is a list of specifications for all steels necessary for procurement purposes. Here also is noted recommendation as to whether or not the steel can be welded satisfactorily.

Since heat treatment of the replacement and substitute steels listed in Table I requires a different process, Table III is included to give the processing details that must be followed to heat treat the replacement or substitute steel to the condition where it can satisfactorily replace the basic steel.

We have used steel in the NE-9000 series in a number of places as substitutions only. These steels must have special approval of the Materials Control Group and the customer, as this series has not as yet been approved by the Material Section at Wright Field. We have used this series for such applications as listed in Table V and found them to be quite satisfactory.

The NE-8620 and NE-8630 steels have been approved by the Material Section of the Army which has specifications covering these materials.

NE-8620 steel is used as a carburizing steel and has been successfully used in replacing such steels as SAE-2315, 3115, 3120 and 4615 for such applications as

(*Please turn to Page* 134)

TABLE II—SPECIFICATIONS

Steel	Welding	Specifications
BAR, ROD AND WIRE		
1015	Yes	A 57-107 N 46S32
1020	Yes	AN-QQ-S-646
1025	Yes	AN-QQ-S-646
1035	Do Not Weld	AN-S-4
1066 (X1065)	Do Not Weld	QQ-S-671
1085	Do Not Weld	A 57-107
1090	Do Not Weld	A 57-107
1095	Do Not Weld	AN-S-5(BAR) AN-QQ-W-441 (WIRE)
T-1335	Do Not Weld	A 57-107 N QQ-S-671
2115	Do Not Weld	.....
2317 (2315)	Do Not Weld	A 57-107
2330	Do Not Weld	AN-QQ-S-689
2515	Do Not Weld	QQ-S-671
3115	Do Not Weld	A 57-107 N 46S32
3120	Do Not Weld	A 57-107-26
3130	Do Not Weld	F QQ-S-671
3135	Do Not Weld	A 57-107
3140	Do Not Weld	AN-QQ-S-690
3240	Do Not Weld	A 57-107-4
3250	Do Not Weld	A 57-107-6
3312	Do Not Weld	A 57-107-22
4037	Do Not Weld	AN-S-9
4130	Yes	AN-QQ-S-684
4140	Do Not Weld	AN-QQ-S-752
4340	Do Not Weld	AN-QQ-S-756
4615	Do Not Weld	A 10240 N 46S32
4620	Do Not Weld	F QQ-S-671
4815	Do Not Weld	A 57-107 D
6145	Do Not Weld	.....
6150	Do Not Weld	AN-QQ-S-687
8620	Yes	AN-S-13
8630	Yes	AN-S-14
8735	Do Not Weld	AN-S-15
8740	Do Not Weld	AN-S-16
SHEET AND STRIP		
1010	Yes	QQ-S-636, Deep Drawing Quality
1015	Yes	.....
1020	Yes	QQ-S-636
4130	Yes	AN-QQ-S-685
8630	Yes	AN-S-12
8735	Do Not Weld	AN-S-22
TUBING		
1025	Yes	AN-WW-T-846 (Seamless) AN-T-4 (Welded)
4130	Yes	AN-WW-T-850 (Seamless) AN-T-3 (Welded)
8630	Yes	AN-T-15 (Seamless)
8735	Do Not Weld	AN-T-22 Seamless

TABLE III—STANDARD PROCESSES INDEXED BY STEEL INVOLVED

Steel	Condition Desired	Standard Process
1015	Carburized	60
1020	Carburized	60
1035*	Tempered	109
1066* (X1065)	Tempered to Rockwell "C" 40-45	100
1085*	Tempered to Rockwell "C" 40-45	101
1090*	Tempered to C 40-45	102
1095*	Tempered to C 40-45	20
T-1335*	Tempered to T.S. 100,000 P.S.I.	104
	Tempered to T.S. 125,000 P.S.I.	105
	Tempered to T.S. 150,000 P.S.I.	90
2115*	Carburized	106
2317* (2315)	Carburized	61
2515*	Carburized	110
2330*	Normalized	7
	Tempered to T.S. 100,000 P.S.I.	10
	Tempered to T.S. 125,000 P.S.I.	11
	Tempered to T.S. 150,000 P.S.I.	12
	Temper, Drop Forged T.S. 125,000 P.S.I.	13
3115*	Carburized	63
3120*	Carburized	63
3130*	Tempered to T.S. 100,000 P.S.I.	108
	Tempered to T.S. 125,000 P.S.I.	35
	Tempered to T.S. 150,000 P.S.I.	36
3135*	Tempered to T.S. 100,000 P.S.I.	112
	Tempered to T.S. 125,000 P.S.I.	37
	Tempered to T.S. 150,000 P.S.I.	38
3140*	Tempered to T.S. 125,000 P.S.I.	39
	Tempered to T.S. 150,000 P.S.I.	40
	Tempered to T.S. 180,000 P.S.I.	113
3240*	Tempered to T.S. 150,000 P.S.I.	114
3245*	Tempered to T.S. 150,000 P.S.I.	115
3250*	Tempered to T.S. 150,000 P.S.I.	116
3312*	Carburized	117
4037*	Normalized	65
	Tempered to T.S. 100,000 P.S.I.	118
	Tempered to T.S. 125,000 P.S.I.	68
	Tempered to T.S. 150,000 P.S.I.	67
4130	Normalized	14
	Tempered to T.S. 100,000 P.S.I.	17
	Tempered to T.S. 125,000 P.S.I.	18
	Tempered to T.S. 150,000 P.S.I.	19
	Tempered to T.S. 180,000 P.S.I.	22
4140*	Tempered to T.S. 125,000 P.S.I.	45
	Tempered to T.S. 150,000 P.S.I.	46
	Tempered to T.S. 180,000 P.S.I.	47
4340*	Tempered to T.S. 150,000 P.S.I.	41
	Tempered to T.S. 180,000 P.S.I.	42
	Tempered to T.S. 200,000 P.S.I.	119
4615*	Carburized	62
4620*	Carburized	62
4815*	Carburized	120
6135*	Tempered to T.S. 150,000 P.S.I.	26
6140*	Tempered to T.S. 150,000 P.S.I.	25
6145*	Tempered to Rockwell "C" 40-45	121
6150*	Tempered to Rockwell "C" 40-45	23
8630	Normalized	72
	Tempered to T.S. 100,000 P.S.I.	77
	Tempered to T.S. 125,000 P.S.I.	75
	Tempered to T.S. 150,000 P.S.I.	74
	Tempered to T.S. 180,000 P.S.I.	91
8735*	Annealed	99
	Tempered to T.S. 125,000 P.S.I.	93
	Tempered to T.S. 150,000 P.S.I.	94
	Tempered to T.S. 180,000 P.S.I.	95
8740*	Tempered to T.S. 125,000 P.S.I.	81
	Tempered to T.S. 150,000 P.S.I.	80
	Tempered to T.S. 180,000 P.S.I.	92
8620	Carburized	98
	Tempered to T.S. 125,000 P.S.I.	71

*Steels so marked must not be welded.

CONTINUOUS FINISHIN

. . . . facilitates production of steel landing mats

COMBINED OPERATIONS of our armed forces now extend to far-off zones where improvised landing fields must be constructed in a matter of hours, instead of months. It is only through the development of portable steel runways that these feats are possible. Such a runway is made up of steel panels or "planks" which can be laid in position by untrained ground crews or native labor.

Special interlocking lugs and spring wedges make it possible to fasten each section securely into the next to form a smooth continuous runway without the need for special tools of any sort. See STEEL, Aug. 9, p. 112. Because of the open design of the mats, a natural background such as grass, mud or sand is retained. Aiding in natural camouflage, engineers can produce various desired effects, such as creating dummy trees and boulders which are easily and quickly removed.

Although the portable steel landing mat was primarily developed for airport runways, it is also used for seaplane ramps, truck roads and narrow tracks where the load bearing capacity of the earth may be unusually low.

Because a runway 3000 feet long and 150 feet wide can be laid in a day, there is a tremendous demand for these landing mats. This in turn demands that high speed continuous production methods be utilized to supply the needs of our armed forces.

Since Empire Plow Co., Cleveland, previously fabricated various types of formed metal parts which incorporated many punching, extruding and shearing operations, it was logical to select that company as one manufacturer of airport landing mats. After they had been consulted by Army Ordnance and awarded a contract, plant officials immediately directed their engineering department to set up an efficient production system.

In a few short months, production was well under way. Major operations in the manufacture of the landing mats at Empire Plow Co. are beading, punching and extruding, bending, shearing and continuous finishing. This last step includes loading on a continuous conveyor which then carries the work through solvent degreasing, paint dipping, paint baking and cooling. Unloading from the continuous conveyor is then followed by bundling and strapping.

Outstanding features of this high production system include the unique punching and extruding die design, minimum attendant labor, automatic processing on continuous conveyor, and minimum floor area utilized for entire production. The outcome is that Empire Plow has

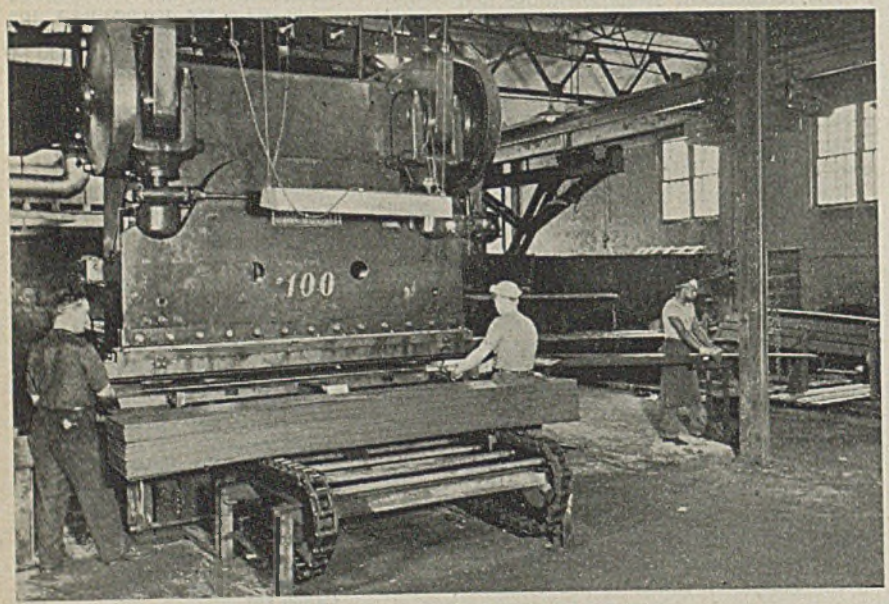
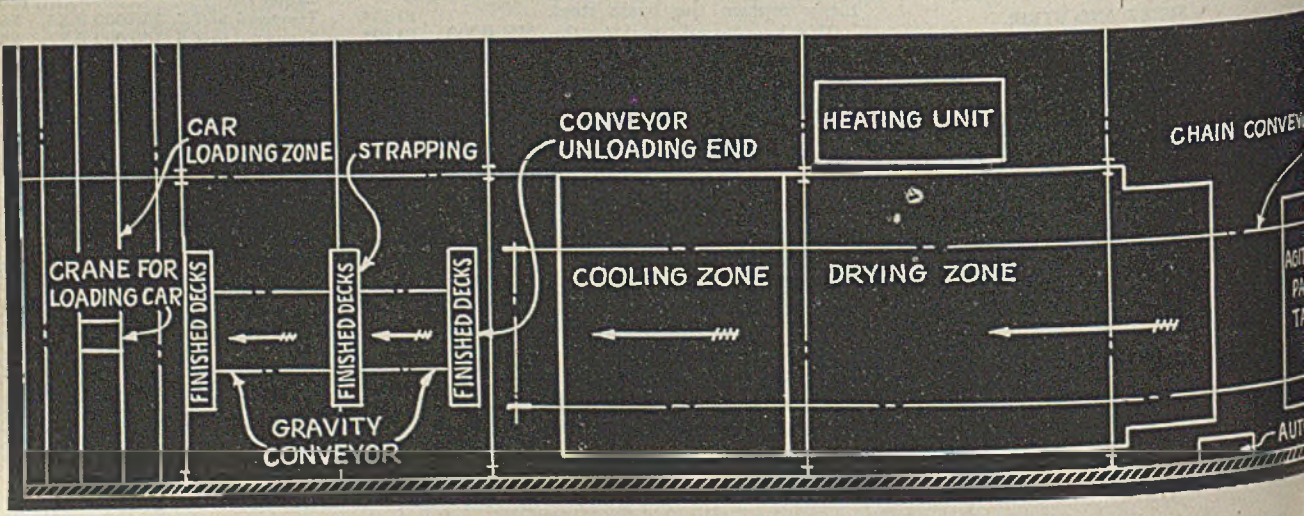


Fig. 1. (Immediate left)—Beading is the first operation, 160 tons being handled in 10 hours in this setup with three men. Operation includes turning mat over after it is beaded in preparation for second step on next machine. Note chain conveyor table feeding press

Fig. 2. (Below)— This diagram shows how the finishing setup is in a compact series of units totaling 120 feet in length, including loading zone. All units are arranged in straight line



SETUP

By W. R. BAXTER
Factory Manager
Empire Plow Co.
And
D. M. WILKINSON
Assistant Chief Engineer
Industrial Oven Engineering Co.
Cleveland

been able to produce more mats per man-hour than other manufacturers.

Beading, (First Operation): Ten-gage steel sheets which are unloaded from a railroad car are transferred directly to a roller conveyor located at a Cincinnati braking press as shown in Fig. 1, by means of an overhead traveling crane. Here the first step, known as the beading operation, is performed by two hits of the press. The beaded sheet is then

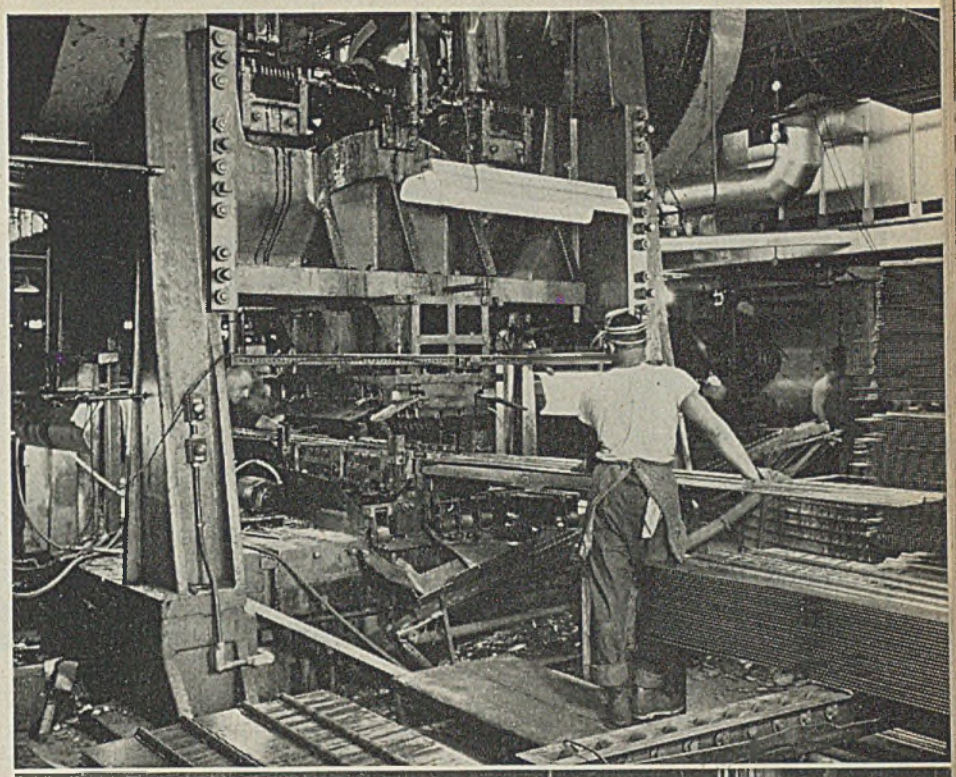


Fig. 3. (Right, above)—Second operation involves punching and extruding. One man feeds press at rate of 200 pieces per hour. Conveyor sections on each side of press dies speed handling. Note rollers in right foreground on which whole stack of sections can be shifted easily

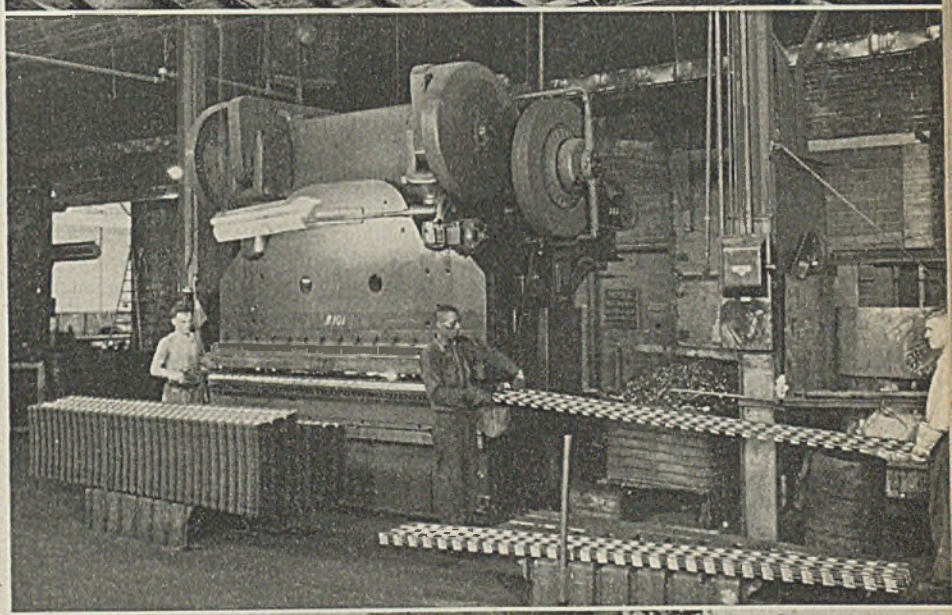
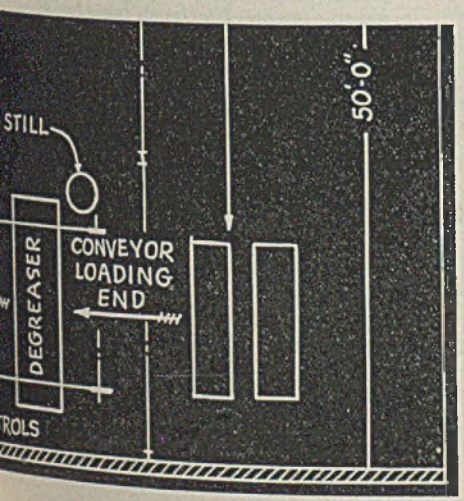
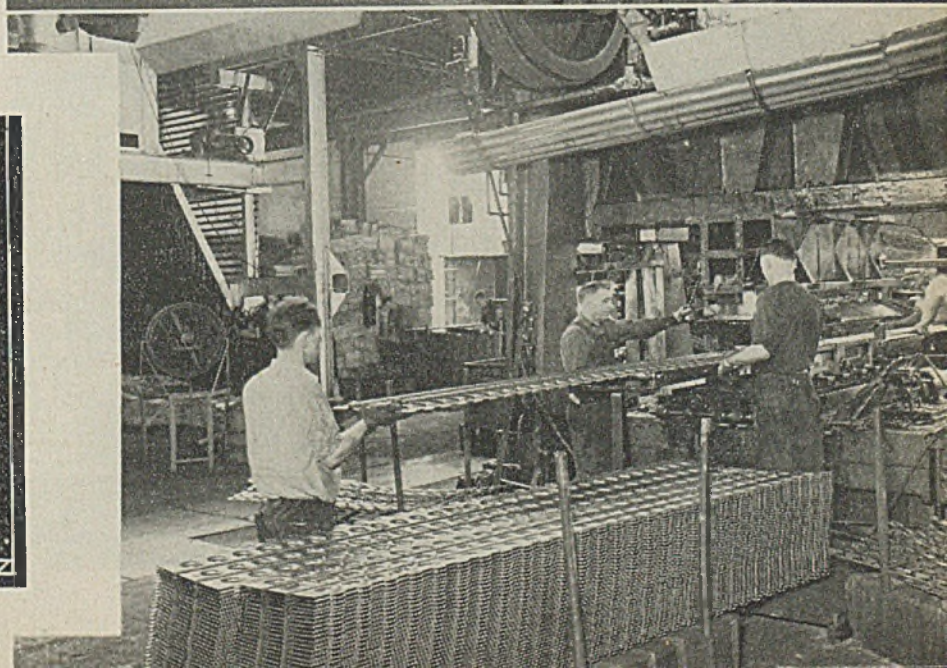


Fig. 4. (Right, center)—Mat is trimmed at both ends, corners trimmed, bayonet hooks bent—all in one stroke of press. Three men are kept busy, two feeding, one pulling out work

Fig. 5. (Right, below)—Work coming from second operation after punching 60 slots, 87 holes, and 60 bayonet hooks, extruding the 87 holes. This is completed in two strokes of press





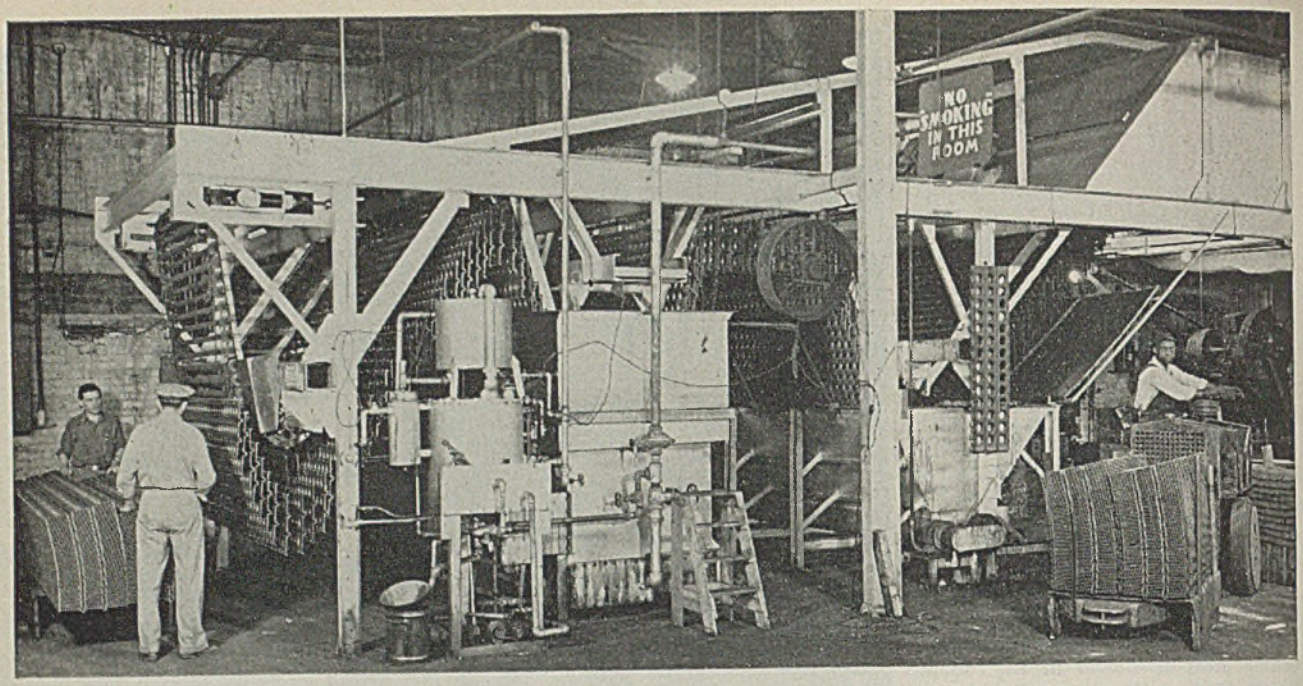


Fig. 6—Loading the conveyor of continuous finishing setup diagrammed in Fig. 2. First dip tank is degreaser, second is paint. Then work goes up to drying oven. Two men load conveyor at rate of 4250 mats in 10 hours

turned over preparatory to the second operation as shown in Figs. 3 and 5. The beading operation requires a complement of three men, and the nominal production for a 10-hour shift is 160 tons of mats.

Punching and Extruding, (Second Operation): The beaded stock is transferred by means of a 5-ton overhead traveling crane to another gravity conveyor located just ahead of the 900-ton Cleveland punch press which performs the punching and extruding operations. The feeder operator, shown in Fig. 3, is holding a sheet in position prior to its entrance into the punching and extruding die. The operation of feeding the press requires one man who handles 200 pieces per hour.

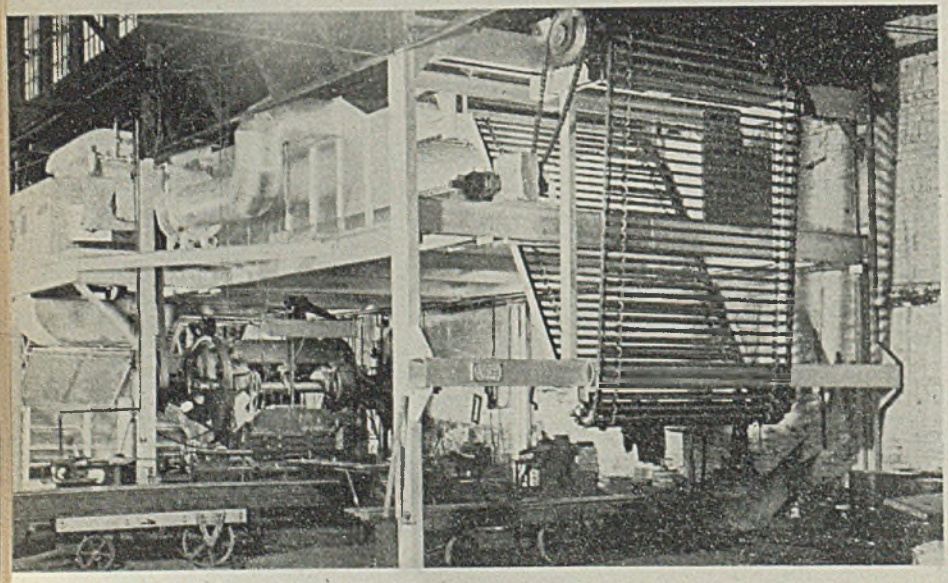
The full complement for the complete operation includes four men. One man feeds the press, a second pulls the sheet through and gages it for the second hit of the press, and finally one machine operator and helper constantly check the dies and remove the scrap strips from the sides.

The complete operation here consists of punching sixty 2½ x ⅜-inch slots, punching sixty 2⅛ x ⅜-inch bayonet hooks, punching eighty-seven 2¼-inch diameter holes, and extruding eighty-seven 2¼-inch diameter holes to 2⅝-inch diameter. All of this is accomplished in two strokes of the 900-ton Cleveland punch press with the press repeating continuously.

A unique system of scrap removal is employed in these operations and is built into the die proper. Small endless belt conveyors can be seen, mounted below the bottom of the die in both Figs. 3 and 5. The slugs from the round holes drop through the bottom die on the three center conveyors. The slot slugs are pressed up into the top die and are discharged on the two outside conveyors. All of the conveyors travel in the same direction and transfer their slugs to a common conveyor at the feeder end of the press. This common conveyor transfers the scrap to a removable 5-ton tote box which is immediately transferred by an industrial truck to a 5-ton overhead crane and dumped into a scrap car.

The unique and rugged die, designed for these punching and extruding operations, has processed well over 2,000,000 feet of landing mat sections without being removed from the bed of the press for maintenance or repairs. This alone is an outstanding record of achievement.

Fig. 7—Continuous finishing setup as seen from unloading end. Gas-fired heater is shown at upper left



Bending and Shearing, (Third Operation): The punched and extruded stock is placed on steel skids and then transferred to a second Cincinnati press brake by means of a gasoline truck. The third operation as shown in Fig. 4 is a combination bending and shearing job performed in one hit of the press. The mats are sheared to the exact length, including trimming all four corners on a radius and bending the bayonets on each side at approximately a 23-degree angle.

Three men are required as shown in Fig. 4, two feeding the press and one discharging the mats on steel skids preparatory to transferring them by means of a gasoline truck to the load position of the continuous processing conveyor.

Continuous Finishing, (Fourth Operation): The continuous finishing system designed and built by the Industrial Oven Engineering Co., Cleveland, is one

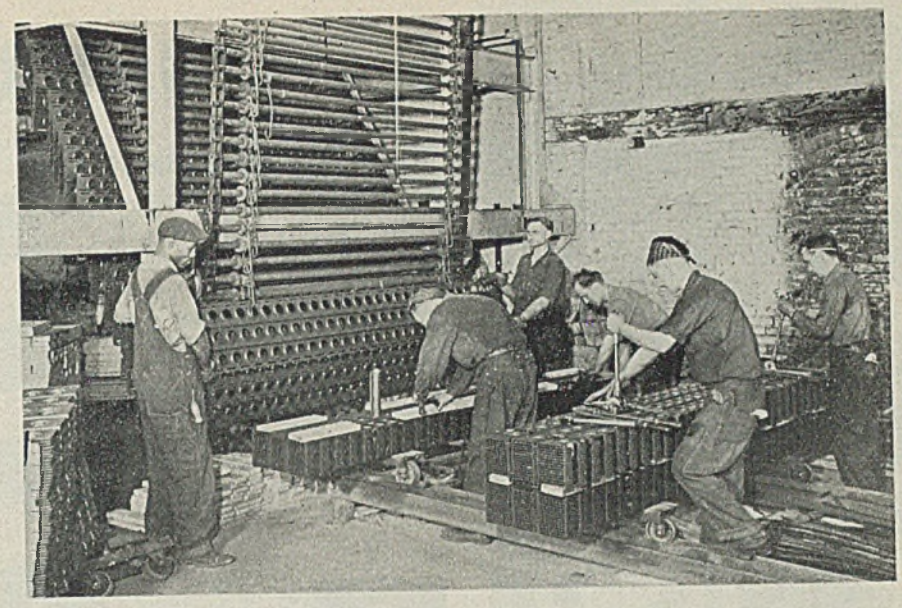


Fig. 8—Unloading, packing 500 tons daily (maximum capacity of line) is no job for "softies". Bundling is done on dollies which ride inclined track to facilitate travel to crane pickup point

of the most outstanding features of the complete production setup. It was designed specifically for the finishing and handling of landing mats as described in this article but its flexibility makes it easily convertible to handle a widely diversified line of products requiring a similar sequence of operations. Naturally, in a conveyorized system of this type, see Figs. 6 and 7, attendant labor is reduced to a minimum. The only work required is that of loading and unloading.

Two men are required to load the conveyor as shown in Fig. 6. The rate of loading is dependent upon the production and this system was originally designed to handle one complete mat every 7 seconds. In event of a decreased production rate, it is only necessary to adjust the conveyor speed accordingly by means of a Reeves Vari-Speed pulley, visible in the upper left hand corner of Fig. 8. This view shows the unloading end of the system.

After the landing mats are hung on the conveyor, they first pass through a solvent degreaser which removes all grease and film, preparing the mat for automatic paint dipping. This degreasing equipment accommodates the maximum capacity of the conveyor.

Paint Tank Specially Equipped

The paint dip tank is of a V-type design with specially constructed agitating blades mounted on a through shaft at the bottom of the tank to provide the necessary turbulence to assure a homogeneous solution. The agitating mechanism is driven by means of a 2-horsepower motor in conjunction with a planetary gear reducer. By controlling the paint conditions, the mats emerge from the dip tank evenly covered, with minimum carry-over to the drain board.

After the freshly dipped mats pass from the dip tank, they pass over the drain board to enter the exhaust zone of the oven. A large-volume exhaust fan located at this point performs three major functions. The primary function of the fan is to exhaust approximately 25 per cent of the oven atmosphere to maintain safe operating conditions within the oven zone. As the hot air is pulled from the main oven zone into the exhaust zone, it passes over the freshly dipped mats and flashes the volatiles from the surface before the mats reach the main or baking zone of the oven. The third function of the exhaust fan is that it effects an efficient air seal at the open entrance end of the oven by pulling air from both the oven and the room.

After being in the exhaust zone for approximately 4 minutes, the mats pass into the baking or high-temperature zone of the oven where the finish is properly baked. The major factors contributing to the excellent finishes produced in the oven are efficient air distribution over the work, temperature uniformity in the baking zone, correct exhaust conditions to maintain proper oven atmosphere, and a low overall temperature gradient between the supply and recirculation temperatures. A self-contained 3,000,000 B.t.u. direct gas-fired heating system mounted on its own structural platform alongside the oven furnishes the heated air. A double width double inlet centrifugal fan located within the insulated heater casing circulates the air.

The air heater is equipped with electronic safety controls, protecting the system against any type of flame, fuel, power or mechanical failure. The fuel input to the heating system is regulated according to the demand of the main temperature recording controller whose actuating bulb is located in the oven zone. Protective controls prevent the system from exceeding safe operating temperatures and also prevent temperature build-up anywhere in the system.

Hot Air Recirculated

The mats progress directly from the baking zone to the cooling zone where room air is inspirated through grill type openings by means of a large volume centrifugal-type cooling fan. The heat pulled from the mats on cooling is used to preheat the primary and secondary combustion air of the heating system. Any excess air can be diverted to the room for space heating. Utilization of this heat readily effects substantial savings and increases the overall efficiency of the system.

Unloading and Packing: After the mats pass through the cooling zone, they are unloaded at the floor level as shown in Fig. 8. Some idea of the efficiency of this continuous finishing setup can be had when it is realized that production capacity is over 500 tons per day.

Two men are required to unload the mats from the oven conveyor. They place the mats on special dollies which ride on an inclined track as shown in Fig. 8. The dollies are equipped with a locating pin which aligns the mats for wiring and strapping.

Due to the multiplicity of operations at the unloading end of the system (which includes sub-bundling, in groups of five mats and wiring at six points, and the final strapping of 30 mats per bundle), a total of six men are required here. After these operations are completed, the mats roll down the gravity conveyor to a position where the crane man picks them up and loads them into a gondola car for shipment.

Arc Welding Studies By Lincoln Foundation

Studies in Arc Welding; simulated leather, 1295 pages, 5¾ x 8¾ inches; 1007 illustrations; published by James F. Lincoln Arc Welding Foundation, Cleveland, for $1.50 in the United States, $2 elsewhere, postpaid.

Covering the period from 1940 to 1942, this volume contains 98 outstanding papers on arc welding submitted by trained technicians and engineers in the James F. Lincoln Arc Welding Foundation's industrial progress award program. The volume represents careful editing of papers on arc welding practice, the work of 113 engineers, designers, works managers, superintendents, executives and other technicians, each applied to a specific design study.

A large amount of authentic arc welding design applications and data, which may be translated into new applications, is included in this collection. Most of the 1007 illustrations are from actual photographs of welding procedures. Each study includes designs, calculations, procedures and other pertinent information showing how advantages attributed to arc welding are obtained.

Many of the studies involve plants now engaged in war production but principles and practices reported in individual studies are also applicable to individual design and manufacture after the war.

STEEL CARTRIDGE CASES

. . . . are made successfully as small as .30-caliber

EVANSVILLE, Ind., Ordnance Plant, operated by Chrysler Corp., Detroit, has been making .30-caliber cartridge cases of steel since last October after a whirlwind program of experiment and testing to develop proper procedure for forming and heat treating the steel cartridge cases in this smaller and much more difficult size.

The difficulty with a steel cartridge case is to produce in it those physical properties necessary to allow it to expand to fit the breech chamber tightly upon firing, yet regain its original shape and dimensions sufficiently after firing to permit the cartridge case to be extracted from the gun easily. To get that required "springiness" was a difficult task to accomplish.

Nevertheless, after receiving word in June, 1942, to change over to steel from brass, the extensive development work with Frankford Arsenal resulted in the

(*Please turn to page* 166)

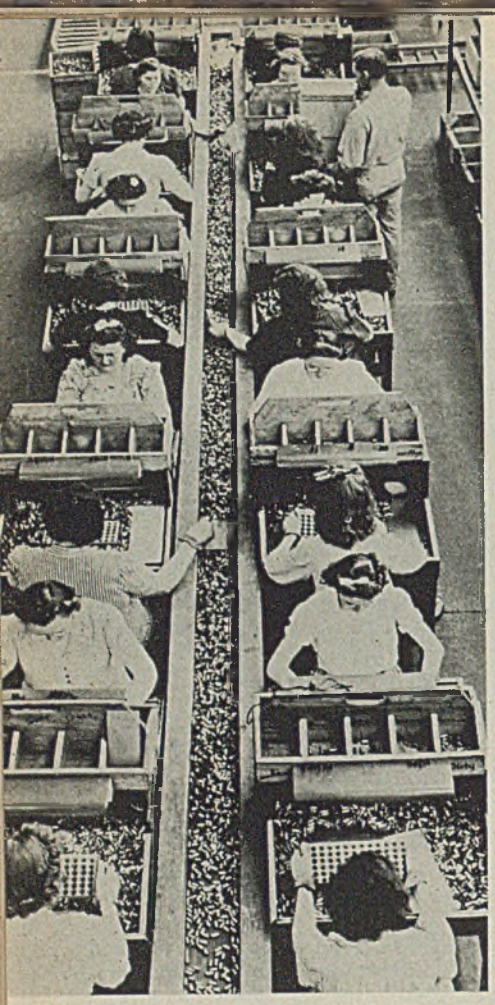
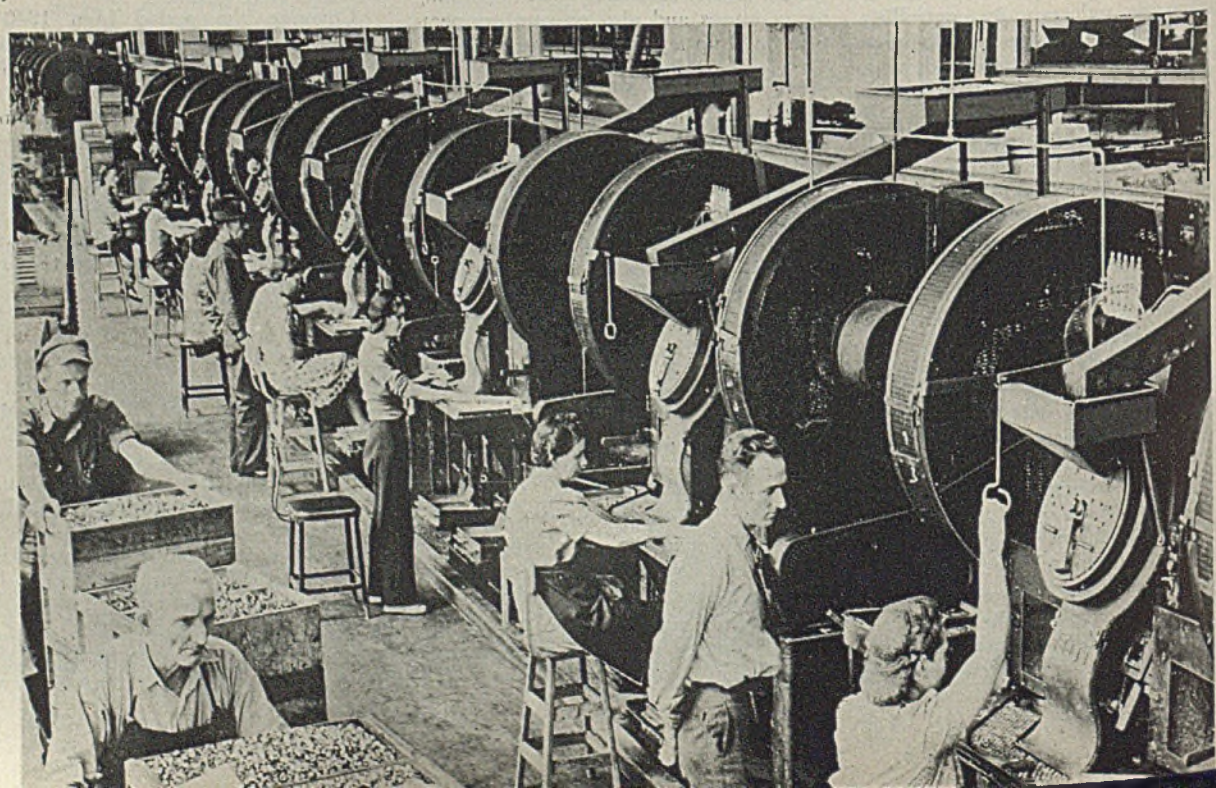
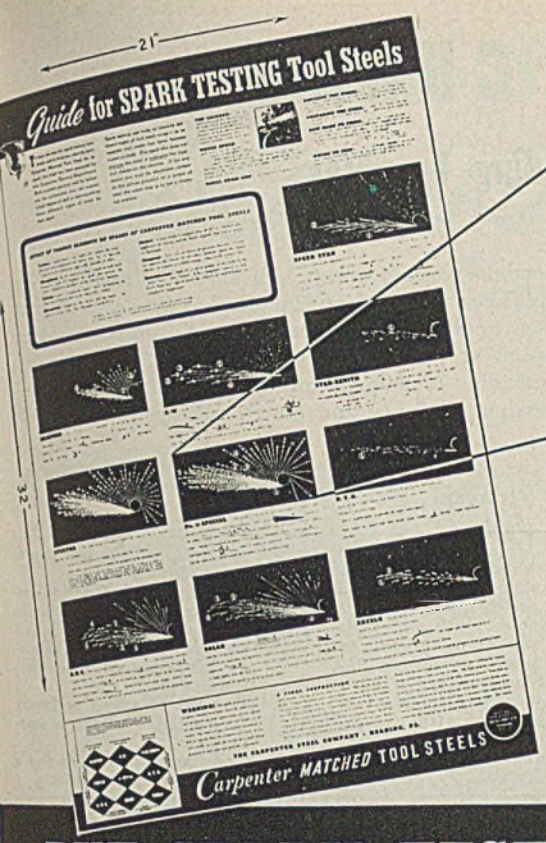


Fig. 1. (Above)—One of the 334 inspections given each round of ammunition. Here girls are gaging and inspecting steel cartridge cases, placing rejects in boxes labeled for such defects as scratches, dents, long case, short case, broken punch mark, poor identification, round heads, bad plating and laminated metal

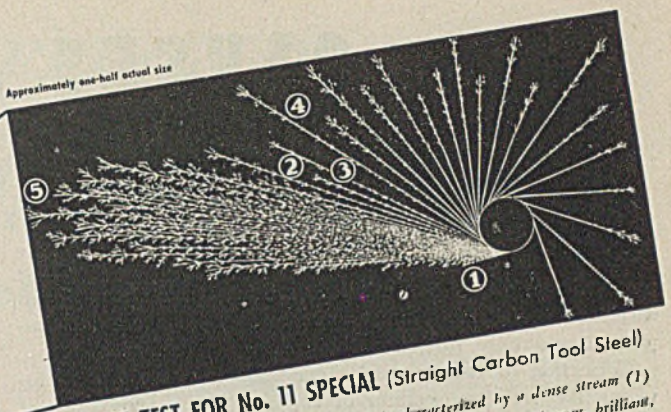
Fig. 2. (Left)—Discharge end of continuous heat-treating furnace in which steel cartridge cases are conditioned after forming

Fig. 3. (Below)—Battery of presses performing the first or "cupping" operation on steel slugs in manufacture of steel cartridge cases for .30 and .45-caliber ammunition



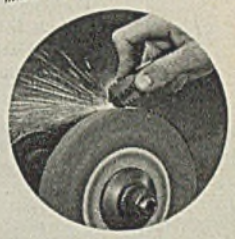


Put this Useful Spark Testing Guide to Work Today!



SPARK TEST FOR No. 11 SPECIAL (Straight Carbon Tool Steel)

This spark stream is full and brilliant. It is characterized by a dense stream (1) adjacent to the wheel. Carrier lines (2) are relatively long, continuous, brilliant, almost white. Stream is composed of sprigs (3), preliminary bursts (4) and main bursts (5)—none of them suppressed. There is a marked tendency for the spark to be carried around the periphery of the wheel.



PUT SPARK TESTING TO WORK IN YOUR PLANT...

- **to "unscramble" mixed tool steel stocks**
- **to check the identity of tool steel before hardening tools**

If, in spite of all your precautions, stock mix-ups do occur, *Spark Testing* can help you quickly identify an unknown piece of tool steel.

And this method is often used to check the identity of tool steel before tools are hardened. Thus, it helps to insure correct heat treatment on each job.

By simply holding the steel against an emery wheel and watching the colors of the lines and bursts of the spark stream, you get a quick indication of the major elements present. For example, the Carpenter "Guide for Spark Testing Tool Steels" describes the spark patterns caused by major elements such as carbon, tungsten, molybdenum, etc.

This convenient wall chart was prepared by our own testing department, and is designed to assist your men in getting started on *Spark Testing*. It even contains instructions for *Spark Testing* procedure-grinding wheel speeds, etc. With this chart as a guide, the study of *Spark Testing* is greatly simplified and your men can easily become familiar with this method of steel identification.

For your copy of the Carpenter "Guide for Spark Testing Tool Steels", drop us a note on your company letterhead. We'll be glad to give you a copy.

THE CARPENTER STEEL COMPANY
139 W. Bern Street, Reading, Pennsylvania

Carpenter MATCHED TOOL STEELS

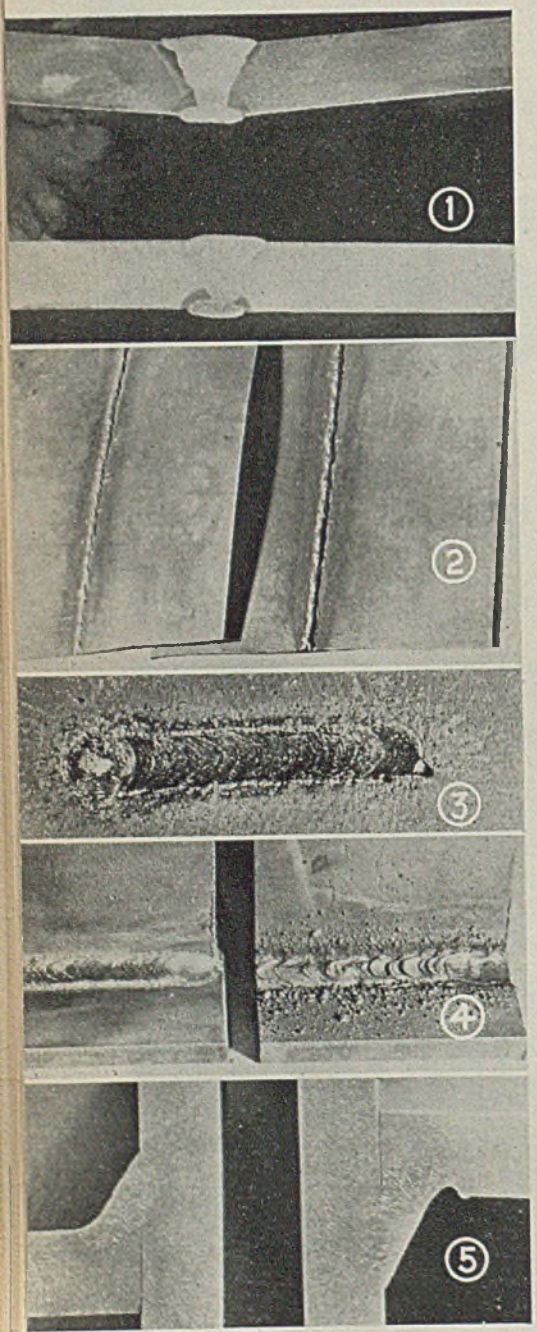
CAUSES and CURES

For 14 Common Welding Troubles

MANY difficulties may arise in fabricating a welded structure. Some of these can affect seriously the strength and serviceability of the ultimate structure. Others are less important and only influence the cost or appearance.

Correction of these troubles generally is not difficult providing the welding operator or engineer has a knowledge of the conditions causing them. To assist in detecting and correcting some of these undesirable factors, 14 of the more common troubles are illustrated here and discussed from the standpoint of "cause and cure". It is felt that a thorough understanding of these factors will prove helpful in improving welding efficiency and the resulting product.

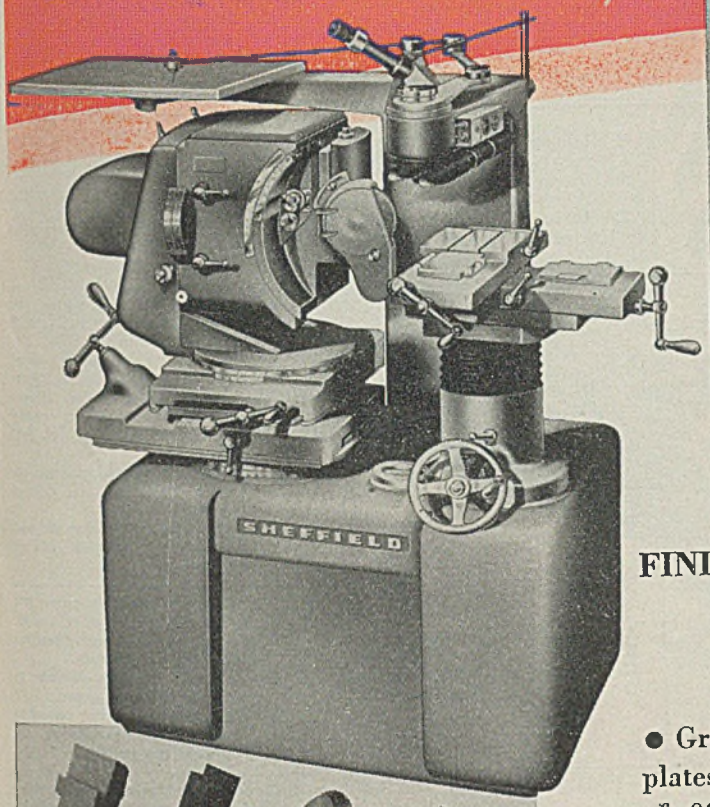
By C. H. JENNINGS
Welding Engineer
Research Laboratories
Westinghouse Electric & Mfg. Co.
East Pittsburgh, Pa.

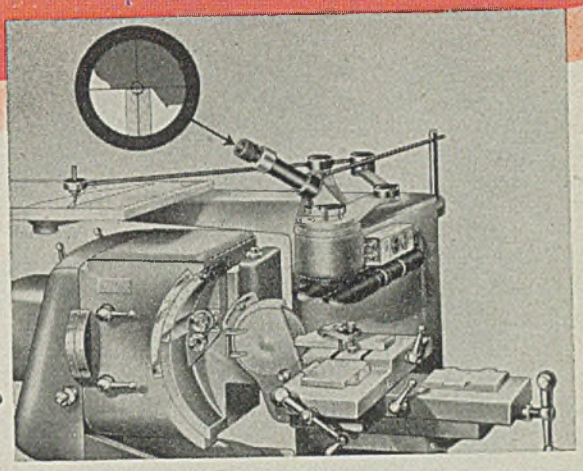


TROUBLE	CAUSE	CURE
Distortion Figure 1	A Shrinkage of deposited metal pulls parts together and changes relative positions. B Non-uniform heating of parts during welding causes them to distort before welding is finished. Final welding of parts in distorted position prevents the maintenance of proper dimensions. C Improper welding sequence.	A Properly clamp or tack parts to resist shrinkage. B Pre-form parts sufficient to compensate for shrinkage of welds. C Distribute welding to prevent excessive local heating. Preheating desirable on some heavy structures. D Removal of rolling or forming strains before welding is sometimes helpful. E Study structure and develop a definite sequence of welding.
Warping (Thin Plates) Figure 2	A Shrinkage of deposited weld metal. B Excessive local heating at the joint. C Improper preparation of joint. D Improper clamping of parts.	A Select electrode with high welding speed and moderate penetrating properties. B Weld rapidly to prevent excessive local heating of the plates adjacent to the weld. C Do not have excessive spaces between the parts to be welded. D Properly clamp parts adjacent to the joint. Use back up to cool parts rapidly. E Use special welding sequence: step back or skip procedure. F Peen joint edges slightly before welding. This elongates edges and the weld shrinkage causes them to pull back to the original shape.
Welding Stresses Figure 3	A Joints too rigid. B Improper welding sequence. C Inherent in all welds, especially in heavy parts.	A Slight movement of parts during welding will reduce welding stresses. B Make weld in as few passes as practical. C Peen each deposit of weld metal. D Anneal finished product at 1100-1200° Fahr., one hour per inch of thickness. E Develop welding procedure that permits all parts to be free to move as long as possible.
Spatter Figure 4	A Inherent property of some electrodes. B Excessive welding current for the type or diameter of electrode used. C Excessively long arc. D Arc blow.	A Select proper type of electrode. B Do not use excessive welding current. C Hold proper arc length. D Reduce arc blow. E Paint parts adjacent to weld with whitewash. This prevents spatter from welding to parts and makes removal easy.
Undercut Figure 5	A Excessive welding current. B Improper manipulation of electrode. C Attempting to weld in a position for which the electrode is not designed.	A Use a moderate welding current and do not try to travel too rapidly. B Do not use too large an electrode. If the puddle of molten metal becomes too large, undercut may result. C Excessive weaving will cause undercut, consequently it should not be used. D A uniform weave will aid greatly in preventing undercut in butt welds. E If an electrode is held too near the vertical plane when making a horizontal fillet weld, undercut may be obtained on the vertical plate.

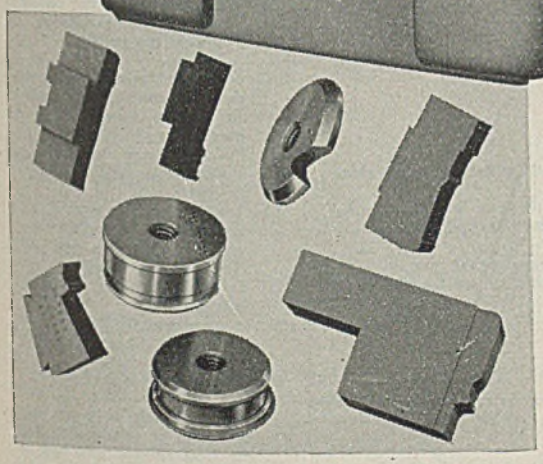
The SHEFFIELD MICRO-FORM GRINDER

With Pantograph and Microscope





Operator feeds grinding wheel toward point marked by cross hairs.



Typical flat and circular form tools possible to produce on Micro-Form Grinder.

FINISH GRINDS PROFILES DIRECT FROM DRAWING

No Templates Nor Masters

- Grinds both circular and flat form tools, templates, profile gages, cams, dies, etc. to accuracy of .0003".
- Especially suited for grinding cemented carbides and hardened steel.
- Grinding time, especially on intricate profiles, reduced as much as 50-75% compared to other methods.
- Not limited by regularity nor irregularity of work, nor by straight lines, angles or curves.
- Can be used reversely for making layouts from parts having unknown profiles, and for checking parts against layout drawings.

Manufactured under Patent No. 1811940

WRITE FOR FULL DETAILS · BULLETIN M-120-143

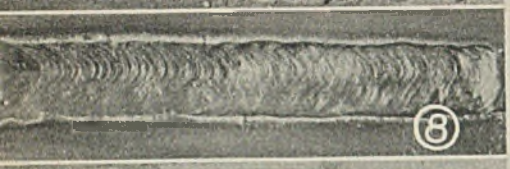
ARMY E NAVY

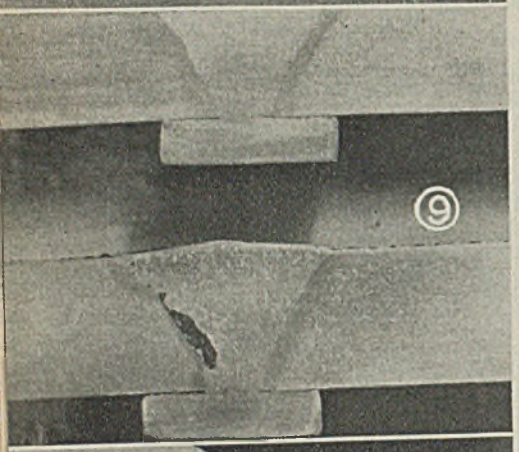
SHEFFIELD MASTER CRAFTSMEN

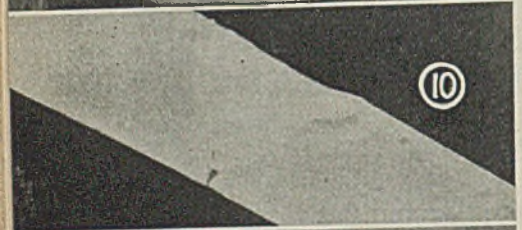
THE SHEFFIELD CORPORATION

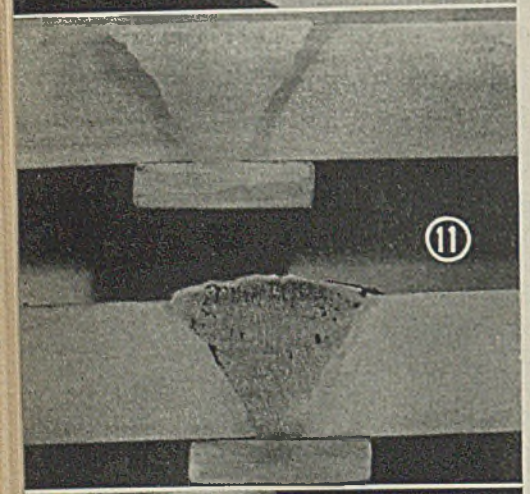
Dayton 1, Ohio, U.S.A.

MACHINE TOOLS—GAGES—MEASURING INSTRUMENTS—CONTRACT SERVICES

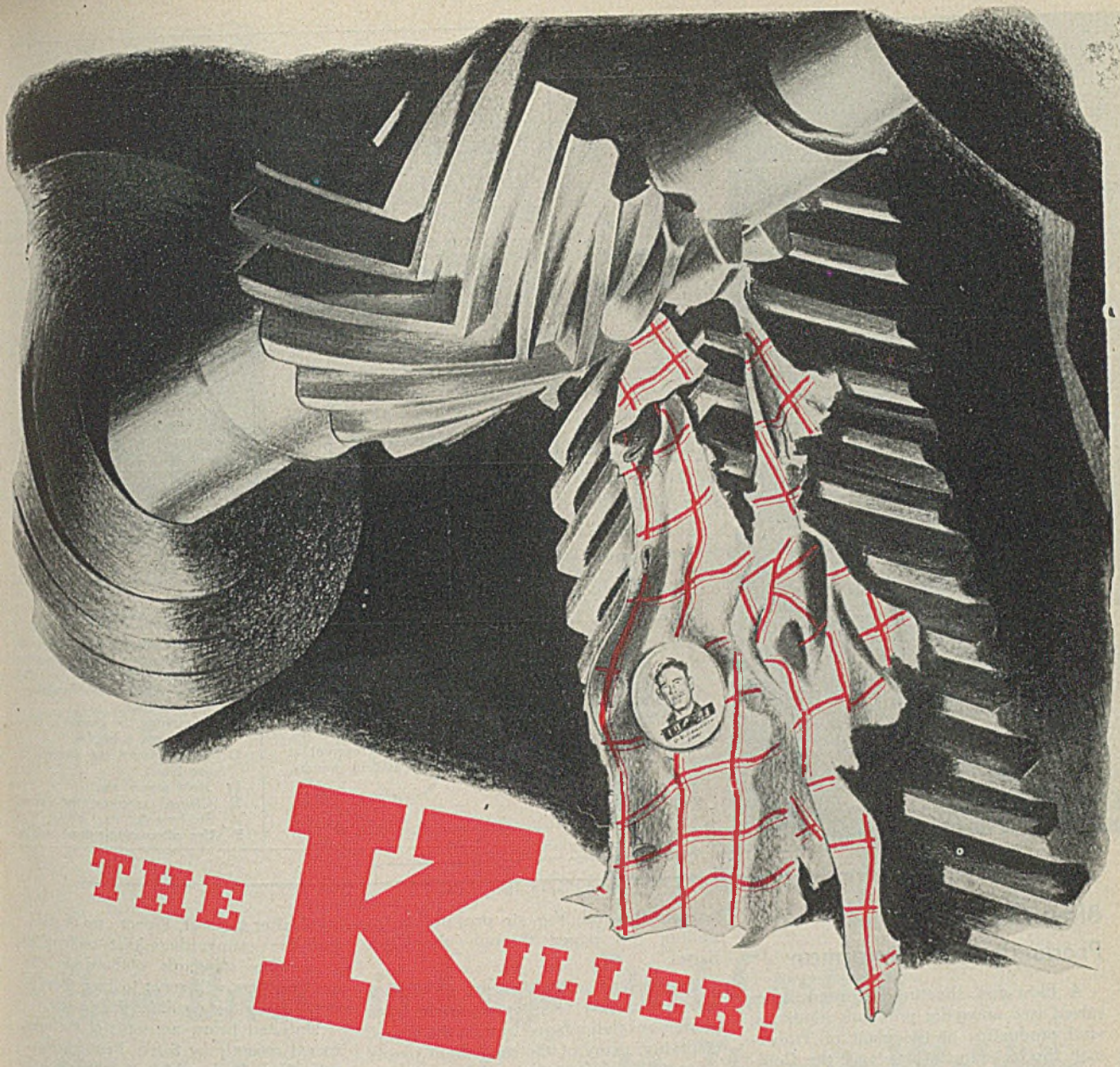








TROUBLE	CAUSE	CURE
Cracked Welds Figure 6	A Joint too rigid. B Welds too small for size of parts joined. C Poor welds. D Improper preparation of joints. E Improper electrode.	A Design the structure and develop a welding procedure to eliminate rigid joints. B Do not use too small a weld between heavy plates. Increase the size of welds. C Do not make welds in string beads. Make weld full size in short section 8" to 10" long. D Welding sequence should be such as to leave ends free to move as long as possible. E Insure that welds are sound and the fusion is good. F Preheating parts to be welded sometimes helpful. G Prepare joints with a uniform and proper free space. In some cases a free space is essential. In other cases a shrink or press fit may be required.
Poor Surface Appearance Figures 7 & 8	A Improper current and arc voltage. B Overheated work. C Poor electrode manipulation. D Inherent characteristic of electrode used.	A Insure the use of the proper welding technique for the electrode used. B Do not use excessive welding currents. C Use a uniform weave or rate of travel at all times. D Prevent overheating of work.
Poor Fusion Figure 9	A Improper diameter of electrode. B Improper welding current. C Improper preparation of joint. D Improper welding speed.	A When welding in narrow vees use an electrode small enough to reach the bottom. B Use sufficient welding current to deposit the metal and penetrate into the plates. Heavier plates require higher current for a given electrode than light plates. C Be sure the weave is wide enough to melt thoroughly the sides of a joint. D The deposited metal should tend to sweat onto the plates and not curl away from it.
Incomplete Penetration Figure 10	A Improper preparation of joint. B Use of too large an electrode. C Insufficient welding current. D Too fast a welding speed.	A Be sure to allow the proper free space at the bottom of a weld. B Do not expect excessive penetration from an electrode. C Use small diameter electrodes in a narrow welding groove. D Use sufficient welding current to obtain proper penetration. Do not weld too rapidly.
Porous Welds Figure 11	A Inherent property of some electrodes. B Not sufficient puddling time to allow intrapped gas to escape. C Poor base metal. D Too short an arc length.	A Some electrodes inherently produce sounder welds than others. Be sure the proper electrodes are used. B Puddling keeps the weld metal molten longer and often insures sounder welds. C A weld made of a series of strung beads is apt to contain minute pinholes. Weaving will often eliminate this trouble. D Do not use excessive welding currents. E In some cases the base metal may be at fault. Check this for segregations and impurities. F Do not hold too short an arc.
Brittle Joints Figure 12	A Air hardening base metal. B Improper preheating. C Unsatisfactory electrode.	A When welding on medium carbon steel or certain alloy steels the heat affected zone may become hard as a result of rapid cooling. Preheating at 300-500°F. should be resorted to before welding. B Multiple layer welds will tend to anneal hard zones. C Annealing at 1100-1200° Fahr. after welding will generally soften hard areas formed during welding. D The use of austenitic electrodes is sometimes desirable on steels which harden readily. The increased weld ductility compensates for the brittle heat affected area in the base metal.



THE KILLER!

That shocking and pitiable thing is a piece of shirt. . . . The man who wore it is gone.

Whose fault? The machine's? The man's? Neither! He was the victim of a monstrous and nameless killer loosely known as Carelessness. That accident was the result of a conspiracy of "harmless" circumstances. He had his sleeves rolled up. He leaned down to reach for a tool. He turned. The gears bit into the roll of his sleeve.

Ghastly? Sure. That's why we speak of it. For last year there were more than 5,000 industrial accidents every day in this country. Nearly 20,000 men were killed at their jobs last year, in the battle we lost with Carelessness.

Yet, this killer can be cornered; and has been in scores of plants. Aroused by our tragic losses in men and manpower, the National Safety Council is directing a major counterattack against the accident menace. In support of that program, we offer the following Safety Quiz for executives and production men as a check on conditions in your own plant. For detailed information on accident prevention, your government urges you to call upon the National Safety Council.

Are there any unrailed grease pits, unguarded gears, exposed belt drives, or unprotected saws and other cutting tools in the plant?

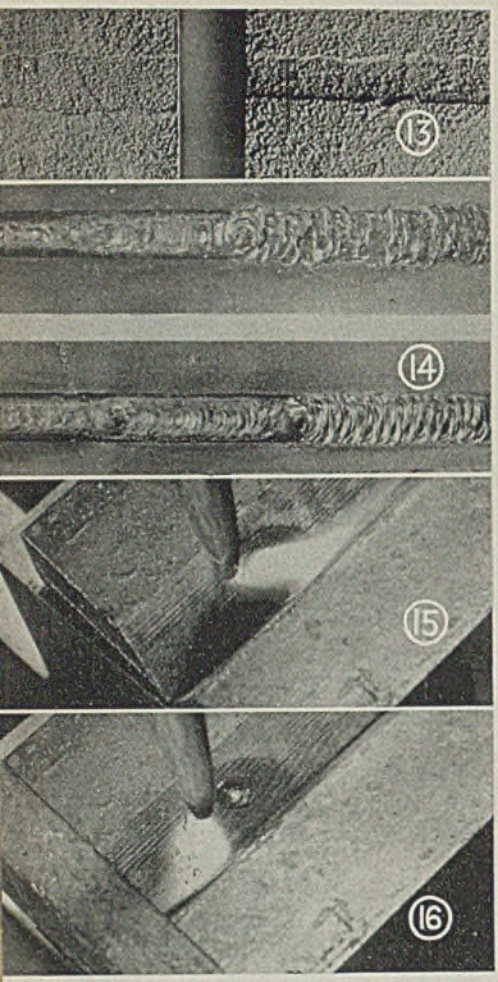
Is there improper lighting and unsafe visual contrast between moving and stationary parts of machines? (Accidents were reduced 75% in one plant by painting non-operating parts white, leaving working parts in their natural metallic lustre.)

Are traveling cranes, straddle trucks and similar moving machines skirted and fendered, brightly painted (yellow is best) and equipped with alarm horns?

Is there any guard against loose material on scaffoldings, and crews working one beneath another?

Are workers' garments checked for loose sleeves, dangling neckties, rings; women workers' hair and heels; correct use of helmets, goggles, safety visors, etc.?

Are new workmen properly instructed about all hazards they may encounter?



TROUBLE	CAUSE	CURE
Corrosion Figure 13	A Type of electrode used. B Improper weld deposit for corrosive media. C Metallurgical effect of welding. D Improper cleaning of weld.	A Bare type electrodes produce welds that are less resistant to corrosion than the parent metal. B Shielded arc type electrodes produce welds that are more resistant to corrosion than the parent metal. C Do not expect more from the weld than you do from the parent metal. On stainless steels use electrodes that are equal or better than the base metal. D When welding 18-8 austenitic stainless steel be sure the analysis of the steel and welding procedure is correct so that welding does not cause carbide precipitations. This condition can be corrected by annealing at 1900-2100° Fahr. E Certain materials such as aluminum require careful cleaning of all slag to prevent corrosion.
Irregular Weld Quality Figure 14	A Improper electrode manipulation. B Excessive welding current. C Welding in improper position for which electrode is designed. D Improper joint design.	A Use a uniform weave or rate of travel at all times. B Do not use excessive welding currents. C Use an electrode designed for the type of weld and the position in which the weld is to be made. D Prepare all joints properly.
Magnetic Arc Blow Figures 15 & 16	A Magnetic fields cause the arc to blow away from the point at which it is directed. Magnetic blow is particularly noticeable with direct current at ends of joints and in corners.	A Proper location of the ground on the work. Placing the ground in the direction the arc blows from the point of welding is often helpful. B Separating the ground in two or more parts is helpful. C Weld toward the direction the arc blows. D Hold a short arc. E Change magnetic path around arc by using steel blocks. F Use alternating-current welding.

Blow Gun Simplifies Production at Tinnerman

A blow-gun shooting compressed air solved two annoying problems hindering vital production at the plant of Tinnerman Products Inc., Cleveland, the Compressed Air Institute, New York, revealed recently.

The one problem was the separation of long strips of paper rolled up with strips of stainless steel to protect the metal's surfaces during the course of shipment to the plant; the other was the separation of Speed nuts which had stuck together after being subjected to a lacquer treatment in a revolving barrel.

Regarding the first problem, the company found that when stainless steel was fed into the stampers there was no convenient way of discarding the paper. So, with a few lengths of pipe, mechanics at the plant devised a compressed air blow gun that guides the paper into a waste paper basket.

As the metal is started off the roll and fed into the die of the stamping machine, the end of the paper is fed into the "barrel" of the gun. Latter consists of 3-inch pipe about 2 feet long. Inserted in this "barrel" is the open end of another pipe about 1-inch in diameter carrying a current of compressed air. Air is blown into the "barrel" in the same direction the paper travels. Thus as the metal is fed off the roll, the air pressure keeps pulling the paper through the "gun barrel."

The second problem was of a different nature. Lacquer is sprayed on the nuts inside a revolving barrel and, in the course of drying, many of the small light pieces of metal stick together. Separation of these was a time-consuming job. Therefore a gun similar to the other was devised. This gun has a "barrel" of about the same size with the outlet of the compressed air pipe a few inches from the mouth of the "gun barrel." In operation, the nuts are dumped on a tray on top of the apparatus, and are permitted to drop, a few at a time, into the air stream. Here they are immediately blown through the gun by the air current, at about 90 pounds pressure, and shot against a heavy wire screen at the other end of the apparatus. Hitting the screen, the nuts break apart and fall into a basket.

How To Protect Present Fire Equipment

Because use of critical metals for the manufacture of new fire extinguishers is greatly curtailed and practically the entire output of the industry is going to the armed forces and war plants with high priorities, damaged or obsolete units in all probability will not be replaceable until after the war. Proper care of standard fire extinguishers that conform to peacetime standards outlined by the underwriters will serve to keep them in good operating condition indefinitely.

Outlined below are some of the rules issued recently by Safety Research Institute, New York, which, if followed, will prolong the usefulness of existing equipment.

—Recharge extinguishers immediately after use or after the interval of time recommended by the manufacturer.

—Use only recharging supplies and replacement parts obtained from the manufacturer.

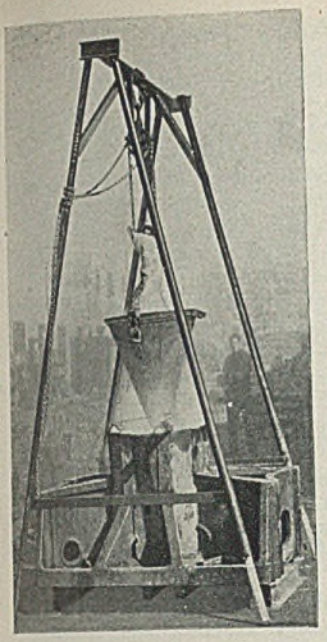
—Follow instructions on the units closely when recharging any type of extinguisher.

—Inspect extinguishers at least once a month to make certain they are filled, operative and have not been disturbed.

—If an extinguisher is damaged by a blow or fall creating possible damage to the shell or seam, have the extinguisher tested by the manufacturer or his agent.

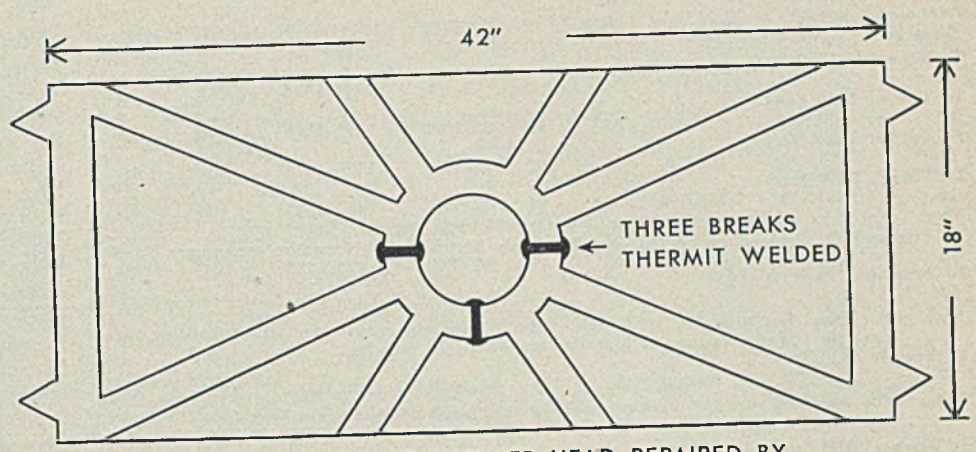
—Do not attempt repairs of damaged extinguishers. Return them to the manufacturer.

—Have men on the premises familiar with the inspection and recharging of extinguishers, and be sure they understand correct methods for keeping the equipment ready for instant, effective use.

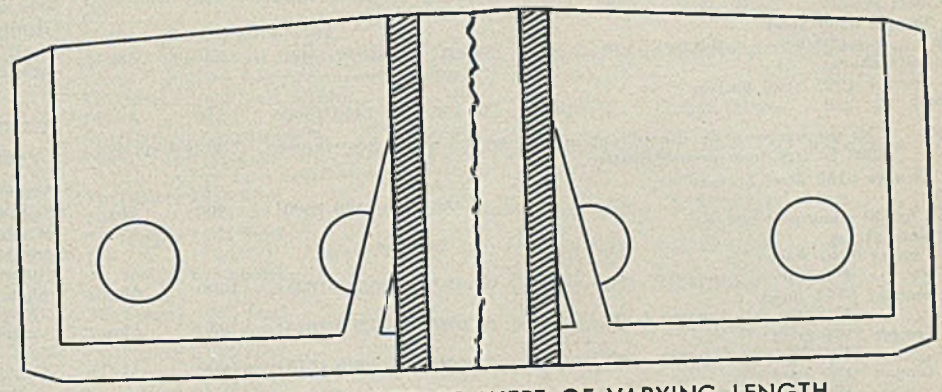


Photo—Solar Aircraft Company, San Diego, Cal.

Pouring molten Thermit steel from reaction crucible into mold which surrounds hub of air-hammer head. Three fractures were welded in one operation.



PLAN VIEW OF AIR-HAMMER HEAD REPAIRED BY THERMIT WELDING



CROSS SECTION—BREAKS WERE OF VARYING LENGTH

Three Breaks in Large Steel Casting Repaired at same time with Thermit Welding

The flexibility of the Thermit welding process and the ease with which complex repairs can be made by its use are illustrated by the work done on the fractured head of a large piston driven hammer head.

This steel casting measuring 42" x 18" x 18", used in forging airplane parts, was cracked in three places, as shown by the accompanying diagrams. In repairing it, all three breaks were filled simultaneously by a single pour, using 175 pounds of Thermit. No machining was necessary prior to welding as all preparatory work on the parts was done by oxy-acetylene cutting. Because little or no internal local stresses are present in Thermit welds, stress relieving was not required. The total time required for the welding was three days, compared with seven months for obtaining a new casting.

For detailed information about this rapid process for salvaging broken castings and forgings and fabricating large units from smaller ones, send for booklet, "Thermit Welding."

TABLE IV—STANDARD HEAT-TREATING CYCLES

Heat Treatment Number	Physical Properties Required: Tensile Strength PSI	Yield Point PSI	Red. in Area %	Elong. %	Hardness Rockwell	Heat-Treating Operations: Quenching Temp. °F.	Drawing Temp. °F.	Cooling
To Normalize 2330 Steel								
7						1475-1525		Air
To Temper 2330 Steel								
10	100,000	75,000	58	21	95-100B	1475-1525†	1100	Air
To Temper 2330 Steel								
11	125,000	100,000	55	17	25-30C	1475-1525†	950	Air
To Temper 2330 Steel								
12	150 000	125,000	53	14	32-36C	1475-1525†	800	Air
Note: Not to be used on new drawings if section thickness exceeds ¾ inch.								
To Temper 2330 Steel—Drop Forged (Not Previously Normalized) (Normalize per process No. 7)								
13	125 000	100,000	55	17	25-30C	1475-1525†	950	Air
To Normalize 4130 Steel								
14						1600-1700		Air
Note: For metal less than No. 16 B.W.G. (.065") thickness, reduce time at normalizing temperature. Minimum time at heat for thin metal, 15 minutes.								
To Temper 4130 Steel								
17	100 000	80,000	58	21	95-100B	1550-1600‡	1225	Air
Note: For sheet less than ⅛" thickness and bar up to and including ⅜" diameter or thickness, use an oil quench.								
To Temper 4130 Steel								
18	125,000	105,000	55	17	25-30C	1550-1600‡	1050	Air
See Note above								
To Temper 4130 Steel								
19	150 000	130,000	53	14	33-37C	1550-1600‡	900	Air
See note above.								
To Temper 4130 Steel								
22	180,000	160,000	50	12	38-42C	1550-1600‡	750	Air
See note above.								
To Temper 1095 Steel Springs								
20					40-45C	1450-1500†	850	Air
Note: This process must be carried out in a controlled atmosphere furnace. Finished springs must be free from decarburization.								
To Temper 6150 Steel Springs								
23					40-45C	1550-1600†	900	Air
Hold for 30 minutes at 900°F.								
See note above.								
To Temper 6140 Steel								
25	150 000	130,000	53	14	33-37C	1575-1625†	1000	Air
To Temper 6135 Steel								
26	150 000	130,000	53	14	33-37C	1575-1625†	950	Air
To Temper 3130 Steel								
35	125 000	100,000	55	17	25-30C	1525-1575†	1000	Air
To Temper 3130 Steel								
36	150 000	125,000	53	14	33-37C	1525-1575†	850	Air
To Temper 3135 Steel								
37	125 000	100,000	55	17	25-30C	1500-1550†	1050	Air
To Temper 3135 Steel								
38	150 000	125,000	53	14	33-37C	1500-1550†	900	Air
To Temper 3140 Steel								
39	125 000	100,000	55	17	25-30C	1475-1525†	1075	Air
To Temper 3140 Steel								
40	150 000	125,000	53	14	33-37C	1475-1525†	925	Air
To Temper 4340 Steel								
41	150 000	130,000	53	14	33-37C	1475-1550†	1100	Oil
To Temper 4340 Steel								
42	180 000	160,000	50	12	38-42C	1475-1550†	950	Oil
To Temper 4140 Steel								
45	125 000	105,000	55	17	25-30C	1525-1575†	1100	Air
To Temper 4140 Steel								
46	150,000	130,000	53	14	33-37C	1525-1575†	1000	Air
To Temper 4140 Steel								
47	180 000	160,000	50	12	38-42C	1525-1575†	850	Air
To Normalize 4037 Steel								
65						1550-1600		Still Air
To Temper 4037 Steel								
67	150 000	130,000	53	14	33-37C	1525-1575†	950	Air
To Temper 4037 Steel								
68	125 000	100,000	50	17	25-30C	1525-1575†	1150	Air
To Temper 8620 Steel								
71	125 000	100,000	50	17	25-30C	1550-1600‡	900	Air
To Normalize 8630 Steel								
72						1625-1675	900	Air
Note: The yield strength of normalized 8630 steel is substantially increased by tempering at 900°F. If the steel is to be used in the normalized condition a tempering treatment is required, but if the steel is to be heat treated at a later date, the tempering treatment may be omitted.								
To Temper 8630 Steel								
74	150 000	130,000	53	14	33-37C	1525-1575‡	900	Air
Note: For sheet material less than ⅛" thick and bar stock less than ⅜" thick, use an oil quench.								
To Temper 8630 Steel								
75	125,000	105,000	55	17	25-30C	1525-1575‡	1050	Air
See note above.								
To Temper 8630 Steel								
77	100,000	80,000	58	21	95-100B	1525-1575‡	1200	Air
See note above.								
To Temper 8739 & 8740 Steel								
80	150 000	130,000	53	14	33-37C	1500-1550†	1000	Air
To Temper 8739 & 8740 Steel								
81	125,000	100,000	50	17	25-30C	1500-1550†	1100	Air

NE Alloy Steels

(*Continued from Page* 121)

ring and pinion gears, differential spider gears and spline shafts.

NE-8630 is a semi-thorough hardening steel and is weldable. We have used this steel as a replacement for SAE-2330 and SAE-4130 in such forms as tubing, bar, rod and some forged parts. This steel conforms very favorably with SAE-4130 and has been used very successfully as a replacement.

NE-8640 steel has been used to replace SAE-4140. However, we do not recommend it for welding as it requires too much care in order to keep it from cracking in the vicinity of the weld.

NE-8740 steel is a thorough-hardening steel and has been used as a substitute for such SAE steels as 2330, 4130, 4340. This particular steel is not recommended for welding and must have the approval of the Materials Control Group for the intended application.

There are, however, some things about Table I that require further explanation and some precautions that should be pointed out. All steels marked with an asterisk must not be welded. As previously mentioned, the **replacement steels** may be used interchangeably with basic steels specified on drawings. However, the proper heat treatment, see Table III, must be used for the replacement steels to obtain in each case the physical properties specified on the drawing. When basic steels called for on original drawings are not available, the production department authorizes use of replacement steels without further approval of the engineering department. Replacement steels should be selected in the order given.

Substitute steels are only used when **replacement steels** are not available and only after the engineering department has approved each application in writing on a special form provided.

Example for Selecting a Replacement Steel: A drawing is received by the production department calling for SAE-4130 steel and the part is heat treated to a tensile strength of 125,000 pounds per square inch. No. SAE-4130 steel is available so the following steps are taken to select the replacement:

—Find 4130 steel in column 1, Ta-

TABLE V—TYPICAL SUBSTITUTIONS

Application	Basic Steel Substitute
Bomb Bay Operating Cylinder—	
Orifice	SAE-2330 NE-9442
Cowl Flap Operating Drive—	
Internal Gear	SAE-3145 NE-9445
Shaft	SAE-2330 NE-9442
Drive Shaft	SAE-4340 NE-9445
Adaptor Shafts	SAE-4340 NE-9442
Flap Controls—	
Center Wing Sprockets	SAE-4130 NE-9440
Bomb Bay Door Operating Mechanism—	
Clutch Driving Face	SAE-4620 NE-9420

For information on development of NE steels and data on 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; Aug. 2, p. 100.

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: Aug. 2, p. 94: Aug. 23, p. 107; Aug. 30, p. 66; Sept. 6, p. 106.

For latest revised listing of NE ALLOY steels, see Sept. 6, p. 112.

For list of NE CARBON steels, see March 8, 1943, p. 90.

For latest revised list of AMS (Aeronautical Materials Specification) steels, see Aug. 9, 1943, p. 92. AMS nonferrous alloys are also listed there.

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.

ble I, under "basic steel". Then find in second column that line listing the 125,000 pounds per square inch. Follow this same line across to the right to first column under "replacement steels" which is listed here as NE-8630, which then is the replacement for the SAE-4130 steel.

—But the NE-8630 must be heat treated to the tensile strength desired. Since this heat treatment will be different than that for the standard steel, SAE-4130, the required heat treatment is found by referring to Table III where a standard process No. 75 is located on the line corresponding to the steel and condition desired. Then reference to Table IV will give the exact heat treating procedure called for by this standard process No. 75.

—Completing the sequence, the production department attaches to the production folder a colored tag that calls for the replacement material, NE-8630 steel. and for standard heat-treating process No. 75.

Example for Selecting a Substitute Steel: If NE-8630 is not available as a replacement material, a substitute steel is selected from Table I which lists NE-8735 as first choice for a substitute steel for SAE-4130 steel heat treated to 125,000 pounds per square inch tensile strength.

The asterisk found alongside 8735 in this table indicates that the steel is not to be welded. If the application requires welding, the engineering department must be consulted. If no welding is involved, NE-8735 is selected. Reference to Table III then gives the standard process number for the heat treatment required as No. 93, the exact heat-treating procedure being found by reference to Table IV.

Production department then fills out a "materials deviation form" and forwards

TABLE IV—STANDARD HEAT-TREATING CYCLES (Cont.)

Heat Treatment Number	Tensile Strength PSI	Physical Properties Required Yield Point PSI	Red. in Area %	Elong. %	Hardness Rockwell	Heat-Treating Operations Quenching Temp. °F.	Drawing Temp. °F.	Cooling
To Temper 1335 Steel								
90	150,000	130,000	45	14	33-37C	1525-1575†	850	Air
Note: Not recommended for use in this temper except as a last resort.								
To Temper 8630 Steel								
91	180,000	160,000	50	12	38-42C	1525-1575†	750	Air
Note: For sheet material ⅛" or less in thickness and bar stock ⅜" or less in thickness quench in oil.								
To Temper 8739 & 8740 Steel								
92	180 000	160,000	50	12	38-42C	1500-1550†	900	Air
To Temper 8735 Steel								
93	125 000	100,000	55	17	25-30C	1525-1575†	1050	Air
To Temper 8735 Steel								
94	150 000	130,000	53	14	33-37C	1525-1575†	950	Air
To Temper 8735 Steel								
95	180 000	160,000	50	12	38-42C	1525-1575†	850	Air
To Anneal 8735 Steel								
99	Heat to 1525°-1575°F. Soak* Cool in furnace to 900°F., remove from furnace and cool to room temperature in still air.							
To Temper 1066 (X1065) Steel Springs								
100					40-45C	1475-1525†	800	Air
Hold at heat for 30 minutes.								
Note: This process must be carried out in a controlled atmosphere furnace. Finished springs must be free from decarburization.								
To Temper 1085 Steel Springs								
101					40-45C	1450-1500†	800	Air
Hold at heat for 30 minutes.								
Note: This process must be carried out in a controlled atmosphere furnace. Finished springs must be free from decarburization.								
To Temper 1090 Steel Springs								
102					40-45C	1450-1500†	800	Air
Ho'd at heat for 30 minutes								
Note: This process must be carried out in a controlled atmosphere furnace. Finished springs must be free from decarburization.								
To Temper 1335 Steel								
104	100 000	80,000	58	21	95-101B	1525-1575†	1250	Air
To Temper 1335 Steel								
105	125,000	100,000	55	17	25-30C	1525-1575†	1000	Air
To Temper 3130 Steel								
108	100 000	80,000	58	21	95-100B	1525-1575†	1200	Air
To Temper 1035 Steel								
109	100 000	80,000	58	21	95-101B	1525-1575†	900	Air
To Temper 3135 Steel								
112	100 000	80,000	58	21	95-100B	1500-1550†	1250	Air
To Temper 3140 Steel								
113	180 000	160,000	50	12	38-42C	1475-1525†	800	Air
To Temper 3240 Steel								
114	150.000	130,000	53	14	33-37C	1475-1525†	1000	Air
To Temper 3245 Steel								
115	150 000	130,000	53	14	33-37C	1450-1500†	1050	Air
To Temper 3250 Steel								
116	150 000	130,000	53	14	33-37C	1450-1500†	1050	Air
To Temper 4037 Steel								
118	100 000	80,000	58	21	95-100B	1525-1575†	1225	Air
To Temper 4340 Steel								
119	200 000	180,000	46	10	42.5-45C	1475-1525†	850	Oil
To Temper 6145 Steel Springs								
121					40-45C	1575-1625†	850	Air
Hold at heat for 30 minutes.								
Note: This process must be carried out in a controlled atmosphere furnace. Finished springs must be free from decarburization.								

†Indicates quench in oil bath. ‡Indicates quenching in water.
*Soak period of course is included at this temperature, 30 minutes a common figure.

CARBURIZING

To Carburize 1015 & 1020 Steel

60—Pack in sealed container with carburizing material. Carburize at 1650°-1700°F. as follows: Case depth 1/64 inch—2 hours, case depth 1/32 inch—4 hours, case depth 1/16 inch—9 hours. Cool in pack to room temperature. Remove from pack and reheat to 1625°-1650°F. Quench in water. Reheat to 1425°-1450°F. Hold at temperature for one hour per inch of section thickness. Quench in water. Heat at 300°F. for one hour per inch of section thickness (minimum time at heat, one hour).
Case—Rockwell C 60-65
Core—80,000 p.s.i.

To Carburize 2315 & 2320 Steel

61—Pack in a sealed container with carburizing material. Carburize at 1650°-1700°F. as follows: Case depth 1/64 inch—2 hours, case depth 1/32 inch—4 hours, case depth 1/16 inch—9 hours. Cool in pack to room temperature. Remove from pack and heat to 1500°-1525°F. and hold at temperature for one hour per inch of section thickness. Quench in oil. Reheat to 1375°-1400°F., and hold at temperature for one hour per inch of section thickness. Quench in oil. Heat to 300°F. and ho'd at temperature for one hour per inch of section thickness. (Minimum time at heat one hour).
Case—Rockwell C 58-62
Core—115,000 p.s.i.

To Carburize 4615 & 4620 Steel

62—Pack in sealed container with carburizing material. Carburize at 1650°-1700°F. as follows: Case depth 1/64 inch—2 hours, case depth 1/32 inch—4 hours, case depth 1/16 inch—9 hours. Cool in pack to room temperature. Reheat to 1550°-1575°F. and hold at heat for one hour per inch of section thickness. Quench in oil. Reheat to 1400°-1425°F. and hold at temperature for one hour per inch of section thickness. Quench in oil.
Case—Rockwell C 60-65
Core—110,000 p.s.i.

To Carburize 3115 & 3120 Steel

63—Pack in sealed container with carburizing material. Carburize at 1650°-1700°F. as follows: Case depth .025 inch—2 hours, case depth .050 inch—4 hours, case depth .100 inch—9 hours. Cool to room temperature in pack. Reheat to 1525°-1550° and hold at temperature for one hour per inch of section thickness. Quench in oil. Reheat to 1400°-1425°F. and hold at temperature for one hour per inch of section thickness. Quench in oil. Heat to 300°F. and hold at temperature for one hour per inch of section thickness. (Minimum time at temperature, one hour). Gives case of 58-62 Rockwell C, core 120,000 p.s.i.

To Carburize 8620 Steel

98—Pack in sealed container with carburizing material. Heat to 1650°-1700°F. and hold as follows: Case depth .025 inch—2 hours, case depth .050 inch—4 hours, case depth .100 inch—9 hours. Cool to room temperature in box. Reheat to 1550°-1575°F. and hold at temperature for one hour per inch of section thickness. Quench in oil. Reheat to 1400°-1425°F. and hold at temperature for one hour per inch of section thickness. Quench in oil. Heat to 300°F. and hold at temperature for one hour per inch of section thickness. (Minimum time at heat one hour).

Case—Rockwell C 58-62. Core—120,000 p.s.i.

To Carburize 2115 Steel

106—Pack in sealed container with carburizing material. Heat to 1650°-1700°F. and hold as follows: Case depth .025 inch—2 hours, case depth .050 inch—4 hours. case depth .100 inch—9 hours. Cool to room temperature in pack. Reheat to 1600°-1650°F. and hold for one hour per inch of section thickness. Quench in oil. Reheat to 1375°-1425°F. and hold at temperature for one hour per inch of section thickness. Quench in water. Heat to 300°F. and hold for one hour per inch of material thickness. (Minimum time at temperature one hour). Gives case of 57-61 Rockwell C, core 90,000 p.s.i.

To Carburize 2515 Steel

110—Pack in sealed container with carburizing material. Carburize at 1650°-1700°F. and hold as follows: Case depth .025 inch—2 hours, case depth .050 inch—4 hours, case depth .100 inch—9 hours. Cool in pack to room temperature. Reheat to 1400°-1425°F. and ho'd at temperature for one hour per inch of section thickness. Quench in oil. Heat at 300°F. for one hour per inch of section thickness. (Minimum time at heat one hour). Gives case of 56-60 Rockwell C, core 150,000 p.s.i.

To Carburize 3312 Steel

117—Pack in sealed container with carburizing material. Heat to 1650°-1700°F. and hold as follows: Case depth .025 inch—2 hours, case depth .050 inch—4 hours. case depth .100 inch—9 hours. Cool in pack to room temperature. Remove from pack and reheat to 1375°-1425°F. Hold at temperature for one hour per inch of section thickness. Quench in oil. Heat to 300°F. and hold for one hour per inch of section thickness. (Minimum time at heat one hour).

Case—Rockwell C 59-63

Core—160,000 p.s.i.

To Carburize 4815 Steel

120—Pack in a sealed container with carburizing material. Heat to 1650°-1700°F. and hold as follows: Case depth .025 inch—2 hours, case depth .050 inch—4 hours. case depth .100 inch—9 hours. Quench in oil directly from pack, or cool in pack, reheat to 1626°F. and quench in oil. Reheat to 1400°-1425°F. and ho'd at temperature for one hour per inch of section thickness. Quench in oil. Heat to 325°F. and hold for one hour per inch of section thickness. (Minimum time at heat one hour).

Case—Rockwell C 60-64. Core—150,000 p.s.i.

it to the engineering department for approval. Upon receipt of the engineering department "okay", production department attaches colored tag to production folder calling for NE-8735 as a substitute and specifying standard process number 93 for heat-treating cycle.

In the event that replacements result in welded assemblies containing both SAE-4130 and NE-8630 steels and the assemblies call for heat treatment, then the heat treat should be that normally given the SAE-4130 steel.

The permission given to use replacement steels interchangeably with basic steels is specifically stated as not to be construed to allow mixing raw materials or finished parts prior to inspection after final heat treat when made from more than one type of steel. In fact it is directed specifically that when more than one steel is used to make a certain part, parts must be separated into lots composed of only one steel and must be kept separate and carefully identified through heat treating and final inspection.

For this necessary identification, all parts made from a basic steel are marked with the part number only, thus 162B69345. All parts made from replacement or substitute steels also carry the applicable steel number thus 162B69345-8630.

The substitution system described here can easily be adapted by other manufacturers. While the data presented obviously cannot be used indiscriminately, much of it can be employed.

Fifteen Container Features Used for Signal Can

Features of 15 different containers were used to produce the can for the newest daytime distress signal for castaways at sea, according to the American Can Co., New York. The signal is visible for 5 miles and can be seen 8000 feet in the air.

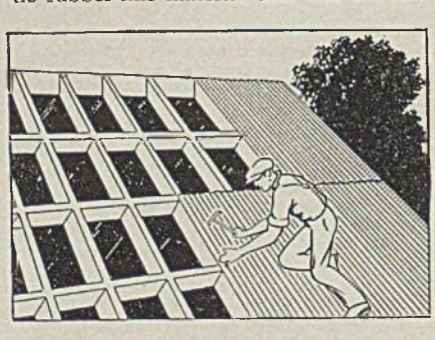
Signals are encased in containers constructed so that the chemical operates even when submerged. The cans also are impervious to extremes of heat and cold and, upon being cast into the water, set up a spinning motion sending up spiral columns of smoke.

Upon removal of a screw cap from the top of the container, the castaway jerks a ring lying beneath it and the chemical is automatically ignited. The signal, which was invented by Joseph W. Van Karner, becomes hot in 3 seconds.

Corrosion-Resistant Sheet Forms Into Many Shapes

A tough metal product that can be sheared, bent, Pittsburgh locked, mallated, die formed, riveted, soldered and worked with regular shop tools is being offered by Cheney Metal Products Co., P. O. Box 818, Trenton 5, N. J. The new development can be formed into corrugated metal roofs, siding, warm air or ventilating ducts, flashings, valleys, gutters, termite shields, expansion joints, and can be adopted to any general sheet metal work of any shape.

Basically, the metal consists of a hot rolled pickled steel sheet combined with stearine-cotton-seed pitches and pulverized slate. The steel sheet is heated to high temperatures and the stearine-cotton-seed pitches and slate added under pressure. As a result, the steel core is protected completely with a very elastic rubber-like material that will not run



at high temperatures or crack or peel at very low temperatures, it is reportetd.

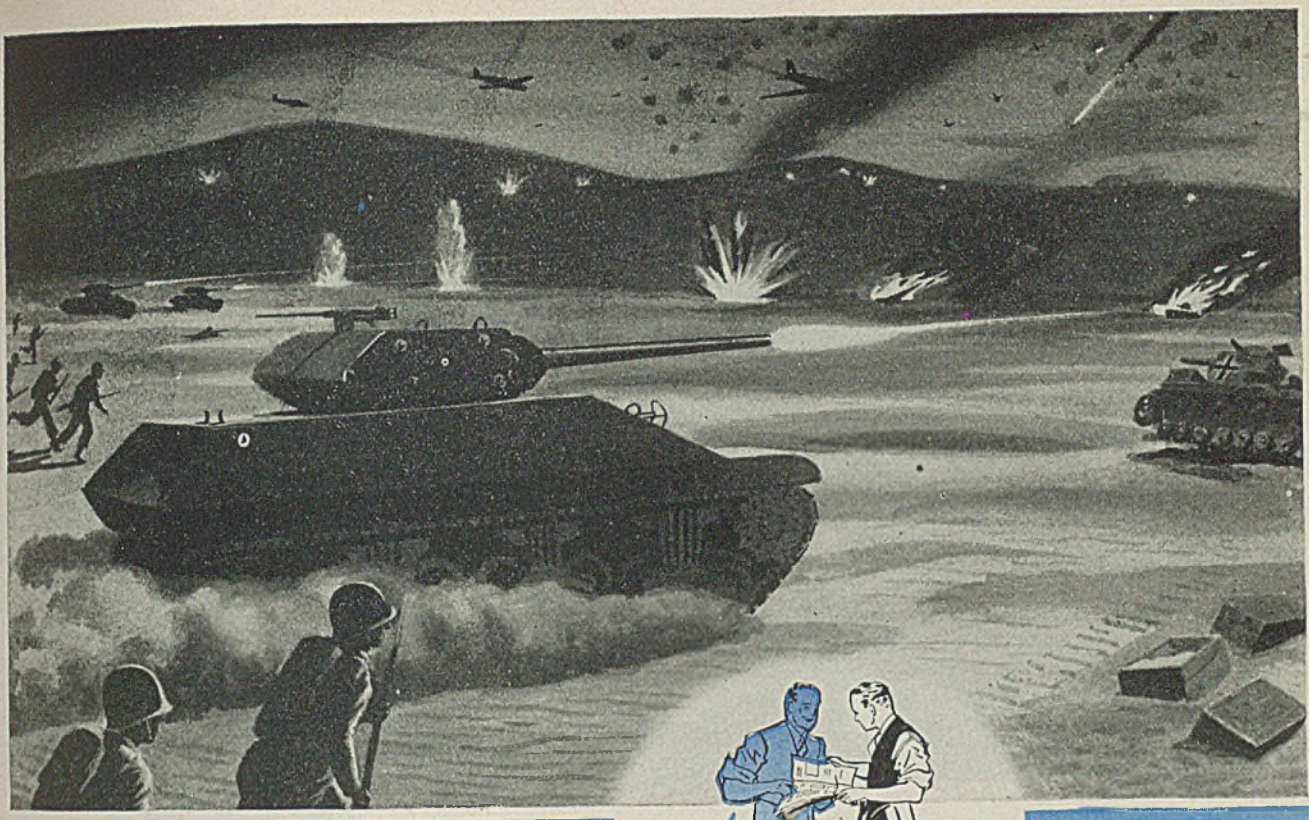
On a 26-gage steel sheet, a coating about 0.003-inch thick is applied on each side of the metal. This makes the total thickness of the sheet about 0.024-inch—equivalent to a 24-gage sheet.

In testing the development, it was found to withstand the action of weather, water and fire. It resists corrosion and most acid and sulphur conditons. Because of the absence of asphalts or coal tars, bleeding is eliminated. Paint of any color can be applied directly on the product.

Tungsten Carbide Offers Reamers from Stock

Standard sizes of carbide-tipped reamers with hardened shanks are now offered from stock, Tungsten Carbide Tool Co., 2661 Joy road, Detroit 6, announced recently. Outstanding feature of the line is that the entire shank of the reamer is hardened, providing greater strength and reduced shank wear. All tips are diamond ground and ready to use, while the outside diameter is held to tolerances of plus zero and minus 0.0003-inch.

The line comprises both straight shank and tapered shank varieties, with sizes ranging from ¼ to 1½ inches in both styles. Up to 1 inch, the reamers are offered in steps of 1/32-inch, while above 1 inch, the diameters change by 1/16-inch. Reamers up to ½-inch are provided with four flutes, with six flutes for reamers from ½ to 13/16-inch inclusive, and eight flutes for larger sizes of reamers.



then I said to myself—

They've Deflated the German Mark VI

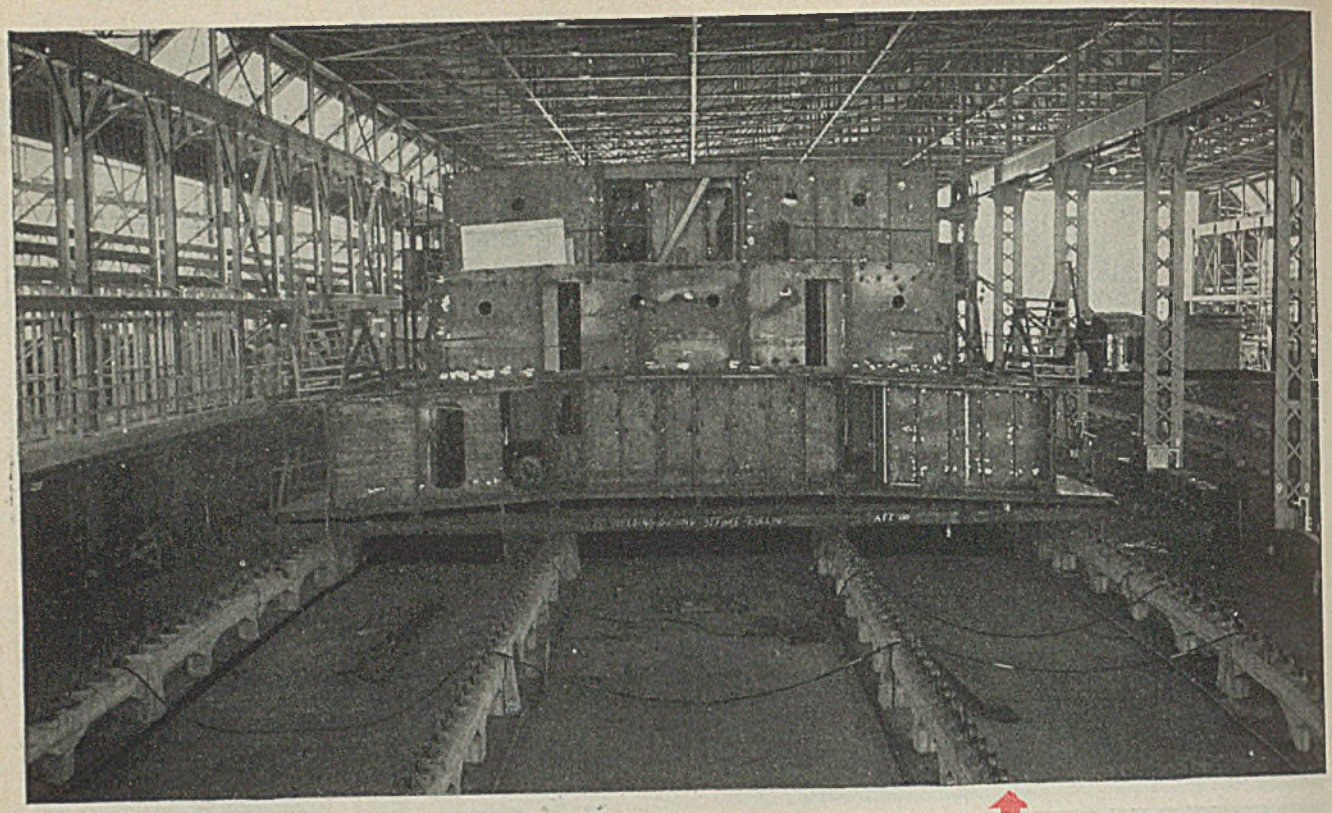
With fanfare of invincibility, the Mark VI tanks strutted out on the African sands. They're still there . . . with the accent on STILL.

American engineers gave our men the surprise weapon to do it . . . . . the all-welded M-10 tank buster—another cleaner-upper in the class with invasion "ducks", "flat tops" and other all-welded weapons that weren't in the textbooks.

Welding enabled the producers to plan, design, tool up and turn out QUICKLY the means to outsmart competition.

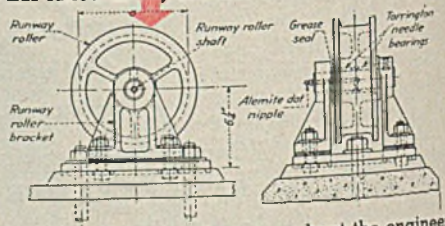
Carrying this technique into postwar operations can provide REMUNERATIVE jobs on design, engineering, fabrication and sales, with a neat nest-egg of profit.

THE LINCOLN ELECTRIC COMPANY, CLEVELAND, OHIO



Kaiser *Ship production* rolls on *Meehanite* rollers

Again, Meehanite has been called upon to fulfill an exacting assignment. For the pre-fabrication of Liberty Ship Sections at the Kaiser-managed Permanente Metals Corporation Shipyard at Richmond, heavy-duty rollers were needed in a hurry. Meehanite was selected because it could be furnished promptly with the high strength and other physical properties needed for the job. The installation has been in operation for some time, and a recent report says . . . "The Meehanite rollers have proved 100% efficient and not a single one has failed in any manner . . ."



If you are interested in knowing about the engineering and physical properties that can be obtained — dependably — in Meehanite, contact the nearest Meehanite Foundry or write us direct!

Ask for the MEEHANITE HANDBOOK.

MEEHANITE research institute
NEW ROCHELLE, N. Y.

These Meehanite *foundries are ready to serve you NOW!*

ALLENTOWN, PA. ..... Traylor Engineering Company
ANSONIA, CONN. ..... Farrel-Birmingham Co., Inc.
BIRMINGHAM, ALA. ..... Continental Gin Co.
BRIDGEWATER, MASS. ..... The Henry Perkins Co.
BROOKLYN, NEW YORK ..... E. W. Bliss Company
BUFFALO, N. Y. ..... Pohlman Foundry Co., Inc.
CHARLESTON, W. VA. ..... Kanawha Manufacturing Co.
CHATTANOOGA, TENN. ..... Ross-Meehan Foundries
CHICAGO, ILL. ..... Greenlee Foundry Company
CINCINNATI, OHIO ..... Cincinnati Grinders Incorporated
CINCINNATI, OHIO ..... The Cincinnati Milling Machine Co.
CLEVELAND, OHIO ..... Fulton Foundry & Machine Co.
DENVER, COLO. ..... The Stearns-Roger Mfg. Co.
DETROIT, MICH. ..... Atlas Foundry Co.
FLINT, MICH. ..... General Foundry & Mfg. Company
HAMILTON, OHIO ..... The Hamilton Foundry & Machine Co.
HAMILTON, ONTARIO, CANADA, Otis-Fensom Elevator Company
IRVINGTON, N. J. ..... Barnett Foundry & Machine Co.
JEANNETTE, PA. ..... Elliott Company
LOS ANGELES, CALIF. ..... Kinney Iron Works
MILWAUKEE, WIS. ..... Koehring Company
MT. VERNON, O., GROVE CITY, PA. ..... Cooper-Bessemer Corporation
NEW ROCHELLE, N. Y. ..... Meehanite Metal Corporation
NEW YORK, N. Y. ..... The American Brake Shoe Co.
OAKLAND, CALIF. ..... Vulcan Foundry Company
ORILLIA, CANADA ..... E. Long, Ltd.
PHILADELPHIA, PA. ..... H. W. Butterworth & Sons Co.
PHILADELPHIA, PA. ..... Florence Pipe Foundry & Machine Co., (R. D. Wood Company, Selling Agents)
PHILLIPSBURG, N. J. ..... Warren Foundry & Pipe Corp.
PITTSBURGH, PA. ..... Rosedale Foundry & Machine Co.
PORTLAND, OREGON ..... Crawford & Doherty Foundry Co.
ROCHESTER, N. Y. ..... American Laundry Machinery Co.
ST. LOUIS, MO. ..... Banner Iron Works
ST. PAUL, MINN. ..... Valley Iron Works
SEATTLE, WASHINGTON ..... Washington Iron Works

ASSOCIATED COMPANIES

LONDON, ENG. ..... The International Meehanite Metal Co., Ltd.
WATERLOO, N. S. W. ..... Australian Meehanite Metal Co., Ltd.
JOHANNESBURG, SOUTH AFRICA ..... Meehanite Metal Co. (S.A.) (Pty.) Ltd.

F. E. FLYNN
President, A.I.S.E.

C. L. McGRANAHAN
1st Vice President, A.I.S.E.

I invites you

To our friends in the steel industry:—

Never before has our industry been confronted with so many problems that call forth the utmost in our technical knowledge and skill—and never before has our pool of such knowledge and skill reached its present magnitude, or been so well employed.

With no thought of detraction from those brave lads who are carrying our arms in all corners of the world, I nevertheless feel that, when victory comes, some recognition must be extended to the technicians and engineers who have evolved the answers to the multitude of complex problems arising from our tremendous war production program.

This production has been rendered possible only through the pooling of our "know-how"—an exchange of ideas such as that resulting from technical papers and discussions. For the steel industry, no better medium for such interchange may be had than the Annual Engineering Conference of the Association of Iron and Steel Engineers, to be held in Pittsburgh, September 28-29-30th, and it is my earnest desire that as many men from the industry as possible will accept this invitation to participate in this meeting.

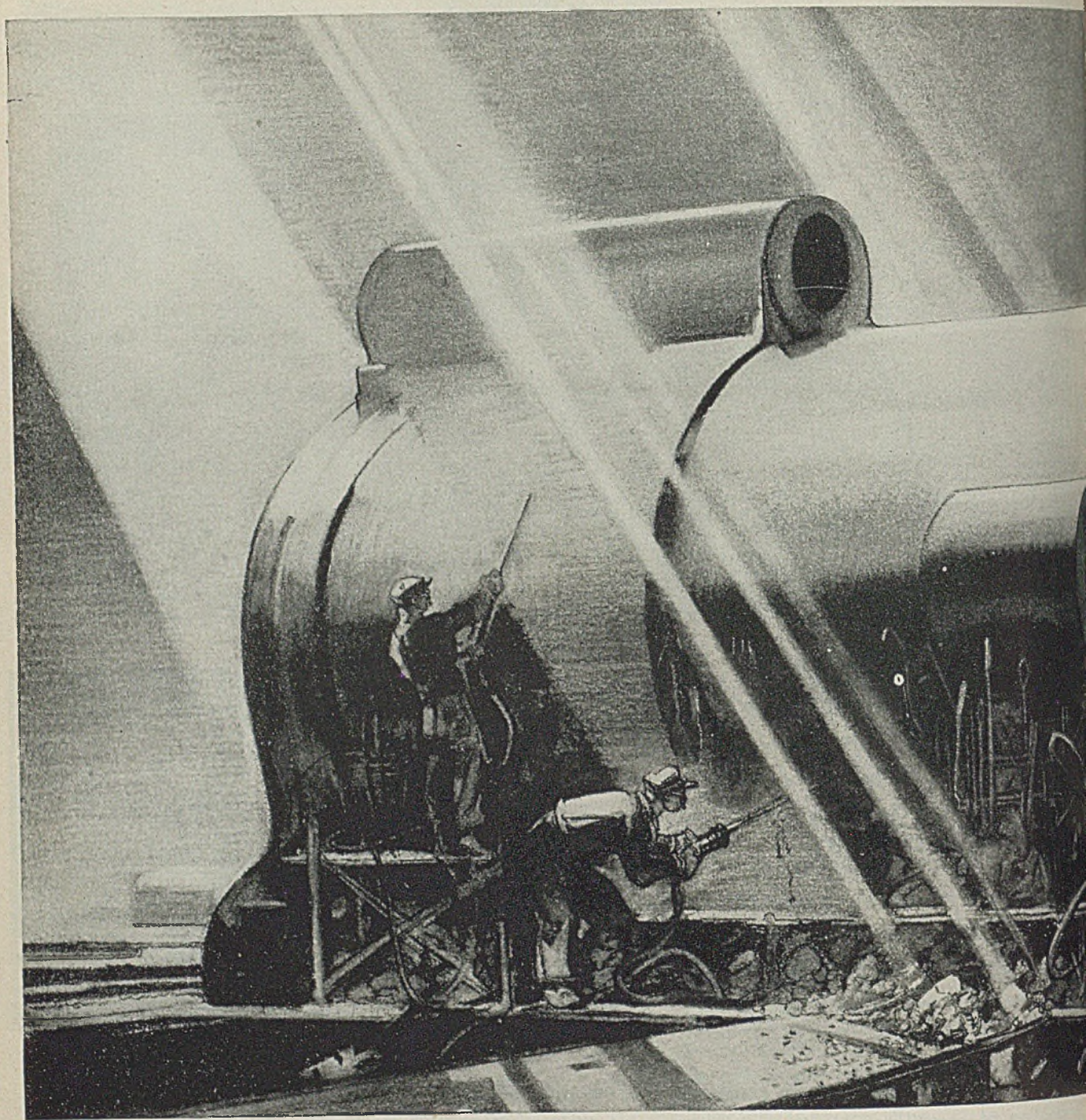
Very truly yours,

F. E. Flynn

President
A. I. & S. E.

J. S. MURRAY
Treasurer, A.I.S.E.

F. H. DYKE
Secretary, A.I.S.E.



STRONG STEEL—THE METAL BY WHIC

Gouged, hammered, pried from its mold of sand and gagger-bars, this mammoth one-piece casting of war-steel emerges in a form of massive strength to do a job on the production front as no other material could do it. A product of the art and skill of J&L foundrymen, this casting, a hydraulic cylinder, is the heart of power for a gigantic extrusion press. Strong steel in this and other castings, weighing up to 280,000 pounds, enables the giant mechanical presses to exert pressures so great as to squeeze aluminum, copper, brass and other metals, as well as certain steels, through small die openings like a pastry cook extrudes cake-icing through the tip of a pastry cone. By this extruding process these other metals are formed into hundreds of parts for aircraft engines, flying instruments and airplane assemblies as well as parts for weapons and other fighting equipment.

Thus steel — strong steel — which is being produced at the rate of 90 million tons a year, is doing two war jobs. First: steel is serving on the

CAST STEEL

"Ten cats couldn't catch a rat in that mold," is way steel foundrymen express complex maze of slits, slots, holes, channels, passages, partitions, grooves, gutters and criss-cross tunnels that make up molds in which steel castings for extrusion presses are poured, such as illustrated here.

110 army tanks on a man's back, if he could carry them, would create pressure on his feet equivalent to the force developed by an extrusion press plunger, 160,000 pounds or 80 tons per square inch, in forming airplane parts of aluminum and other metals.

More than 3 Weeks Cooling off period is allowed large steel castings after they have been poured at J&L Otis Works, Cleveland. Molds are constructed in a hole in the ground big enough for basement of a dwelling. Molds are made up with core sections fitted together like a three-dimensional jig-saw puzzle. Approximately 13 weeks are required from start of mold to finished casting, several weeks of which are required for properly drying mold and allowing cast molten steel to become solid and to cool off in the ground.

"One who plays jokes," is dictionary definition for word "gagger", but as used in advertisement at left the definition that applies is — "a piece of iron used in a mold to keep the sand or core in place."

Your invasion dollars, invested in securities of the Third War Loan, will help push our invading forces deeper into enemy territory and hasten end of War.

110 hours with Jap bullet hole in its Wright Cyclone engine valve stem, is record performance of a Curtiss Mohawk 75-A fighter, Thompson Products, Inc. reports. The 25-caliber Jap missile drilled a ¼-inch hole through the Thompson sodium-cooled valve. This was unknown to pilot, who was in the dog fight. The valve, discovered during a routine engine overhaul, was still in sound condition after an estimated 30,000 air miles.

Plasma, surgery and sulpha drugs account for saving lives of more U. S. soldiers in evacuation hospitals during the African campaign than were ever saved by any army at any time. Death rate in this campaign was between 2½% and 3% of those wounded, according to Major-General Norman Thomas Kirk, surgeon-general, U. S. Army. During first World War, General Kirk said, mortality rate was 15%. Blood plasma, contributed by American public, the "cream of American surgery" stationed at front line hospitals, and use of the new sulpha drugs to control infection, if it sets in, account for the splendid record in this war, the surgeon-general stated. One of the chief sources of sulpha drugs is the by-product coke ovens of the steel industry.

W. A. IRVIN

Director, U. S. Steel Corp. and chairman, board of trustees, National Safety Council, New York, who will speak at Safety Luncheon, Thursday noon.

Program

Tuesday, Sept. 28

9:00 A.M.

Registration

Chairman: J. S. Murray, Chief Electrical Engineer, Follansbee Steel Corp., Follansbee, W. Va.

Vice Chairman: H. W. Neblett, Special Engineer, Inland Steel Co., E. Chicago, Ind.

9:15 A.M.

Business Session

Chairman: F. E. Flynn, District Manager, Republic Steel Corp., Warren, O.

Vice Chairman: F. H. Dyke, Superintendent, Blooming, Bar and Hot Strip Mills, Wheeling Steel Corp., Steubenville, O.

9:30 A.M.

Electrical Division

Chairman: H. R. Ford, Electrical Engineer, Wheeling Steel Corp., Steubenville, O.

Vice Chairman: R. W. Graham, Assistant Electrical Superintendent, Bethlehem Steel Co., Lackawana, N. Y.

"Fire Protection in Steel Plants," by C. A. Getz, Director of Research, Cardox Corp., Chicago.

"Robots vs the Manpower Situation," by F. Mohler, Engineer, Steel Mill Section General Electric Co., Schenectady, N. Y.

"Relay Protection of Distribution Lines," by L. L. Fountain, Switchgear Engineering Department, Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

1:30 P.M.

Mechanical and Welding Division

Chairman: F. E. Kling, Assistant Chief Engineer, Carnegie-Illinois Steel Corp., Pittsburgh.

Vice Chairman: S. G. Girard, Electrical and Mechanical Superintendent, Sharon Steel Corp., Sharon, Pa.

"Plant Distribution Systems for Oxygen and Acetylene," by H. Ullmer, Process Service, Linde Air Products Co., New York.

"Chain and Chain Repairs," by F. W. Shaw, Columbus-McKinnon Chain Co., Tonawanda, N. Y.

"Prevention of Corrosion in Water Systems," by H. M. Olson, Ohio Salt Co., Pittsburgh.

1:30 P.M.

Operating Practice Division

Chairman: A. S. Glossbrenner, General Superintendent, Youngstown District, Youngstown Sheet & Tube Co., Youngstown, O.

Vice Chairman: A. D. Brodie, Superintendent, 93-Inch Cold Strip Mill, Jones & Laughlin Steel Corp., Pittsburgh.

"Industrial Engineering on War Production," by C. P. Spangler, Industrial Engineer, Jones & Laughlin Steel Corp., Pittsburgh.

"Electrolytic Tinning Operations," by H. P. Munger, Metallurgist, Republic Steel Corp., Warren, O.

"Steel for Cartridge Cases," by Lt. R. E. L. Stanford, Ordnance Department, Cincinnati.

8:00 P.M.

Motion Pictures, selected subjects

Wednesday, Sept. 29

9:00 A.M.

Rolling Mill Division

Chairman: H. G. R. Bennett, Engineer, Hot Rolling Mills, Carnegie-Illinois Steel Corp., Pittsburgh.

Vice Chairman: J. A. Scholl, Chief Roll Designer, Tennessee Coal, Iron & Railroad Co., Fairfield, Ala.

"Blooming and Billet Mills and Their Rolls," by F. C. T. Daniels and D. L. Eynon, Mackintosh-Hemphill Co., Pittsburgh.

"Some Developments in Plate Mills," by W. A. White, Superintendent of Mills, Kaiser Co. Inc., Fontana, Calif.

"Bar Mill Arrangement and Pass Design," by R. E. Beynon, Superintendent of Roll Shop Department, Carnegie-Illinois Steel Corp., S. Chicago, Ill.

9:00 A.M.

Combustion Division

Chairman: E. C. McDonald, Combustion Engineer, Republic Steel Corp., Cleveland.

Vice Chairman: C. J. Wyrought, Superintendent, Steam Efficiency and Combustion Department, Jones & Laughlin Steel Corp., Pittsburgh.

"Fuel Oil Systems," by F. C. Frye, Steam and Fuel Engineer, Great Lakes Steel Corp., Ecorse, Mich.

"Pitch As An Open-Hearth Fuel," by J. F. Wilbur, Superintendent, Fuel and Combustion, Bethlehem Steel Co., Johnstown, Pa.

J. T. WHITING

Director, Steel Division, WPB, who will speak on "Steel After 22 Months of War" at Stag Dinner, Wednesday evening.

W. SYKES

President, Inland Steel Co., Chicago, who will speak on "Retrospect and Prospects" at Stag Dinner, Wednesday evening.

Round Table Discussion — Burning the Lighter Oils in the Open Hearth.

1:30 P.M.

Electrical Division

Chairman: J. H. Miller, Electrical Superintendent, International Harvester Co., Wisconsin Steel Works, Chicago.

Vice Chairman: C. A. Kaufman, Chief Electrical Engineer, Jones & Laughlin Steel Corp., Pittsburgh.

"A New Method of Speed Control and Braking for AC Cranes," by E. J. Posselt, Engineer, Cutler-Hammer, Inc., Milwaukee.

"AC and DC Drives for Draw Benches and Wire Blocks," by R. A. Geuder, Manager, Metal Industry Applications, Reliance Electric & Engineering Co., Cleveland.

"Electrical Equipment for Modern Arc Furnaces," by C. C. Levy, Industry Engineering Metalworking Section, Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

1:30 P.M.

Operating Practice Division

Chairman: A. C. Cummins, General Superintendent, Carnegie-Illinois Steel Corp., Youngstown, O.

Vice Chairman: C. P. Betz, Assistant Manager, Hanna Furnace Division, Great Lakes Steel Corp., Ecorse, Mich.

"Gas Yield and Economy in the Coke Plant," by R. W. Campbell, Superintendent, By-Product Department, Jones & Laughlin Steel Corp., Pittsburgh.

"Modern Trends in Blast Furnace Design," by Frank Janecek, Blast Furnace Engineer, Republic Steel Corp., Cleveland.

"Variations in Blowing Rates for Blast Furnaces," by E. L. Clair, Vice President, Interlake Iron Corp., Chicago.

"Bedding and Reclaiming Metallurgical Raw Materials," by A. J. Boynton, A. J. Boynton & Co., Chicago.

7:30 P.M.

Informal Stag Dinner

Speakers: W. Sykes, President, Inland Steel Co., Chicago — "Retrospects and Prospects." J. T. Whiting, Director, Steel Division, WPB, Washington —"Steel After 22 Months of War."

Thursday, Sept. 30

9:00 A.M.

Combustion Division

Chairman: P. F. Kinyoun, Combustion Engineer, Bethlehem Steel Co., Lackawanna, N. Y.

Vice Chairman: H. C. Reese, Fuel Engineer, Wheeling Steel Corp., Steubenville, O.

"Pulverized Fuel for Heating and Metallurgical Furnaces," by L. S. Wilcoxson, Babcock & Wilcox Co., New York.

"Colloidal Fuel As a War and Postwar Liquid Fuel," by J. G. Coutant, Fuel Engineer, New York.

"Feed Water Treatment for Weirton's High-Pressure Station," by J. H. Strassburger, Manager, Maintenance and Service, Weirton Steel Co., Weirton, W. Va.

9:00 A.M.

Lubrication Division

Chairman: P. J. Doyle, Lubrication Engineer, Republic Steel Corp., Cleveland.

Vice Chairman: C. E. S. Eddie, Plant Lubrication Engineer, Great Lakes Steel Corp., Ecorse, Mich.

"Centralized Lubrication for Blast Furnaces," by A. J. Jennings, General Sales Manager, Farval Corp., Cleveland.

"Lubrication of Nonmetallic Bearings," by G. E. Reiser, Assistant Lubrication Engineer, Bethlehem Steel Co., Lackawanna, N. Y.

Round Table Discussion — Lubrication Practices.

12:00 P.M.

Safety Luncheon

Speaker: W. A. Irvin, Director United States Steel Corp., and Chairman, Board of Trustees, National Safety Council, New York.

2:00 P.M.

Safety Division

Chairman: R. H. Ferguson, Manager of Safety, Republic Steel Corp., Cleveland.

Vice Chairman: L. R. Palmer, Equitable Life Assurance Society of United States, New York.

"Developing a Practical Safety Program," by A. H. Fosdick, Superintendent of Blast Furnaces, Bethlehem Steel Co., Bethlehem, Pa.

"Building Safety Into the Plant," by H. J. Griffith, Manager of Safety and Welfare, Jones & Laughlin Steel Corp., Pittsburgh.

"The Responsibility for Safety," by W. Dean Keefer, Vice President, Lumberman Mutual Casualty Co., Chicago.

Builds WELDED BLAST FURNACE In Eight Months

EACH BLAST furnace built by arc welding increases production by 130,000 tons—enough iron, when refined into steel, to build 93,000 jeeps, or 4600 medium tanks, or 65 destroyers or even three battleships.

The increased production, so vital at present, is created by the reduced time required to build a welded blast furnace by permitting its operation to begin months earlier. The conventional blast furnace requires 12 months to build. The first welded furnace began pouring iron 8 months after work was started.

The welded furnace has been adopted only recently by the steel industry. During the period from 1930 to 1938 when arc welding was rapidly replacing older methods of fabricating steel in many industries, the steel industry itself was operating essentially with equipment built prior to that period. This was particularly true of the 220 blast furnaces in the United States.

Recently the rapid increase of steel consumption by defense industries caused the need for a considerable expansion of iron and steel production equipment. One of the first furnaces built under the expansion program was the No. 3 stack of Weirton Steel Co., Weirton, W. Va. It was blown in December, 1941. The furnace has a rated capacity of 400,000 tons a year—slightly more than 1000 tons a day. Advantages of arc welding were applied in the fabrication of the steel plate work including the furnace shell, mantle, tuyere breast jacket, bosh bands, hearth jacket, dust catcher, whirler, hot blast stoves, gas and air piping and walkways.

When the recent rapid expansion of the steel industry became necessary, it was thought by some, that to save time in building new furnaces, duplicates of the older furnaces should be made. This would eliminate to a certain extent, the preparation of new designs and detail drawings. But upon further consideration, the advantages of arc welding offset this savings so that practically all of the furnaces built recently have been welded.

An example of this trend is the No. 3 Weirton stack. The Weirton Steel Co. acting as general contractor on this project, requested separate bids at different times on the various steel structures. The first of these was the furnace shell and mantle based on riveted design. An alternate bid on arc welded design was suggested. The estimated cost of the two structures indicated a substantial savings by using the welded design, Fig. 3. In view of this fact, the remaining structures were then considered only on the basis of a welded design.

The blast furnace and its accessory equipment including gas-cleaning apparatus, piping and hot blast stoves were designed for an internal pressure of 30 pounds per square inch. In addition to this pressure, the weight of the structure, the loads of ore, coke, limestone, dust, brick lining and wind were considered.

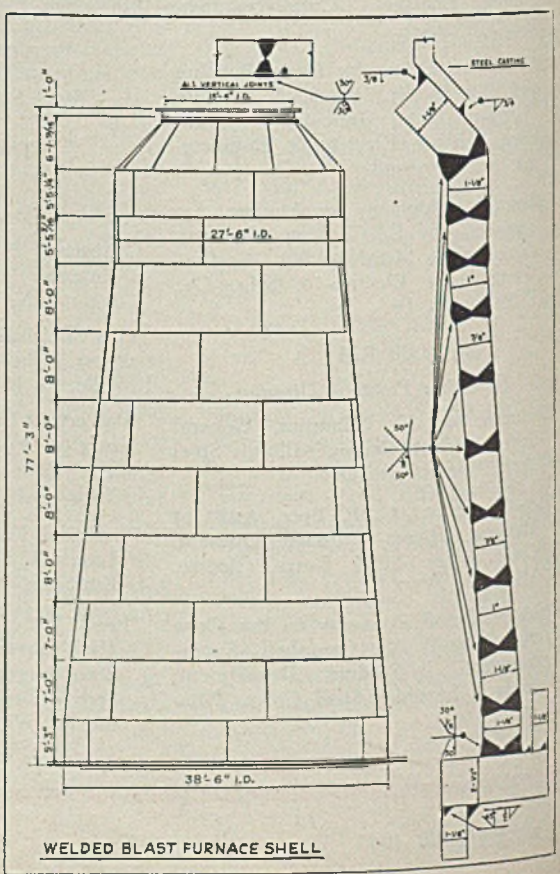
Furnace Shell: This, made of ⅞, 1 and 1⅛-inch plates, was entirely butt-welded, Fig. 1. It has 11 courses, six plates to the course. All of the vertical joints were of the double U-type, fabricated by planing. The horizontal joints were double-V. These edges were burned. The bottom of the shell was welded to the mantle with a double J-joint.

The mantle, having 1⅛-inch flanges and a 2½-inch web also was buttwelded. It was shop fabricated in eight sections. The flanges were designed and shop welded to the web in such a way so as to reduce to a minimum the tendency to warp or distort the sections. In the field, these sections were welded together to form a complete ring. Webs were joined by using a deep single U-

Fig. 1. (Immediate right)—Blast furnace shell showing type of weld employed

Fig. 2. (Upper right, opposite page)—Welded blast furnace recently completed by Weirton Steel Co.

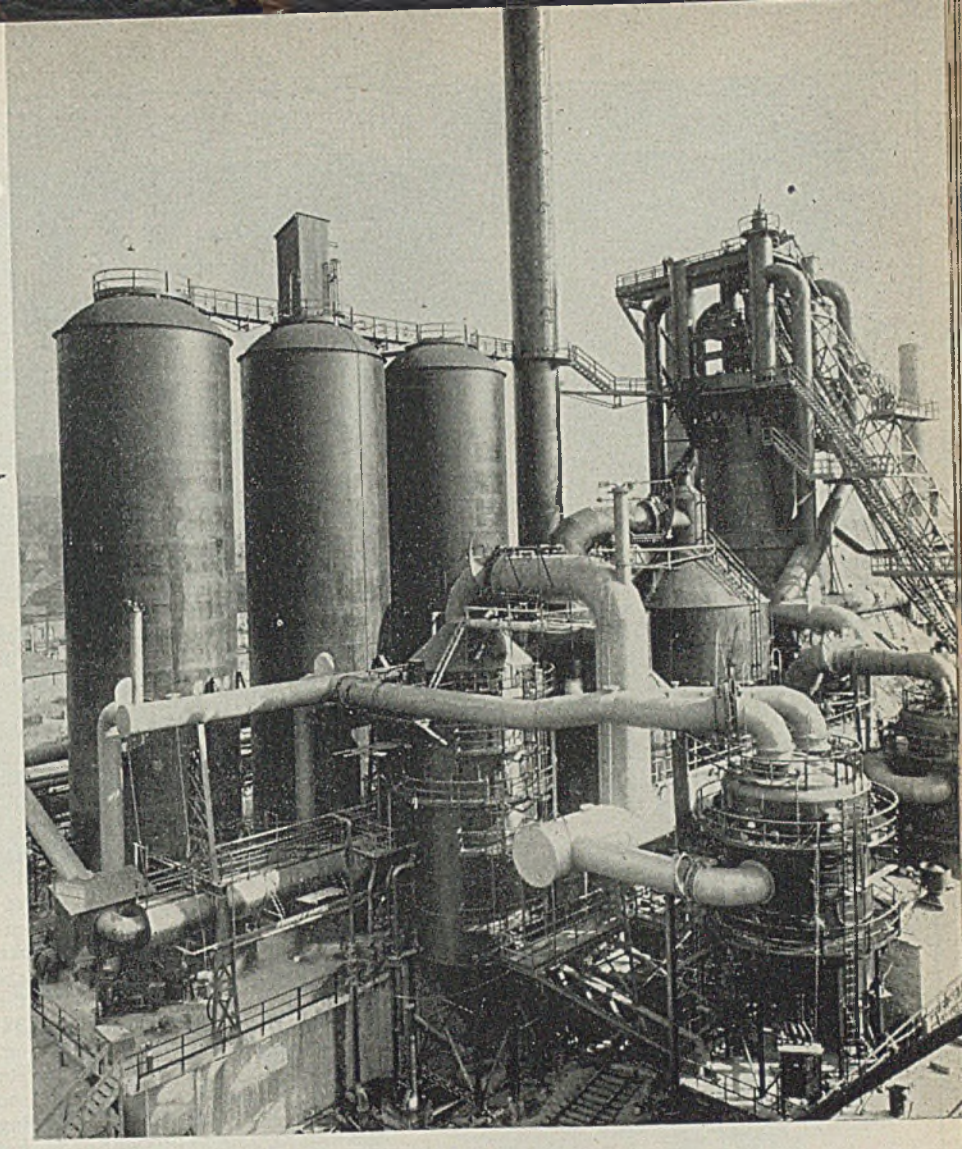
Fig. 3. (Lower right, opposite page)—Blast furnace shell showing two types of design



WELDED BLAST FURNACE SHELL

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

By REGIS F. FEY
Structural Engineer
Pittsburgh-Des Moines Steel Co.
Pittsburgh



joint, thus permitting all down welding.

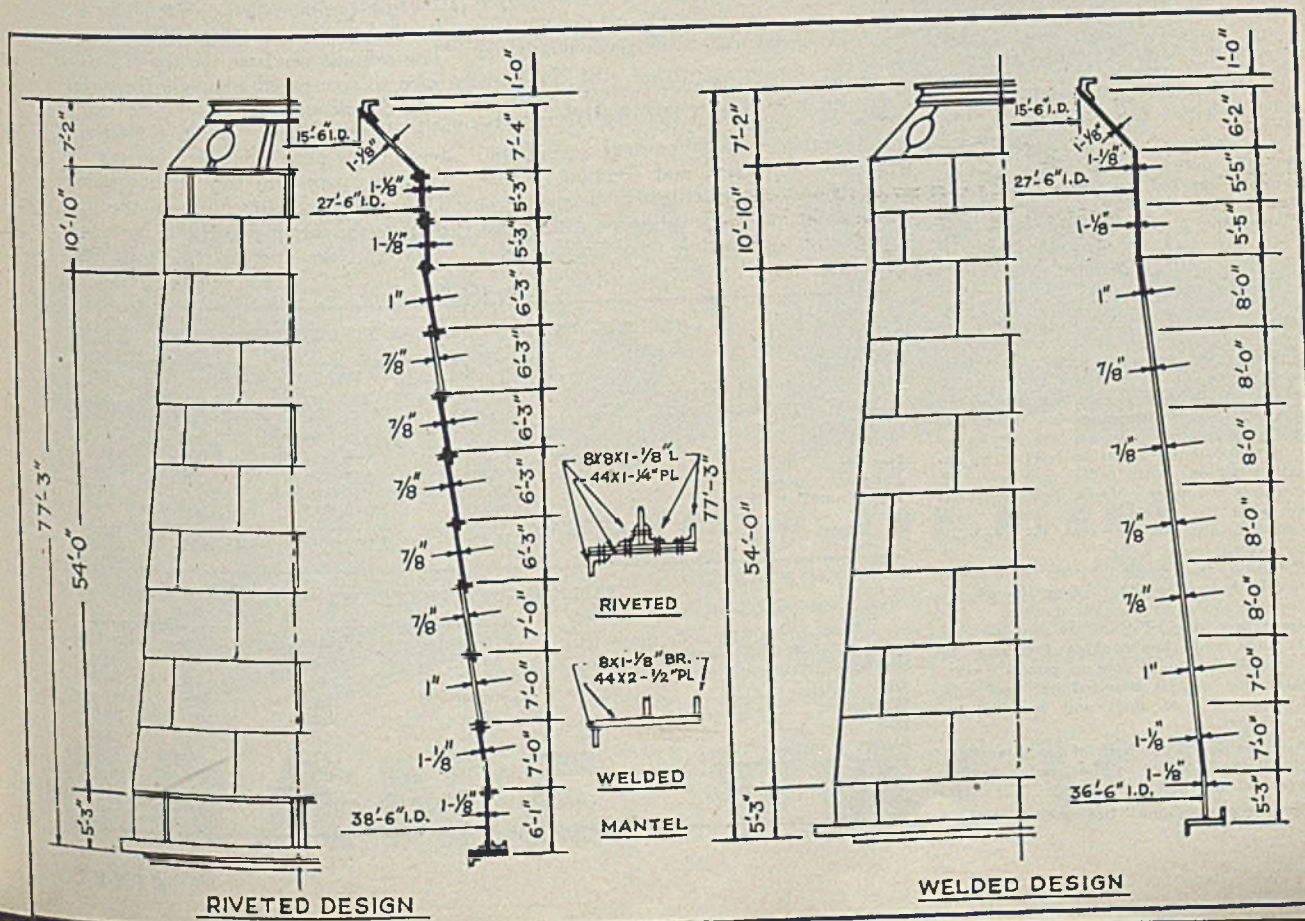
At the top of the shell, the top ring steel casting, made in four parts, was attached to the plate with welds as small as was practical—⅜-inch fillets on each side.

The buttwelded joints of the shell and mantle required special consideration in detailing the plates. A shrinkage of ⅛-inch was anticipated at each joint in the shell plates. Therefore, the plates were detailed and fabricated to the size required on the basis that the edges of the plates touched, then they were erected with a ⅛-inch gap between the edges.

A special welding procedure consisted of welding the joints in sequence so as to reduce as much as possible a tendency to distort the structure due to the shrinkage of the joints.

I. Filler rod metal Fleetweld No. 5 for all seams.

II. Qualifications of welders: All welders



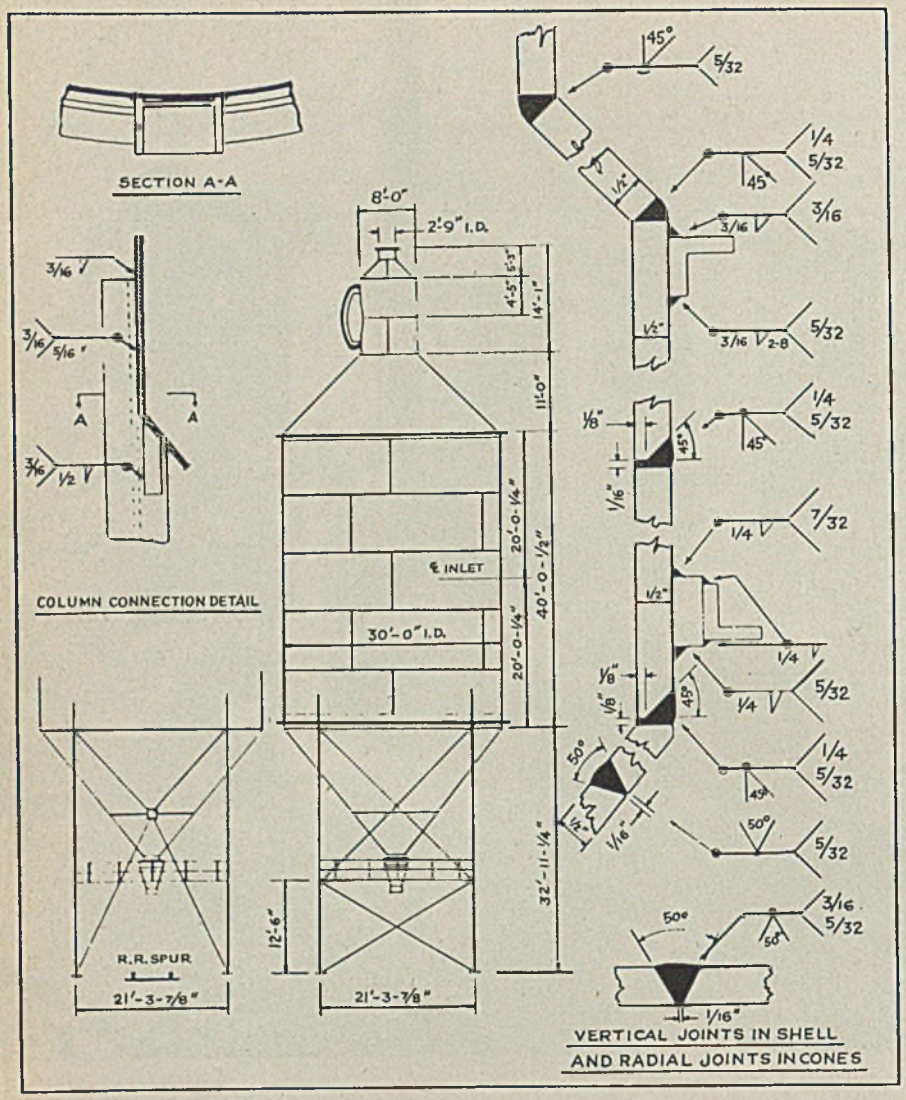


Fig. 4—Details of dust catcher

must have passed previously the A. W. S. qualification test for types of joints shown on drawing or must take the A. W. S. qualification test on the job before starting to weld. A record of each welder shall be kept for the foreman and papers for each new welder should be sent to the office.

III. General: Each bead of welding shall be peened only sufficiently to break up slag. Chip out all cracked and poorly fused tack welds.

IV. Procedure: 1. Erect mantle sections, FM1 and FM2, and tack them together with the edges of the mantle sections in contact. Do not attempt to bolt the mantle ring to the columns with the 2-inch round bolts before the mantle is entirely welded. The mantle ring has been fabricated oversize to accommodate the welding shrinkages in the joints, and it is, therefore, impossible to line up the holes in the mantle with the holes in the top of the columns until the mantle has been completely welded. The mantle, however, may be bolted lightly to the columns so as to hold it in approximate position with bolts that are 1¼ inches or less diameter. These bolts must be removed after the joints of the mantle have been continuously welded and be replaced with the 2 inch round bolts.

2. Establish the inside of the shell with punch marks spaced at about 12 or 18-inch intervals on the top surface of the mantle.

3. Erect first ring of shell by first tacking vertical joints and then tacking first ring to mantle to hold inside of ring to punch marks.

4. After first ring is rounded out and tack welded, remainder of shell and furnace top may be erected.

5. Weld at least one-half of each vertical joint above and below a horizontal before that horizontal joint itself is welded.

6. Furnace top should be welded in following sequence: radial joints first, top plates to shell second, and finally plates to top ring casting.

7. Erect and bolt liner castings on furnace top after it has been entirely welded.

A furnace shell requires exceptional care in fabrication and erection so that the complete structure is accurate in alignment and elevation. After this shell and top casting were erected and welded, a plumb-line dropped from the center of the top casting to the bottom of the furnace indicated no measureable out-of-alignment from the center of the furnace at the bottom. Measurements to determine the actual elevation at the top of the flange of the casting indicated a difference of only 1/16-inch from the previously figured elevation. These results indicated a thorough understanding of welding shrinkage and distortion problems which was applied to the fabrication and welding procedure of the structures.

It may be noted that during erection and welding there is a certain amount of control, within limits, of the alignment and elevation of the structure.

Furnace Accessories: The lower part of the furnace from the mantle to the bottom of the hearth consists of a thick circular firebrick wall. The upper portion is encased by the welded tuyere breast jacket. Through this water-jacketed band pass the tuyeres through which the blast is injected into the furnace. In the firebrick from the bottom of the tuyere breast jacket to the bottom of the hearth are embedded steel reinforcing bands. There are eight bosh bands made of 12 x 1½-inch bars. Each band is made in four sections. Splice bars are welded to the ends of the bars in the shop. The rings are bolted together in the field. They range in diameter from 32½ to 38½-feet. They are placed one on top of the other, increasing in diameter toward the top. The bands are separated about 6 inches by spacer castings. Below these are four hearth jacket bands made of 12 x 1¾-inch bars. Splices are similar to those on the bosh bands.

Dust Catcher: This vessel, Fig. 4, is the first in a series of gas-cleaning units. The exhaust gas from the top of the furnace is conveyed through the uptake and downcomer pipes into the side of the dust catcher. About 40,000 cubic feet of gas per minute, at a considerable velocity, pass into this large container. The reduced velocity in the dust catcher permits the larger particles of coke, limestone and ore dust to settle to the bot-

TABLE I—WEIGHT OF STEEL STRUCTURES

Item	Weight, pounds		Savings	
	Riveted	Welded	Pounds	Per cent
Furnace shell and mantle	510,000	412,000	98,000	19.2
Furnace accessories	163,000	132,000	31,000	19.0
Dust catcher	205,000	184,000	21,000	10.2
Whirler	77,000	69,000	8,000	10.4
Hot blast stoves	903,000	832,000	71,000	7.9
Exhaust stack	153,000	138,000	15,000	9.8
Piping and walkways	1,215,000	1,042,000	173,000	14.2
Total	3,226,000	2,809,000	417,000	12.9

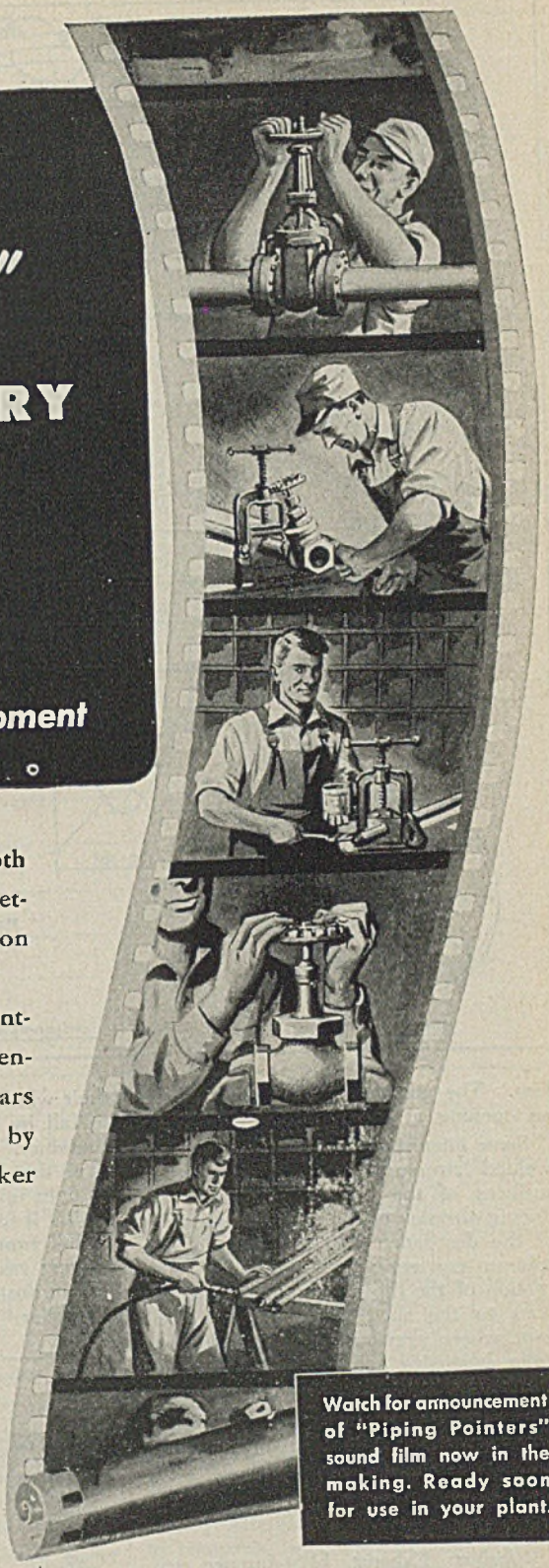
TABLE II—DRAFTING COSTS

Item	Design		Savings	
	Riveted	Welded	Dollars	Per Cent
Furnace shell and mantle	$403	$265	$138	34.2
Furnace accessories	202	128	74	36.6
Dust catcher	654	402	252	38.5
Whirler	353	252	101	28.6
Hot blast stoves	260	196	64	24.6
Stack	215	127	88	40.9
Piping and walkways	8,270	4730	3540	42.8
Total	$10.357	$6100	$4257	41.1

"PIPING POINTERS"

A SERVICE TO INDUSTRY AT WAR

Helps Train Piping Crews
Helps Conserve Critical Metals
Helps Speed Piping Installations
Helps Keep Pipe Lines Flowing
Helps Get Longer Life from Piping Equipment



As industrial manpower and equipment supplies grow more critical, more and more plants are realizing the usefulness of "Piping Pointers" Bulletins in coping with maintenance problems. Listed above are five major helps these bulletins are giving. Users say there's no end of ways in which this Crane service is helping piping men, both trainees and veterans, do a better job of keeping piping on the job.

Every hint in "Piping Pointers" is sound, practical, authentic. They're based on 88 years of flow control engineering by Crane—world's leading maker of valves and fittings.

Watch for announcement of "Piping Pointers" sound film now in the making. Ready soon for use in your plant.

FREE TO ANY PLANT

One of its emergency services to industry, Crane offers a supply of "Piping Pointer" Bulletins to any plant requesting them. No obligation. Ask your Crane Representative, or address Crane Co., 836 S. Michigan Ave., Chicago 5, Ill.

CRANE VALVES

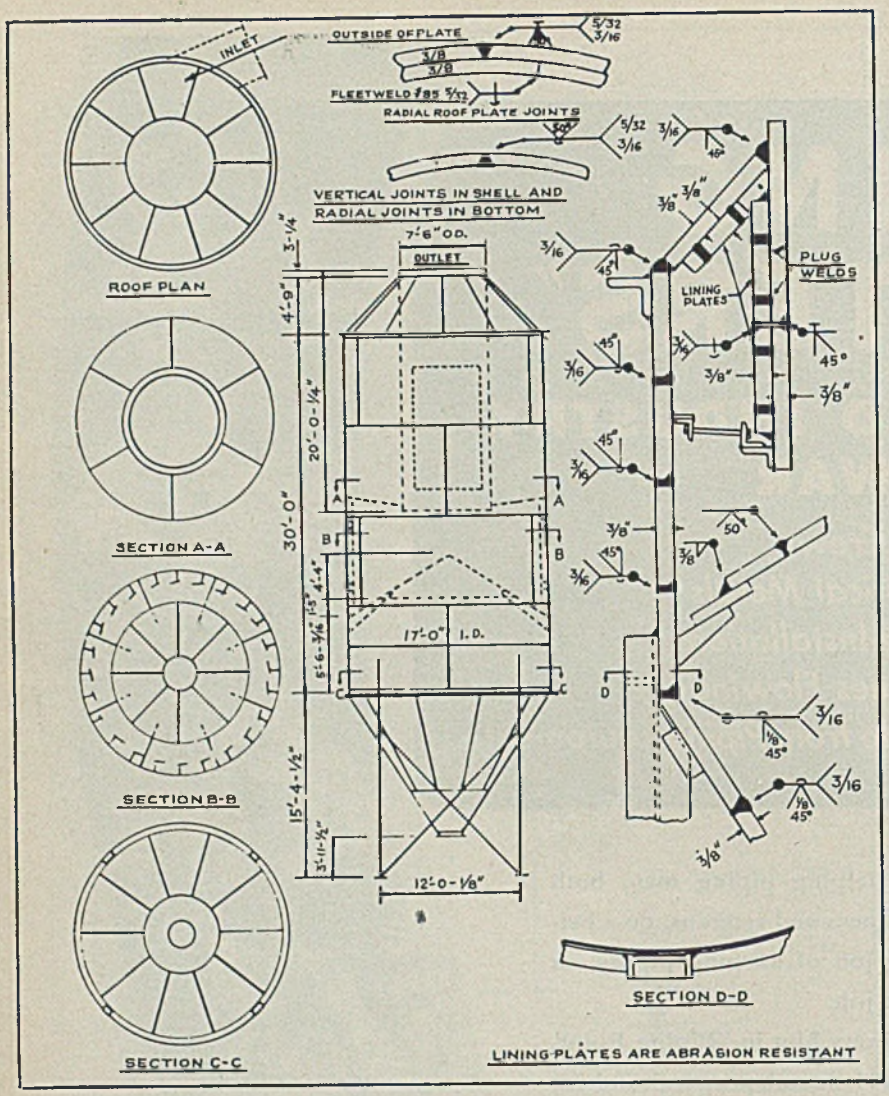


Fig. 5—Details of whirler

tom. The gas then passes out through an opening at the top.

Some interesting design features of this welded structure are: Smooth inside surfaces of the buttwelded plates, reducing abrasion of the plates by particles of the dust-laden gas; simplicity of the column connecting to the shell; connection of the top and bottom cone sections to the shell using a buttwelded joint where previous designs would require expensive flanging of these plates to make a lap joint; the compression ring at the belt seam, consisting of an angle and a bar; the simple welded detail transmitting the equivalent of this section around the column connection and the plain portal bracing in two panels of the tower.

Whirler: Exhaust blast-furnace gas then passes through the whirler, Fig. 5, at an average velocity of 550 feet per minute. The inlet gas pipe enters the shell at an angle so that the incoming gas passes around the outside of the 7½-foot diameter uptake tube in a downward rotating motion and then passes up through this tube to the next cleaning apparatus. Gas whirling at a reasonably high velocity causes the dust particles to be thrown outward toward the shell by centrifugal force. These are 24 vertical vanes attached to the lower part of the shell to catch these particles, stopping their whirling motion and allowing them to fall by gravity to the bottom of the container. A cone, smaller in diameter than the whirler itself, is placed with its apex upward in the lower part of the shell. It permits the particles of dust to fall from the vanes and prevents the moving gas from agitating an accumulation of dust particles in the bottom.

Similar welded design features to those used on the dust catcher were incorporated in this structure. In addition, special consideration was given to the abrasion of the steel plate by the dust particles. A ⅜-inch thick abrasion-resistant steel plate, having a carbon content of 0.45 per cent was welded to the outside surface of the uptake tube and to the underside of the cone roof. These plates were attached by plug welds and joints were then sealed with a filler bead of shield arc No. 85 rod. All of these welded surfaces were then ground smooth. It may be noted here that it would have been much more expensive to provide a smooth continuous abrasion-resistant surface by any other method than welding. The shell plates from the cone roof down to the vanes were protected from abrasion by a brick lining.

Hot Elast Stoves: After the gas is thoroughly cleaned, part is burned in the hot blast stoves. There are three stoves of the 2-pass type, each 26 feet diameter by 102 feet 2¾ inches shell height, Fig. 6. Sixty carloads of a silica checker brick are placed in each stove. The gas burns in a brick combustion chamber which is near the center of the stove extending to the top of the shell. It then travels down numerous small passages in the brickwork near the periphery of the stove and exhausts through chimney valves near the bottom. The schedule is to heat the stoves for two hours while air is passed through them for one hour. They are operated alternately, two being heated while through the third is forced air preheated to about 1100 degrees Fahr. before passing to the stack.

The stoves are entirely buttwelded, using ⅝ and ¾-inch plates. The numerous nozzles were also welded. This construction facilitated the laying of the brickwork adjacent to the smooth inner surfaces. It also assured a gas-tight construction.

Exhaust Stack: One stack serves the three stoves to carry off the burned gas which enters through the bottom. The stack is 200 feet high by 10 feet 9 inches diameter, having a conical bell section 45¼ feet high by 20 feet diam-

TABLE III—FABRICATION COSTS

	Structure		Savings	
	Riveted	Welded	Dollars	Per Cent
Furnace shell and mantle	$9,582	$5,819	$3,763	39 3
Shop assemble and ream holes	1,880		1,880	100.0
Furnace accessories	5 275	3,067	2 208	41.9
Dust catcher	6,512	3,705	2,807	43.1
Whirler	4,367	2.543	1,824	41.8
Three hot blast stoves	11.784	7.685	4,099	34.8
Stack	2.808	1,936	872	31.1
Piping and walkways	80,346	48,840	31,506	39.2
Total	$122,554	$73,595	$48,959	39.9

TABLE IV—ERECTION COSTS

	Structure		Savings	
	Riveted	Welded	Dollars	Per Cent
Furnace shell and mantle	$14,200	$7,040	$7,160	50.4
Furnace accessories*				40.4
Dust catcher	6,970	4,150	2.820	45.4
Whirler	2 800	1.530	1.270	45.1
Three hot blast stoves	30.400	16,700	13.700	37.7
Stack	7.950	4.950	3,000	44.0
Piping and walkways	40,550	22,700	17,850	
Total	$102,870	$57,070	$45,800	44.5

*Furnace accessories were erected in conjunction with brickwork by brick contractor.

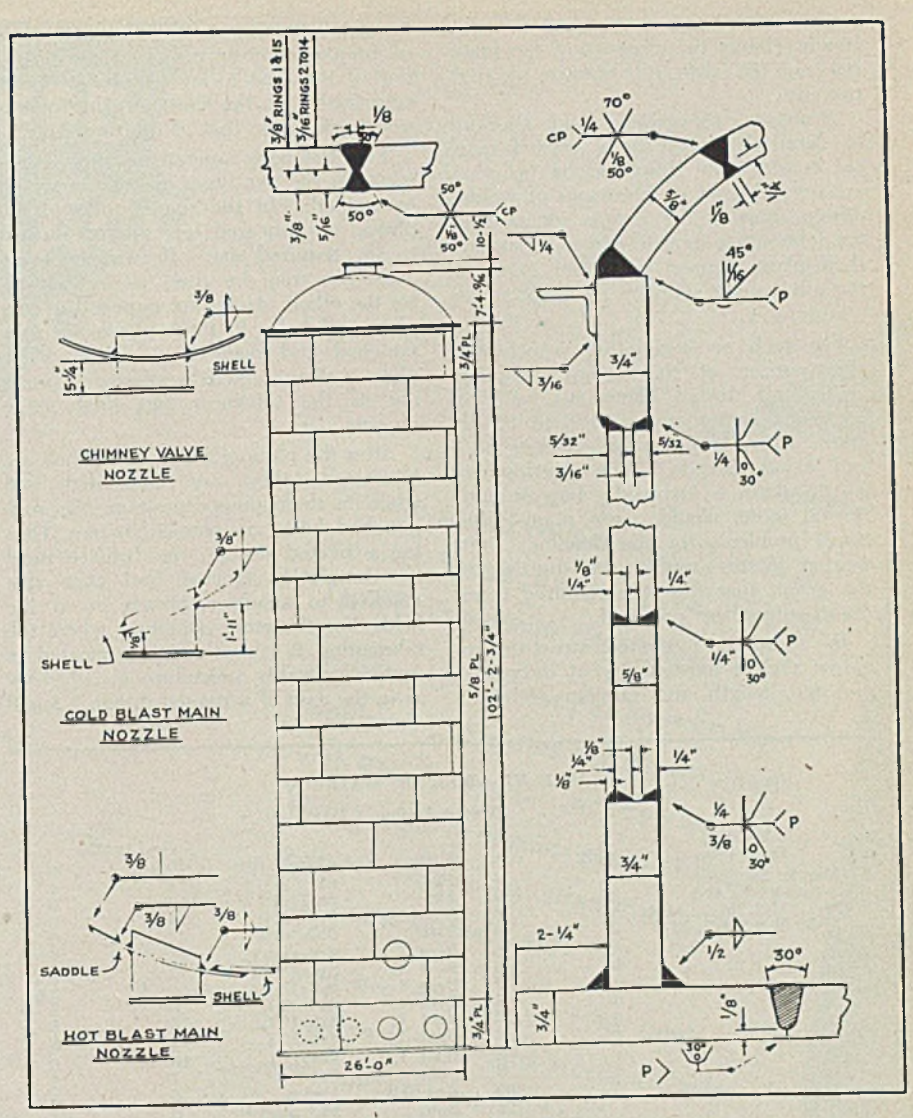


Fig. 6—Hot blast stove of gas-tight construction

eter at the base; self-supporting having 24 two-inch diameter anchor bolts not upset; and is fabricated of 5/16 to ½-inch thick plates, with seams entirely buttwelded.

The stack was so situated that a large guyed derrick placed on top of the lower 100-foot section was used to erect the steel for all the other structures except No. 3 stove where a basket pole was used. The steel plates and welded joints for this lower section of the stack were designed to withstand erection loads.

Piping: This ranges from 3 to 9 feet in diameter, fabricated from ⅜ and ½-inch buttwelded plate. The hot blast main and bustle pipe have a 4-inch brick lining. Offtakes, uptakes and downcomer have 0.7 per cent carbon wearing plates, welded to the inside of the pipe at the various bends.

It was originally intended to shop-weld the pipe in sections of 20 to 24 feet long. However, during fabrication and erection the shop, due to the schedules of other jobs, was not able to supply the field crew with steel fast enough to keep them working efficiently. To relieve this situation, the shop only prepared the edges and rolled the plates. They were then shipped to the location where the field crew welded the plates into sections. The costs showed no noticeable loss of efficiency. This indicates the adaptability of welded pipe designs to production scheduling.

Walkways and Platforms: These were made by the usual construction methods, the members being welded or bolted together. As many of the walkways were placed along the top of the piping and, as the exact location and alignment of the piping in several instances were established during erection, these walkways were then of necessity "made to fit" in the field. This assured an accurate fit, a condition that scarcely could be anticipated if completely shop fabricated.

Proportionate Cost Savings: Every item or operation included in the total cost of the job is considered, such as cost of material, preparation of detail drawings, shop fabrication, freight charges, erection cost, taxes, insurance, general overhead and profit. These items then are summarized to obtain the total savings. This cost analysis reveals the proportionate savings of each item or operation.

Weight: The furnace shell, whether riveted or welded, usually is made of the same thickness of plate. This ranges from ⅞ to 1¼ inches depending upon the location of the plate in the shell. The advantage of buttwelding the plates arises from the consideration that the heavy butt straps or plate laps are eliminated.

Other structures, including furnace accessories, dust catcher, whirler, hot blast stoves, stack and piping and walkways also indicate a weight savings. These usually are of a nominal plate thickness. Therefore, the reduction in weight by using a welded design is also reflected in the elimination of lap or butt-riveted joints and in the simplification of the structural details.

The weights of the welded structures as compared with the estimated weights of these structures on a riveted basis are indicated in Table I.

On the basis of the published mill base price of $2.10 per hundredweight for steel plates and shapes plus an average allowance of 15 cents per hundredweight for unloading the steel at the fabricating plant, the cost of welding wire or rivets, and mill extras on the steel, etc., the savings in metal costs amounts to:

($2.10+.15) × 4170 cwt.=$9370

This weight savings not only causes a reduction in the material cost but also is reflected in a lesser handling cost dur-

TABLE V—TOTAL COSTS

	Structure		Savings	
	Riveted	Welded	Dollars	Per Cent
Furnace shell and mantle	$65.750	$39.250	$26.500	40.3
Furnace accessories	10,220	6,870	3,350	32.8
Dust catcher	27,450	18,100	9,350	34.1
Whirler	14,420	9,250	5,170	35.8
Three hot blast stoves	98.210	67,880	30 330	31.0
Stack	17,410	12,150	5,260	30.2
Piping and walkways	204,100	130,230	73,870	36.2
Total	$437,560	$283,730	$153,830	35.2

TABLE VI—SUMMARIZED COSTS

	Structure		Savings	
	Riveted	Welded	Dollars	Per Cent
Material	$72 550	$63.200	$9.350	6.1
Drafting	10,360	6,100	4,260	2.8
Shop Fabrication	122,550	73,590	48.960	31.8
Erection	102.870	57.070	45,800	29.8
Accessories	21,340	12.180	9,160	6.0
Freight	3,540	2,930	610	0.4
Taxes, insurance, general overhead profit	104,350	68,660	35.690	23.1
Total	$437,560	$283,730	$153,830	100.0

ing fabrication and erection and a smaller freight charge in transporting the material from the fabricating plant to the erection site.

Drafting: Preparation and checking of detail drawings for a blast furnace are considerably simplified by using an arc-welded design. Drawings of welded design showing the details required by the fabricating shop to make the furnace shell plate, mantle and other items on the job greatly simplify the work of assembly.

For such an installation, a considerable portion of the piping comprises bends and turns. These are made in segments having arcs from 6 to 10 degrees. There is also a large variety of T and Y-intersections. The development of the plates is involved. Lap or butt-riveted joints would cause many additional problems for the detailer. Butt-welded joints simplify the drafting to the extent that the time required is reduced almost by one half.

In addition, a riveted structure requires a rivet location layout indicating the size, length and number of rivets the detail drawings. Therefore, the time to prepare the drawings is an indication of the time to lay out the steel. A comparison of the costs of this operation is similar to that of drafting costs.

The following operations vary somewhat for the two types of design, riveted or welded. In the riveted design, the plates are sheared or square burned to the required size. If two plates are alike one may be used as a template for the other. Holes are punched in thin plate and holes in thick plates are subpunched and reamed or drilled. The plate is then formed by rolling or pressing as the thickness and final shape require.

After the parts of the furnace shell are fabricated, they are assembled and while in their proper position, the subpunched holes are reamed to size. Thus for a riveted design, the furnace must be completely erected and then dismantled to assure a proper fit in the field. For the other structures where the fabrication is considered complicated, a similar assembly procedure is necessary as in the case of a riveted design. Small

TABLE VII—BILL OF MATERIAL

No. pcs.	Description	Mark	No. pcs.	Shape	Finished size	Lengths ft.	Lengths in.
	Riveted Design						
8	Mantle Sections 1—each marked M-1, M-2, M-3, M-4, M-5, M-6, M-7, M-8	f	4	Plate	68⅞"x1¼"	14	0
		g	4	Plate	68⅞"x1¼"	14	0
		k	4	Plate	68⅞"x1¼"	14	0
		d	4	Plate	68⅞"x1¼"	14	0
		a	8	Bent L.	8x8x1⅛" L.	15	1⅜
		b	8	Bent L.	8x8x1⅛" L.	13	3¼
		c	8	Bent L.	8x8x1⅛" L.	13	2 7/16
		m	2	Bent L.	8x8x1" L.	10	8
		n	2	Bent L.	8x8x1" L.	10	8
		p	2	Bent L.	8x8x1" L.	10	8
		s	2	Bent L.	8x8x1" L.	10	8
		t	8	Plate	8x1"	1	1
			389	Rivets	1⅛" ø	0	3½
			16	Bolts	1¾" ø	0	11
			16	Bolts	1¾" ø	1	0
	Welded Design						
8	Furnace Mantle Mark FM	3pa	8	Plate	48x2½"	8	2 7/16
		3ha	8	Plate	8x1⅛"	13	7⅞
		3hb	8	Plate	8x1¼"	16	4⅞
		3pb	8	Plate	48x2½"	8	2 7/16
			64	Bolts	1¾" ø	1	6
			110	W. Wire	¼" ø F.W.	..	..
			240	W. Wire	5/16" ø F.W.	..	..

furnished and the joint of the structure where they are to be used. For a welded structure, the size of weld wire for each bead is indicated on a large scale section shown on the erection or assembly drawing. Table II shows the drafting costs on this job as compared to a riveted job built in 1937. The costs are given for the time required to make and check the detail shop drawings.

Shop Fabrication: This is one of the larger items of cost of the structures. Several comparisons of shop costs make the welded design more economical for such an installation.

For the welded design there is a savings in unloading the steel to the stockyard and a similar reduced cost in handling and moving the steel through the sequence of shop operations because of the lesser weight.

The first shop operation is laying out the steel. This involves marking on the steel the dimensions that are shown on items such as pipe bends are assembled and then shop riveted in sections.

Many of the plates in these structures would be bent or flanged to form a lap riveted joint. At a transition section the plate is either hot or cold worked depending upon the thickness of the plate, radius of bend and angle of flanging.

In the welded design, after the plate is laid out, the edges are prepared by either burning or planing. The plate then is formed by rolling or pressing as the thickness and shape require. Plates joined by buttwelds do not require flanging at transition sections. Plates fabricated for field welded construction generally do not require a shop assembly to assure an accurate fit.

A reduction in the number of pieces for an item by using a welded construction is another savings indication, due to necessary connection welds. This is particularly obvious of the blast furnace mantle. A bill of material for each mantle is presented below in Table VII.

The overhead of a weldery is somewhat lower than that of a similar shop having facilities for riveted construction. The machinery is smaller and less expensive. There are fewer tools required. Fewer operations involve lesser machinery and supervisory workmen.

Table III shows the fabrication costs of the various structures. They reflect the various aforementioned advantages of a welded design.

Erection: The procedure was to first completely erect each structure, then to weld the joints, carefully following the welding sequence as previously outlined.

Welded design showed several advantages during erection. As previously indicated with respect to the piping, the erection crew was kept working by welding the pipe in the field. Also an uncanny accuracy was obtained in the alignment and top elevation of the furnace shell.

The erector of welded structures has the same two important tools in the field that are generally used in the fabricating shop—the burning torch and the welding machine. Of occasion he may use these to make adjustments to the shop fabricated steel. On this job, all of the openings in the structures for the pipes were burned at their proper locations, these being determined only after the structures were completely erected and welded. This procedure assured an accurate alignment. There were some instances where the piping did not fit and adjustments were made by burning and welding. Some of the platforms and stairways on this piping were then of necessity detailed and fabricated approximately in size and then "made to fit" in the field.

These advantages combined with a comparison of making a buttwelded joint to riveting a joint are indicated in Table IV.

Details of Cost Items

Other items of cost to be considered are freight, taxes and insurance. The freight is primarily a function of the weight, the welded structures being lighter will cost less. To a lesser degree it is a function of the type of fabrication. Certain riveted pipe sections must be shop assembled and riveted. These large sections at times require less car load rate or a car load minimum charge, while if they are welded they may be shipped knocked down.

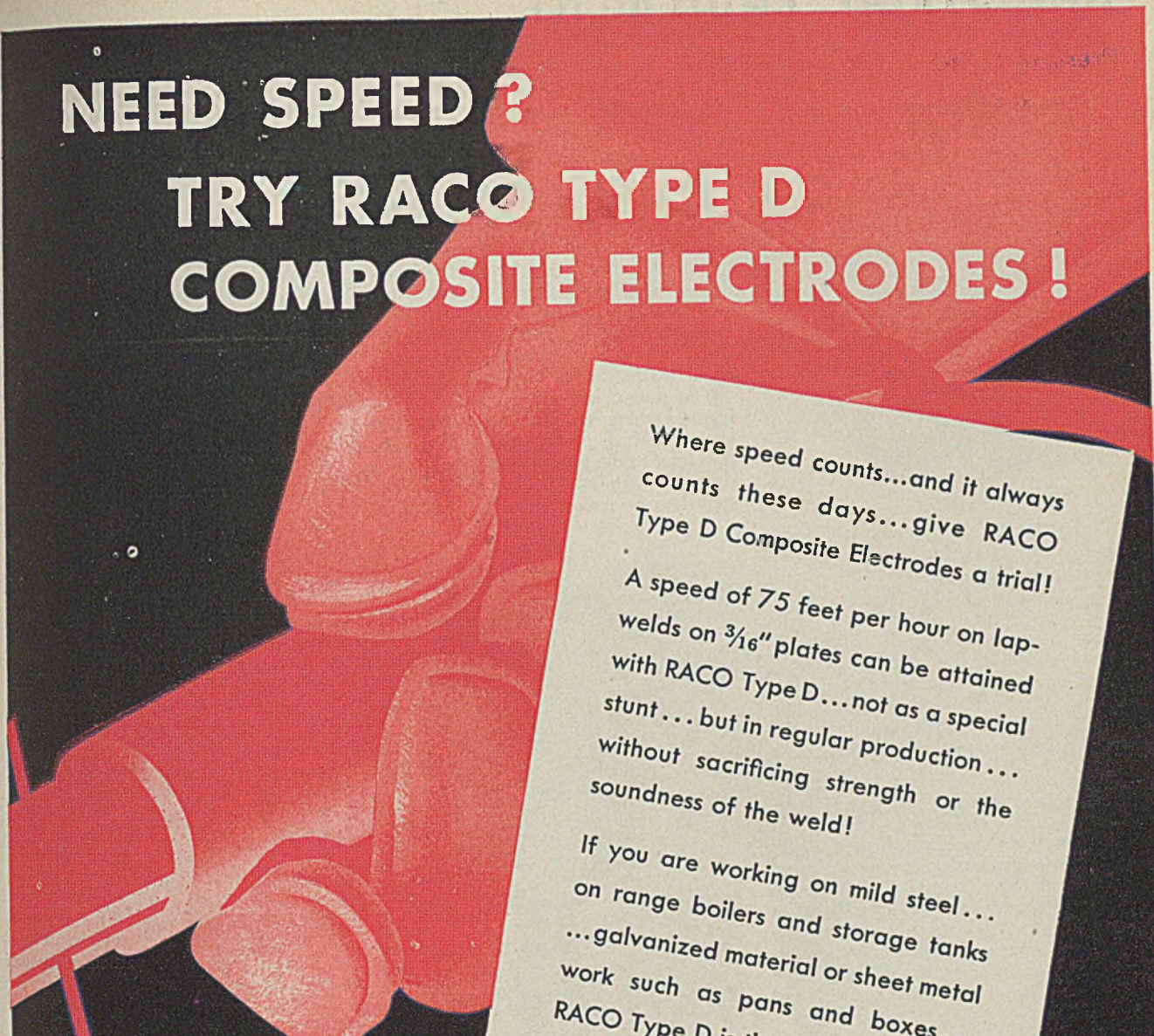
Cost of social security tax varies as the shop and field labor costs. As these costs are reduced by using a welded design the tax is reduced in proportion.

To protect the workmen and the company, insurance is carried during the erection of the structure. This insurance is for workmen's compensation, public liability and property damage. Its cost is set up as a percentage of the field labor cost. It is also reduced by using a welded design.

Proportionate prices and savings for the entire unit is summarized in Table V. These include the cost of materials,

(*Please turn to Page* 168)

NEED SPEED?
TRY RACO TYPE D COMPOSITE ELECTRODES!



Where speed counts...and it always counts these days...give RACO Type D Composite Electrodes a trial!

A speed of 75 feet per hour on lap-welds on 3/16" plates can be attained with RACO Type D...not as a special stunt...but in regular production...without sacrificing strength or the soundness of the weld!

If you are working on mild steel...on range boilers and storage tanks ...galvanized material or sheet metal work such as pans and boxes...RACO Type D is the ONLY electrode readily available that will give results most closely comparable to standard shielded arc electrodes.

Will you make a test in your own plant? We will be glad to help you do it by sending samples of stand-ard size RACO Type D Composite Electrodes. Just drop us a line telling the sizes you want for the test!

RACO SHIELDED ARC ELECTRODES

We are accepting orders for deferred delivery on:

RACO Type H-D No. 5 for deep groove welding in flat position AC or DC

RACO Type H-D No. 6 for fillets flat and positioned machine and plate construction AC or DC

RACO Type H-D No. 7 for all position, general construction — shipbuilding. DC Reverse Polarity

RACO Type H-D No. 8 for all position general purpose, single pass, building up wearing surfaces, low carbon. DC Straight Polarity or AC

Samples and Literature on Request

The REID-AVERY COMPANY

DUNDALK BALTIMORE 22° MARYLAND

INDUSTRIAL EQUIPMENT

Pressure Switch

Designed for controlling pressures in liquids, air or gases, the new pressure switch developed recently by Vapor Car

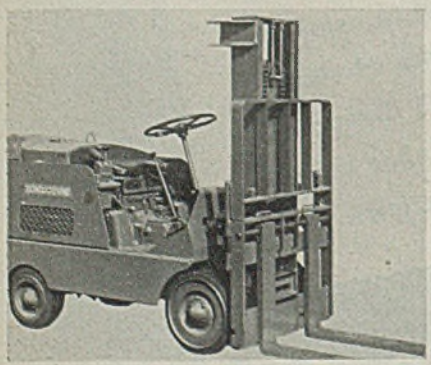
Heating Co., 80 East Jackson boulevard, Chicago, is suitable for operation at pressures up to approximately 100 pounds providing a very high degree of accuracy.

Switch operation depends upon the effect of pressure on a specially designed spring-compensated bellows that operate a unique snap-action beryllium-copper switch. It can be used with either direct or alternating current.

Extended Load Support

To facilitate handling higher stacks of small bulky loads, Towmotor Corp., 1226 East 152nd street, Cleveland, recently developed a carriage backrest extension for industrial trucks which provides increased support and minimizes the possibility of shifting while high loads are being lifted, moved and stacked.

Of steel welded construction, the new extension is quickly attached to the truck by inserting its permanently attached pins into sockets welded to the standard lifting carriage. Held securely in this position, the extension increases the support area afforded by the lifting carriage's standard backrest, making it practical to handle multi-unit loads. Removal of the extension is merely a matter of lifting it from supporting sockets.

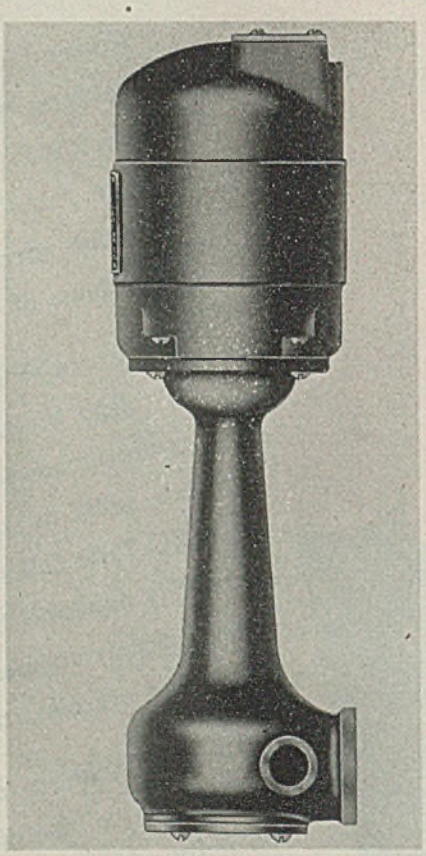


Model illustrated extends 60 inches above the surface of the lifting forks. Others, increasing backrest height from 48 to 72 inches above forks, also are being offered.

Coolant Pump

Dependable coolant flow to small machines such as hand mills, surface grinders, internal grinders, drill presses and tapping machines can be assured with the new small size seal-less coolant pump, placed on the market lately by Pioneer Pump & Mfg. Co., Detroit. Though less than 16 inches high, its performance is equal to that of its larger counterparts.

The pump, known as model MVBD, features three outlets which permit a choice of three piping arrangements: To the right, to the left, or back into coolant sump through intake bracket. It is designed to be mounted on the outside of

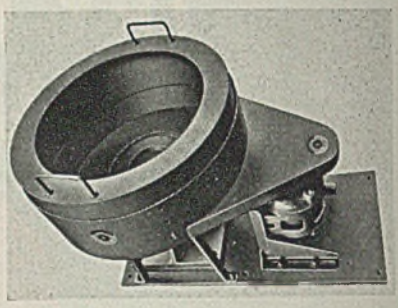


a coolant tank or machine pedestal, and functions efficiently with an extremely low water level. The pump is equipped with a single-phase heavy duty motor.

Casting Machine

A new vertical centrifugal casting machine designed to produce a wide range of sizes of ferrous and nonferrous castings is reported by Centrifugal Casting Machine Co., P. O. Box 947, Tulsa, Okla. It will accommodate molds up to 24 inches in diameter and up to 12 inches in height, and is suited for permanent mold centrifugal casting of bushings with dimensions such that the length of the bushing does not appreciably exceed the diameter.

Bushings with a flange at one end, gear blanks and other similar castings



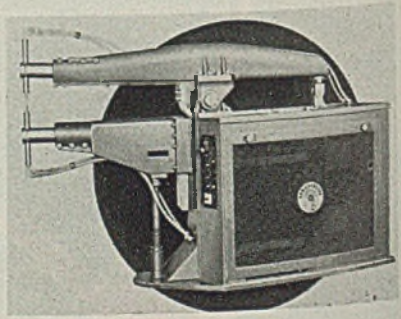
also can be produced quickly and economically.

All dross collects on the inside diameter of the castings due to the separating action of the centrifugal force. If the hole in the cover of the mold is made equal in diameter to the desired inside diameter of the casting, a slight excess of metal may be poured to flush out the accumulated dross. Practically 100 per cent metal yield is obtained as no gates, sprues or risers are required.

The machine, known as the model J, is completely integrated on a single base so that it can be readily moved as a unit. For permanent installation, it may be bolted to the foundation through holes provided in the base. For work most suitable for production continuously, variable speed control is not necessary. Rotation speed of the machine can be adjusted by using the proper set of sheaves to suit the particular size of casting being produced.

Aluminum Welder

An improved model B rocker-arm welder designed specifically for condenser-discharge welding of aluminum sheet is announced by Progressive Welder Co., Detroit 12. It requires fewer point dressings in a day's run than other types introduced by the company. The machine is designed to handle any combination of two thicknesses of 24-ST Alclad.



between 0.016 and 0.081-inch at overall production rates of between 1000 and 2000 spots per hour—including point dressing time, etc.

Features of the machine include adjust-

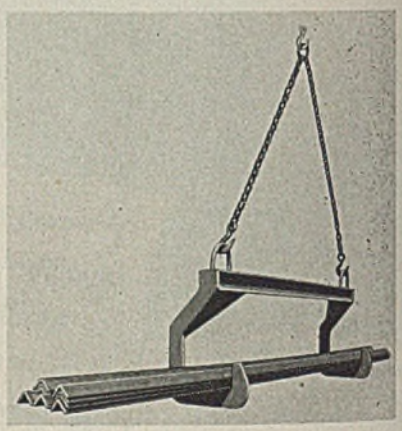
(All claims are those of the manufacturer of the equipment being described.)

able throat depth, from 36 to 42 inches, and a retractable upper arm to permit insertion of flanged work—arm movement being accomplished through a separate air cylinder controlled by an auxiliary foot switch. Both upper and lower arms are of the universal type, and the lower knee with its arm is vertically adjustable over a range of 10 inches. Welding arms are of 3½-inch diameter hard-drawn copper, and current-conducting castings are of high-conductivity bronze to reduce voltage drop to a minimum.

The machine can be used with refrigerated electrodes, insulated piping etc. Solenoid valves permit the application of a light preset air pressure to the operating cylinder to hold the points together while dressing. Standard equipment includes solenoid-operated valves for controlling the air-operating mechanism, air pressure gages, air-regulating valves, airline lubricator and dual-shrouded operator's treadle.

Bar Stock Sling

Palmer-Shile Co., 796 South Harrington, Detroit, is offering a new bar stock sling to facilitate handling of bar stock, rods, angle iron, heavy tubing and other materials. Built of heavy stock, strongly braced and reinforced, and weighing approximately 50 pounds, the sling takes care of any load up to 2000 pounds. The sling measures 5 feet in length. Its cradle is 10 inches wide and 8 inches high.



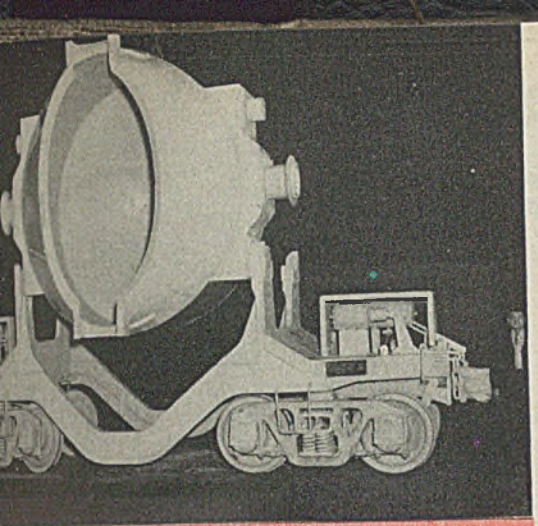
Rivet Feeder

Flush type, flat head, brazer, modified brazer and button-head rivets are handled by the new Ayr-flo-matic magazine rivet feeder developed by Industrial Aircraft Mfg. Corp., 721 Central Tower building, Akron, O.

The feeder shoots rivets into holes, ready to be driven, at a rate three times faster than any known method. By actual time study it increases production 100 per cent.

The feeder head, through which the rivets are shot by air pressure, is attached to the rivet gun by an adjustable

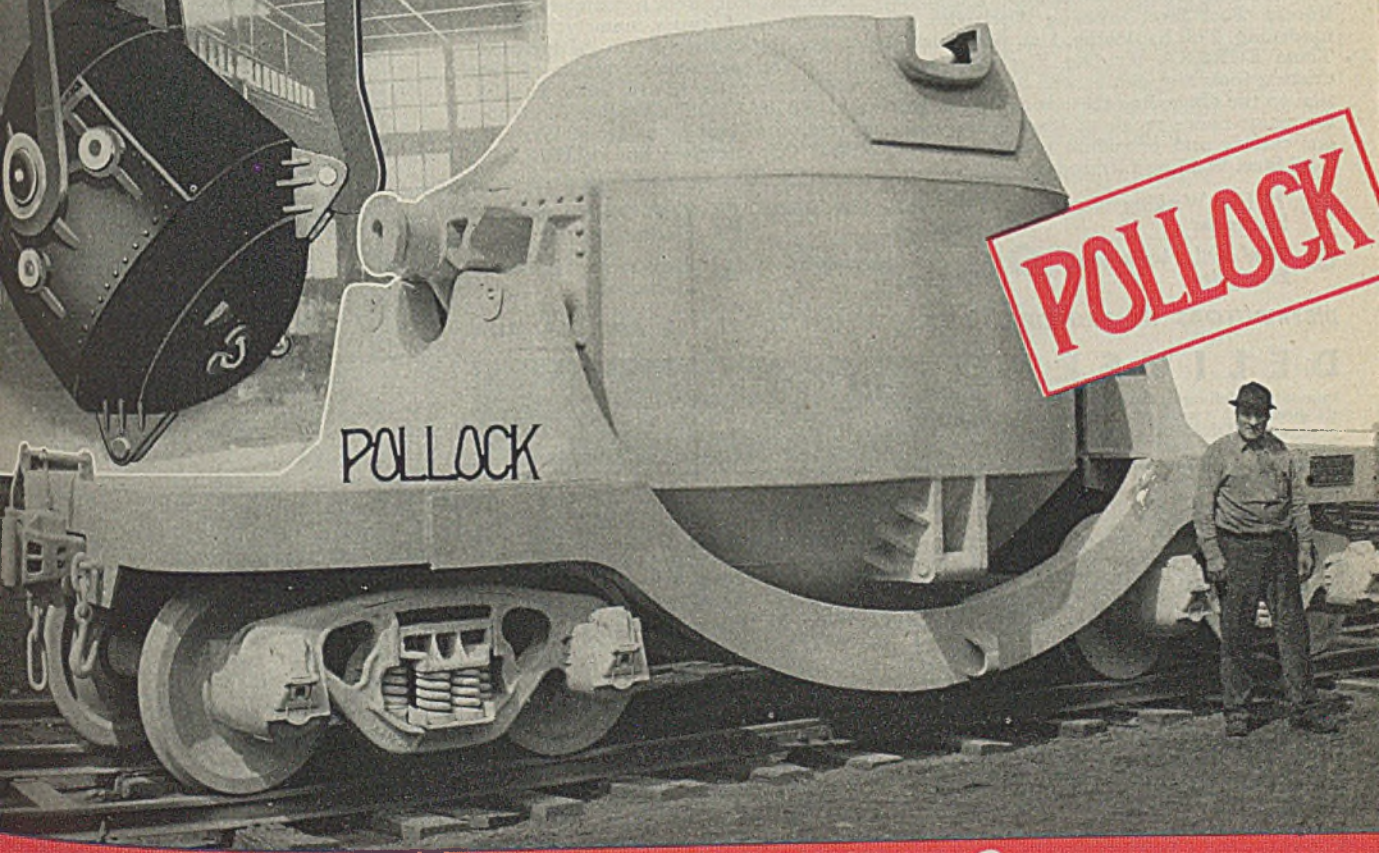
A PRACTICAL APPLICATION OF THE "GOOD NEIGHBOR" POLICY



Above—The Pollock-Kling (heat-retaining type) ladle can be poured in the car itself.

Below—The Pollock-Kling Ladle can be lifted from the car and poured directly into the mixer.

The William B. Pollock Company is proud to furnish its Latin-American neighbor, The National Steel Company of Brazil, modern blast furnace and steel plant equipment of Pollock design and manufacture. Of the equipment the Pollock Company is furnishing the Brazilian Company, there is shown on this page one of the Pollock-Kling type hot metal ladle cars to be used to transport molten iron from the blast furnace. When planning new steel plants or when revamping old, investigate the merits of Pollock equipment before you buy.



THE WILLIAM B. Pollock COMPANY

YOUNGSTOWN, OHIO

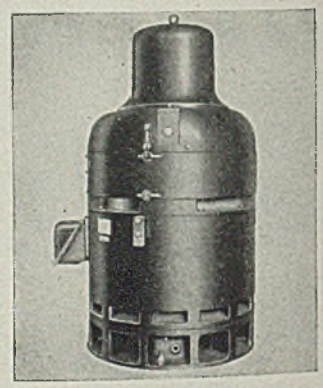
BLAST FURNACE AND STEEL PLATE CONSTRUCTION Since 1863

hinge-bracket. Use of the hinge-bracket allows freedom of movement between the gun and the feeder, adjustable to all rivet spacing from ¾ to 2 inches, and so makes possible continuous simultaneous action of the rivet gun and the Ayr-flo-matic feeder. A simple trigger controls the release of each rivet exactly and accurately. While one rivet is driven with the gun, the rivet feeder is placing the next rivet in its hole. The feeder is supplied with rivets by means of a motor-driven hopper which forces them into the plastic tubing magazine.

The hopper accommodates all sizes of rivets by changing the gravity fall track only when the size of the rivet shank is changed, and by changing only the head at the end of the track when a different type rivet head is fed through it. The feeder also can be used with a multiple machine riveter. It may be used coiled or uncoiled and fastened to a suspended air hose above the work. When using a multiple riveter, one operator can do six times as much work.

Synchronous Motors

Ratings from 100 to 1000 horsepower, and speeds of 514 to 1800 revolutions per minute are features of a new line of vertical high-speed hollow-shaft synchronous motors announced by the Motor Division, General Electric Co., Schenectady, N. Y., for pumping applications



where a large volume of fluid is handled, such as in ordnance and synthetic rubber plants.

For protection, the motors are provided with drip-proof enclosures. The top cover of each motor is removable to permit adjustment of the pump shaft. Unlatching a flush-mounted steel plate gives access to the brushes and collector rings. Frames of the motors are of cast-iron construction, providing strength to withstand high-thrust loads.

The motors can be furnished with non-reverse ratchets to prevent reversal of pump rotation at shutdown or on starting.

Gear Shaving Machine

Gears up to 4 inches pitch diameter, and 20 diametral pitch and finer can be handled by the new No. 4 gear shaving machine placed on the market by Fellows Gear Shaper Co., Springfield, Vt. Work