Speeding deliveries with unit packages and power handling equipment. Page 88.

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Volume 111—No. 7 STEEL August 17, 1942

NEWS

FEATURES

TECHNICAL

PRODUCTION

MARKETS

They'll help you keep *Electrically Fit!*

FOR 168 HOURS OF WAR-WORK A WEEK!

Keeping plants *electrically fit* for continuous war production calls for all the know-how you can rally on two important points:

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Your GRAYBAR Representative is your first-line source of this know-how. And he is backed up, when you need it, by the Graybar Power Apparatus Specialist . . . a man whose full-time job is concentrated on industrial power-application problems. Particularly if your problem is to decide how far to go in the re-use of old equipment . . . how it can best be supplemented by new control units, capacitors, voltage regulators, etc., to increase production while conserving critical materials . . . GRAYBAR is the place to call.

For advice on compliance with priority rules, for a broad knowledge of what's available and when deliveries can be made, check with your GRAYBAR Representative. Or if it's maintenance help you're after, ask him for copies of helpful service bulletins compiled by manufacturers whose products come to you "via GRAYBAR".

"HOW TO CARE FOR MOTORS"

Whether your motors are old or new, you can help to steer clear of interruptions and delay by following the maintenance plan developed by General Electric and fully outlined in this new bulletin GEA 2856.

A "COMBINATION" THAT ADDS TO PROTECTION

You save installation time, conserve on wiring and give your motors unfailing protection when you specify the new G-E Combination Motor Starters. One self-contained unit combines magnetic starter and safety switch. Bulletin GEA 3715 gives full details.

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IN OVER 80 PRINCIPAL CITIES

GraybaR QUALITY — Everything Electrical . . . THAT IT TAKES TO WIN!

HIGHLIGHTING

this issue of STEEL

NEWS Very shortly there should be an end to charges of wartime "profiteering". The Army, the Navy and other government agencies are organizing contract renegotiation boards which will examine production costs and lower contract prices where justified (p. 53).

An American mission will visit England to form a better understanding as to the steel needs of the United Nations (p. 54).

We are not using our most competent men effectively in the direction of the war effort, declares STEEL editor, E. C. Kreutzberg, who emphasizes the necessity of following the lead of private industry in placing responsibilities in the hands of men qualified by aptitudes and training to handle them (p. 39).

Evidence is accumulating that top labor leaders and top industrial leaders are in harmony in an effort to obtain national unity (p. 50). One encouraging feature is that they also are in agreement that the American free enterprise system must be preserved.

Advertising is in a safe position under the present administration but there is a widespread lack of understanding in high places in the government as to the real nature of advertising. The suggestion is made that advertising might well do a job in "selling" itself at the national capital (p. 50).

Scrap ceiling prices on certain items have been revised (p. 127).

PRIORITIES By an important change in the priorities setup last week the armed services now have a free hand in directing the distribution of critical materials. They have exclusive use of the top priority ratings and power to disapprove all ratings down to and including A-4. Extension of reratings is simplified as a result of revisions. Provision has been made for companies operating under the Production Requirements Plan (p. 49). . . .Warehouse distributors have been rerated at AA-3 on certain products (p. 128). . . Steel procurement is becoming much more complicated; more and more consumers must get along with material they are able to get.

CONSERVATION An important change in scrap utilization is in store as a result of the development of new compositions of alloy steels identified as the "National Emergency 9400 Series". These are to be made entirely from scrap with almost no additions of alloying elements (p. 40). . . .Little so far is known about the "NE" steels in general (p. 41).

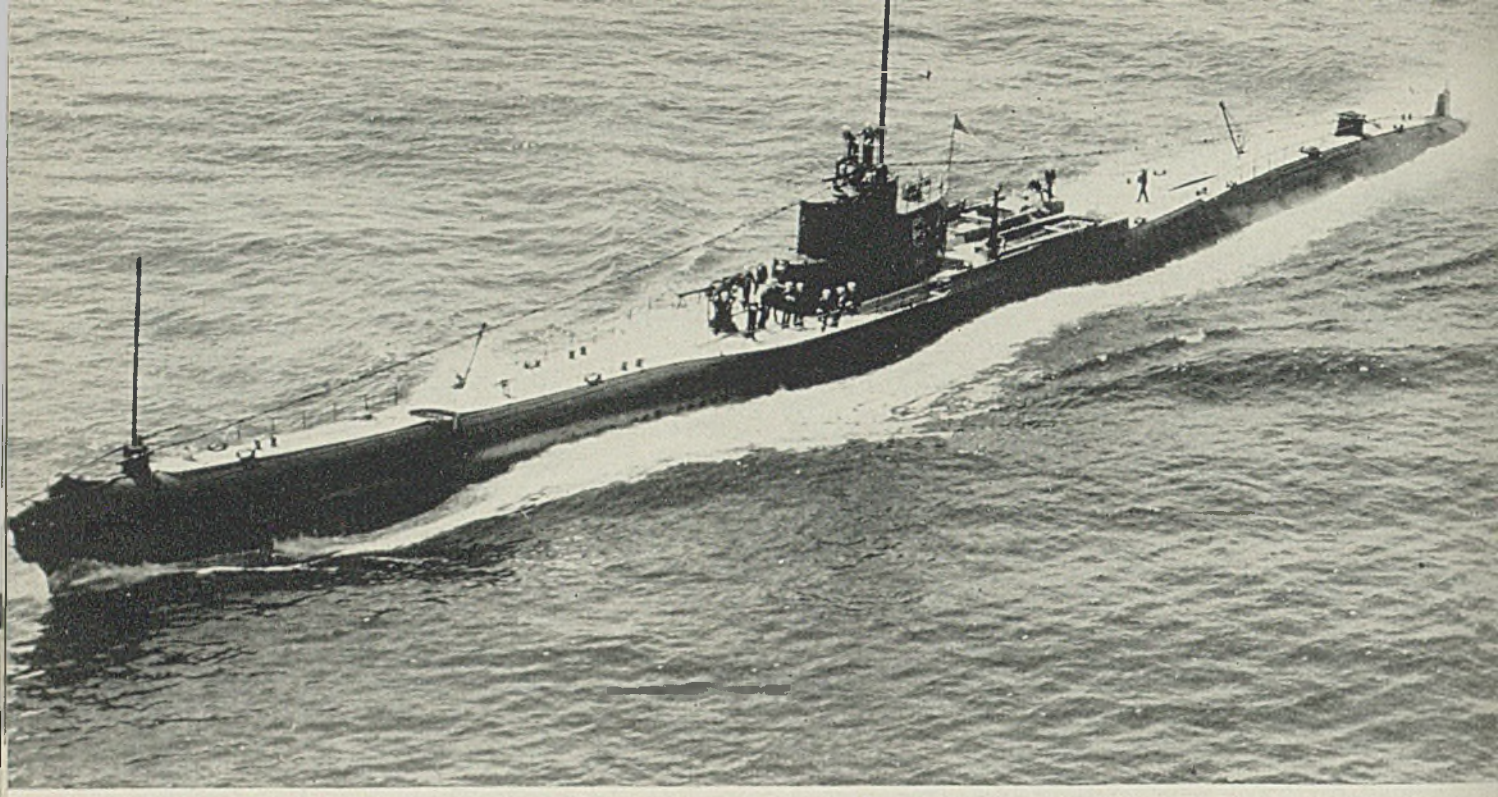
An inventory of all second-hand machinery held for sale is being worked out by OPA; one of its purposes is to locate obsolete equipment that can be scrapped (p. 53). George L. Stewart heads the new Steel Recovery Corp. organized to liquidate frozen and surplus steel inventories (p. 55).

PRODUCTION One manufacturer alone reports 117 production improvements that have come out of employe suggestions in recent months, with 207 more still under consideration (p. 57). A new profession brought on by the war is that of examining into the records and loyalties of war workers so as to minimize possibilities of plant sabotage (p. 65). The War Manpower Commission is studying reports obtained through selective service registrations and expects shortly to be in a position to advise industry where and how it can obtain engineers, chemists and other men with special training (p. 66). To guard against interruptions in the iron ore movement from any possible closing of the upper lake locks an alternate, overland, route is to be established (p. 67).

TECHNICAL A. Grodner reviews the steels that can be used to advantage in the oil refining industry under today's wartime conditions, to meet corrosive conditions and to maintain a safe degree of strength at various working pressures and temperatures (p. 72). In Section 15 of the series of articles on forgings and the forging processes, Prof. Arthur F. Macconochie discusses heat treatment of steel forgings. He describes effects on the grain structure of a forging of the temperature to which it is subjected, the time during which it is held at that temperature and the manner in which heat is removed (p. 74).

W. C. Buell Jr., J. R. Miller and H. W. Potter believe that open-hearth operators soon will be working with high iron charges. They review American basic open-hearth practice and some of the modifications involved in a change in methods (p. 78).

Timely, and important in view of the "big push" on America's production lines is the advice E. H. Alexander offers maintenance men on how to go about selecting, installing and maintaining electric control equipment. He tells how to make adjustments, prevent "burnouts," how to "trouble shoot" and what to do in the case of equipment in severe service (p. 84).



Sub Propeller Shafts Needed Quickly!

Story of How Ryerson Ingenuity Saved Five Weeks

URGENTLY needed at a distant shipyard were fourteen forged submarine propeller shafts that must pass Navy specifications.

Forgings were specified, but none could be secured in time.

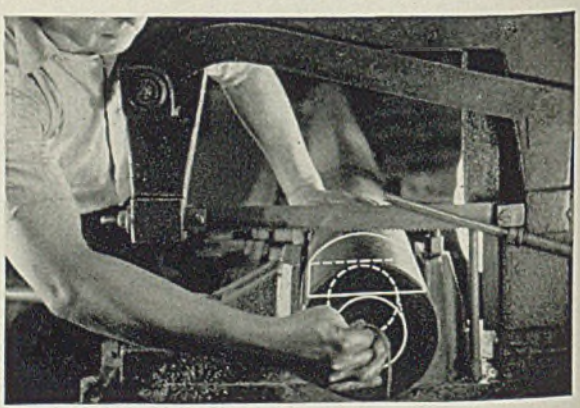
Quickly available in Ryerson stocks were cold rolled bars—the right size—but in five different analyses.

Navy Inspectors were skeptical. Could Ryerson heat-treat and assure uniform physicals—also furnish pull tests for each bar? Well, no; because the piece left after the bars were cut to the needed length, would be too short to make a standard 6″ test sample. A delay of five weeks loomed ahead. . . .

Then Ryerson metallurgists found a way: Inquiry revealed that the shafts were to be machined down at each end for a distance of 7″. So, why not cut a piece from the side of each bar, *before machining*—enough for all tests yet leaving sufficient stock for machining to size? The idea worked perfectly.

The data charts always furnished with Ryerson Certified Steels provided the exact analysis of each bar and assured proper heat-treatment. A few minutes hacksaw work yielded the necessary test samples . . . and all fourteen bars passed the rigid Navy Inspection with flying colors.

Ryerson ingenuity has helped many manufacturers in solving production problems—has also cut ultimate delivery time from months to days. Ryerson engineers and metallurgists, backed by a century of service to the nation, are ready to work with you in accordance with WPB plan in making the most of all available steel.



Cutting 6″ test pieces from side of bar without affecting length.

JOSEPH T. RYERSON & SON, INC., Chicago · Milwaukee · St. Louis
Cincinnati · Detroit · Cleveland · Buffalo · Boston · Philadelphia · Jersey City

RYERSON STEEL—SERVICE

STEEL
August 17, 1942

SQUARE PEGS IN ROUND HOLES

It is fair to speculate as to just why it is that the federal government fails to pattern its methods of managing the war after the principles so well developed by private industry.

American industry long ago learned the importance of placing responsibilities in the hands of men qualified by aptitudes and training to handle them. It long has understood the significance of the old adage about placing "square pegs in round holes."

This lesson has not yet been learned by the government. In addition to witnessing much actual incompetency, habitual visitors at the national capital constantly are amazed over the inefficiency with which really competent and experienced men often are used. It seems a man must not have a hand in directing his industry because of possible bias in favor of his friends in that industry. Thus we see a top-ranking petroleum executive directing iron and steel. We see a first-class executive from the stamping industry in direction of tools and machine tools.

Only recently, as recounted under Windows of Washington, in STEEL of Aug. 3, has the iron and steel scrap collection program become professionalized. This result comes after many months of fumbling. Nobody ever will know how many additional millions of tons of steel we might have produced had the problem originally been assigned to experienced scrap men, along with necessary powers and government funds for implementing collection.

A long time ago Westbrook Pegler expressed the opinion that an experienced organizer of the iron-fisted type should be placed in charge of war production and he nominated Tom Girdler as his man for this job. This same idea, expressed by quite a few other writers, never took hold.

The policy of putting the right man in the right place is followed by our enemy with brilliant results. We should not longer delay in taking this leaf from his book.

E C Kreutzberg

Editor

New Series of Alloy Steels, Made of Scrap, Created in Ten Days

✦

Five metallurgists mobilize staffs to work 24 hours a day at War Production Board's behest . . . New metals better in some respects than those they replace

✦

AN IMPORTANT change in the utilization of scrap is in store for the near future, as implied in the American Iron and Steel Institute's announcement, last week, of the development by the steel industry of a new series of emergency alloy steels for the manufacture of war goods.

The new compositions, known as the "National Emergency 9400 series," are to be made entirely of alloy scrap, with almost no addition of virgin alloying elements.

The institute's complete announcement follows:

The new steels were developed at the urgent request of the federal war agencies. They will be designated as the NE (National Emergency) 9400 series. The alloying elements used are, in general, small amounts of silicon, chromium, nickel and molybdenum fortified by amounts of manganese somewhat greater than normal.

"The story of how these steels were developed follows:

"On a hot Wednesday afternoon in mid-July, a telephone rang in an office in the American Iron and Steel Institute. On the wire was an executive of the War Production Board in Washington.

" 'We're holding a meeting here a week from this coming Saturday,' the WPB man said, 'to establish new steel specifications for'—and here he named certain war products.

" 'We'd like to have your alloy steel committee present to that meeting a series of alloy steels which: 1, can be made entirely from steel scrap, with almost no additions of virgin alloying elements; and, 2, can be used in place of the steels now doing the job without any changes in design of the parts. Can it be done?'

"The institute man was staggered.

" 'You're asking the steel industry to develop an entirely new set of steels in ten days. Well, the industry has licked some tough problems before; it can again.'

Worked Day and Night

"He immediately telephoned the top-flight metallurgists in five prominent alloy steel-producing companies, outlined the problem, and passed along to them certain technical information which the WPB man had furnished him.

"The necessary research work—devising formulas, making up sample heats of steel and testing them for chemical composition, strength and hardenability — was parceled among the five metallurgists to avoid duplication of effort.

"Each of the metallurgists mobilized his laboratory staff for day and night effort, and the job got under way at once in five steel plants.

"Some of the analyses tried soon proved to be no good for the job; others showed promise and were thoroughly tested. Countless times during the week that followed, the five metallurgists consulted with each other by telephone, reporting progress or failure, and exchanging advice. Finally came the Saturday on which the WPB meeting was scheduled.

"The five metallurgists and the man from the institute, who had been co-ordinating the work and reporting progress to the WPB, met at 7:30 a.m. in the Union Station in Washington. Over the breakfast table, the results of the experiments and the recommendations of the metallurgists were consolidated into a report.

"A few hours later, full descriptions and characteristics of a brand new set of steels were laid before the WPB officials.

"The happy ending to the foregoing story is that the new steels have now been officially approved for war use, and are about to go into commercial production.

"In the opinion of metallurgists and engineers, the new steels will do the jobs they are supposed to do fully as well as the steels they replaced, and in some respects even better.

"Chemical composition of the new steels is shown in the accompanying table."

Although no further details are disclosed in the institute's announcement, it is assumed that the new Series 9400 steels will be produced to a large extent from alloy steel borings and turnings of which somewhere between 200,000 and 300,000 tons are available monthly. It is estimated that hitherto fully 50 per cent of the alloying elements in this scrap has been lost in the form of residuals.

To implement production of the new steels it is understood certain moves now are in the making. Some companies with open-hearth furnace lines will install tilting open-hearth furnaces into

Chemical Composition of NE 9400 Steels

	Carbon	Manganese	Silicon	Chromium	Nickel	Molybdenum
NE 9415	.13/.18	.80/1.10	.40/.60	.20/.40	.20/.40	.08/.15
NE 9420	.18/.23	.80/1.10	.40/.60	.20/.40	.20/.40	.08/.15
NE 9422	.20/.25	.80/1.10	.40/.60	.20/.40	.20/.40	.08/.15
NE 9430	.28/.33	.90/1.20	.40/.60	.20/.40	.20/.40	.08/.15
NE 9435	.33/.38	.90/1.20	.40/.60	.20/.40	.20/.40	.08/.15
NE 9437	.35/.40	.90/1.20	.40/.60	.20/.40	.20/.40	.08/.15
NE 9440	.38/.43	.90/1.20	.40/.60	.20/.40	.20/.40	.08/.15
NE 9442	.40/.45	1.00/1.30	.40/.60	.20/.40	.20/.40	.08/.15
NE 9445	.43/.48	1.00/1.30	.40/.60	.20/.40	.20/.40	.08/.15
NE 9450	.48/.53	1.20/1.50	.40/.60	.20/.40	.20/.40	.08/.15

which to charge scrap billet crops with the exception of crops high in chromium which have to be melted in electric furnaces to conserve the chromium.

Certain companies with electric furnaces are expected to put in more facilities for removing oil from borings and turnings and for crushing or briquetting this scrap into suitable form for charging. In some instances the practice involves melting of crushed or briquetted scrap in cupolas, desulphurizing it in mixers or ladles, removing carbon in bessemer converters, thus yielding hot metal for charging into electric furnaces. Or, where desirable, tilting open-hearth furnaces can be used instead of bessemer converters as with such units phosphorus as well as carbon may be removed.

In view of the equipment necessary, therefore, it probably will require a short interval before the full NE 9400 series program can be realized.

An important feature of the projected practice is that it will permit charging hot metal into electric furnaces. Power saved in this way will permit operation of several more electric furnaces, thus materially increasing electric furnace capacity.

To make the plan effective some provision must be made for extra costs involved. The cost of briquetting borings and turnings is estimated at somewhere between $3 and $5 per ton. To make this cost permissible it would be necessary either to lower the present ceiling on borings and turnings, or to set up a government subsidy from which compensation could be made for the added costs.

Five Hundred Hear Discussion of Emergency Steels at Chicago Conference

CHICAGO

DEMAND for information on the characteristics and treatment of the new National Emergency (NE) steels was illustrated at a special meeting here Aug. 6, arranged at the request of the War Production Board and sponsored by the Chicago chapter of the American Society for Metals. Numerous technical groups participated in the meeting, which attracted an attendance of 500, many coming from cities outside of this area.

Seven speakers, each taking 10 minutes, explained and discussed various phases of the NE steel program which has been undertaken in the interest of alloy conservation. Time did not permit getting down very far into the practical shop problems which are arising in connection with the new material. However, as these steels become available more widely and experience with them is gained, more meetings probably will be arranged.

Opening speaker was Robert C. Brown Jr., consulting technical director, contract division, WPB, Chicago, who explained the co-ordination of engineering efforts in production of war materials. He described the set-up whereby technical societies have been organized into committees affiliated with the board to collect and give assistance on problems on materials and processes arising as a result of the war program.

In speaking on "National Emergency Steels; Types, and Background of their Development," Albert L. Kaye, manager, alloy bureau, metallurgical division, Carnegie-Illinois Steel Corp., Chicago, stated that in 1942 alloy steel will amount to between 8 and 9 per cent of the total tonnage of steel melted; in 1943, it is expected it will reach between 20 and 21 per cent of the total. In connection with the war program, the shortage of nickel was cited first, but subsequently shortages developed in chromium, vanadium and molybdenum. Consequently, in the spring and summer of 1941, work was initiated to find substitutes for these elements and to develop new series of steels.

Agreement was reached that hardenability would be used as the criterion of suitability of the substitute steels developed. Manganese was set at a maximum of 1.9 per cent, and other elements were not limited. It was also recognized that as the amount of alloy scrap reaching steel mills increases, a considerable amount of contained nickel would be available and if this scrap were used judiciously, less amounts of nickel would have to be added to meet nickel specifications.

Harry B. Knowlton, chief metallurgist, gas power engineering department, International Harvester Co., Chicago, described the fundamental considerations in the "Jominy End-Quench Hardenability Test" which is used in measuring hardenability of the new steels. In connection with this well-known standard test, Mr. Knowlton said that hardenability may not tell all one wants to know about toughness and machinability, for example, but perhaps it is possible to sacrifice some hardenability without losing too much.

Taking "Deep-Hardening National Emergency Steels" as his topic, Roy D. Allen, asistant chief metallurgist, Republic Steel Corp., Chicago, asserted that the chromium-nickel-molybdenum series is the most intelligent of the new NE steels which has been advanced. This series gives a good solution of elements for deep hardening uniformity. It will give sufficient hardenability in parts which are quenched and drawn to spring temper, also to parts requiring hardness in excess of spring temper. Mr. Allen compared the series with SAE 4140 steels, and stated that there is no reason why some of the NE steels can not be substituted for some of the steels which have been used previously.

A wide range of physical properties are available in the semihardening NE steels, according to Morris J. Day, metallurgist, alloy division, Carnegie-Illinois Steel Corp., Chicago, who discussed this series through interpretation of S-curves, or transformation data. In this group of steels, namely, NE 8200, 8300, 8400 and 8600, manganese - molybdenum - nickel-chromium, good advantage can be taken of carbon. According to Mr. Day, the important factor is the effect of various elements, rather than physical properties.

Dealing with the carburizing types of NE steels, Alfred S. Jameson, works metallurgist, West Pullman plant, International Harvester Co., Chicago, made numerous comparisons between newly developed types with long standing types, using tensile tests as the yardstick.

Position of the Steel Warehouse

The formal presentation was concluded by Greswold Van Dyke, manager, special steel department, Joseph T. Ryerson & Son Inc., Chicago, who explained "The Position of the Steel Warehouse in the National Emergency Steel Program." As the new steels will be used widely and in relatively small amounts, function of the warehouse is to distribute them speedily in individual quantities far too small for mills to distribute economically. In the program set up by WPB, the warehouse is expected to make the NE steels available to consumers (1) for experimental applications to determine suitability, (2) for production in quantities large enough to sustain operations, and (3) for maintenance and repair.

Thus far, however, Mr. Van Dyke pointed out, the new steels have not been available from mills in sufficient tonnages that these functions can be fulfilled. To date, distribution has been limited to experimental applications only, and even this in a restricted manner. He suggested that consumers might aid themselves, and at the same time the warehouses, by making known to WPB their difficulties and delays in obtaining the new materials.

Early Decision Promised by NWLB In U. S. Steel-CIO Wage Dispute

SUBSIDIARIES of the United States Steel Corp. and the United Steelworkers of America-CIO last week asked the National War Labor Board to assume jurisdiction in collective bargaining conferences. The union has asked that its contract with the companies be renewed on the basis of the board's directive in the "Little Steel" case.

A spokesman for the Corporation said: "While the conferences have been friendly and there has been an appreciation of the problems of both parties, it has been impossible to agree to all of the provisions of the so-called 'Little Steel' directives. In matters as fundamental as the maintenance of membership, checkoff, and wages, particularly those which involve, despite a labor contract, retroactive features, it would seem not only consistent with the needs of the case, but entirely consistent with the objectives of the National War Labor Board to permit that agency to develop an equitable solution.

"The National War Labor Board only last week proposed that employers should not be permitted to grant wage increases without board approval.

"It is expected that there will be no disturbance with operations and that both the union and the companies will co-operate in permitting the War Labor Board to explore promptly and completely the points of difference."

NWLB in accepting jurisdiction in the case promised an early decision and arranged for a public hearing on the issues Aug. 18. Attaches of the board said that U. S. Steel had objected to paying the full 5½-cent increase demanded and also to making any increase retroactive beyond Aug. 9 when the wage agreement with the union expired.

Affected are 300,000 employes of five of the Corporation's operating subsidiaries.

Negotiations were started last week toward revising the complicated wage structure of open-hearth workers at the Homestead works of Carnegie-Illinois Steel Corp. following a brief unauthorized strike. Workers protested the scrap shortage had curtailed steel production and their wages, based on tonnage rates, were reduced. Army officers and federal conciliators persuaded the men to return to work pending settlement of the problem.

Wheeling Steel Corp. and the United Steelworkers have agreed to extend their 1941 contract for a sufficient period to permit the negotiation of a new agreement. Wheeling Steel officials stated that the negotiations with union representatives are proceeding "satisfactorily".

"General" Coxey Leads a New March

"GENERAL" Jacob S. Coxey, who in 1894 led his famous "army" of unemployed on a march to Washington, and riding in the same buggy he used then, leads a parade of war workers pledged to uninterrupted production. The occasion was an Army-Navy salute to Massillon, O., war workers at the dedication of Tyson Roller Bearing Co.'s new $1,350,000 airplane parts plant. NEA photo

Tin Mill Employment Drops At Carnegie's Gary Plant

Curtailment in production of tin plate necessitated by tin shortage and restrictions on use of tin plate for food and other containers, has forced Carnegie-Illinois Steel Corp. to abolish 2500 jobs at its Gary, Ind., sheet and tin mills since Jan. 1.

In the most recent curtailment last week, 600 workers were released, reducing the number of employes to 4500. The company is making every effort to provide other work. Workmen let out are offered applications for new jobs in the Gary steelworks, but only a small number have filled them. Several large war plants are being built in the Gary area and are furnishing more attractive jobs in construction work.

One of the Gary mills, active before the war but now closed for the duration, is the hot tin mill, for the product of which no place has been found in war production. Other units running at only a fraction of capacity are the cold reduction tin mill, the 42-inch hot strip mills, the hot and cold sheet mills and the galvanizing house.

Westinghouse, General Electric Wage Increases Approved

National War Labor Board last week found a voluntarily negotiated wage increase for 165,000 employes of General Electric Co., Schenectady, N. Y., and the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., fell within the wage formula promulgated several weeks ago in the "Little Steel" directives.

Detroit Tool, Die Industry Asked To Maintain Status Quo

The War Production Board, the National War Labor Board and the War Manpower Commission in a joint statement last week asked all employes and all employers in the tool and die industry in the Detroit area to maintain the status quo on wages and employment, pending a conference of labor and management representatives on methods of employment and submission to the WLB of the question of wages.

Coal Truck Strike Ends

Truck drivers hauling coal to beehive coke ovens in the Connellsville, Pa., area returned to work last Thursday, ending a 4-day strike over wage rates. Arbitration of the wage issue is being continued.

Three Cleveland Companies Receive Joint Army-Navy Production Awards

ARMY and Navy officials presented three of the first of the newly established Army-Navy "E" production awards in Cleveland, Aug. 12. Recipients were Wellman Engineering Co., White Motor Co. and R. W. Kaltenbach Corp. The ceremonies at the White company, attended by more than 6000 workers, were rendered highly dramatic by a parade of "halftracs" and other military vehicles.

On this occasion Undersecretary of War Robert P. Patterson broadcast a speech in which he said: "Cleveland is a mighty fortress on America's industrial front. This area is a complete arsenal in itself. The country round about yields raw materials. Your factories make them into tools of war. The emblem of the Army-Navy Production Award, hoisted over this plant, is a testimonial to unified achievement.

"Management alone could not have won this banner. Labor alone could not have won it. An industrial 'house divided' never can merit this banner because it can't hold its sector of America's production front. Only unselfish teamwork by labor and management can do the job on the home front. The Army commends labor and management at the White plant for showing how it is done."

Robert F. Black, president of White Motor Co., accepted the banner from Mr. Patterson.

Guest of honor and principal speaker at the ceremonies at Wellman Engineering Co., was Capt. H. G. Taylor, U.S.N., superintending civil engineer for the Ninth Naval District, Bureau of Yards and Docks. This company, one of the largest builders of heavy machinery, including drydock cranes, has the distinction of having delivered critically needed naval equipment as much as eight months ahead of promised dates.

Capt. H. G. Taylor, U. S. N., and Alfred E. Gibson, president, Wellman Engineering Co., Cleveland, are here shown with the Army-Navy "E" production award banner, following presentation ceremony Aug. 12. Photo, courtesy Cleveland Plain Dealer

In his presentation speech, Captain Taylor said: "These are critical times —of that there is not the slightest doubt. This country is at war—a war which we did not desire but which has been forced upon us, a war which at present must be fought where others wish to fight it but which—before we are through with it—will be fought where *we* want to fight it. That, you may be certain, will not be in these United States of ours, but in the other fellow's country."

In reviewing Wellman achievements over many years, Captain Taylor said: "Many of you are familiar with the 250-ton floating crane—a product of this company and reputedly the largest self-propelled crane in the world. This was built on the hull of the old battleship KEARSARGE in 1920. It has served and still is serving the Navy well, first on one coast and then on the other.

"What is more natural then in these times of great stress, than for the Bureau of Yards and Docks, in looking around for drydock cranes of larger radius and greater lifting capacity than any heretofore used in a navy yard, to enter into a contract with a company upon which it could place absolute dependence to fulfill the Navy's exacting requirements? Was the bureau justified in the action it took? The ceremonies which are taking place here today are, I believe, the best answer to that last question!"

The award was accepted by Alfred E. Gibson, president, Wellman Engineering Co. Mr. Gibson, who has been associated with the company ever since he graduated in mechanical engineering in 1909, is widely recognized as an authority on welding and other phases of steel construction. In a brief address, Mr. Gibson emphasized the fact that not one hour had been lost through company-labor disputes in the Wellman organization.

"Frankly", he added, "I have no patience—in this critical period—with peacetime curtailment of hours of work. The need demands more and greater effort and sacrifice. There is not one of us who with determined effort and real understanding of the desperate and efficient foes we face, cannot produce in quantity vastly more than in the past."

G. W. Burrell, chairman of the board, presided over the ceremonies, and Capt. L. N. Moeller, U.S.N., director of the progress and statistical department, Bureau of Yards and Docks, Washington, presented "E" lapel pins to employes longest in the company's service. These were Daniel W. Edwards, with a record of 40 years, and Miss Olive Scheer, with 31 years to her credit. An unscheduled event which drew hearty applause was

the kiss which the captain bestowed on Miss Scheer along with the pin.

Mayor Frank J. Lausche, Cleveland, who also was a guest at the earlier White ceremony, likewise stirred the enthusiasm of the Wellman workers when he said: "To you, Hitler, Hirohito and Mussolini, we as soldiers, sailors and plain American workers serve notice that we shall beat you in every effort of this war. We shall excel in workmanship, in speed of production, in sacrifice. We shall demonstrate that in heroism and bravery the youth of America has no equal on this earth!"

Captain Taylor and Captain Moeller also were honor guests when the Army-Navy "E" award was made to Kaltenbach Corp. at the plant in Garfield Heights, a suburb of Cleveland. This company headed by R. W. Kaltenbach, has collaborated with Wellman Engineering Co. in design of drydock cranes which both companies are building for the Navy.

Peace Restored in Chicago Bottle-Cap Controversey

CHICAGO

The controversy which metropolitan salvage officials have been having with Great Lakes Naval Training Station and Navy Pier over the disposal of tin cans has been settled. The solution was offered by bottlers to whom the Navy has been under contract to sell the cans as material for manufacture of bottle caps.

Instead of being obliged to choose between bottlers and the drive for cans for detinning, the Navy will now give the cans to the former, who will turn over all except No. 10 (one-gallon) sizes to the salvage drive, and also over 51 per cent of the No. 10 sizes after pressing out caps. Army officials have agreed to the solution.

Controversy arose when salvage officials found that some of the largest users of cans, such as military establishments, were selling them to bottlers for about 2 cents each, instead of contributing them to the drive. To preserve this source of material for caps, bottlers have agreed to use their collection facilities to pick up cans for the drive, to restrict their use to the No. 10 size, and prepare and contribute to the drive all other sizes, plus the residue from the No. 10's.

Scrap Salvage Campaign Launched in Dairy Industry

Salvage campaign in the dairy industry, announced last week by the WPB Conservation Division, is expected to yield 1,000,000 pounds scrap.

The campaign will embrace about 37,000 dairy plants. A minimum of 30 pounds of scrap from each plant has been established as the collection goal.

Decision to embark upon the campaign followed proposals by representatives of the dairy equipment and supplies industry submitted to the WPB through the Dairy Equipment and Machinery Manufacturers industry advisory committee.

Copper, nickel, brass, bronze, and stainless steel—all used in the manufacture of dairy equipment—are the most

Scrape for Scrap, from Bottle Caps to Slag

SALVAGE campaign at the Metro Glass Bottle Co., Jersey City, N. J., already has yielded nearly 52,000 pounds of scrap. Above a worker sorts the caps from broken bottles according to the kind of metal from which they are made. NEA photo

THIS shovel is picking up 5 tons of steel scrap in one "spill" at the slag dump at Bethlehem Steel Co's Steelton, Pa., plant. "Spills" are steel spilled in casting or pouring, and formerly often were discarded because they were too large to recharge into the furnace and their value did not justify the expense of breaking them into usable sizes. Now they are lanced with oxygen torches and broken up with dynamite. To date, a workover project at the Steelton slag dump has yielded 4000 tons of scrap

important metals expected to be made available as a result of the campaign. They will be salvaged from such types of dairy equipment as milk pumps, pasteurizers, vacuum pans, sanitary pipe and fittings, milk heaters and coolers, bottling machines, etc.

Program will cover only milk processing plants—such as bottling depots, cheese plants and ice cream manufacturers. Dairy equipment manufacturers and jobbers are actively co-operating through their sales and service representatives who come into personal contact with plant owners. They will attempt to locate potential sources of scrap and, in instances where only a small amount is involved, will transport it to a central warehouse where it will be held for sale to authorized scrap dealers. Where large and bulky types of scrap are involved—such as vat coils and cooler sections—arrangements will be made for the first empty or partially loaded truck available to pick up the machinery.

Money derived from sale of the scrap will be paid either to the plant supplying the scrap or to the USO. All overhead expenses will be borne by the dairy manufacturing industry.

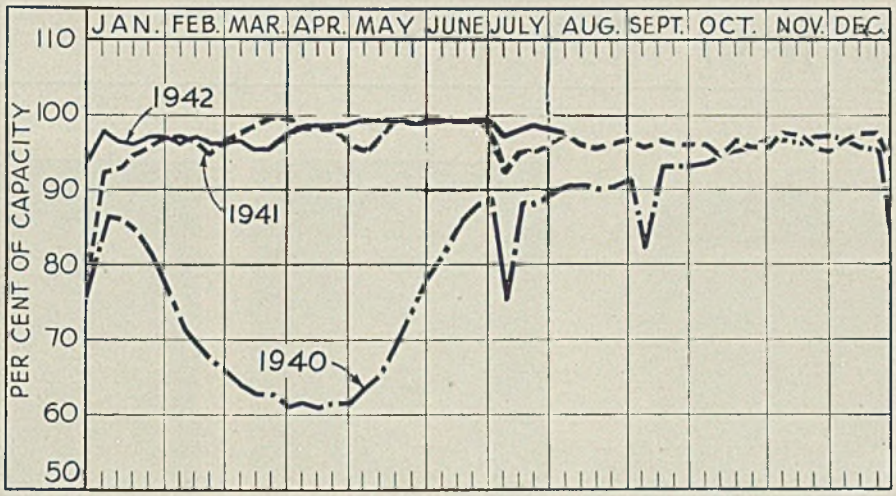
Norton President Aids in Scrap Salvage Campaign

George N. Jeppson, president, Norton Co., Worcester, Mass., is participating in the work of the American Industries Salvage Committee to enlist full co-operation of individual industrial concerns behind the current scrap salvage program of the WPB, according to Robert W. Wolcott, committee chairman.

Serving as liaison between the American Industries Salvage Committee and individual companies in the abrasives industry, Mr. Jeppson has written to companies in the industry urging full and complete co-operation with the program of the Industrial Salvage Section of WPB. He has also asked that each company appoint a responsible official to assist in any way possible the local general salvage committees.

July Gear Sales 7.8 Per Cent Below June

American Gear Manufacturers Association, Wilkinsburg, Pa., reports industrial gear sales for July were 15.4 per cent above July, 1941 and 7.8 per cent below June this year. Sales in the seven months ending with July were 32.5 per cent above the corresponding 1941 period. This compilation applies only to industrial gears and does not include automotive gears or gears used in high speed turbine drives.



PRODUCTION . . . Down

PRODUCTION of open-hearth, bessemer and electric furnace ingots last week declined ½-point to 97 per cent. Four districts were lower; three advanced; five were unchanged. A year ago the rate was 95.5 per cent; two years ago it was 90 per cent, based on capacity as of those dates.

St. Louis—Unchanged at 98 per cent, rate likely to be maintained through remainder of the month.

Detroit—Up 2 points to 90 per cent.

Central eastern seaboard—Damage to district equipment caused by floods dropped the rate 3 points to 92 per cent.

New England—Held at 95 per cent, frequent minor repairs preventing capacity operations.

Cincinnati—Declined 3 points to 89 per cent. One open hearth was idle for repairs.

Chicago—Advanced ½-point to 101 per cent, after holding two weeks at lowest rate since week ended Dec. 6. Only 35 of district's 38 blast furnaces were operating as two more units were taken off for relining. Repairs on a third furnace continued.

Buffalo—Steady at 90½ per cent, as additional capacity was shut down for repairs and other units were relighted.

Birmingham, Ala.—Unchanged at 95 per cent, with 23 open-hearth furnaces in operation, 15 in Birmingham and all eight at Gadsden.

Cleveland—Gained 1.8 points to 97.8 per cent, as result of higher operating schedules. Two interests report all open hearths active, while a third is operating at near capacity levels.

Wheeling—Declined 4 points to 80.5 per cent. Continuing difficulty in scrap supply indicated.

Pittsburgh—Furnace repairs reduced the rate ½ point to 93 per cent.

Youngstown, O.—Maintained its rate of 94 per cent for the second week.

District Steel Rates

Percentage of Ingot Capacity Engaged in Leading Districts

	Week ended Aug. 15	Change	Same week 1941	Same week 1940
Pittsburgh	93	— 0.5	100	80
Chicago	101	+ 0.5	100	97.5
Eastern Pa.	92	— 3	95.5	89
Youngstown	94	None	98	86
Wheeling	80.5	— 4	93	99
Cleveland	97.8	+ 1.8	89.5	86
Buffalo	90.5	None	90.5	88.5
Birmingham	95	None	90	88
New England	95	None	90	80
Cincinnati	89	— 3	85.5	78
St. Louis	98	None	98	77.5
Detroit	90	+ 2	94	89
Average	97	— 0.5	°95.5	°90

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

Carnegie Grants Option On Canonsburg Property

Carnegie-Illinois Steel Corp. has granted a 60-day option for the Canonsburg, Pa., works property to the Defense Plant Corp. It is reported the government will convert the plant to war production.

Vultee To Build Steel Training Planes

Vultee Aircraft Inc., Los Angeles, will convert its southern California plant for production of trainer planes built largely of steel.

A process whereby thin sheet steel is welded to "expanded metal" will be utilized. The expanded metal is described not unlike metal lathing in appearance. It will serve as a reinforcement for the steel.

MEN of INDUSTRY

R. E. W. Harrison

W. R. King

E. P. Cramer

R. Edson Emery

COMMANDER R. E. W. HARRISON, after serving a little more than two years as staff officer in the offices of the assistant and under secretaries of the United States Navy, has been released from active duty to devote his efforts to the provision of basic tools required to produce airplanes. While on duty in Washington, he was assigned the task of providing machine tools required at the United States Navy yards, naval bases and other establishments. Upon entering active service in the Navy, Commander Harrison resigned as vice president, Chambersburg Engineering Co., Chambersburg, Pa., and Clarke-Harrison Inc., Philadelphia. He now resumes his duties as vice president of both these companies.

♦

W. R. King has been placed in charge of all activities in connection with the promotion and sale of motors, controls and other electric apparatus to the machine tool industry for General Electric Co., Schenectady, N. Y. Associated with General Electric since 1928, he became a member of the machinery manufacturers section, industrial department, in 1936. Mr. King has prepared many papers for the business and technical press on application of electric equipment to machine tools.

♦

James E. Holmes has resigned as assistant sales manager, Tubular Division, Youngstown Sheet & Tube Co., Youngstown, O., to become associated with D. V. Sawhill, president, Mercer Tube & Mfg. Co., Sharon, Pa.

♦

R. E. Powers, the past four years manager of the manufacturing and repair department, Westinghouse Electric & Mfg. Co., with headquarters at Chicago, has been transferred to Emeryville, Calif., as Pacific coast district manager of the manufacturing and repair department.

♦

E. P. Cramer has been appointed advertising manager, Edison Storage Battery Division, Thomas A. Edison Inc., West Orange, N. J. He has been associated with the division's advertising department ten years as field editor of *Storage Battery Power,* a house publication.

♦

Joseph Michaels has been elected chairman of the board, Hyman-Michaels Co., Chicago. **Sparrow E. Purdy** has been elected president, and **Everett B. Michaels,** executive vice president.

♦

Lowell L. Henkel, the past eight years research engineer, metallurgist and chemist, Interlake Iron Corp., Chicago, is now administrative aid, Technical Development Section, Production Branch, War Production Board, Chicago.

♦

Frank J. Smith, general superintendent of the iron ore mines of Oglebay Norton & Co. in Michigan and Minnesota, has been appointed general superintendent of all iron ore mines under management of the company, including the Montreal mine in Wisconsin. Associated with the company 34 years, he will continue his headquarters at Ramsay, Mich.

♦

William L. Davis has been named manager of operations, Scully Steel Products Co., Chicago. Mr. Davis' entire career has been with United States Steel Corp. subsidiaries. He was first employed in 1905 as a shipping clerk at the Donora, Pa., works of the former Carnegie Steel Co. Since 1937 he has been superintendent of the Texas warehouse for Tennessee Coal, Iron & Railroad Co., Houston, Tex.

♦

R. Edson Emery, president, Jessop Steel Co., Washington, Pa., is celebrating his forty-second anniversary of service in the steel industry. Mr. Emery started in 1900 with the Crucible Steel Co., serving in many capacities. He was general superintendent of all works in 1922 when he left Crucible to become president of Superior Steel Co. In 1927 he became vice president, Colonial Steel Co., and since 1929 has been president of Jessop.

♦

Harry J. Dixon has been named acting manager of the Buffalo district priorities office, War Production Board. He succeeds **Paul R. Smith,** who has been appointed regional priorities manager of New York and northern New Jersey.

♦

Paul W. Norris, heretofore manager of purchases and production planning, Denison Engineering Co., Columbus, O., has been placed in charge of sales, service and engineering as manager of marketing. **J. T. Hively,** formerly head of the personnel and public relations department, has become manager of purchases. **George L. Avery,** office manager, has been named manager of priorities and production requirements, while **Walter H. Hackett,** assistant manager of personnel, has been advanced to manager of personnel and public relations.

♦

William R. Odell Jr., assistant treasurer, International Harvester Co., Chicago, has been appointed assistant to **James F. Oates Jr.,** head of the contract service division, Chicago Ordnance

District, to aid in the work of price adjustment. This includes review of all ordnance contracts awarded to date to determine whether profits have been excessive.

♦

C. Grannis Bonner, former comptroller-treasurer, Brunswick-Balke-Collender Co., Chicago, has been elected treasurer, Pomona Pump Co., Pomona, Calif.

♦

Ralph C. Stuart has been appointed manager of manufacturing to supervise production at five plants of the lamp division of Westinghouse Electric & Mfg.

Ralph C. Stuart

Co., Bloomfield, N. J. Mr. Stuart was formerly manager of parts manufacturing at the lamp division.

♦

Robert L. Warfel has been named a research engineer, Battelle Memorial Institute, Columbus, O., and has been assigned to the division of analytical chemistry. Mr. Warfel formerly was associated with Carnegie-Illinois Steel Corp., Gary, Ind.

♦

G. P. Longabaugh has been named section manufacturing engineer on the headquarters subcontracting staff, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Previously, Mr. Longabaugh had been time study supervisor, supervisor of equipment and methods at the Westinghouse Gearing Division, layout engineer, Switchgear Division, and manufacturing engineer.

♦

George H. Minchin, general manager, Western lines, Atchison, Topeka, Santa Fe & Pacific railroad, Amarillo, Tex., has been named assistant to vice president of the operating department, at Chicago. **George C. Jefferis** replaces Mr. Minchin as Western general manager.

♦

Leonard J. Wahler, assistant chief engineer, Western Foundry Co., Chicago, has been appointed chief engineer, succeeding **E. J. Brady,** resigned. Before joining Western Foundry three and one-half years ago, Mr. Wahler was affiliated for 20 years with the former Stover Mfg. & Engine Co., Freeport, Ill., the last seven as foundry superintendent.

♦

Milton Kutz, assistant to the general manager, electrochemicals department, E. I. du Pont de Nemours & Co., Wilmington, Del., was guest of honor at a testimonial dinner given by associates Aug. 4, upon his completion of 45 years of continuous service. Mr. Kutz was presented with an engraved mahogany mantle clock, congratulatory messages from leaders in the chemical industry were read and his career reviewed in speeches by his associates.

♦

Frederick G. Dawson and **Leonard C. Mallet** have been named general manager and assistant general manager, respectively, for the new Kansas City, Mo., plant of United Aircraft Corp., East Hartford, Conn. Both men have been associated with the organization 13 years. Mr. Dawson was formerly assistant secretary, while Mr. Mallet, since 1938 has been division accountant of Pratt & Whitney Aircraft. The new plant will build Pratt & Whitney Aircraft engines.

♦

N. F. Melville has been named assistant manager of sales, steel and wire products, Pittsburgh Steel Co., Pittsburgh. Associated with the company in various sales capacities the past 15 years, his recent duties have been directing sales of munitions and of manufacturers wire, which duties he will continue to handle.

♦

H. W. Anderson has been promoted to vice president, Aviation Division, Whiting Corp., Harvey, Ill., while **M. J. Rice** has been advanced to vice president of the Quickwork-Whiting Division. Heretofore both men have been employed in managerial capacities.

♦

Bert Dingley, heretofore executive vice president, Marmon-Herrington Co. Inc., Indianapolis, has been elected president. **R. C. Wallace** has been named vice president in charge of engineering; **Seth Klein,** vice president in charge of production; **C. Alfred Campbell,** vice president in charge of public relations; **George E. Reynolds,** vice president in charge of the eastern district.

To succeed **D. I. Glossbrenner,** who has resigned as secretary-treasurer to enter military service, **William B. Nottingham** has been elected secretary, and **H. DeBaun,** treasurer. **John J. Klein** has become assistant secretary, and **L. M. O'Connor,** assistant treasurer.

A. W. Herrington continues as active chairman of the board of directors.

DIED:

John G. Benedict, 70, president, Landis Machine Co., Waynesboro, Pa., in Waynesboro hospital, Aug. 4, after an illness of two years. He started his industrial career in 1900 in the office of Landis Tool Co., subsequently becoming identified with Fred Frick Clock Co., Waynesboro, as secretary, and branch manager at Minneapolis for Geiser Mfg. Co. He joined Landis Machine in 1904 as secretary-treasurer. Mr. Benedict was also president, Canadian Landis Machine Co.,

J. G. Benedict

Welland, Ont., and was active in the National Industrial Conference Board, National Founders Association, American Society of Mechanical Engineers, and also served two years as president, National Metal Trades Association.

♦

Earl H. Fisher, 47, assistant to the president, Unitcast Corp., Toledo, O., of heart failure on Sylvania Country Club golf course, Toledo, Aug. 9. Mr. Fisher, well known in the metal trades, formerly lived in Cleveland and Cincinnati.

♦

Roy Diercksmeier, formerly central district sales manager, Heil Co., Milwaukee, Aug. 7, in Chicago.

♦

Rudolph Schoemann, general foreman for over 25 years, Pressed Steel Tank Co., Milwaukee, in that city, Aug. 7.

♦

Edwin H. Breviller, 64, president, Union Iron Works, Erie, Pa., at his home in that city, Aug. 10.

♦

Francis C. Williams, president, F. C. Williams Inc., Dearborn, Mich., in that city, July 18.

♦

Thomas Aurelius, 63, vice president, Colorado Fuel & Iron Corp., Denver, Colo., until his retirement in 1940, in Santa Ana, Calif., Aug. 1. He joined the company in 1901, working as a furnace liner in the wire mill at Pueblo. In

1908 he was shifted to the sales department in El Paso, Tex., moving to Los Angeles as division sales manager, before returning to Pueblo as superintendent in 1910. He became vice president in 1933, after serving as manager of sales and manager of railroad sales.

♦

Paul Lester Keiser, 59, president, Pottstown Metal Products Co., Pottstown, Pa., Aug. 5.

♦

W. L. Trammel, 50, vice president in charge of traffic, American Smelting & Refining Co., New York, Aug. 5. He was also vice president and a director, General Cable Corp., New York.

♦

Frank A. Bosh, 65, factory superintendent the past ten years, Kellogg Switchboard & Supply Co., Chicago, Aug. 3, in LaGrange, Ill.

♦

John Billington Nicholson, 51, founder and president of the engineering and construction firm of J. B. Nicholson Corp., New York, at his home in Scarsdale, N. Y., Aug. 8. He founded the company 28 years ago.

♦

William M. Reay, 68, retired vice president, International Harvester Co., Chicago, at his home in Winnetka, Ill., Aug. 7. He joined the Harvester company upon its formation in 1902, was comptroller for 20 years, and afterward served as vice president, the post he held upon retirement in 1935.

♦

Lee Moses Rumsey, 66, retired president, Fort Worth Machine & Foundry Co., Fort Worth, Tex., Aug. 3, in New York.

♦

Thomas E. Knox, 63, president and chairman, Thomas F. Carey Co. Inc., New York, railroad equipment dealer, Aug. 7, at his home in Brooklyn, N. Y. Born in Ottawa, Canada, he had been associated with the Carey company 22 years.

♦

Milton Theodore Thompson, 72, retired electrical and civil engineer, Aug. 9, at his home in Upper Montclair, N. J. He was a member, American Society of Civil Engineers and American Society of Electrical Engineers.

♦

Herman A. Rock, 68, former president, Van Dorn Iron Works, Cleveland, Aug. 7, at his home in Euclid, O. He joined the company following graduation from Case School of Applied Science. In 1925 he resigned the presidency to enter the investment and trust business, but continued a director until 1936.

PRIORITIES — ALLOCATIONS — PRICES

Weekly summary of orders and regulations issued by WPB and OPA, supplementary to Priorities-Allocations-Prices Guide as published in Section II of STEEL, July 6, 1942

M ORDERS

M-9-b (Amendment): Copper, effective Aug. 7. Requires foundries and ingot makers authorized to receive deliveries of refined copper to surrender their allocation certificates to dealers at the time orders are placed.

M-9-c (Amendment): Copper Use, effective Aug. 7. Permits use of copper insignia and jewelry already fabricated. Prohibits use, in household gas stoves, of valves containing more than ½-ounce copper base alloy and of controls containing more than 1½ ounces. Bans copper use in lanterns and lantern parts Sept. 7. Repeals provisions relating to disposition of frozen inventory.

M-99: Printing Plates, effective Aug. 5. Requires printers, publishers and other owners to dispose of old plates before acquiring new metal.

M-110 (Amendment): Molybdenum, effective Aug. 8. Requires WPB approval of melting of molybdenum as provided in M-21-a.

M-112 (Amendment): Antimony, effective Aug. 8. Increases permitted antimony content of alloys for battery grids from 7½% by weight to 12%, provided only secondary antimonial lead used.

L ORDERS

L-79 (Amendments): Metal Plumbing and Heating Equipment, effective Aug. 11. Extends order provisions to cover cooking and baking equipment using coal, oil or gas. Second amendment includes the following gas-burning heating equipment in terms of the order: Steam and hot water heating boilers, warm air furnaces, floor furnaces, unit heaters, conversion burners and gas steam radiators.

L-81 (Amendment): Toys and Games, effective Aug. 8. Eliminates restrictions on use of various pigments, oils and other metals used in paints and varnishes for coating toys and games.

L-104 (Amendment): Metal Hairpins and Bobpins, effective Aug. 8. Permits manufacture to continue to Sept. 15 at rate of 50% of 1941 average.

L-121 (Amendment): Construction Lumber, effective Aug. 8. Extends freeze on such lumber to Aug. 27.

L-163: Turbo-Blowers, effective Aug. 7. Requires authorization on Form PD-616A for placing orders for blowers covered by the order definitions. Application for authorization to place orders must be made on Form PD-616.

L-172: Heat Exchangers, effective Aug. 5. Provides for complete allocation. Requires authority on Form PD-615A to place or accept orders. Application for authorization to place orders must be made on Form PD-615. Army, Navy and Maritime Commission and War Shipping Administration exempt from terms of the order for next 30 days.

PRIORITIES REGULATIONS

No. 1 (Amendment) effective Aug. 10, places AA-1 and AA-2 ratings at same level and creates new rating of AA-2X ranking between these two ratings and AA-3.

No. 11 (Amendment) effective Aug. 5, exempts companies located outside continental United States from mandatory use of Production Requirements Plan. Amendment No. 3, Aug. 5, provides for interim procedure for applicants under PRP who have not received their certificates, permitting acceptance of delivery of up to 70% of indicated requirements for the quarter in the first and second months. For this purpose ratings under any "P" order under which such companies formerly operated may be used, even though such order may have expired.

No. 12 (Amended) effective Aug. 10, permits extension of reratings to obtain specified amount of operating supplies; simplifies provisions for extending reratings to suppliers; permits use of rerating directions in PD-4X series by armed services on orders to subcontractors; and permits companies operating under PRP to revise not oftener than twice a month the rating pattern of outstanding purchase orders in accordance with reratings it has received.

PRICE REGULATIONS

No. 4 (Amendment): Iron and Steel Scrap, effective Aug. 14. Increases spread between prepared bundles and light sheet iron, new clippings and light galvanized scrap to $4 a gross ton. Permits basic open hearth and blast furnace consumers to pay electric furnace price for electric furnace, acid open hearth and foundry grades shipped under WPB allocation orders. Removes allocated tonnages from railroads operating in basing point to an off-line consumer from $1.06-per-ton limitation on off-line freight charges. Adds briquetted alloy free turnings to schedule and removes tube scrap. Revises basis for computing vessel charges on scrap movement. Designates as remote those Kansas and Nebraska shipping points where maximum shipping point price is $13.

No. 199: Lead Bullet Rod, effective Aug 13. Maximum price is 1.10 cents per lb. above the cost to the producer of required metal ingredients. Differential for inexperienced producers is 1.25 cents for first 200 tons of rod made.

MEETINGS

Builds Program Around Power Supply Problems

Most of the papers to be presented at the Pacific Coast convention of the American Institute of Electrical Engineers, Hotel Vancouver, Vancouver, B. C., Sept. 9-11, will deal with the problems of power supply and the protective apparatus used on power systems. Two papers will describe the application of rectifiers to the electrochemical industry, guides to the safe overload operation of transformers, and the supply of kilowatts and kilovars—and these should aid in getting the most out of electrical systems, thus conserving copper and other critical materials.

Meeting of Electrical Engineers Is Postponed

The middle eastern district meeting of the American Institute of Electrical Engineers which was to have been held in Pittsburgh, in October, has been postponed indefinitely.

Top Priority Ratings Reserved for Exclusive Use of Armed Services

WASHINGTON

PRIORITY revisions announced last week by the War Production Board will give the Army and Navy right-of-way to all critical materials.

The armed services will have exclusive use of top priority ratings, AAA, AA-1 and AA-2, latter two to be treated as the same, in a clear-the-decks order for essential armament production. They also have assurance that no industrial operation, civilian or military, will be granted any of the four highest ratings without Army-Navy concurrence.

The sequence of preference ratings as they now stand: AAA, AA-1, AA-2, AA-2X, AA-3, AA-4, etc.; A-1-a, A-1-k, etc.; A-2, A-3, etc.; B-1, B-2 etc.

Procedures for applying the high preference ratings assigned under terms of Priorities Regulation No. 12 have been changed by a complete revision of the regulation.

Priorities Regulation No. 1 also has been amended to change the order of ratings in the AA series. All AA-1 and AA-2 ratings are to be treated as the same; neither will take precedence over the other. A new rating, AA-2X, is created which will be lower than the AA-1 or AA-2 rating, higher than AA-3.

Avoids Individual Rerating

Purpose of the change is to raise all outstanding AA-2 ratings to the AA-1 level without rerating them individually, and to provide a new rating which will correspond hereafter to the AA-2 level. When provision for reratings was first made all outstanding AA ratings issued before that time were automatically changed to AA-2. New amendment has the effect of raising them to AA-1.

Most important changes effected by amendment to No. 12 are:

1. Permission to extend reratings to obtain operating supplies up to 10 per cent of the value of materials processed to fill a rerated order is now granted to all companies whose orders are rerated, subject to restrictions identical with those already imposed by Priorities Regulation No. 3. Companies operating under the Production Requirements Plan were previously forbidden to extend reratings to obtain operating supplies.

2. Provisions for extending reratings to suppliers have been simplified. The new higher ratings may now be applied to outstanding purchase orders for material to fill the rerated order by telegram, letter, or by issuance of new purchase orders with the higher ratings, as well as by use of PD-4Y certificates.

3. Rerating directions in the PD-4X series may now be used by officials of the armed services not only to rerate orders which have been placed with prime contractors, but also on orders to subcontractors which have previously been rated by the armed services.

4. The provision regarding the effect of a rerating on a production schedule has been modified to eliminate the distinction between a "fixed production schedule" and a "production schedule." The regulation now provides simply that no company receiving a rerating is required to interrupt its production schedule for 40 days if such interruption would cause a substantial loss in production.

5. An entirely new procedure is provided for application of reratings by companies operating under the Production Requirements Plan. Chief feature of the new procedure is that a PRP unit (a company under PRP) may, not oftener than twice a month, revise the rating pattern of its outstanding purchase orders in accordance with reratings it has received.

This means that if a PRP unit which is filling a certain volume of A-1-a orders has 50 per cent of these orders raised to AA-1, it may without further authorization raise to AA-1 the ratings on 50 per cent of the purchase orders it has placed for materials to fill these rated orders.

In revising its whole rating pattern on outstanding purchase orders as provided by the amended regulation, a PRP unit will adjust the percentage of AA-1's, A-1-a's, etc., to conform to the percentage pattern of ratings (on the basis of dollar volume) of the orders which it has scheduled for production.

To take a simplified example, suppose that a PRP unit has scheduled production to fill orders with the following rating pattern and has been authorized on its PRP certificate to place purchase orders with the same pattern:

A-1-a	$1,000	33 1/3%
A-2	$1,000	33 1/3%
A-4	$1,000	33 1/3%

If half of the A-1-a orders are rerated AA-1, the rating pattern will change as follows:

AA-1	$500	16 2/3%
A-1-a	$500	16 2/3%
A-2	$1,000	33 1/3%
A-4	$1,000	33 1/3%

The company may re-calculate its rating pattern in this way twice each month, using percentages of dollar volume, and apply corresponding reratings to its outstanding purchase orders for the needed materials. However, no single purchase order may be rerated more than once in any 31-day period.

In making this calculation, another provision of the amended regulation permits the PRP unit to group all ratings from A-1-b through A-1-k and apply to the whole group the highest rating within the group previously authorized on its PRP certificate. It may do the same with all orders rated A-2 to A-10, inclusive.

PRP units which rerate their outstanding orders in this way are expressly forbidden to change the rating pattern of such orders so that the percentage of high ratings would exceed corresponding ratings on the orders they have scheduled for production.

The procedure for PRP units applies only to preference ratings, and may not be used to increase the amount of material which such companies have been authorized to receive on their PRP certificates.

Railroads Must Have Steel To Play War Role, Says General

If steel required for the war effort is to be obtained, railroads must be allowed equipment necessary to move the materials that produce the metal, Brig. Gen. Charles P. Gross, chief of the transportation corps of the Army's Services of Supply, declared last week in a radio round table.

"The railroads need steel," General Gross said. "Every war agency seems to require more steel than it is getting. But in order to make one ton of steel, the railroads must haul 5 tons of ore, coal, coke, limestone and other essentials for its manufacture.

"To get the steel, the railroads must be able to play their essential part. They must be geared to the full, all-out war effort of this nation."

Railroad officials, proud of their record to date, have pointed out the increasing traffic burden will cause difficulties unless more equipment is forthcoming.

U. S. To Lend Mexico Funds for Steel Mill

Export-Import Bank will extend credits of $6,000,000 to Mexico to aid in the establishment of the Altos Hornos steel plant at Monclava, state of Coahuila. The loan which is guaranteed by the Mexican government will be used to cover cost of new and second-hand equipment and materials and of services in the United States.

WINDOWS of WASHINGTON

Eric A. Johnston, new president of Chamber of Commerce of United States, wins support in program to build national unity—to win the war and to win the peace

WASHINGTON

THERE is a growing conviction that Eric A. Johnston, young and dynamic new president of the Chamber of Commerce of the United States, actually is making progress in his campaign to bring about national unity.

When he first assumed his new duties one of his first acts was to visit William L. Green of AFL and Philip Murray of CIO, in order to talk things over. When this news got out it was considered bordering on the sensational, and a good many editorials that were published in newspapers all over the country hailed Mr. Johnston's liberalism as propitious.

Mr. Johnston is working toward two objectives. First, we must win the war. Second, we must win the peace. Without national unity, he fears, we will not win the war. Without unity, we will not win the peace.

In order that we may have unity, he contends, it is essential that pressure blocs be eliminated and that industry, labor and agriculture agree whole-heartedly on a general program shaped for the best interests of the country as a whole.

Recognizes Labor's Place

Mr. Johnston has made considerable progress in obtaining agreement on certain fundamental principles acceptable both to leaders of industry and to leaders of labor. He has earned the friendly esteem of labor leaders and has brought about less name-calling between industry and labor and vice versa. He has obtained full co-operation of the National Association of Manufacturers.

Mr. Johnston's approach has been smoothed considerably by his readiness in admitting the sins of which industry has been guilty in the past, also by his freely expressed belief that organized labor has a permanent place in our economic structure and must have a voice in our national planning.

One of the fundamental planks on which he finds himself in agreement with organized labor leaders is that the American free enterprise system must be preserved. It is agreed this can be accomplished only if private industry is able to provide jobs on the required scale when the war emergency is at an end and it becomes necessary to reconvert to a peacetime economy. If private industry is unable to provide the jobs, the government will—and Mr. Johnston finds himself in accord with labor leaders who do not want a return to a system where the government has to bolster an unhealthy economy with work relief and doles of various types.

Mr. Johnston firmly believes that there will be a job in private industry for every returning fighting man, and for every man and woman now employed on war production, provided there is adequate, intelligent and unselfish planning. He bases his convictions on the following five precepts:

Eric A. Johnston

"1. After this war we will have the greatest plant capacity in history;

"2. We will have a greater source of raw materials, both natural and synthetic, than we have ever had;

"3. We will have the greatest number of skilled mechanics and technicians ever available to any nation;

"4. We will have the greatest backlog of accumulated demands for all sorts of commodities;

"5. The people will have accumulated savings with which to buy this backlog of accumulated demands."

He personally believes that he is making progress and recently said: "There are indications that I am not working in vain."

A successful businessman at 45, Mr. Johnston hails from Spokane, Wash. He is head of the Columbia Electrical & Mfg. Co., and the Brown-Johnston Co., and chairman of the Washington Brick & Lime Co. He is a director of the Seattle First National Bank, of New World Life Insurance Co. and the Spokane & Eastern Trust Co. He is a former president of the Inland Empire Manufacturer's Association and of the Spokane Chamber of Commerce. He has a law degree from the University of Washington.

An ex-captain of Marines—he retired with that rank in 1923 after five years of service in this country, the Orient and in Europe—Mr. Johnston has a reputation for being hard-headed and for not getting discouraged. He intends to keep right on hammering away toward his objective of national unity, both to win the war and to win the ensuing peace.

Moley's Views on Advertising Endorsed

Raymond Moley's editorial on Advertising in Wartime, in *Newsweek* of July 20 has been the subject of some comment in Washington, especially by those interested in consumers goods from various standpoints.

Mr. Moley first cited as "admirable" the widely quoted statement by Secretary Morgenthau on May 28, which contained the following definition as to the status of advertising under the tax laws:

"The test of whether expenditures for advertising are deductible is whether they are ordinary and necessary and bear a reasonable relation to the business activities in which the enterprise is engaged. This is not intended to exclude institutional advertising in reasonable amounts or good-will advertising calculated to influence the buying habits of the public. If such expenditures are extravagant and out of proportion to the size of the company or to the amount of its advertising budget in the past, or if they are not directed to public patronage which might reasonably be expected in the future, such payments will be disallowed as deductions."

Mr. Moley also brings to mind that several other government heads, including the President, have spoken well of such advertising as a means of helping the war effort while at the same time keeping alive the good name of producers. He recalls that the government has suggested a number of things which it regards as useful subjects for such publicity, such as urging the public to buy bonds and stamps,

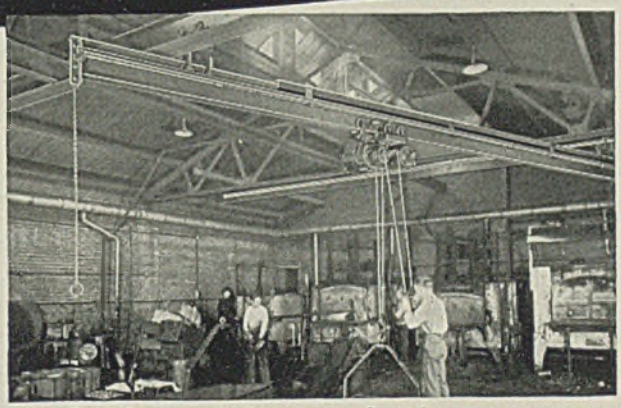
LET SKILLED HANDS DO REAL WAR WORK

Long span cranes serve machine operations on heavy castings.

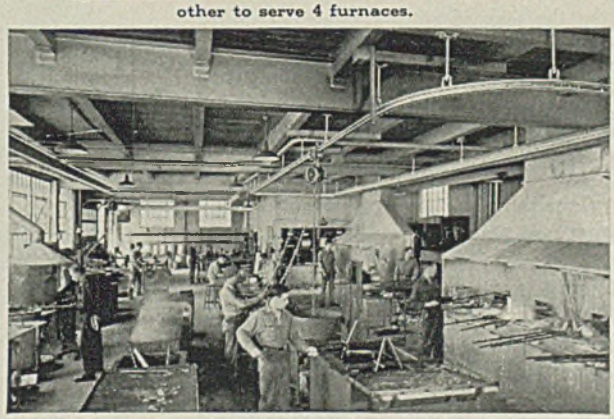
★ Too much lifting and carrying of heavy loads means "too little" protion and "too late" delivery.

American MonoRail Overhead Handling Equipment will eliminate delays in your production — from unloading raw materials to loading your finished products. In every operation where handling is involved, American MonoRail Engineers have been able to speed up production by eliminating delays, relieving skilled labor from lifting and carrying, reducing accidents, conserving energy and increasing efficiency.

American MonoRail Systems are playing a vital part in speeding up production in hundreds of plants engaged in war work. Supplied for manual, electric or automatic operation. There is no interruption during installation. Call in an American MonoRail Engineer — he will show you how it can be done in your plant.



Special crane swivels on one end — telescopes on other to serve 4 furnaces.



Simple MonoRail loop provides quick handling through heat treat operations.

WRITE FOR Blue Book illustrating hundreds of MonoRail installations.

THE AMERICAN MONORAIL CO.

13102 ATHENS AVENUE ★ ★ CLEVELAND, OHIO

recruiting, conservation, salvaging and morale building.

But the big purchasing agencies, such as the Army and Navy, have not yet clarified policies with regard to advertising costs allowable in war contracts, he points out. In a further discussion of the subject in the July 27 issue of *Newsweek*, Mr. Moley regarded this omission as ground for considerable disturbance and anxiety on the part of manufacturing industry and to all who are interested in advertising.

It can be stated that Mr. Moley's thinking is endorsed by quite a few prominently-placed individuals here in Washington who have occasion to study the overall functions of advertising.

The feeling among these idividuals is that advertising is safe as long as Mr. Morgenthau directs the policies of the Treasury.

But these same individuals hold that many persons in influential positions do not share the Treasury attitude, nor that of President Roosevelt and certain other government officials. Not long ago, for example, Thurman Arnold classed as "hokum" all advertising that does not advertise price. In discussing cigarette advertising, he said, it was all "hokum" and he held it is wasteful expenditure of money which adds to the price the consumer must pay.

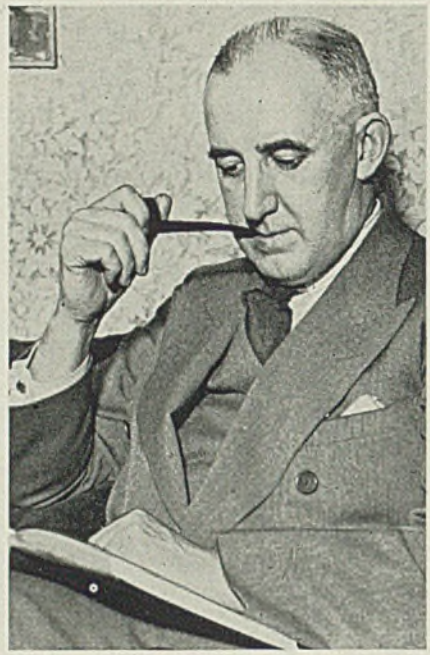
Mr. Arnold is by no means alone in taking such a view of advertising, so that the present assurance of safety is regarded as only to be depended upon as a temporary condition. In view of this situation, one highly-placed and sound government economist raises this question:

"Why would it not be a good thing for the advertising profession to undertake the task of getting more people in public office really to understand the function of advertising in our economy?"

Admirals and Generals Still Determine Censorship Policies

Censorship of news continues to be strict and there are no indications at all that Elmer Davis' new Office of War Information is going to be able to work any great improvement in the near future in informing the American public about the progress of the war. The generals and the admirals still are top dogs in deciding what should and what should not be made public.

It should be stated at once that no more co-operative groups can be found in Washington than the generals and the admirals. Although inclined to be liberal, they have learned through costly lessons that censorship is absolutely necessary. There are many instances



Raymond Moley

where publication of military information has resulted in enemy action. As just one instance, when it was broadcast that General MacArthur had gotten away from Corregidor in a speed boat, the Japanese systematically bombed the shores of that island with the objective of destroying any similar craft that still might be available to the Americans.

On the whole the Army and Navy have been quite patient in attempting to get the co-operation that is necessary to enforce censorship. There are frequent violations. In a single day not long ago there were 78 violations of the code provision that ship movements must not be publicized. On the same day there were nearly as many violations of the rule against publicizing troop movements. It has proven quite a task to get well-meaning newspaper editors to learn just what can and what cannot be published.

The principal difficulty is that there is no muzzle that can be applied to the members of Congress and to certain government officials. They can give out with perfect immunity any choice morsels of information they care to release. In case after case members of Congress have given out confidential information obtained from the generals and admirals in secret hearings.

It seems fair to expect that there will be a trend toward greater liberality in releasing war information as time goes on. When a country goes to war the art of censorship has to be relearned.

British Relax Policies

The British, for example, recently came to the conclusion that their enemies were quite well informed about British military "secrets", and about various things Britain is doing or proposes to do in this war. It was concluded that a too-strict policy of censorship, instead of withholding information from the enemy, prevents the British public from being as well informed about British affairs as it should be and therefore is bad policy. Of late certain information formerly withheld has been published in the British papers, and with a notable improvement in morale on the part of the British public.

There is one angle of our censorship policy that is rather mystifying. That is the taboo on publication of techniques employed in producing quite a few items of ordnance. For instance, technical publications are unable to publish a line on metallurgy and heat treatment of armor plate, or on the metallurgy of armor piercing projectiles. Why this should be is not at all clear, for the reason that the Germans and the Japanese do not need any metallurgical assistance from us. Further, our enemies understand thoroughly what materials we possess, and in what amounts, so that they are informed as to the limitations within which we have to work. The only effect of this ban, as an observer views it, is to make it more difficult for our manufacturers confronted with problems having to do with armament production to get needed information.

Little Business' Friend

Lou E. Holland

CHAIRMAN of the Smaller War Plants Corp., has been intrusted with the task of helping hundreds of small manufacturing establishments threatened with extinction to convert to war production. The corporation was established under terms of recent congressional action and has capital of $150,000,000 (STEEL, *Aug. 10, p. 50*). *Mr. Holland in private life is president of the Double Rotary Lawn Sprinkler Corp., Kansas City, Mo.*

Survey of Used Machinery Held For Sale Is Launched by OPA

WASHINGTON

INVENTORY of every piece of second-hand machinery in the United States held for sale has been started by OPA.

Primary purpose of the survey is to provide OPA with basic information required in connection with administration of Maximum Price Regulation No. 136, which establishes maximum prices for most machines and parts and machinery services, including second-hand machinery.

The inventory will assist OPA to keep machinery prices fair and reasonable. In addition, it has these purposes:

1—It will provide the OPA and WPB jointly with a complete and accurate census of idle machinery which owners and brokers desire to sell, together with the prices they ask for the machinery. As a compendium of machines awaiting sale, it will thus provide WPB with a stock list of second-hand machines available to qualified purchasers. OPA already has a list of available second-hand machine tools. The new compendium will provide a list of second-hand machines and parts other than machine tools.

2—It will locate obsolete machines containing thousands of tons of scrap iron and other waste materials which may be recovered by the salvage committees of the WPB Conservation Division, and after dismantling, added to the nation's scrap metal piles.

Scrap Yield To Be Heavy

OPA officials estimate there may be a billion dollars of idle second-hand machines catalogued before the inventory-taking is completed.

Price Administrator Leon Henderson revealed there are now over 35,000 machines listed in the ever-expanding inventory classifications. The number of machines is expected to rise to over 500,000.

Although just getting started on a broad scale, the second-hand machinery inventory already is bearing fruit. In one company alone has been found 50,000 tons of obsolete and worn-out machinery that may be converted into scrap. An idle heavy plate straightening machine, valuable in straightening ship plates, was found stored in Missouri. Two 3¼-ton buckets for steam shovels which had been rusting in another concern's yards were found. The scrap yield at this concern should be around 200 tons altogether.

Through the inventory, officials have found a complete distillery, built some years ago but never used, which can be put into production of alcohol needed in munitions and synthetic rubber making. Another distillery of 1000 gallons' capacity was found idle and unused in California. In a four-block area in New York were found 80,000 sewing machines stored in garment concerns' warehouses Over 600 wood-working machines, ranging from 20 to 60 years in age, were found stored in a warehouse in New England. The owner of the machines had not made a sale in 20 years. Some of the 600 are to be listed with OPA for sale, others turned into scrap.

OPA has sent instructions to all machinery price specialists in all its regional, state and district offices to start distributing to all second-hand machinery dealers and industrial and business concerns copies of a new form, 2:10:P1, upon which inventory reports are to be tabulated. Wages and Hours Division inspectors of the Department of Labor are to assist OPA field representatives in the circularization job.

Owners of second-hand machines held for sale, others turned into scrap.
the machine, its manufacturer, certain descriptive data, its present condition, and the price of an equivalent new machine as of Oct. 1, 1941. They are also asked to state if the machine is rebuilt and guaranteed and to give their offering price. The reports are to be filled in by the owner of the second-hand machine and returned to OPA within ten days following receipt of the forms.

Urgency Standings Should Not Be Used with PD-1A

WPB has advised machine tool producers that an urgency standing should not be used in connection with a Preference Rating Certificate PD-1A.

Urgency standings govern the sequence of deliveries of machine tools as between service purchasers of the same group within percentage quotas established pursuant to recommendations of the Army and Navy Munitions Board. General Preference Order E-1-b defines as service purchasers those whose preference rating certificates or whose endorsed purchase orders show that the preference rating was assigned by an original Preference Rating Certificate PD-3, PD-3A or PD-4 or by Preference Rating Order P-19-h.

An urgency standing should not be used in connection with a Preference Rating Certificate PD-1A, because the holder of such a certificate cannot, by the definition, be a service purchaser.

If a person seeking to procure a machine tool is not a service purchaser, he cannot be a member of one of the service purchaser groups, and the urgency standing, therefore, has no effect upon the delivery of the tool to him. The tool must come out of the quota assigned to foreign and other purchasers and the sequence of its delivery will be determined solely by its required delivery date and its preference rating.

Renegotiations Boards Being Set Up By Armed Services

Contract renegotiation boards are being set up in the Army, Navy, Maritime Commission and other government agencies in connection with recent legislation demanding renegotiation of war contracts.

While there is talk heard that some government officials want the act repealed there seems little chance of such action at this time.

In connection with procedure, an industrial firm first takes the matter up with his regional board, then with a subordinate board and finally with an overall board if the case has not been settled by the first two.

It is understood a base period is set up which deals with the financial situation of the individual companies for the years 1938 through 1940 and then present conditions.

Henderson Clarifies Rules on Price Conformance Certification

Certification that prices charged conform to OPA regulations need not be accompanied by a sworn statement for every invoice, Price Administrator Leon Henderson announced last week.

To a manufacturer who reported that some customers asked that every invoice carry a sworn statement to the effect that prices charged in the invoice fully conform with OPA regulation, the office advised:

"In making a certification for the protection of the buyer, it is not necessary that a sworn statement accompany each invoice. It will be satisfactory to this office if an appropriate statement is imprinted on invoices and in addition a separate statement is supplied to the buyer by the seller, sworn to by a responsible company official, to the effect that the prices set forth on all invoices being issued or to be issued will not exceed applicable maximum prices established by the Office of Price Administration, and that the company's method of setting its prices has been so established as to achieve this result."

American Steel Mission to Britain

To Study Means of Increasing Output

WASHINGTON

AN AMERICAN steel mission of six members soon will go to Great Britain to study that country's methods and requirements and investigate means to increase the quantity of steel needed for the United Nations' war effort, and to obtain maximum efficiency in the use and allocation of the combined productive capacity of the two countries.

Members of the mission, appointed by the Combined Production and Resources Board, are:

Chairman, Charles R. Hook, president, American Rolling Mill Co., Middletown, O.

Paul F. Schucker, chief of the lend-lease and import section of the WPB Iron and Steel Branch, Washington.

Lt. Col. Paul P. Llewellyn, United States Army.

Capt. G. A. Duncan, United States Navy.

Walter S. Tower, president, American Iron and Steel Institute.

Earl C. Smith, chief metallurgist, Republic Steel Corp., Cleveland.

In announcing the mission, the Combined Board pointed out that the capacity of the United States and Great Britain to make weapons of war of steel now is greater than their joint capacity to produce steel. The mission will study:

1. Ways to increase total production of steel in the United States and Great Britain.

2. The British system for control of steel production, allocation and distribution.

3. How the steel programs of the two nations can be brought into better balance so that plates, shapes, structural steel and so on will all be produced in the proper ratio.

4. Whether increased production and savings in shipping space can be effected by sending more ingot steel and less finished weapons to Britain or vice versa.

5. What steel products can best be made in the United States and what can best be made in Britain.

6. Which theatres of war should be supplied from Britain and which from the United States in order to save shipping space.

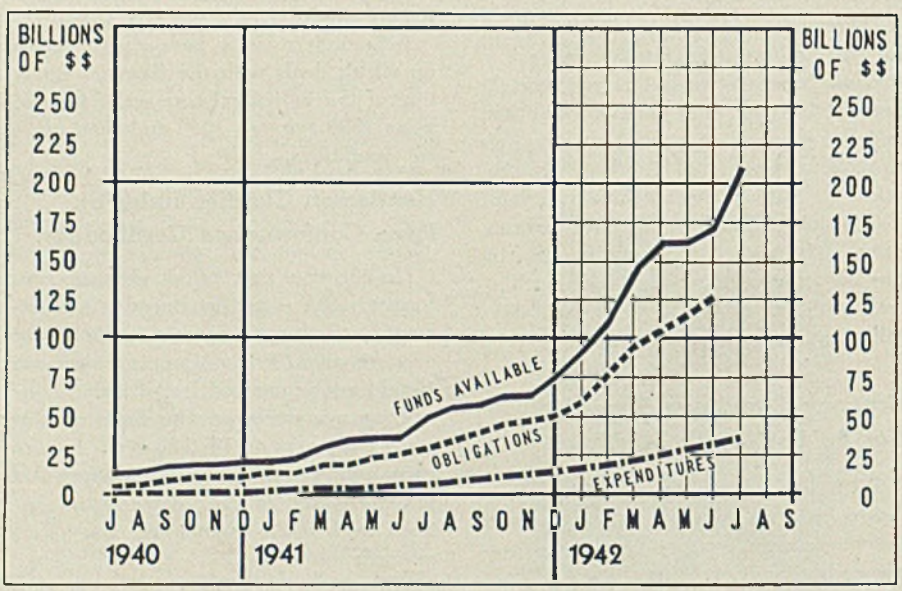
7. Methods used by Britain to collect steel scrap and the use of it.

8. British progress in reducing steel consumption by substitution, simplifying specifications and eliminating wasteful machining operations and means for pooling such information by the two countries.

9. What percentage of British steel production is used in war production and what percentage in civilian production.

10. Means of obtaining savings in the use of scarce alloy steels.

United States War Financial Progress—Cumulative



War equipment, supplies and services ordered by the government in the first two years of intensive war effort cost $129,998,000,000.

During the first 12 months, July, 1940, through June, 1941, war contracts and commitments amounted to $27,801,000,000; in the next 12 months ended June 30, 1942, they amounted to $102,197,000,000.

June, 1942, contracts and commitments rose to $12,098,000,000, an increase of $2,367,000,000 over May. This was the highest monthly figure since March, when the volume of war contracting reached $16,395,000,000. The peak month was February, this year, when $20,932,000,000 of goods and services were reported ordered by the government for the prosecution of the war.

Average daily rate of expenditures advanced sharply in July to $184,400,000, compared with $158,600,000 in June, a gain of 16.3 per cent. Expenditures included disbursements by the Treasury and war expenditures by the Reconstruction Finance Corp. and the latter's subsidiaries.

Liberty Ship Built in 46 Days by Oregon Yard

Performance records established by American shipyards engaged solely in construction of emergency cargo vessels, or Liberty ships, since the inception of the program with awards of the first contracts for facilities by the British in December, 1940, and by the United States in January, 1941, were announced last week by the Maritime Commission.

Heading the list with the most records made is the Oregon Shipbuilding Corp. yard, Portland, Oreg., managed by Edgar F. Kaiser. That yard has built the most ships per way, constructed a ship in the shortest time, 46 days, and produced vessels in the shortest average time per ship, 108 days.

Bethlehem-Fairfield Shipyard Inc., Baltimore, holds the record for the shortest time elapsed from the date of the original contract for facilities until the laying of the first keel. That yard ranks second in the shortest time for construction of a vessel and fourth in the number of ships produced per way.

In second position for the number of ships produced per way is the California Shipbuilding Corp., Wilmington, Calif. That yard ranks third in the shortest production time for a ship.

Holding second place in the total number of ships built are the Richmond Shipyards, Richmond, Calif., also under Kaiser management. Both U. S. Liberty and British ships have been produced there. They rank third in the number of ships built per way and second in the average production time per ship.

Steel Recovery Corp. Organized; Will Send Inventory Forms to 250,000

ARRANGEMENTS for the purchase and sale to war contractors of idle, frozen and excess stocks of iron and steel will be made by the recently organized Steel Recovery Corp., WPB officials said last week. The corporation will function in much the same manner as the Copper Recovery Corp., which now is channeling millions of pounds of copper into war use.

Headquarters of the corporation will be established in Pittsburgh.

By the end of August the first of 250,000 inventory report forms will be mailed to known holders of iron and steel. These will go to 37,000 owners of stainless steel. Similar programs covering other types will follow. Accompanying the forms will be a letter explaining the program and a list of prices at which the government will purchase material which cannot be used in its existing form and must be remelted.

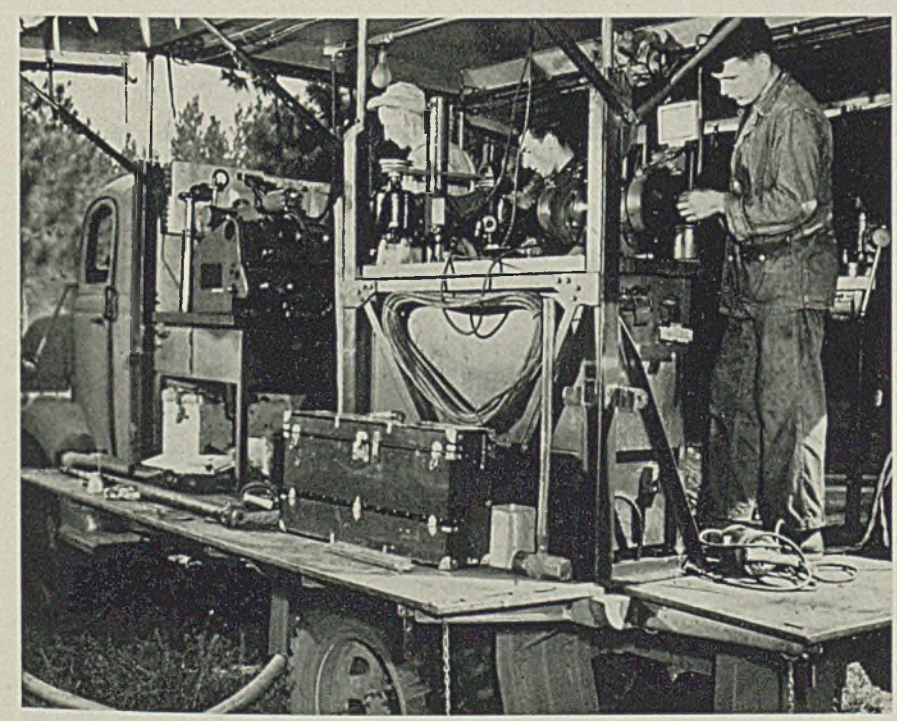
In cases of materials usable "as is" by qualified war contractors, owners and potential buyers will be notified so that private sales may be arranged.

Every attempt will be made to find uses for idle material in its existing form, but where this cannot be accomplished the steel will be purchased by the Steel Recovery Corp. for use as scrap.

The Steel Recovery Corp., WPB's Inventory and Requisitioning Branch and the Iron and Steel Branch will co-operate in the recovery program. The Inventory and Requisitioning Branch will be responsible for locating idle iron and steel, for establishing prices at which it will be bought by the government, and for requisitioning when other attempts to obtain the materials are unsuccessful. The Iron and Steel Branch will direct allocation of the recovered steel to war plants. Steel Recovery Corp. will arrange for inspection, supply shipping directions, and handle payments for government-purchased stocks. It also will bill purchasers on behalf of the Metals Reserve Co., of which it is an agent.

President of Steel Recovery Corp. is George L. Stewart, vice president, Edgar T. Ward's Son Co., Pittsburgh. Other members of the board are: C. W. Nichols, vice president, Metals Reserve Co.; John May, vice president, American Steel & Wire Co., Cleveland; N. J. Clark, vice president, Republic Steel Corp., Cleveland; B. E. Kibbee, vice president, Sharon Steel Corp., Sharon, Pa.; Richmond Lewis, president, Charles C. Lewis Co., Springfield, Mass.; Everett D. Graff, president, Joseph T. Ryerson & Son Inc., Chicago; Lester Brion, president, Peter A. Frasse & Co. Inc., New York; Walter S. Tower, president, American Iron and Steel Institute, New York; Walter S. Doxsey, president, American Steel Warehouse Association, Cleveland.

Mobile Shops Keep Army's Equipment in Repair



MOBILE machine shops to repair mechanical equipment are essential to today's army. Above unit is part of an ordnance company, now participating in the 8th Army Corps, Third Army Louisiana maneuvers. Photo by U. S. Army Signal Corps

First-Half Construction Exceeds $6,000,000,000

WASHINGTON

Total private and public construction activity for the first half of 1942 in the continental United States amounted to more than $6,000,000,000, Secretary of Labor Frances Perkins reports.

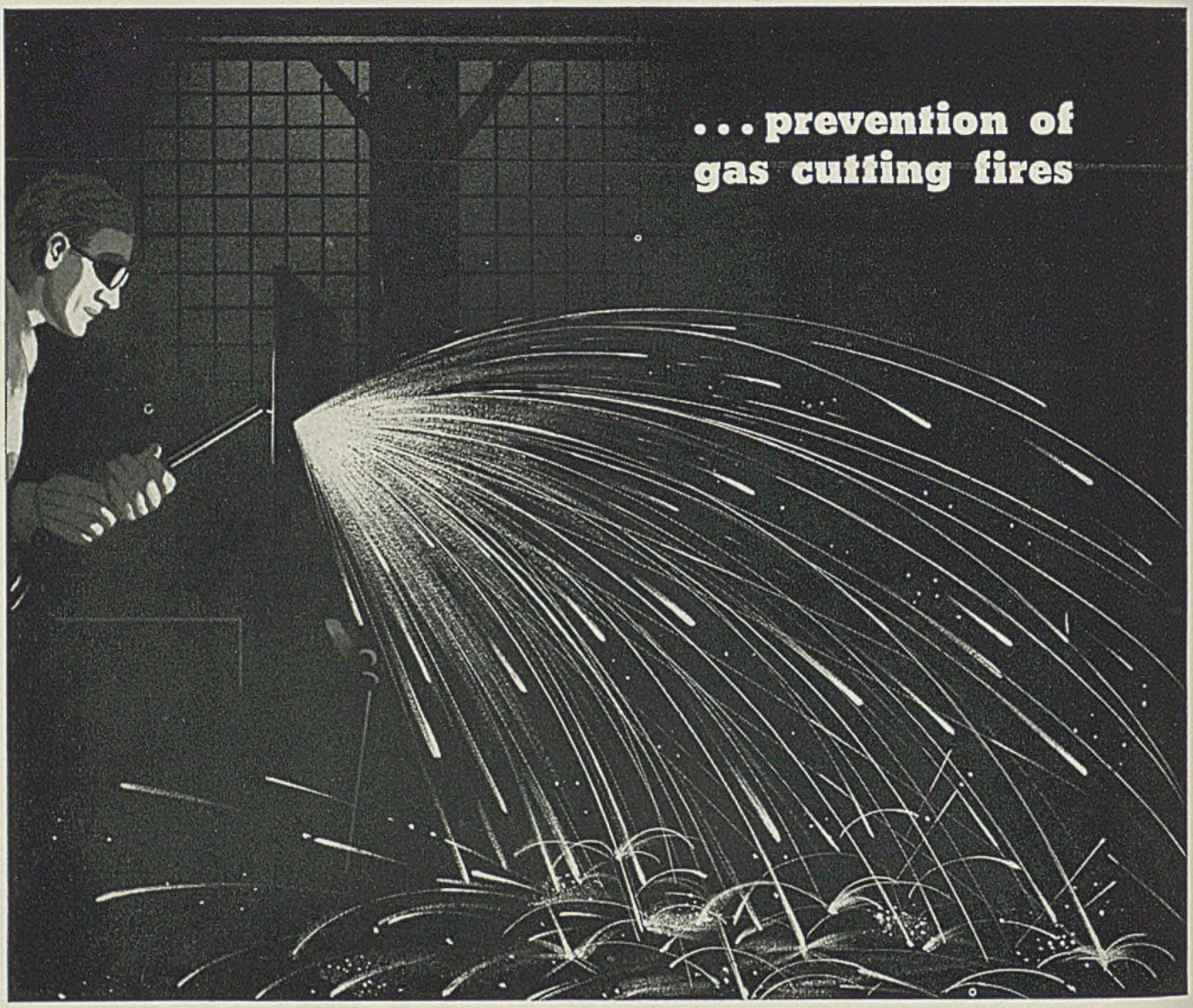
"Under the expanded war program public construction rose from approximately $2,400,000,000 in the first six months of 1941 to $4,000,000,000 during the first half of 1942," she said.

"Military and naval construction increased 84 per cent over the first half of 1941 and the construction of federally financed industrial facilities increased threefold over the same period.

"Shortages of critical materials and Conservation Order L-41, prohibiting the start of unauthorized construction after April 8, 1942, resulted in sharp curtailment of private construction. Total private construction during the first half of 1942 amounted to $2,000,000,000, a decrease of about $400,000,000 from the same period in 1941. First quarter activity was almost as great in 1942 as in 1941, with the decrease of $400,000,000 occurring in the second quarter.

"Private nonresidential expenditures, including privately financed war plants, declined 41 per cent in the first half of 1942 as compared with the same period in 1941. Nonfarm residential construction activity was 24 per cent under the 1941 level. Expanding farm income during the first half of 1942 resulted in greater expenditures for farm residential and service buildings. In order to meet war and essential civilian requirements public utility construction was increased 17 per cent over the level for the first half of 1941.

"Federally financed war housing expenditures in the first six months of the year amounted to $226,000,000. Public nonresidential activity declined to about 75 per cent of the total for the first half of 1941. Highway construction was curtailed about 14 per cent. Other federal construction, largely conservation and development work, increased slightly.



Information supplied by National Fire Protection Association

The surest way of preventing cutting and welding fires is to keep flames, sparks, molten slag and hot metal away from flammable materials. This elementary precaution is the most often ignored.

There are other precautions which, if observed, will do much to prevent cutting fires.

1. Always check fire hazards in new locations before starting work.
2. Have precautions in individual cases specified by responsible authority.
3. Move combustible material at least 30 to 40 feet away from cutting operation.
4. Sweep floors clean before lighting the torch.
5. If combustible material cannot be moved, or if sparks or slag may lodge in wooden structures, or drop through pipes or holes to floor below, use sheet metal guards, asbestos paper or curtains to localize flying sparks or slag.
6. Before cutting steel or iron be sure that it will not drop on combustible material.
7. When finished check surroundings thoroughly to make sure *all* smouldering sparks are put out.

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

MIRRORS of MOTORDOM

Outpouring of shop suggestions helps to raise efficiency and lower scrap. Ideas come from young and old, from veterans and recruits . . . Figures show unionization has worked the other way

DETROIT

"ASK any shop operator whether 117 workable ways to better his plant output is a lot or a little, and he'll tell you that 117 acceptable suggestions represent a veritable army of ideas," says George T. Christopher, president and general manager of Packard, in commenting on suggestions which workmen in his aircraft and marine engine plants have already seen put into practice. Shop suggestions are an integral part of the labor-management "Work to Win" program instituted several months ago by the company. A total of 4158 have been received so far, 30 per cent of them ideas for improvement of production techniques.

In addition to the 117 suggestions already in effect, 207 more are being considered for early adoption. The result has been stimulation of production, higher efficiency and decreased scrap, goals toward which any factory manager always drives. Now, under the stimulation of a war effort, scores of machine operators and other plant workmen are stepping forward with ideas which bring those goals closer. It is unfortunate that the stimulus of preparation for mass murder is necessary to spur men on to thinking about improving production methods at a pace which far exceeds anything experienced in peacetime.

New Era of Productivity

Results of shop suggestions in General Motors plants were summarized here last week. Now the additional reports from Packard simply reinforce the prophecy that American industry is advancing in double-quick time toward a proficiency which, once the war is won, should usher in a new era of productivity.

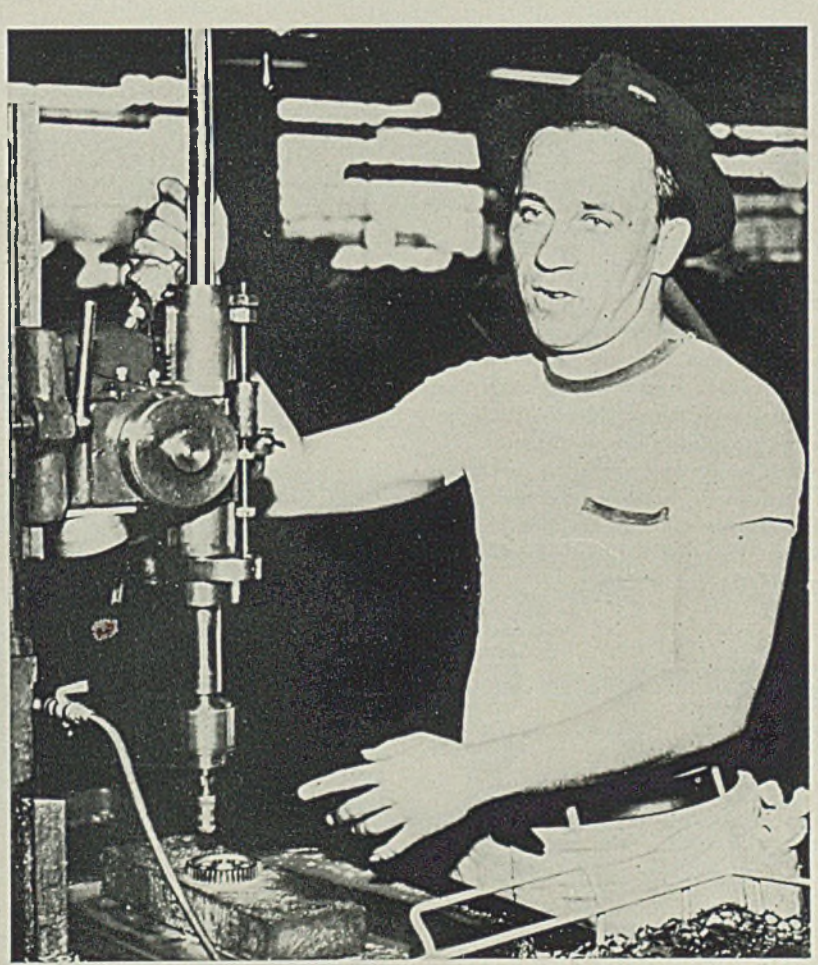
Take some typical cases at Packard. One suggestion came from a man who has been with the company for 18 years. It resulted in a time saving more than enough to add another aircraft engine a month to current schedules. A second suggestion came from a young man just out of high school, and it resulted in a 300 per cent increase in the life of a valuable cutting tool, at a cost of only 25 cents.

The program gives full protection to workmen whose ideas may prove patentable. A standard form is provided for submitting ideas (numbered with stubs to maintain anonymity, by the way), reading in part: ". . . if there is anything patentable about it, I retain the sole right to patent it and grant licenses to others."

Crude drawings, rough sketches or semiprofessional drafts often are submitted by Packard employes to illustrate ideas. Specific forms taken by the suggestions cover a wide range—a new design of dynamometer starter connector which saves time and money; a change in testing procedure to avoid costly engine teardowns; a machine drill to replace a hand chamfer operation; a fiber cover over part of an engine assembly to protect it during construction; a screen box instead of the hand to hold small parts for inspection washing.

There are many recognizable dangers in these employe suggestions, but their values at the moment outweigh the adverse features. Most workmen are unfamiliar with the technicalities of patent law, and when they see an idea adapted profitably, some proponents feel they should immediately start reaping a cash royalty or be bought off handsomely for the suggestion. If these are not forthcoming, the idea-owner may call in a "lawyer friend" who, ambitious to make a name for himself, may undertake steps to get recognition for his client. Then follows the old routine of claims and counterclaims which usually winds up with all parties except the attorneys considerably out-of-pocket.

There is also the difficulty which occasionally crops up with the disgruntled employe who sees his "million-dollar" suggestion turned down or ignored. He immediately starts churning up a resentment against such treatment, even though impartial experts have dismissed his idea



One of more than 300 suggestions for improvements in shop practice made by employes in Packard marine and aircraft engine plants was that offered by John Hooks, machine burring of an aircraft engine gear to replace a hand operation. The job can now be done in one-fifth of the time formerly required

as impractical. His work may suffer and he may even imagine himself one of the world's unwanted creatures just because his brainchild was refused legitimacy.

Again, the matter of "who thought of it first" often comes into the picture, as an obvious change is suggested by different workmen. The Packard system of confining awards to merit badges may have certain advantages over the General Motors system of war bond awards for shop suggestions, in that it tends to lessen the proprietary interest a man will have in his own suggestions. Against this, however, is the diminished incentive to develop these ideas, but results so far in the Packard drive seem to minimize this danger.

The big thing is that workingmen are becoming considerably more than automatons who just push buttons and pull levers. They are thinking about their jobs, finding ways to do them faster and better, and in this way actually sharing in management functions. This creates no dangers of labor taking over management as some thought slyly woven into the WPB Production Drive campaign. Unions naturally point with pride to their members who have contributed important shop suggestions, forgetting that the suggestions did not spring from the fact the men making them happened to be wearing UAW-CIO buttons. Too often the buttons are worn just to protect the head from which the suggestions pop.

Some figures cited by a Ford attorney at a WLB hearing in Washington tend to prove fairly conclusively that unionizing a plant actually lowers efficiency and raises costs, all other factors being equal. A survey was made of 10 processes and 79 points of labor activity ranging from assembling cars to making glass, as of February, 1942, and the production time compared with that of March, 1941, before unionization of the Ford plants. No changes in designs, materials or methods were made between the two dates. The following tabulation shows the excess time required for various jobs after a year of the union shop:

Job	Excess time, minutes, after unionization
Ford and Mercury assembly	398
Truck assembly	401
Tractor assembly	7.39
Front axle forging	8.98
Rolling mill processes (19)	304.08
Spring and upset plant	91.28
Laminated glass, per sq. ft.	0.75
Axle building	76.15
Foundry machine shop	102.68
Foundry operations	116.81
Press shop	178.5
Tire plant labor	37.5
Pistons	4.79
Crankshafts	32.76
Engine assembly	205.09
Connecting rod and bearing	4.57
Transmission gears	7.34

Further figures tend to indicate that general acceleration of production since Pearl Harbor has not measurably improved some operations. A study of scarfing operations in the Ford rolling mill, made at the end of May, shows time required was 81.4 minutes in March, 1941, and 125.1 minutes this year, which would indicate either some pretty bad steel or else a deliberate slowdown resulting from full unionization of the plant.

"Make the Job Last Longer" Attitude Found Prevalent

One of the most vicious forms of nonco-operation by union members in a number of plants in this area is the so-called "string-out" or arbitrary reduction of production rates to "make the job last longer." It amounts to nothing more than sabotage of vital war production, but plant operators are powerless to do anything about it.

The vice president of a Muskegon, Mich., foundry is quoted as saying that restrictions on production have been put into effect at his plant from time to time over a period of two years, and recently have been drastically extended, in some departments production being cut nearly 20 per cent.

At a Flint, Mich., plant union leaders have put into effect a virtual 60 per cent slash in production of certain groups of coremakers and are using the move as a weapon to enforce demands for a change from piece rates to straight day rates in the foundry.

"Personally, I think our country is at a grave crisis in this matter," says a general manager. "Every time I go to Chicago or Detroit or anywhere else I hear this same story. It's time some agency, government or otherwise, removed these restrictions. Even at normal production, America is up against a well-nigh staggering job to turn out the supplies 10,000,000 men in the armed forces will need. With retarded production instituted by the unions, the job becomes impossible."

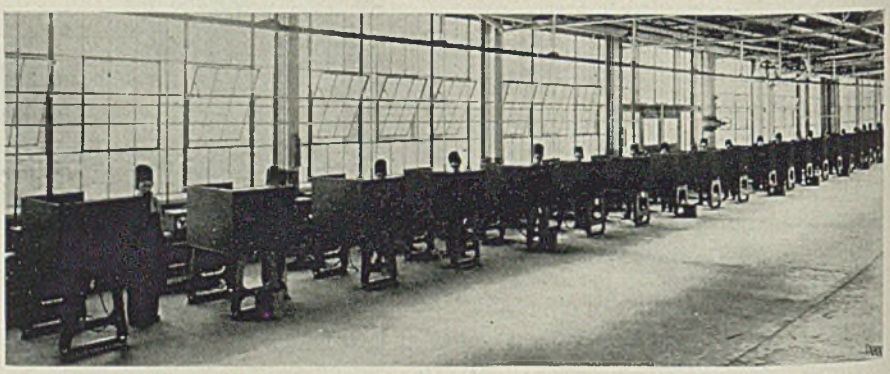
A foundry superintendent, facing a similar situation, charges union labor in this country is moving in the same direction traveled by labor in France before it fell, totally and selfishly oblivious to the dire straits the nation now finds itself in. He has coined a new name for the CIO—the *Comintern of Industrial Obstructionists.*

Comforting statements such as released by the Twentieth Century Fund in its report on labor conditions in industry are just so much poppycock in the opinion of managers and superintendents who have to deal with union labor from day to day. Among union subleaders there is no appreciation of the essential character of war production or of the damaging effect of lost hours. Not much more proof is needed than the recent closing of Pontiac Motor Division plants for a day because of a local row over unionization of grocery clerks in the city.

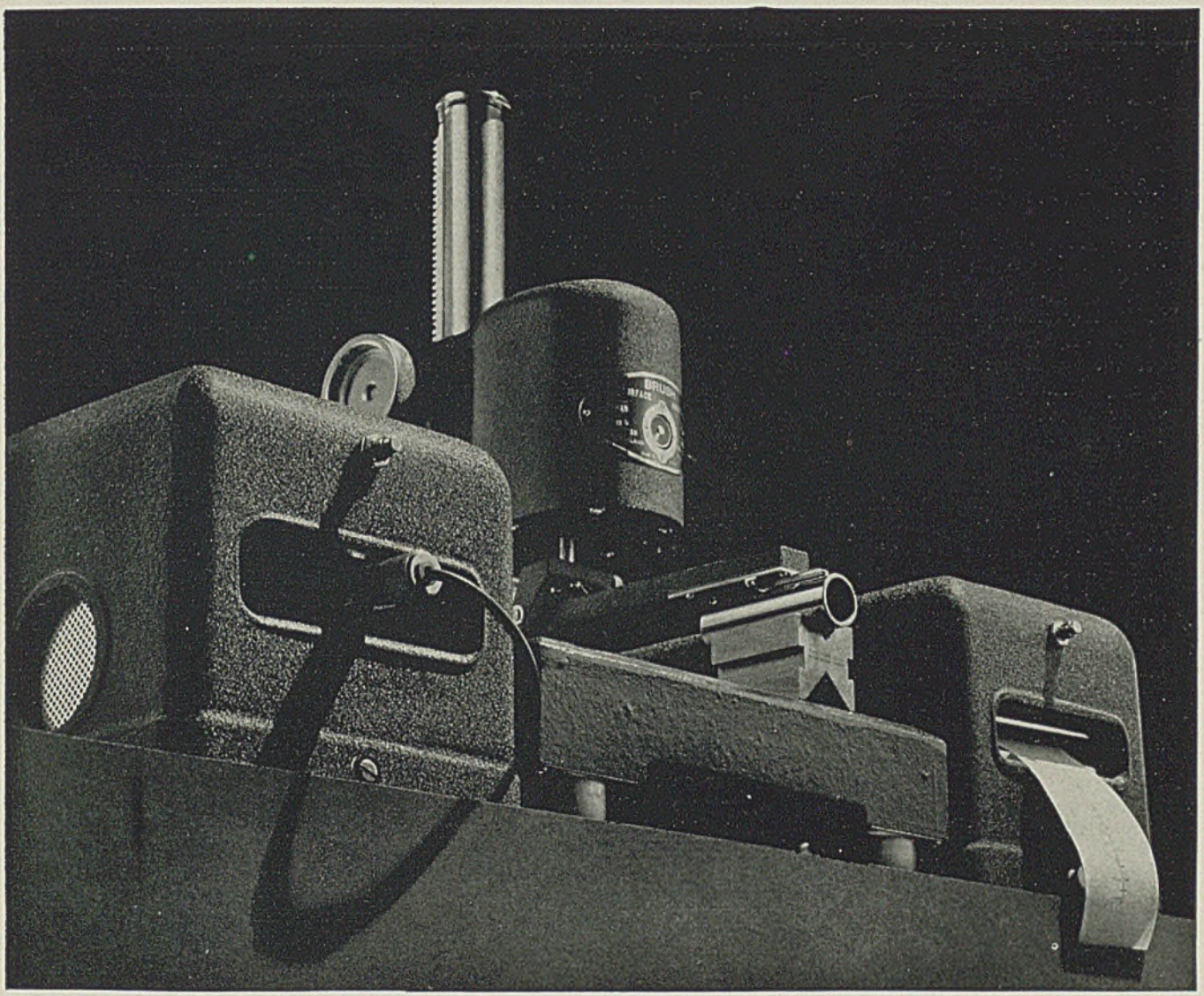
Consolidation of army truck procurement, supply and maintenance activity in the Detroit Ordnance district office under supervision of Col. A. R. Glancy, former General Motors executive, should bring more order out of the chaos apparent in this activity while under direction of the Quartermaster Corps (STEEL, Jan. 26, p. 39). Credit for the obvious shift is given to hard-hitting Gen. Brehon Somervell, head of the

(*Please turn to Page* 62)

Welders Trained for War Production



TWENTY new Lincoln arc welding machines aand their student operators are here lined up beside 20 welding booths in the Twin City branch of the Ford Motor Co., St. Paul, where 200 men already have been trained in the fine points of arc welding for ship, plane, tank and gun carriage construction. H. C. Dorsey, plant superintendent, states the school is a temporary arrangement, and as soon as a sufficient number of operators have been trained and are ready to go into production, the welding machines will be set elsewhere in the Ford plant for actual production, presumably for tank assembly, since this plant is reported being readied for production of tanks. Photo courtesy Lincoln Electric Co., Cleveland



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WING TIPS

Alexander Kartveli, Russian professional soldier in first World war and for 20 years a designer of aircraft, active in U. S. since 1927, responsible for creation of high-power pursuit ship now in production

NOT many people know Alexander Kartveli, except for the comparatively small fraternity of aeronautical design engineers, but just two years ago this month he was at Wright Field, Dayton, O., talking with Army Air Force specialists there, and sketched on the back of an old envelop his conception of something new in a fast, high-power pursuit ship which right now is rolling off production lines at Republic Aviation Corp., Farmingdale, Long Island, N. Y., and shortly will be in production in another plant.

This plane is the P-47 or Thunderbolt interceptor-pursuit, powered by a 2000-horsepower radial engine, which provides a top speed in excess of 400 miles an hour and which gets the ship up higher and more quickly than anything else the air forces are now flying. The P-47 has yet to see action on world battlefronts in any appreciable numbers, but it will not be long before it is demonstrating its power and punch, for in addition to giving top performance in speed and rate of climb, it is armed and armored to the teeth.

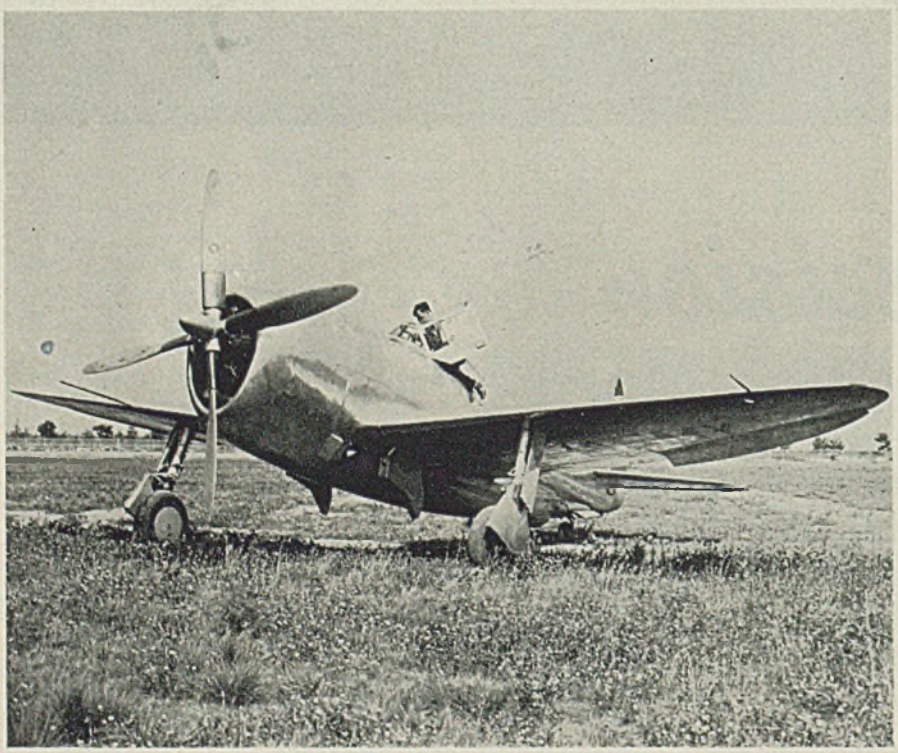
But who is the man, Kartveli? Well, he is nominally vice president and chief engineer of Republic Aviation, and has been since its reorganization from the old Seversky Aviation Co. in 1939. The strange part is that he has never flown an airplane in his life.

In many ways, Kartveli is like that other Alexander, Major De Seversky, except that he is modest to a fault and steers clear of the limelight and the fanfare. There are those who will tell you Kartveli packs more aircraft engineering knowledge in his little finger than Sascha Seversky ever dreamed of, but that is neither here nor there.

Kartveli is a native of Russian Georgia, fought in the last World war as an artillery officer of the Imperial Russian army after education in Czarist military schools.

At the war's end, he was still an army officer, not an airman. He made his way to Paris in 1919 and continued his military studies, discovering a sudden engrossing interest in aircraft. Finally convinced that aviation was the military weapon of the future, he redoubled his efforts at becoming acquainted with all its technical aspects. He progressed rapidly and attained professional status as an aircraft designer in the growing French aircraft industry, which at that time led the world.

In 1927 he came to the United States with designs for an all-metal plane and proved himself a pioneer in the use of metal for airplane construction. In the next ten years he worked with several of the leading aircraft builders, but as so many other enterprising engineers discovered, the industry was struggling along in its infancy, with few orders of any consequence and a military air arm which could do little because of lack of funds. When Republic Aviation was organized in 1939 following the departure of De Seversky from the firm, Kartveli was named to head engineering development.



Fastest and most powerful single-engine fighter plane yet to be built for the Army Air Forces, the P-47 Thunderbolt interceptor-pursuit now is in production at plants of Republic Aviation Corp. and is going into production in certain Curtiss plants, with numerous other subcontractors supplying subassemblies. Note particularly the wide tread on the landing gear, the four-blade propeller, full streamlining of engine cowling and fuselage and the novel canopy design. This view shows an early model without the armament of current models. Power is supplied by a 2000-horsepower double-row radial Pratt & Whitney engine

Responsible for Several Models

Actually his design responsibility goes far back in the line of military planes produced by Republic and its predecessor companies, including the Guardsman dive bomber, the P-43 Lancer pursuit ship, and now the P-47. Many suspect that he had a hand in design of the Seversky P-35 pursuit ship, first built in 1937, the one for which Seversky claims the Army refused to appropriate funds to improve firepower and range because it did not have a liquid-cooled engine. Certainly an inspection of the P-35 and the P-47 shows a remarkable similarity of appearance, and Seversky himself claims in a published article to "have offered substantially this same ship (the P-37) to the Army in 1938."

Yet Republic Aviation officials are careful to point out that "if Alexander de Seversky makes any claim whatsoever to the design of the Republic P-47, it is a gross mis-statement of fact since the design of the airplane was not begun until the fall of 1940, and his company had long since severed any affiliation whatsoever it may have had with Seversky!"

The record shows the War Department announced acquisition of the Republic

HOW GOOD A SCRAPPER ARE YOU ?

How about taking *another* sock at the Axis—aside from the healthy punches you're delivering with war production? Round up all the iron and steel that it's not absolutely essential to keep. Do it both at the plant and at home. Then turn it in for scrap, even if some of it hurts!

In plain words, here's the picture. Steel producers are going to need several million *more* tons of scrap this year than ever before. If we don't get it, you won't get enough *new* steel; and if you're pinched, it's the boys on the fronts who will suffer. • It can be either a vicious or victorious circle. *Will you do your share—and more—to make it the latter?*

AL

STEEL FOR THE NATION'S WELFARE

Allegheny Ludlum
STEEL CORPORATION
GENERAL OFFICES: PITTSBURGH, PENNSYLVANIA

XP-47B (experimental model) on May 8, 1941. Republic received orders to begin work on the Thunderbolt Sept. 6, 1940. Exactly eight months later, or on May 6, 1941, the plane flew for the first time, two days before the War Department's formal announcement.

Perhaps all the real facts would emerge if Kartveli could be persuaded to supply an annotated edition of Seversky's book, *Victory Through Air Power*, but he is a retiring sort of a person and probably would have nothing to do with the controversy. He does have these few words to say about the airplane of the future: "Airplanes will continue to become faster, both in military uses and in commercial service. The chief advantage of air transport is speed. We will continue to see much more of it." There is not much room for argument in this generalized statement.

In any event, the P-47 marks the first use of a radial engine in Army pursuit ships, and there should no longer be any room for charges that favoritism is being shown one type of engine. Likewise the Navy, long committed to the use of radial engines in its planes, shortly will have some models with in-line liquid-cooled engines, a plant now being under construction for their manufacture.

Other ships now in the experimental stage, which will be moved into construction without delay, include a new single-engine high-altitude fighter with 2000-horsepower radial engine and a new two-engine bomber, also with 2000-horsepower radials. Now under construction in an eastern plant is a fleet of 1000 stainless steel transport planes.

Kaiser Authorized To Prepare Plans for Huge Cargo Planes

Plans of Henry J. Kaiser, West coast shipbuilder, to construct a fleet of 70-ton Mars cargo planes for ferrying war materials to the fighting fronts have been placed on a conditional basis by WPB. Mr. Kaiser has been authorized by WPB Chairman Donald M. Nelson to prepare engineering plans and data on facilities and materials needed to build 500 of the air freighters.

WPB said that if Mr. Kaiser's plans satisfy both the war board and the Navy, a contract for the planes probably will be awarded.

Mr. Nelson also authorized Mr. Kaiser to proceed with designs for a 200-ton flying boat which he hopes eventually to construct.

Mirrors of Motordom

(*Concluded from Page* 58)

Army's Services of Supply. It will mean the influx of new hundreds of personnel to the Ordnance office's present staff of around 7000. To house the expanded staff the War Department has taken action to acquire the 40-story Union Guardian building, second highest Detroit skyscraper. Some ordnance offices are now located there, but the plan is to take over the entire building, necessitating removal of about 150 present tenants.

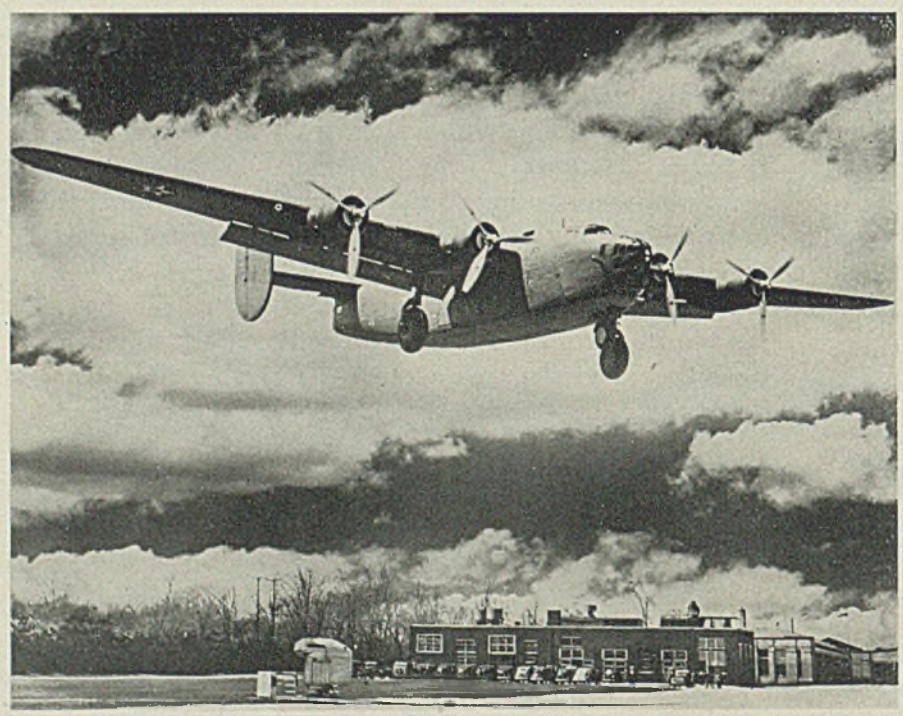
Housing in Detroit being at a premium, the War Department has announced it "plans to use" the $12,000,000 Herman Gardens federal housing project to accommodate part of the personnel to be moved here from Washington and Philadelphia. The housing project, comprising 2150 units, was begun in the fall of 1940 as a joint federal-city slum clearance project. It is scheduled for completion in December. Proposal of the War Department to "use" it drew immediate howls from the UAW-CIO in protest against this encroachment on the future living quarters of war plant workmen.

Reports are heard regularly around town of the Army taking over this or that hotel for housing personnel, both the Statler and Book-Cadillac being mentioned. However, it is believed the services would prefer to reserve, say, 50 or 100 rooms in each of several hotels, rather than to take over entire buildings such as was done in Chicago.

The new Ordnance-Combat arm being set up here will direct design, procurement, supply and maintenance of all Army vehicles and tanks; thus will work not only through the local ordnance office but through the 12 other ordnance districts throughout the country as well.

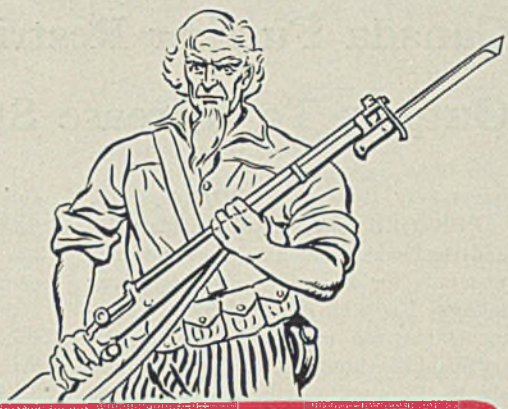
The Ordnance Department itself is undergoing a process of demilitarization, with hundreds of officers being slated for active duty and their posts here to be turned over to civilians. Even the chief, Col. A. B. Quinton Jr., is leaving, transferring his responsibility to a deputy, Oscar Webber, hitherto manager of a large department store.

Maj. Gen. Levin H. Campbell, chief of ordnance for the Army, addressed 5000 workmen at the Detroit (Chrysler) Tank Arsenal last Monday on the occasion of the award of the Army-Navy "E", new joint award which replaces all other similar symbols of recognition presented by either branch of the services. Silver "E" buttons are given to all employes to wear. Concerning them, General Campbell said, "The wearing of the silver 'E', besides being an honor, is a responsibility. It means no shirking at the machines, it means skipping that smoke on the side, or postponing until after-shift hours the relaying of that new joke. It means cheerful punctuality at work. It means proper rest and sensible recreation."

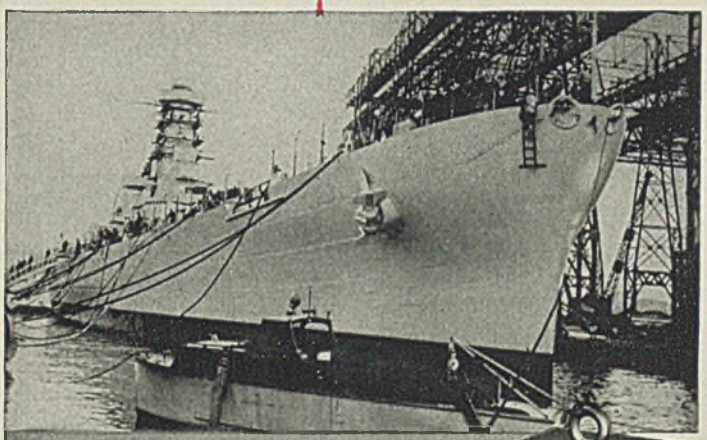


"We're building cargo planes right now," said Tom Girdler, chairman of Republic Steel Corp. and also of Consolidated Aircraft Corp., in a recent radio broadcast from San Diego, Calif. He referred to the giant 4-motor Consolidated B-24 bomber, shown here as it is coming in for a landing at Ford airport, Dearborn, Mich. Specially fitted for cargo handling, this B-24-D has crossed the Atlantic in 7 hours. Weighing 56,000 pounds loaded, it will carry 5 tons for 3000 miles at a speed of close to 300 miles per hour. Power is supplied by four 1200-horsepower Pratt & Whitneys. This is the plane Ford shortly will be turning out on the basis of about one an hour at the new Willow Run bomber plant

"Simplified" Arc Welding



...has won important victories for Uncle Sam.



Excessive shipping demands on railroads could have been disastrous; but Hobart Arc Welding stepped in and pushed to the limit new tank car and freight car production. Also afforded greater strength, lighter weight, and faster, easier fabrication.

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Important weapons of actual combat are now rolling off the lines at unheard of speed; thanks to arc welding... particularly Hobart "Simplified" Arc Welding.

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HOBART *"One of the World's Largest Builders of Arc Welders"*

Canada Further Restricts Civilian Output; To Increase Steel Capacity

TORONTO, ONT.

FURTHER expansion of Canada's iron and steelmaking facilities to provide raw materials for a rapidly expanding war industry has been provided for in agreements between producers and the Department of Munitions and Supply. From six to 12 months will be required to complete the new facilities, estimated to cost $25,000,000.

Demand for iron and steel in the meantime will exceed supply and plans already are being or have been formulated for more drastic curtailment of civilian goods.

Electric toasters, irons and fans no longer may be manufactured. Production of electric and combination electric and coal ranges, grills and heaters has been limited to manufacturers who have inventories of fabricated parts. A permit will be required for the assembly of such parts.

Simplification of sizes and types of all kinds of shovels and spades and of axes has been ordered, to save both materials and manpower.

New instructions for the placing of orders for all types of iron and steel have been issued by F. B. Kilbourn, Canadian steel controller. The order, which covers all finished goods as well as semifinished, is designed to make Canadian methods fit into the pattern under the "End Use Code" adopted in the United States.

Every purchase order for iron or steel products, Mr. Kilbourn has informed industry, must be accompanied by a duplicate copy of Form SC-1000 properly filled out by the buyer. This applies to all orders accepted by any producer of any of the items listed in the revised official schedule of iron and steel products (practically every item sold in the Dominion).

Customers of wholesalers must fill out the form when ordering any quantity of stainless steel or tool steel, including high-speed steel; other grades of alloy steel when quantity ordered is 2000 pounds or more; carbon steel when quantity ordered is 8000 pounds or more.

As result of the new order, considerable confusion has developed in the placing of new orders and many have had to be returned by the producers for more detailed information as to end use.

The Department of Munitions and Supply has announced that the price of tungsten in Canada has been raised from $20 to $24 per short ton unit (20 pounds). Increase applies to concentrates averaging approximately 65 per cent tungsten trioxide and containing harmful impurities in quantities not in excess of the maximum permitted in commercial transactions. The move was designed to stimulate greater production from Canadian mines.

Production of minerals is being stepped up rapidly throughout the Dominion. Although censorship does not permit publication of definite information, it is well known that production of nickel, copper, lead and zinc has gained at a high rate during the past year.

Canadian and United States officials are co-operating in a program to increase production from submarginal deposits. The United States will supply funds to develop such production and the additional metals produced will go to the United States.

Ottawa officials announce that Canada will be self-sustaining in magnesium before the year ends. Much of the magnesium will be derived from brucite deposits in Quebec.

The Dominion already is self-sufficient in mercury and is producing some for the other United Nations.

Scheelite, from which tungsten is produced, has been discovered in several localities, with good finds reported in British Columbia and Yukon. It also is being produced as a by-product in several gold mines.

One-sixth of Canada's tin requirements is being produced by the Consolidated Mining & Smelting Co. Ltd. in British Columbia. Other tin deposits have been found in British Columbia and Manitoba, but further work is necessary before their value can be proved.

One of the Dominion's current and most pressing problems is a shortage of labor to man the expanding war industry. The scarcity has become so acute that early and drastic action is foreseen by the National Selective Service Board. This probably will take the form of a virtual drafting of labor to place every worker in a job where he or she can make a maximum contribution to the war effort. A greatly increased program of vocational training also is planned.

More than 100 ships of all kinds will be added to the Dominion's Navy this year, according to Angus L. Macdonald, Navy Minister. Ship production is keeping pace with the available supply of trained sailors to man them. At present the Navy consists of between 400 and 500 ships, manned by 41,000 men.

STEEL Index Is Ready

■ *The index to Volume* 110, STEEL, *for the first six months of* 1942, *now is ready for distribution. Copies will be sent to subscribers requesting them.*

Even Children Understand

DIFFICULTY of war workers on night shifts in adjusting themselves to sleeping in daytime has led some companies to present employes with posters to be placed in their homes. Since even children who cannot read understand its meaning, it is said to produce desirable results. Photo, Milprint Inc., Milwaukee

"Victory Ultimately Rests On Getting to Work"

A "Fill Every Car" program, originated by the Plant Transportation Committee of Weirton Steel Co., subsidiary of National Steel Corp., Weirton, W. Va., urges company's employes to share their automobiles.

The employes' *Bulletin*, featuring the drive, admonishes those who own cars that they must become custodians of a transportation unit that will outlast the nation's enemies.

"Today, Weirton's tires are getting smoother," the publication says. "Each of us is wondering how he'll get to work in the near future. Many of us believe we've got the answer—'Ride the bus . . . Leave the car at home'. But your government has stopped the manufacture of buses, and the needs of our armies and their weapons rolling on rubber far surpass the small supply of rubber in this country. There may be no rubber even for buses . . . Victory ultimately rests on your getting to work."

Careful Check on Employes To Weed Out Potential Saboteurs Advised

NEW YORK

PROFESSIONAL and potential saboteurs must be eliminated from war plants before they have the opportunity to duplicate the wave of destruction that swept over the country in 1917-18.

This is the urgent warning various government protective agencies are giving to prime and subcontractors who have not yet taken steps to unearth by systematic investigation any signs of disloyalty to the United States in either new or old employes.

In peacetime it is a general assumption that a candidate for a job is trustworthy and loyal until facts show otherwise. Even today the mere accident of name, nationality and place of birth is not *prima facie* cause for suspicion.

However, nothing should be taken for granted. Government agencies are insisting more and more that war plants make a thorough checkup on their employes. It is largely up to each concern to choose its own method of investigation.

Concerns who have suffered the misfortune of sabotage will find it easier to justify their management if they have made a complete investigation than if they have not made a checkup.

The Federal Bureau of Investigation and other agencies gives special attention to agents in the pay of the enemy but it is mainly up to each company to guard against the amateur saboteur.

Winnowing the disloyal workers in the United States and identifying potential enemy agents calls for more than ordinary care. A person's most valuable perishable asset—his good name—is at stake.

These "character reports", which can be compared to "credit reports", are being prepared by various agencies. One of these is Dun & Bradstreet Inc., which provides information for an appraisal of the moral risk in considering a new person or retaining an old employe.

Need for this type of inquiry is illustrated by the experience of an eastern war subcontractor. This concern makes vital parts for bombs. The shop is busy but few new men have been hired and all these have been thoroughly investigated.

The government department supervising this bomb assembly work, over the protest of the manufacturer, insisted that all employes be immediately checked. It was soon discovered that a skilled machinist, employed for 15 years, had been to Germany in 1939.

Since his return he had bragged of his association with the Nazis and warned his neighbors to prepare for the "new order".

Cases like this can be discovered by a checkup on employes and applicants for jobs that includes:

A report on personal history, family background and affiliations, especially to bring out anything of an alien enemy influence.

Verification of statements with special attention to social, fraternal and other associations.

Verification of claims to ability and experience.

Inquiry into record as a law-abiding and loyal citizen.

A summary of opinions expressed by former employers and other reliable sources.

References, previous employers and statement of job ability should be esspecially checked. Special attention should be given to time lapses not fully explained.

With workers moving from one factory to another and from one part of the nation to another the importance of checking on place and type of previous employment can not be over emphasized. The forging of references and collusion with false commercial "fronts" are a part of the game of professional sabotage.

Particular attention should be given to workers and professional help in key positions, to shipping clerks, guards and watchmen.

Dun & Bradstreet does not issue recommendations on what to do with employes or applicants whose records are classed as "questionable" or "unfavorable". It is up to the employer and the affected government agency to take action. Incidentally, affiliation with labor organizations is not a subject of inquiry.

As a guide to war contractors the Navy department has issued "Security

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Systematic investigation of both old and new employes in war plants is being advised by government protective agencies. Especial attention should be given workers in key positions, and to shipping clerks, guards and watchmen

SKILLED LABOR has access to expensive dies, tools, lathes, and the saboteur has the opportunity to do considerable damage to machinery which is difficult to replace. It is in this classification that the fifth columnist is most likely to operate.

UNSKILLED LABOR Many of these workers come from the racial stock of countries now at war. The majority are loyal Americans, but unskilled labor can represent a potential danger unless each employee's history is investigated.

PROFESSIONAL HELP The engineer, draftsman, chemist, clerk and stenographer are frequently entrusted with confidential information. The foreign agent is especially anxious to get at blueprints, photostats, specifications, formulas, etc.

THE SHIPPING CLERK occupies a position of trust which brings him into contact with outside agents of transportation. Knows the sources of supply, destination of shipments, the truck, rail and steamship routings.

GUARDS are entrusted with the responsibility of passing visitors into the plant or examining employees' passes and buttons, and in answering questions of transients. Must be alert, honest, intelligent and have some native judgment.

THE WATCHMAN is often alone and unobserved in his patrol of property. Has access to every part of the plant and his loyalty must be supported by a full knowledge of his ability to meet any emergency and to withstand temptation.

for Industrial Plants", which presents detailed suggestions for checking personnel. The Navy suggests that each war contractor maintain an individual file for each employe. This folder should contain: "The completed application form, the results of the investigation, a record of absences and reasons therefor, periodic reports concerning the employe's loyalty and efficiency and and other information deemed pertinent by the management."

Copies of the espionage and sabotage laws should be posted in the plant and also distributed to each employe. Each person should be asked to state that he understands the meanings of these regulations and the punishment for violation.

Altogether the Navy lists 33 practical ways to establish "security control" in a war plant. This pamphlet may be obtained from the United States Government Printing Office, Washington. Another book which war contractors may readily obtain is "Suggestions for Protection of Industrial Facilities", distributed by the local offices of the FBI. Contents are confidential.

Manpower Commission Will Aid Industry To Obtain Technicians

BUSINESS establishments engaged in war production will be told within the next few weeks where and how they can obtain chemists, engineers, metallurgists and other professional and scientifically trained men, according to Paul V. McNutt, chairman, War Manpower Commission. Representatives of the U. S. Employment Service have been instructed to find out how many employes of this type war production plants will require before the end of the year and during 1943.

With this information the employment service can draw upon the country's largest registration of technically trained persons, the National Roster of Scientific and Professional Personnel. This roster, to which are now being added the names of the scientifically and professionally trained persons who have registered for military service, has been placed under the direction of the WMC.

The employment service will not "raid" the staffs of universities in carrying out this program, but will attempt to place only those persons who are now unemployed or not engaged in work essential to the effective prosecution of the war.

"Scientifically trained men and women who are now engaged as educators in colleges and universities are already performing services that may be regarded as vital," Mr. McNutt said. Industry should not expect to get its technically trained personnel from such sources, although many faculty members have volunteered for war industry work during vacation periods.

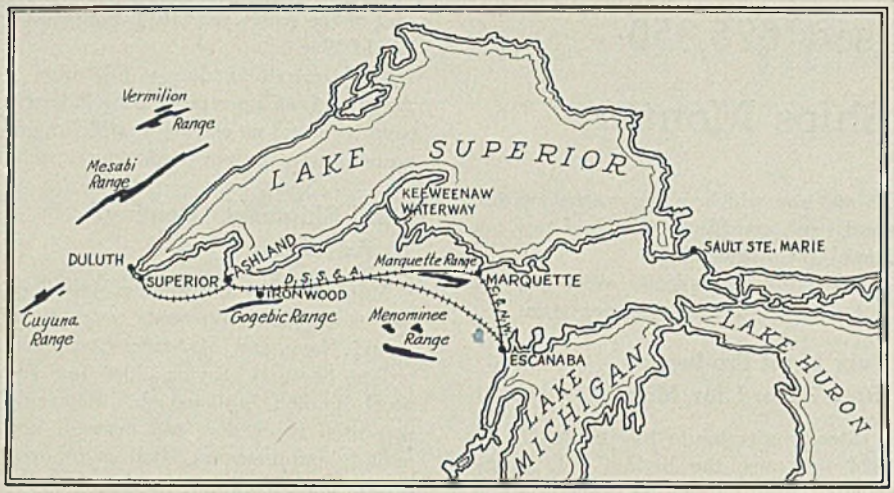
"Representatives of the employment offices," the chairman added, "have been instructed to advise business establishments of the working arrangement which exists between the employment service and the National Roster."

First Half Earnings of Steel Consumers Down 15.5 Per Cent

COMBINED net income earned by 72 iron and steel consumers in the first six months of 1942 totaled $90,096,312, compared with $106,600,676 in the corresponding period last year, a decrease of $16,504,364 or approximately 15.5 per cent. Higher taxes and increasing labor costs were ascribed by the majority for the decline in profits.

	First 1942 Half	First 1941 Half
Anchor Post Fence Co., Baltimore	$ 83,403	$ 112,546
Atlas Tack Corp., Fairhaven, Mass.	64,888	90,314
Aero Supply Mfg. Co., Corry, Pa.	318,039	281,710
American Brake Shoe & Foundry Co., New York	1,248,090	1,479,340
American Steel Foundries, Chicago	2,513,208	2,067,719
American Stove Co., St. Louis	407,268	558,157
Belden Mfg. Co., Chicago	247,722	283,912
Blaw-Knox Co., Pittsburgh	585,434	1,220,496
Bliss & Laughlin Inc., Harvey, Ill.	304,832	417,934
Bower Roller Bearing Co., Detroit	408,550	656,872
Budd, E. G., Mfg. Co., Philadelphia	1,196,235	1,307,472
Budd Wheel Co., Philadelphia	467,860	704,873
Byers, A. M., Co., Pittsburgh	1,650,207	1,155,074
Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich.	651,769	404,143
Caterpillar Tractor Co., Peoria, Ill.	2,468,653	4,298,540
Central Foundry Co., New York	178,309	174,953
Chicago Railway Equipment Co., Chicago	101,950	149,674
Clark Equipment Co., Buchanan, Mich.	844,592	981,954
Cleveland Graphite Bronze Co., Cleveland	518,605	855,315
Cutler-Hammer Inc., Milwaukee	552,632	939,103
Doehler Die Casting Co., Toledo, O.	434,413	699,141
Eaton Mfg. Co., Cleveland	2,064,835	1,979,764
Fairbanks, Morse & Co., Chicago	1,263,220	1,382,499
Federal Motor Truck Co., Detroit	190,005	77,687
Federal Screw Works, Detroit	202,191	181,865
Florence Stove Co., Gardner, Mass.	443,614	564,033
Gabriel Co., Cleveland	119,860	44,661
General Electric Co., Schenectady, N. Y.	20,681,433	26,003,665
General Railway Signal Co., Rochester, N. Y.	412,499	111,375
General Time Instruments Corp., New York	254,433	618,458
Gillette Safety Razor Co., Boston	1,598,863	1,391,790
Holland Furnace Co., Holland, Mich.	108,530	465,903
Hoskins Mfg. Co., Detroit	191,378	299,209
Houdaille-Hershey Corp., Detroit	822,337	1,517,091
International Business Machines Corp., New York	$5,715,106	$4,728,336
Jackson, Byron, Co., Huntington Park, Calif.	650,652	177,846
Le Tourneau, R. G., Inc., Peoria, Ill.	1,086,600	1,613,748
Mack Trucks Inc., Long Island City, N. Y.	1,272,804	1,508,158
Midland Steel Products Co., Cleveland	385,142	977,270
Minneapolis-Honeywell Regulator Co., Minneapolis	1,105,958	1,104,278
Mullins Mfg. Corp., Salem, O.	290,378	536,930
National Acme Co., Cleveland	947,836	1,572,467
National Malleable & Steel Castings Co., Cleveland	585,689	943,570
National Supply Co., Pittsburgh	1,433,056	2,214,747
New York Air Brake Co., New York	510,980	520,245
Noblitt-Sparks Industries Inc., Columbus, Ind.	217,483	283,119
Otis Elevator Co., New York	1,575,507	1,490,419
Packard Motor Car Co., Detroit	3,966,151	1,251,693
Reed Roller Bit Co., Houston, Texas	828,541†	787,907
Seagrave Corp., Columbus, O.	29,544	57,406
Simmons Co., New York	1,871,203	1,262,463
Simonds Saw & Steel Co., Fitchburg, Mass.	733,415	1,183,704
Steel Products Engineering Co., Springfield, O.	448,744	354,543
Studebaker Corp., South Bend, Ind.	902,830	1,313,877
Sullivan Machinery Co., Michigan City, Ind.	231,810	261,213
Superheater Co., New York	520,797	713,431
Symington-Gould Corp., Rochester, N. Y.	322,372	470,384
Transue & Williams Steel Forging Corp., Alliance, O.	95,692	81,644
Twin Coach Co., Kent, O.	378,153	383,313
Underwood Elliott Fisher Co., New York	636,845	1,617,214
United Aircraft Corp., East Hartford, Conn.	6,954,988	5,583,350
United-Carr Fastener Corp., Cambridge, Mass.	360,817	563,101
United States Hoffman Machinery Corp., New York	207,580	402,415
Van Norman Machine Tool Co., Springfield, Mass.	319,513	486,105
Victor Equipment Co., San Francisco	64,608	102,316
Wayne Pump Co., Ft. Wayne, Ind.	350,746	337,414
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.	6,731,701	11,568,401
White Motor Co., Cleveland	590,003	791,355
White Sewing Machine Co., Cleveland	323,882	400,878
Yale & Towne Mfg. Co., Philadelphia	572,591	956,994
Yellow Truck & Coach Mfg. Co., Pontiac, Mich.	2,646,794	3,900,323
Youngstown Steel Door Co., Cleveland	629,944	618,558

†Profit before federal taxes.



Flow of iron ore to the nation's iron and steel mills will be safeguarded by the development of an alternate route from the upper to the lower lakes, permitting the ore to move even through the locks at Sault Ste. Marie were closed. Sponsored by the War Production Board, the program includes the construction of new ore yards and docks at Escanaba and the improvement of railroads operating between Escanaba and Superior, Wis., and Ironwood, Mich. Ore would move to Escanaba by all-rail or by rail and water via Marquette. The Keeweenaw Waterway, recently dredged to a full 28 feet, will shorten the water haul to Marquette

Overland Ore Route To By-Pass Soo Locks; For Tonnage, and Emergency

DEVELOPMENT of an alternate iron ore shipping route to insure continued volume shipments even in event that the locks at Sault Ste. Marie should be closed to traffic has been approved by the War Production Board.

Possibility that the Soo locks, through which about 84,000,000 tons of ore will move this season, might be closed by act of saboteurs or by bombing from the air long has been a matter of concern. To move the great tonnage of ore required for the war effort by rail would be extremely expensive, tie up rail shipments of other war goods and divert equipment urgently needed for other purposes. In addition, some furnaces are situated on lake front sites and are not equipped to receive ore by rail.

To Improve Rail Facilities

WPB's program for an additional route contemplates:

1. Immediate construction of ore yards and docks at Escanaba, Mich., and possible dredging of additional channels in Escanaba Harbor, to make possible the handling of 60,000,000 tons of ore a season.

2. Immediate improvements, through ballasting, tying and strengthening of bridges, of the railroads operating between Escanaba and Superior, Wis., and between Escanaba and Ironwood, Mich.

The program is expected to cost between $20,000,000 and $30,000,000 and will be financed by the U. S. government.

Improvements will require a maximum of 5000 tons of steel. Entire program is expected to be completed by the end of this year.

The plan was worked out by a special committee under the direction of Edgar B. Stern, chairman of the WPB Transportation Committee. The committee estimates the alternate route will be capable of moving up to 100,000,000 tons of ore annually.

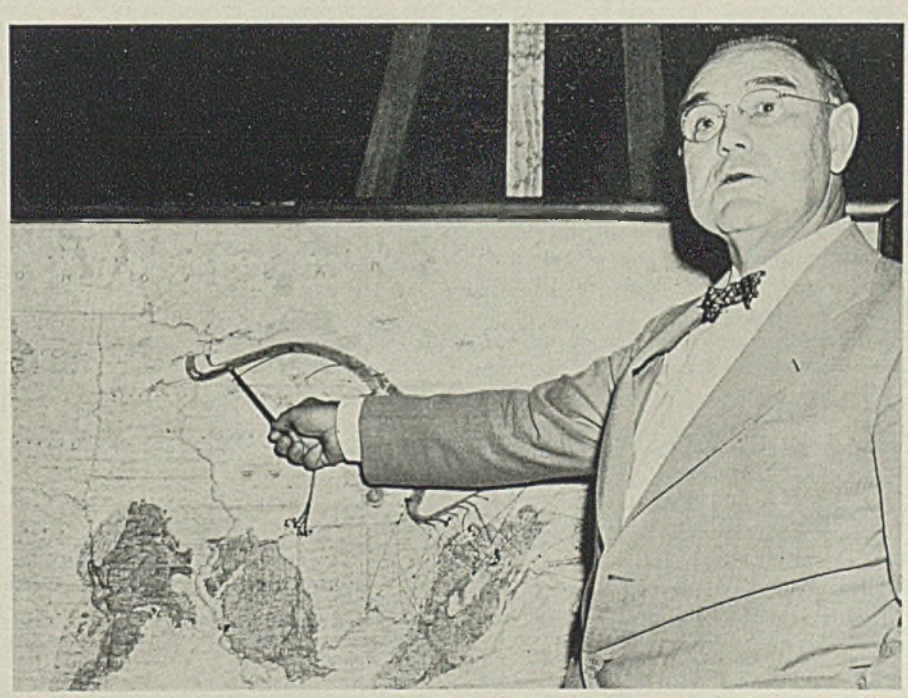
Forty million tons, according to the Office of Defense Transportation, could be moved from the Duluth area to Ohio and Pennsylvania furnaces by rail. Sixty million tons, the committee figures, could be moved from the Michigan ranges and from Duluth, either by all-rail route or by water and rail via Marquette, Mich. From Escanaba, this tonnage would be shipped to furnaces by water.

Insurance Against Sabotage

Primarily the alternate route is intended as insurance against possible interruption of traffic at the Soo. The added expense that would be incurred through the rail haul and extra handling charges would make the route unfeasible if the Soo locks are kept open.

Lake shippers and military officials are taking all possible precautions to protect the locks from damage—either by air raids or by saboteurs. Seamen are carefully checked and the freighters carry armed guards.

While the danger from air raids is not minimized, shippers fear more the possibility of sabotage. It has been necessary for fleet operators to recruit some new seamen to replace those inducted for military service or attracted by jobs in war plants. More than 500 more will be required to man the 16 vessels being built for the Maritime Commission. Applicants for these berths are being carefully investigated.



R. C. Allen, deputy chief of the WPB Iron and Steel Branch, explains geographic problems arising from the various locations of iron ore deposits to the Truman committee investigating the war effort. Map shows the flow of ore to consuming districts.

Steel Capacity Increased 628,350 Tons, Enough for 12 Ships Monthly

ANNUAL steelmaking capacity in the United States, already at the highest level in history, was increased 628,350 tons during the first half of 1942 through construction of new furnaces and enlargement of others, according to the American Iron and Steel Institute.

In terms of the war effort, the new capacity alone is sufficient to provide approximately enough steel every month to build 12 additional Victory ships.

As a result of the new capacity installed during the first six months of this year, the industry reported facilities as of July 1 sufficient to produce a total of 89,198,320 tons of steel per year, which is probably 50 per cent of the entire steel capacity of the world. As of Jan. 1, 1942, American steel capacity was rated at 88,570,000 tons.

The present capacity of the industry is almost half again as large as steel capacity in this country at the close of World War I, and is one-third greater than the maximum tonnage of steel which the industry was called upon to produce in any year prior to 1941.

Since the outbreak of war in Europe, the steel industry of the United States has increased its annual capacity by nearly 8,000,000 tons, equivalent to building in this country during the past 30 months more steel capacity than is available in all of Japan. Present American steel capacity exceeds by almost 50 per cent the total in all Axis and Axis-dominated countries.

Electric Capacity Raised

The program of furnace construction and enlargement during the first six months of this year resulted in adding 139,970 tons to open-hearth furnace capacity, raising the total as of July 1 to the record-breaking figure of 78,247,230 tons per year.

Electric furnace steel capacity was increased by 488,380 tons during the same period to a total of 4,225,890 tons per year. Electric furnaces produce the highest grades of alloy steels, and to meet the war's great need for such products the steel industry has expanded electric furnace capacity by 125 per cent since January, 1940.

Bessemer steel capacity as of July 1 of this year is rated at 6,721,400 tons per year, unchanged since Jan. 1.

Accompanying the 628,350 tons of new steel capacity created in the first half of this year was an increase of 422,500 tons in total blast furnace capacity. The principal product of blast furnaces is pig iron which, along with scrap iron and steel, constitutes the chief raw material for steelmaking.

Blast furnace capacity as of July 1 is rated at 60,816,480 tons per year.

July Ingot Production Sets Record for Month

Steel production in July totaled 7,148,824 net tons, the highest July output ever achieved by the steel industry, American Iron and Steel Institute reports. This represented a small increase over 7,022,155 tons in June and was nearly 5 per cent above 6,812,224 tons in July, 1941.

Total steel production in the first seven months of this year was 49,719,071 tons, 5 per cent more than in the corresponding period of 1941 and within 2 per cent of the whole year 1917, the peak for World War 1.

Steel operations during July were at the rate of 94.5 per cent of the industry's capacity rated as of July 1, which represented a new peak in productive capacity.

Plate Shipments Continue To Advance

More than 75 per cent of July's record steel plate shipments went to fill Army, Navy and Maritime Commission orders, Reese H. Taylor, chief, Iron and Steel Branch, announced. Remainde was used for export and essential nonmilitary requirements, such as transportation, plant facilities, machinery.

July plate shipments were 1,124,118 tons, compared with 1,050,962 in June. Strip mills shipped 530,537 tons in July as against 489,704 in June.

Production of shapes and pilings was slightly ahead of the June total. July shipments were 481,814 tons as compared to 481,182 in June.

STEEL INGOT STATISTICS

	Estimated Production—All Companies								Calculated weekly production, all companies Net tons	Number of weeks in month
	—Open Hearth—		—Bessemer—		—Electric—		—Total—			
	Net tons	Per cent of capacity	Net tons	Per cent of capacity	Net tons	Per cent of capacity	Net tons	Per cent of capacity		
Based on Reports by Companies which in 1941 made 98.5% of the Open Hearth, 100% of the Bessemer and 87.8% of the Electric Ingot and Steel for Castings Production										
1942										
Jan. . .	6,328,128	95.4	490,864	86.0	305,930	96.3	7,124,922	94.7	1,608,335	4.43
Feb. . .	5,791,813	96.7	453,543	88.0	275,700	96.2	6,521,056	96.0	1,630,264	4.00
Mar. . .	6,574,701	99.1	493,294	86.4	324,916	102.3	7,392,911	98.2	1,668,829	4.43
1st quar	18,694,642	97.0	1,437,701	86.7	906,546	98.3	21,038,889	96.3	1,635,994	12.86
April .	6,346,707	98.8	454,583	82.2	321,023	104.4	7,122,313	97.7	1,660,213	4.29
May . .	6,600,376	99.5	454,054	79.5	332,460	104.7	7,386,890	98.2	1,667,470	4.43
June .	6,247,302	97.2	452,518	81.8	322,335	104.8	7,022,155	96.4	1,636,866	4.29
2nd qtr	19,194,385	98.5	1,361,155	81.2	975,818	104.6	21,531,358	97.4	1,654,985	13.01
1st half	37,889,027	97.8	2,798,856	83.9	1,882,364	101.5	42,570,247	96.9	1,645,545	25.87
July .	6,350,047	95.7	453,684	79.6	345,093	96.3	7,148,824	94.5	1,617,381	4.42
Based on Reports by Companies which in 1941 made 98.5% of the Open Hearth, 100% of the Bessemer and 87.8% of the Electric Ingot and Steel for Castings Production										
1941										
Jan. . .	6,274,780	99.0	451,806	76.0	195,766	89.1	6,922,352	96.8	1,562,608	4.43
Feb. . .	5,669,425	99.1	378,536	70.5	182,393	91.9	6,230,354	96.5	1,557,589	4.00
Mar. . .	6,457,641	101.9	460,225	77.4	206,137	93.8	7,124,003	99.6	1,608,127	4.43
1st quar	18,401,846	100.1	1,290,567	74.8	584,296	91.6	20,276,709	97.7	1,576,727	12.86
April . .	6,137,613	100.0	395,056	68.6	221,510	104.1	6,754,179	97.6	1,574,401	4.29
May . .	6,362,245	100.4	444,079	74.7	238,241	108.4	7,044,565	98.5	1,590,195	4.43
June .	6,098,171	99.4	458,848	79.7	235,732	110.8	6,792,751	98.1	1,583,392	4.29
2nd qtr	18,598,029	100.0	1,297,983	74.3	695,483	107.8	20,591,495	98.1	1,582,744	13.01
1st half	36,999,875	100.0	2,588,550	74.6	1,279,779	99.7	40,868,204	97.9	1,579,753	25.87
July . .	6,085,100	94.4	489,297	85.0	237,827	85.7	6,812,224	93.3	1,541,227	4.42
Aug. . .	6,244,353	96.6	495,761	85.9	257,382	92.6	6,997,496	95.6	1,579,570	4.43
Sept. . .	6,054,418	96.9	500,768	89.8	256,568	95.5	6,811,754	96.3	1,591,531	4.28
3rd qtr	18,383,871	96.0	1,485,826	86.9	751,777	91.2	20,621,474	95.1	1,570,562	13.13
9 mos.	55,383,746	98.6	4,074,376	78.6	2,031,556	96.4	61,489,678	96.9	1,576,658	39.00
Oct. . .	6,423,329	99.4	533,060	92.4	279,679	100.6	7,236,068	98.9	1,633,424	4.43
Nov. . .	6,194,679	99.0	488,822	87.5	277,384	103.0	6,960,885	98.2	1,622,584	4.29
Dec. . .	6,387,865	99.0	481,813	83.7	280,637	101.2	7,150,315	97.9	1,617,718	4.42
4th qtr	19,005,873	99.1	1,503,695	87.8	837,700	101.6	21,347,268	98.3	1,624,602	13.14
Total .	74,389,619	98.8	5,578,071	80.9	2,869,256	97.9	82,836,946	97.3	1,588,741	52.14

The percentages of capacity operated in the first six months of 1941 are calculated on weekly capacities of 1,430,102 net tons open hearth, 134,187 net tons bessemer and 49,603 net tons electric ingots and steel for castings, total 1,613,892 net tons; based on annual capacities as of Dec. 31, 1940 as follows: Open hearth 74,565,510 net tons, bessemer 6,996,520 net tons, electric 2,586,300 net tons. Beginning July 1, 1941, the percentages of capacity operated are calculated on weekly capacities of 1,459,132 net tons open hearth, 130,292 net tons bessemer and 62,761 net tons electric ingots and steel for castings, total 1,652,185 net tons; based on annual capacities as of June 30, 1941 as follows: Open hearth, 76,079,130 net tons, bessemer 6,793,400 net tons, electric 3,272,370 net tons.

The percentages of capacity operated in the first six 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 3,737,510 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.

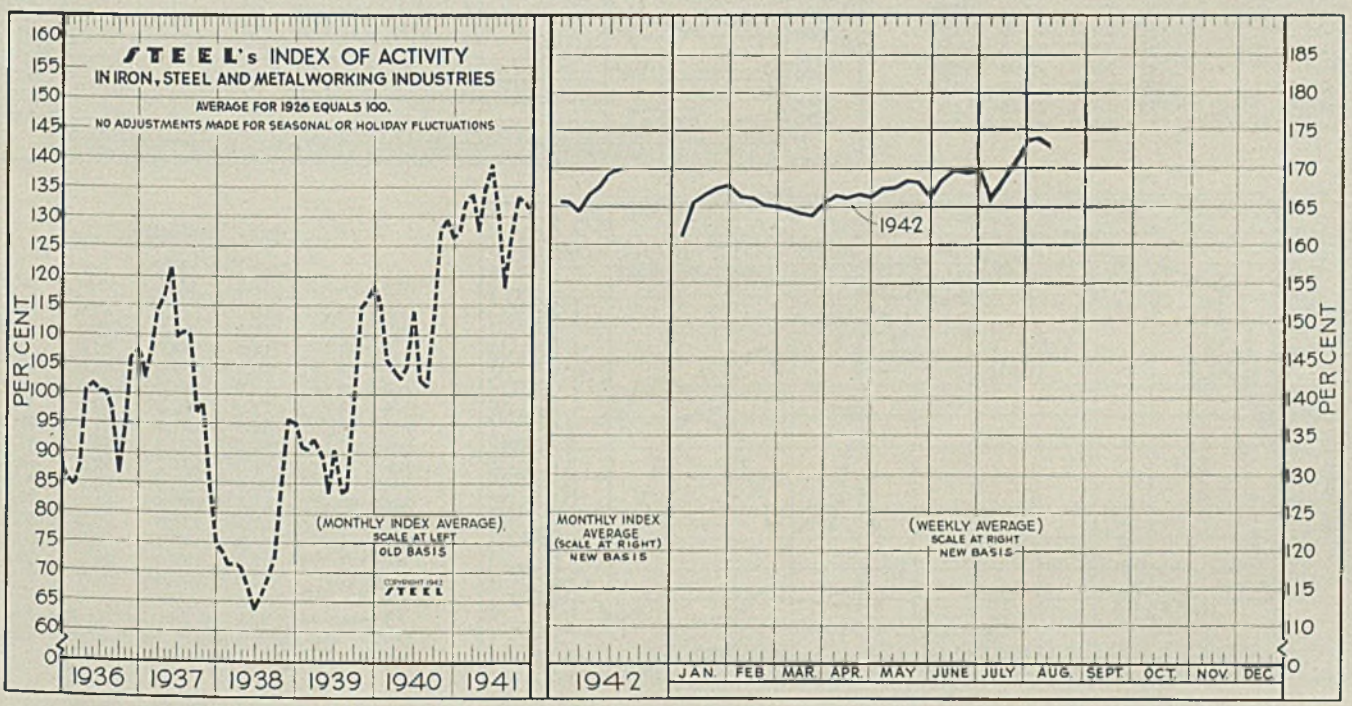
Activity Index Records Moderate Decline

REFLECTING a slight decline in steel ingot production, revenue freight carloadings and electric power consumption, STEEL's index of activity in the iron and steel and metalworking industries eased slightly during the week ended Aug. 8. In that period the index stood at 172.7, off 1.1 point from the preceding week's figure, and represented the first decline since the temporary dip registered during the Fourth of July holiday week.

The national steel rate eased one-half point to 97.5 per cent of capacity during the week ended Aug. 8, due primarily to necessary repairs to open hearths operated at a forced pace for sometime now. In the comparable week a year ago ingot production was at the 96.5 per cent level. The American Iron and Steel Institute reports steel production capacity has been expanded 628,350 net tons during the first half this year and is now rated at 89,198,320 tons annually. Steel scrap situation has shown little improvement, with current collections slightly more than sufficient to maintain present rate of steel operations.

Electric power consumption recorded a moderate decline during the latest period to 3,637,070,000 kilowatts. This compares with peak output of 3,649,146,000 kilowatts recorded in the preceding week and represents a gain of 12.5 per cent over the corresponding 1941 period showing.

Revenue freight carloadings for the week ended Aug. 8 is estimated at 845,000 cars, off slightly from the preceding week's total of 863,528 cars and also compares unfavorably with 878,549 cars loaded in the corresponding 1941 period.



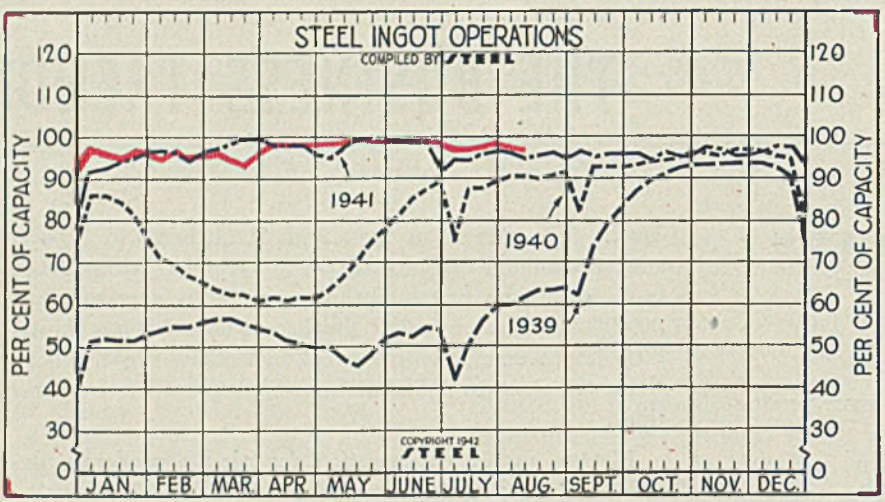
STEEL's index of activity declined 1.1 points to 172.7 in the week ending Aug. 8:

Week Ended	1942	1941
June 6	168.6	138.4
June 13	169.8	138.7
June 20	169.5	138.7
June 27	169.8	138.8
July 4	166.5	120.9
July 11	168.9	133.4
July 18	172.1	133.2
July 25	173.6	132.9
Aug. 1	173.8	123.3
Aug. 8	172.7†	117.5

†Preliminary.

Mo. Data	1942	1941	1940	1939	1938	1937	1936	1935	1934	1933	1932	1931
Jan.	165.7	127.3	114.7	91.1	73.3	102.3	85.9	74.2	58.8	48.6	54.6	69.1
Feb.	165.6	132.3	105.8	90.8	71.1	106.8	84.3	82.0	73.9	48.2	55.3	75.5
March	164.6	133.9	104.1	92.6	71.2	114.4	87.7	83.1	78.9	44.5	54.2	80.4
April	166.7	127.2	102.7	89.8	70.8	116.6	100.8	85.0	83.6	52.4	52.8	81.0
May	167.7	134.8	104.6	83.4	67.4	121.7	101.8	81.8	83.7	63.5	54.8	78.6
June	169.4	138.7	114.1	90.9	63.4	109.9	100.3	77.4	80.6	70.3	51.4	72.1
July	171.0	128.7	102.4	83.5	66.2	110.4	100.1	75.3	63.7	77.1	47.1	67.3
Aug.	....	118.1	101.1	83.9	68.7	110.0	97.1	76.7	63.0	74.1	45.0	67.4
Sept.	....	126.4	113.5	98.0	72.5	96.8	86.7	69.7	56.9	68.0	46.5	64.3
Oct.	....	133.1	127.8	114.9	83.6	98.1	94.8	77.0	56.4	63.1	48.4	59.2
Nov.	....	132.2	129.5	116.2	95.9	84.1	106.4	88.1	54.9	52.8	47.5	54.4
Dec.	....	130.2	126.3	118.9	95.1	74.7	107.6	88.2	58.9	54.0	46.2	51.3

Note: Weekly and monthly indexes for 1942 have been adjusted to offset the forced curtailment in automobile production and to more accurately reflect expanding steel production.



Steel Ingot Operations

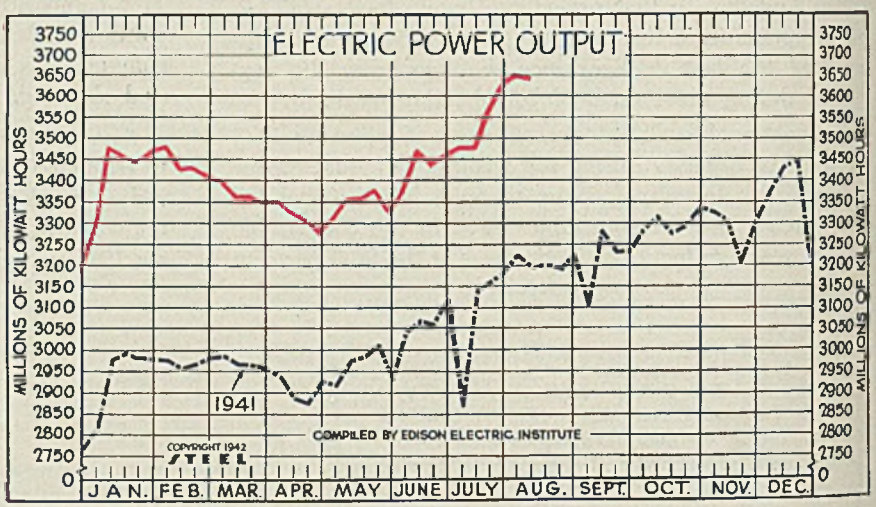
(Per Cent)

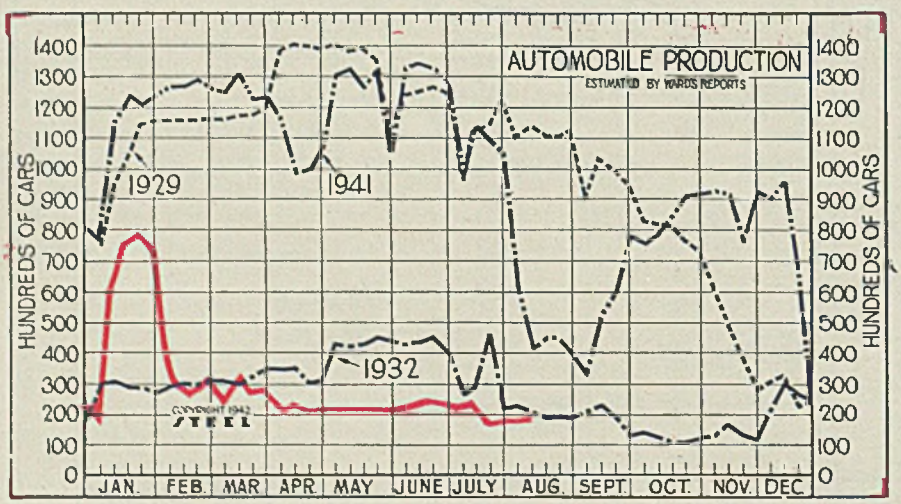
Week ended	1942	1941	1940	1939
Aug. 8	97.5	96.5	90.5	62.0
Aug. 1	98.0	97.5	90.5	60.0
July 25	98.5	96.0	89.5	60.0
July 18	98.0	95.0	88.0	56.5
July 11	97.5	95.0	88.0	50.5
July 4	97.5	92.0	75.0	42.0
June 27	98.5	99.5	89.0	54.0
June 20	99.0	99.0	88.0	54.5
June 13	99.0	99.0	86.0	52.5
June 6	99.0	99.0	81.5	53.5
May 30	99.0	99.0	78.5	52.0
May 23	99.0	100.0	75.0	48.0
May 16	99.5	99.5	70.0	45.5
May 9	99.0	97.5	66.5	47.0
May 2	99.0	95.0	63.5	49.0
April 25	98.5	96.0	61.5	49.0
April 18	98.5	98.0	61.5	50.5
April 11	98.5	98.0	61.0	51.5

Electric Power Output

(Million KWH)

Week ended	1942	1941	1940	1939
Aug. 8	3,649	3,196	2,743	2,414
Aug. 1	3,649	3,226	2,762	2,400
July 25	3,626	3,184	2,761	2,427
July 18	3,565	3,163	2,681	2,378
July 11	3,429	3,141	2,652	2,403
July 4	3,424	2,867	2,425	2,145
June 27	3,457	3,121	2,660	2,396
June 20	3,434	3 056	2,654	2,362
June 13	3,464	3,066	2,665	2,341
June 6	3,372	3,042	2,599	2,329
May 30	3,323	2,924	2,478	2,186
May 23	3 380	3,012	2,589	2,778
May 16	3,357	2,983	2 550	2,235
May 9	3,351	2,975	2 516	2,239
May 2	3,365	2 915	2,504	2,225
April 25	3,299	2,926	2,499	2,244
April 18	3,308	2,874	2,529	2,265
April 11	3,321	2,882	2,530	2,235





Auto Production

(1000 Units)

Week ended	1942	1941	1940	1939
Aug. 8	19.2	41.8	12.6	24.9
Aug. 1	18.3	62.1	17.4	28.3
July 25	18.3	105.6	34.8	40.6
July 18	17.9	109.9	53.0	47.7
July 11	23.0	114.3	65.2	61.6
July 4	22.7	96.5	52.0	42.8
June 27	22.9	127.9	87.6	70.7
June 20	23.2	133.6	90.1	81.1
June 13	22.3	134.7	93.6	78.3
June 6	22.0	133.6	95.6	65.3
May 30	21.5	106.4	61.3	32.4
May 23	21.6	133.6	96.8	67.7
May 16	21.8	127.3	99.0	80.1
May 9	21.5	132.6	98.5	72.4
May 2	22.0	130.6	99.3	71.4

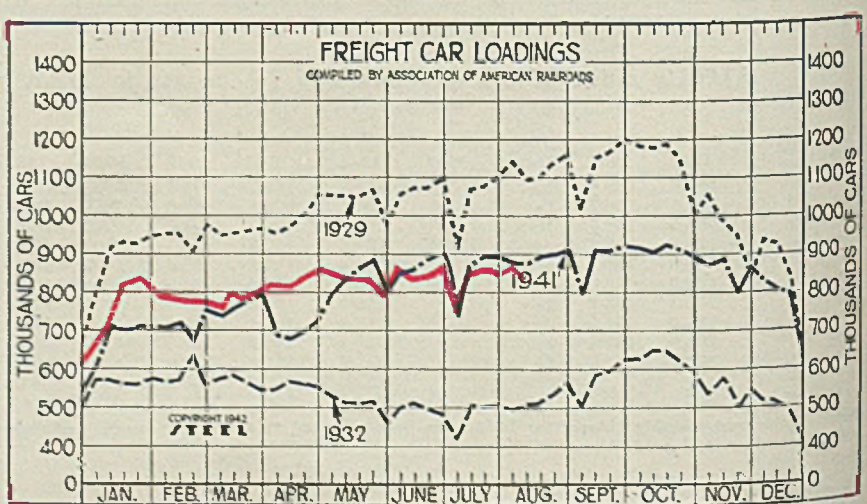
Figures since Feb. 21 last include Canadian trucks and automobiles and United States trucks.

Freight Car Loadings

(1000 Cars)

Week ended	1942	1941	1940	1939
Aug. 8	845†	879	727	665
Aug. 1	864	883	718	661
July 25	856	897	718	660
July 18	857	899	730	656
July 11	855	876	740	674
July 4	739	741	637	559
June 27	853	909	752	660
June 20	840	886	728	643
June 13	833	863	712	638
June 6	855	853	703	635
May 30	796	802	639	568
May 23	838	866	687	628
May 16	839	861	679	616
May 9	839	837	681	555

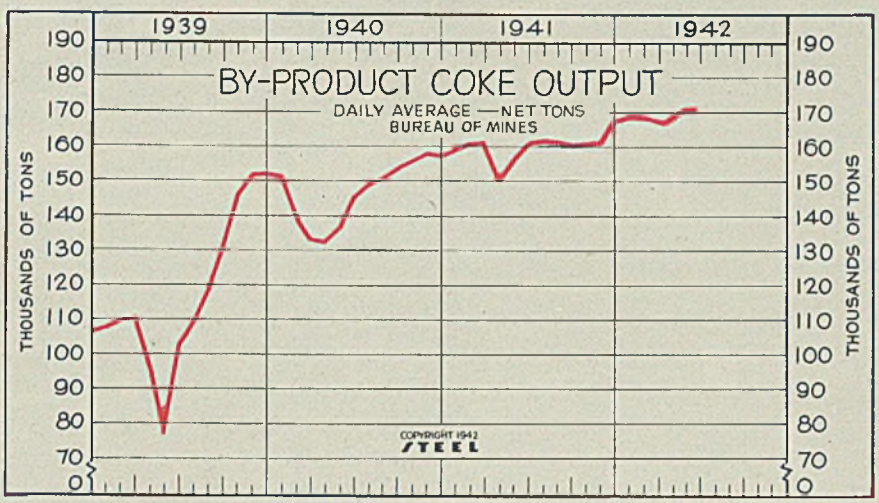
†Preliminary.

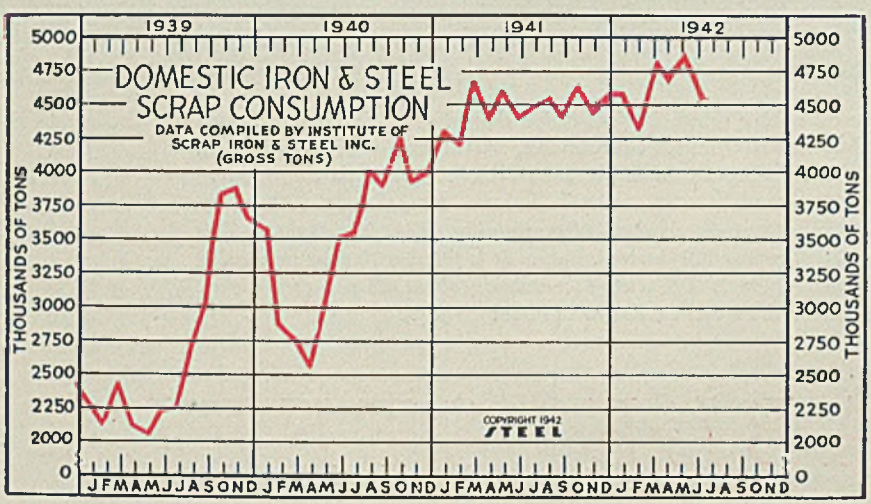


By-Product Coke Output

(Daily Average)

	1942	1941	1940	1939
Jan.	168.508	159.129	151.841	108.611
Feb.	168 414	160,789	138.508	109 923
March	167.733	161.268	133 056	110,921
April	168.966	149,144	132 812	97.155
May	170.187	156 318	136.897	77.304
June	170,593	161.201	145,821	102 991
July	.....	161,731	149,005	108,542
Aug.	.....	161,709	151,035	118 260
Sept.	.....	160.193	154,247	130.144
Oct.	.....	160.344	156,118	146,019
Nov.	.....	161.116	158.331	152 219
Dec.	.....	167,304	157,743	152,200
Total	.....	160,037	147,157	117,892





Iron and Steel Scrap Consumption

(Gross Tons)

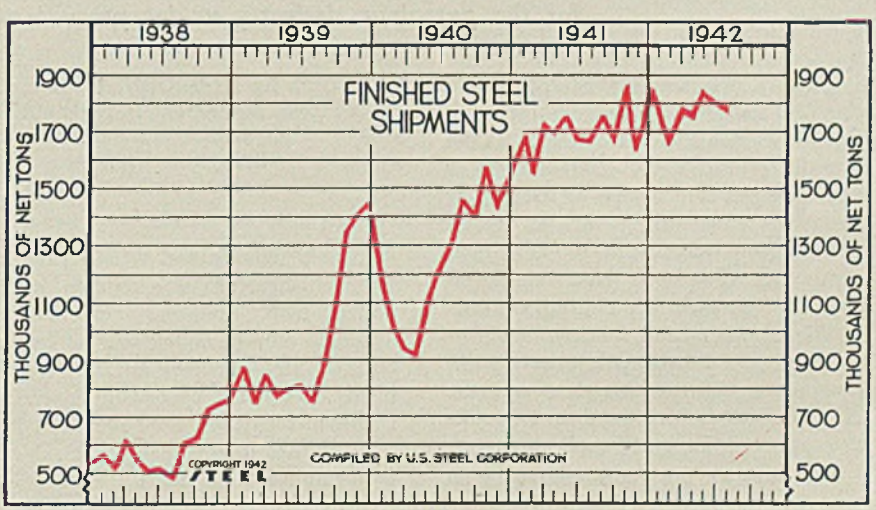
	1942	1941	1940	1939
		(000 omitted)		
Jan.	4,590	4,278	3,581	2,257
Feb.	4.276	4,172	2,812	2,124
Mar.	4 840	4 662	2.728	2,419
Apr.	4,672	4,406	2,548	2,114
May	4,857	4,609	3,061	2,079
June	4,608	4,406	3,482	2,221
July	....	4,415	3,526	2,247
Aug.	....	4,518	3,968	2,675
Sept.	....	4 392	3,876	3,018
Oct.	....	4,649	4,233	3,809
Nov.	....	4,482	3,922	3,858
Dec.	....	4,634	3,950	3,613
Total	....	53,623	41,687	32,434
Mo. Av.	....	....	3,474	2,703

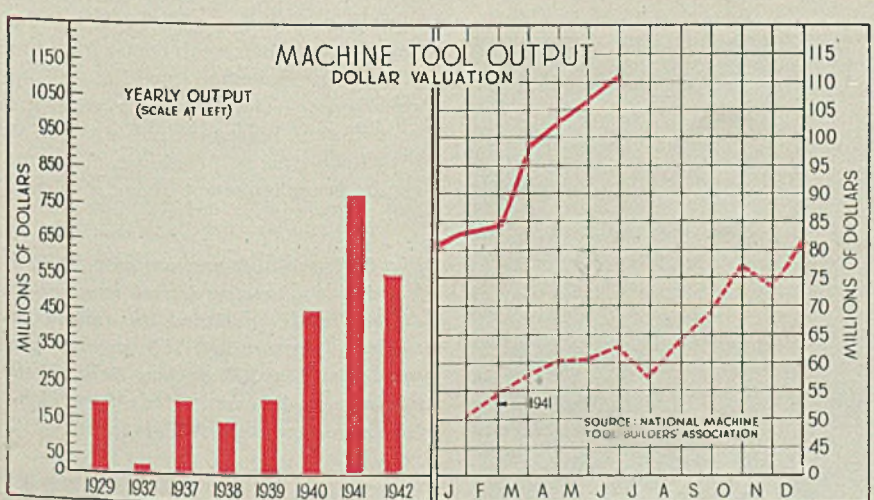
Finished Steel Shipments U. S. Steel Corp.

(Unit 1000 Net Tons)

	1942	1941	1940	1939	1938
Jan.	1738.9	1682.5	1145.6	870.9	570.3
Feb.	1616.6	1548.5	1009.3	747.4	522.4
Mar.	1780.9	1720.4	931.9	845.1	627.0
Apr.	1758.9	1687.7	907.9	771.8	550.5
May	1834.1	1745.3	1084.1	795.7	509.8
June	1774.1	1668.6	1209.7	807.6	525.0
July	1765.7	1666.7	1296.9	745.4	484.6
Aug.	.....	1753.7	1455.6	885.6	615.5
Sept.	.....	1664.2	1392.8	1086.7	635.6
Oct.	.....	1851.3	1572.4	1345.9	730.3
Nov.	.....	1624.2	1425.4	1406.2	749.3
Dec.	.....	1846.0	1544.6	1444.0	765.9
Tot.†	.....	15,013.7	11707.3	7315.5	

†After year-end adjustments.





Machine Tool Output

(000 omitted)

	1942	1941
Jan.	$83 547	$50.700
Feb.	84,363	54,000
Mar.	98,358	57,400
April	103,364	60,300
May	107,297	60,800
June	111,147	63.000
Six Months	558,076	346,200
July	.....	57,900
Aug.	.....	64,300
Sept.	.....	68,400
Oct.	.....	77,200
Nov.	.....	74,600
Dec.	.....	81,435

Year	
1942 est.	1,500,000
1941	775,300
1940	450,000
1939	210,000

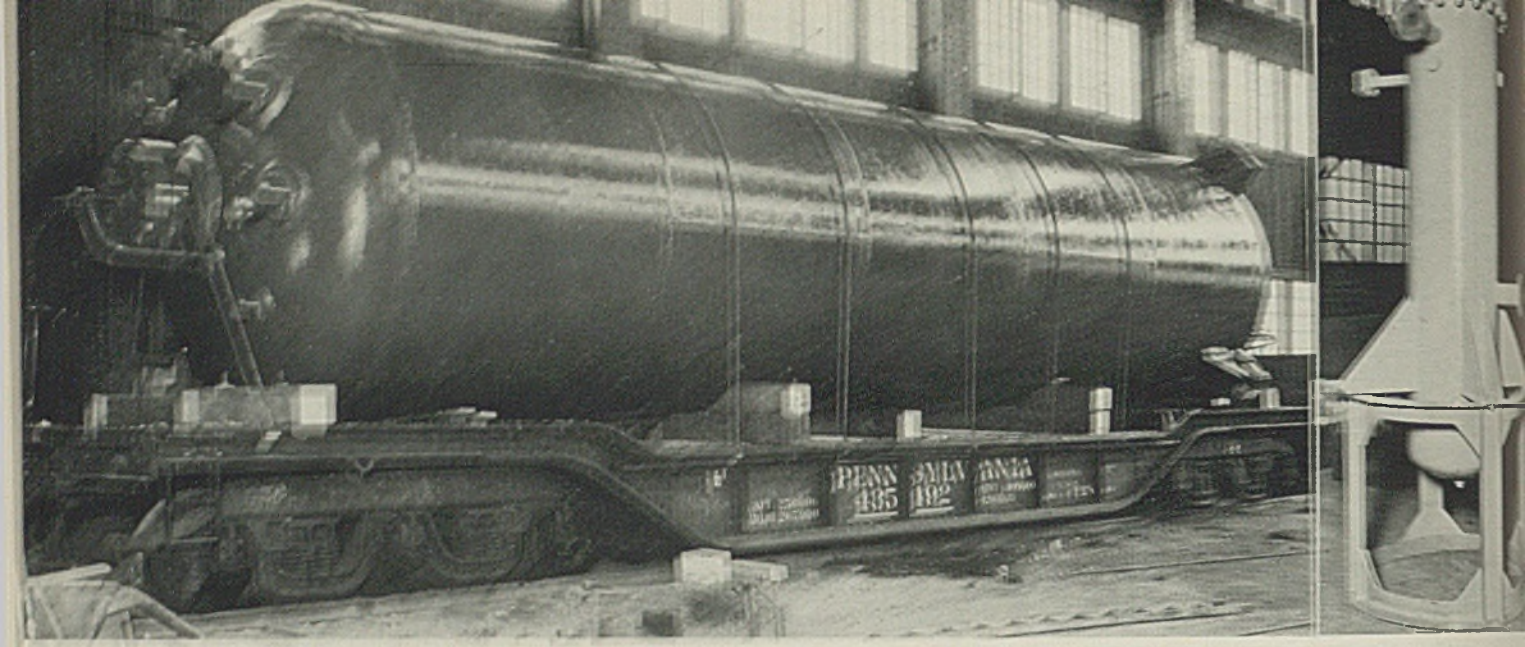


Fig. 1. (Left)—High-pressure oil coking drum, 10 feet inside diameter, 50 feet long 2½-inch shell thickness, made from high-tensile steel ASTM Spec. A-212, 70,000 pounds per square inch, for operation at 900 degrees Fahr. and 850 pounds per square inch. Unit was subjected to hydrostatic test pressure of 1020 pounds per square inch at room temperature. All seams were radiographed. Entire vessel was stress relieved after welding. Fig. 2. (Right)—This fractionating column is for service at minus 100 degrees Fahr. It is fitted with four removable packed trays. Unit is made from ASTM A-203, a steel containing about 2½ per cent nickel. Inside diameter is 24 inches, height is about 13 feet

AVAILABLE STEELS

. . . . for the petroleum industry under present emergency conditions

By A. GRODNER
Process Equipment Department
Blaw-Knox Division
Blaw-Knox Co.
Pittsburgh

IN THE petroleum industry, as in the chemical industry, materials of construction are chosen to resist corrosion at the working pressures and temperatures, or to maintain a safe degree of strength at elevated temperatures, or to retain strength and ductility at sub-zero temperatures. Alloy steels have been developed to meet each of these requirements so the designers and fabricators of reaction vessels, fractionating towers, stills, evaporators, heat exchangers, and the like can specify exactly the most suitable material for each application.

But now we are confronted with an extremely difficult and serious situation, for such elements as chromium, nickel, molybdenum, tungsten, vanadium are available only in limited and in restricted quantities—yet these are the very elements upon which we usually depend for corrosion resistance, for strength at high temperatures or for ductility at sub-zero temperatures. We must therefore look about for low-alloy steels, or even for the simpler carbon steels to do the job for us, even at the expense of shorter life for the equipment to be manufactured.

A brief summary of such readily obtainable materials follows:

For Corrosion Resistance: The austenitic stainless steel group, containing approximately 18 per cent chromium and 8 per cent nickel, with or without additional alloying with columbium, titanium or molybdenum, has heretofore been our first line of defense against corrosion. In many applications, however, such as for ethyl alcohol, benzene, benzol, nitric acid, vegetable and mineral oils, phenol and petroleum ether, the straight chromium steels containing 14 to 18 per cent chromium (type No. 430) are equally satisfactory from the viewpoint of corrosion resistance and strength at high temperatures. Their use, of course, results in an important saving of nickel.

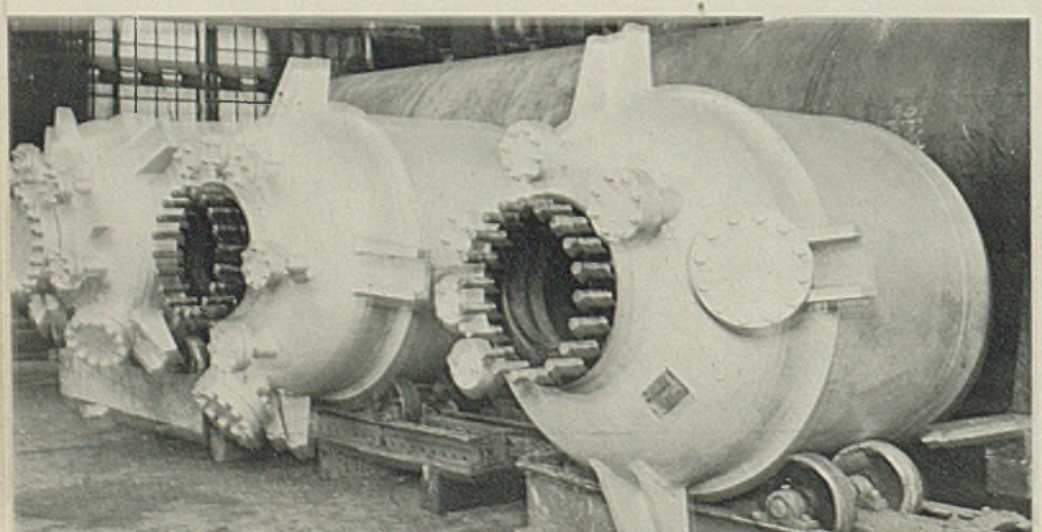


Fig. 3—Three high-pressure autoclaves, 4 feet inside diameter, 6 feet long inside dished heads, designed for maximum working pressure of 750 pounds per square inch at 800 degrees Fahr. Wall thickness is 4 inches. Made from high-tensile carbon steel ASTM Spec. A-212

Since this alloy is air hardening, greater care must be exercised in the welding and subsequent heat treatment of the completed vessel.

As a further step toward conservation of chromium and nickel, the above mentioned 18-8 and straight chrominm stainless steels are commercially available in the *clad* form, with either 10 or 20 per cent of the total plate thickness consisting of the alloy material, the remainder being low-carbon steel. The technique developed by the several steel manufacturers of these clad materials has reached a stage of stability such that the ASME boiler code now recognizes the *total* thickness of the composite plate in computing the required plate thickness of a pressure vessel for all metal temperatures encountered (provided allowance is made for the strength of the steel backing material).

Commercially pure nickel and monel metal are likewise available in the clad form with backing material of either 55,000 or 70,000 pounds per square inch minimum tensile strength. In this application, however, the ASME code limits the pressures and temperatures within which full thickness of the composite plate may be utilized in the formulas.

A notable example in the conservation of stainless steel may be seen in the present newly launched synthetic rubber program. The early polymerization vessels were constructed of solid 18-8 chromium-nickel stainless steel. At a later stage the 20 per cent clad material was employed. Now, low-carbon steel vessels are *glass lined*, and the i-ternal intricate parts are chromium plated.

For Reactions at Elevated Temperatures: While the 18-8 chromium-nickel and the straight chromium stainless steels are excellent materials for retention of strength and freedom from scaling, we must by-pass them now for the lower alloy steels or, even better, for carbon steels.

Between the limits of temperature of minus 20 and 650 degrees Fahr., the ASME code and the API-ASME code for unfired petroleum vessels recognizes the full working strength of the low-carbon flange and firebox quality steels, ASTM Specification A-70, having a minimum tensile strength of 55,000 pounds per square inch. This is not only the least expensive material obtainable, but it is the most readily available from the steel mills, involving neither chromium nor nickel alloying. Above 650 degrees Fahr., these steels decline in strength and creep value and may lose weight from scaling. At 800 degrees Fahr., for example, the working stress permitted for the shell plate drops to 18 per cent of the ultimate tensile strength (as against 25 per cent at 650 degrees Fahr.), but with an additional allowance of ⅛ or 3/16-inch

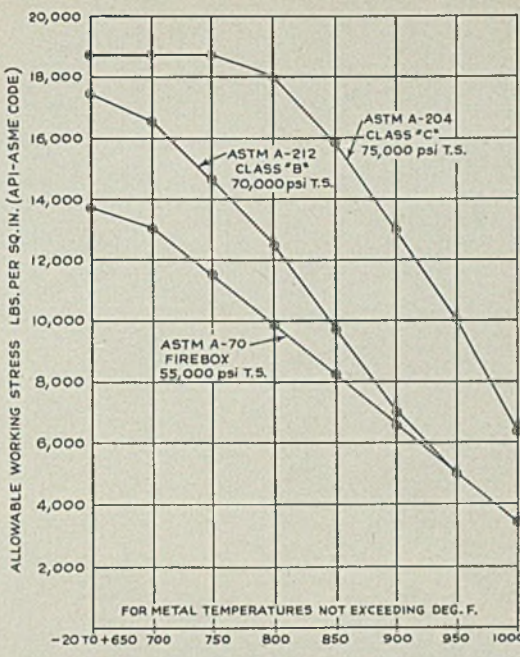


Fig. 4—Graph showing allowable working stresses for three principal grades of steel at elevated temperatures. Working stresses are according to the API-ASME code. The three types of steel include ASTM Spec. A-70, A-212 and A-214. Note the progressively higher tensile strengths

to the computed thickness, these steels can without doubt be employed satisfactorily for most of the processes in the petroleum chemical industries.

Some advantage may be derived from the use of the higher tensile strength carbon steel, ASTM A-212, Class B, having a minimum tensile strength of 70,000 pounds per square inch up to 650 degrees Fahr. and higher allowable working stresses up to metal temperatures of 850 degrees Fahr., as can be seen from the accompanying graph. This material is also readily available at the steel mills at only a slight increase in pound price mentioned in the previous paragraph.

A still greater advantage may be gained from the use of the carbon-molybdenum steel designated as ASTM A-204, containing approximately 0.5 per cent molybdenum and having a minimum tensile strength of 75,000 pounds per square inch up to a temperature of 650 degrees Fahr. Because of its high creep value, this steel alloy maintains its maximum strength up to a metal temperature of 800 degrees Fahr., and it retains fairly reasonable strength at metal temperatures up to 1000 degrees Fahr., as the graph indicates. This material is available not only in plate but in seamless tubing (ASTM A-206) and in forgings (ASTM A-182).

When available, an excellent material containing 4 to 6 per cent chromium and 0.5 per cent molybdenum is used for cracking tubes, hot oil and gas heat exchanger tubes, and hot oil or vapor lines. The addition of molybdenum to this low chromium steel combination improves the strength of the material at elevated temperatures and avoids temper brittleness to which the chromium steels are subject when they are exposed to temperatures of over 900 degrees Fahr.

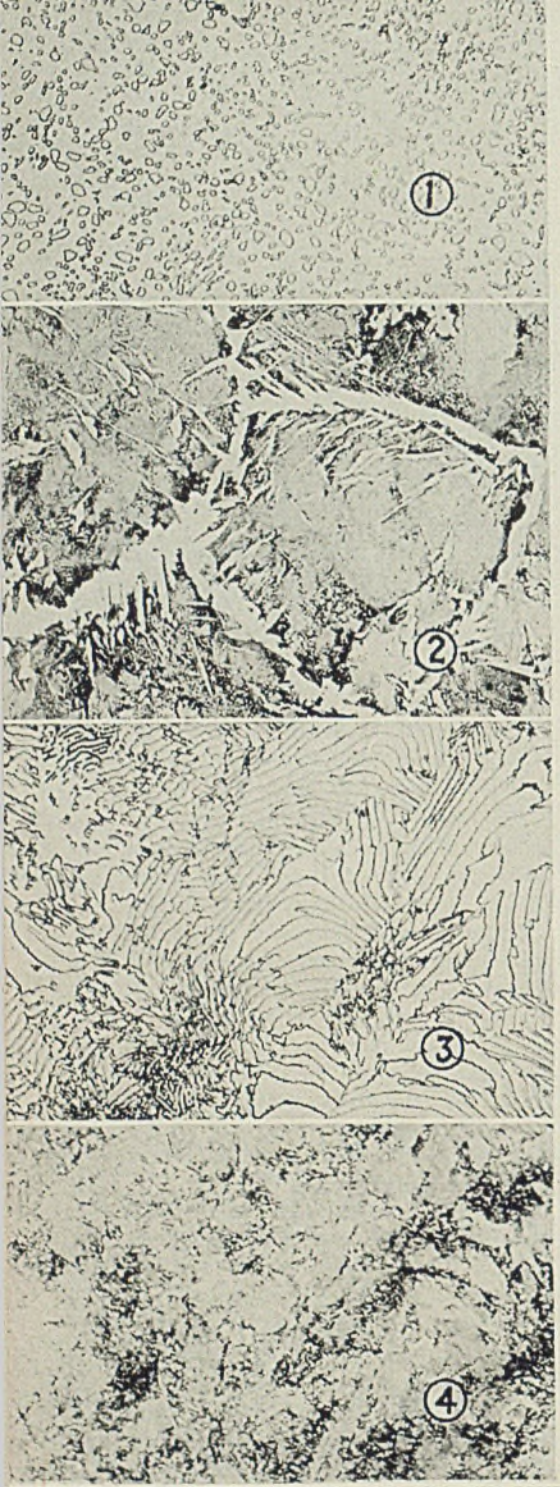
For Sub-Zero Temperatures: In refrigeration, in the liquefaction of gases, in the dewaxing of oils—all performed at extremely low temperatures—steels must retain not only their strength but their ductility and resistance to impact loads. For temperatures down to minus 50 degrees Fahr. the low-carbon steels are satisfactory, provided they are thoroughly deoxidized and given a normalizing treatment (1500 to 1600 degrees Fahr.) to obtain grain refinement, an important factor for low-temperature service. In this way, the ASTM A-70 or ASTM A-212 steels can be prepared for welding into equipment needed in the industry, and they can be expected to give Charpy impact values of 15 foot-pounds down to minus 50 degrees Fahr.

For lower temperatures, down to minus 100 degrees Fahr., a nickel steel containing 2 to 2¾ per cent nickel (ASTM A-203), having a minimum tensile strength of 75,000 pounds per square inch at normal temperatures, has satisfactory impact values. This material can readily be welded and fabricated into the equipment required. For still lower temperatures, down to minus 150 degrees Fahr., the 3½ per cent nickel steels have been utilized with good results. This material, however, requires extreme care in its fabrication and welding. With these nickel steels, stainless steel tubing should be used to obtain equivalent results.

In general, therefore, the low-carbon steels can be employed to replace the low-alloy steels and, in some instances, as a substitute for even the high-alloy steels. It may, of course, be necessary to use heavier sections to counteract corrosion or scaling and lower strength at high temperatures, but it may be the only alternate for use during the present emergency.

Releases Publication On Equipment Standards

A new publication entitled "Service Equipment Standards", released recently by the National Electrical Manufacturers Association, 155 East Forty-fourth street, New York, incorporates general, performance, rating, marking and test standards for devices such as service entrance and meter service switches, service circuit breakers, meter test blocks etc. Copies of this handbook may be obtained from the association headquarters.



The Heat Treatment of . . . . .

STEEL FORG

(Section 15 in a Series on Forgings, Forging Methods and Forging Equipment)

Fig. 1—Spheroidal cementite in high carbon steel, a form obtained by quenching in water from 1382 degrees Fahr. followed by prolonged re-heating at 1112 degrees. This is the softest and most ductile condition of steel, but not very strong. Shown at 600 diameters

Fig. 2—Medium carbon cast steel, cooled fairly rapidly through the granulation and secondary crystallization zones. In passing through the critical range, free ferrite has formed first at the boundaries of the original austenitic grains, but the cooling has been too rapid to permit complete ferrite separation. Thus the meshes are of fine grained pearlitic character (sorbite) containing ferrite in excess of the eutectoid ratio. Development of ferrite boundaries has been followed by separation of ferrite within the grains and along the octahedral crystallographic planes. Note how the ferrite, which separates after the boundary ferrite, radiates from it. Had the cooling of this casting been a little slower, separation of the ferrite within the mesh would have been complete, giving rise to the familiar Widmanstatten structure

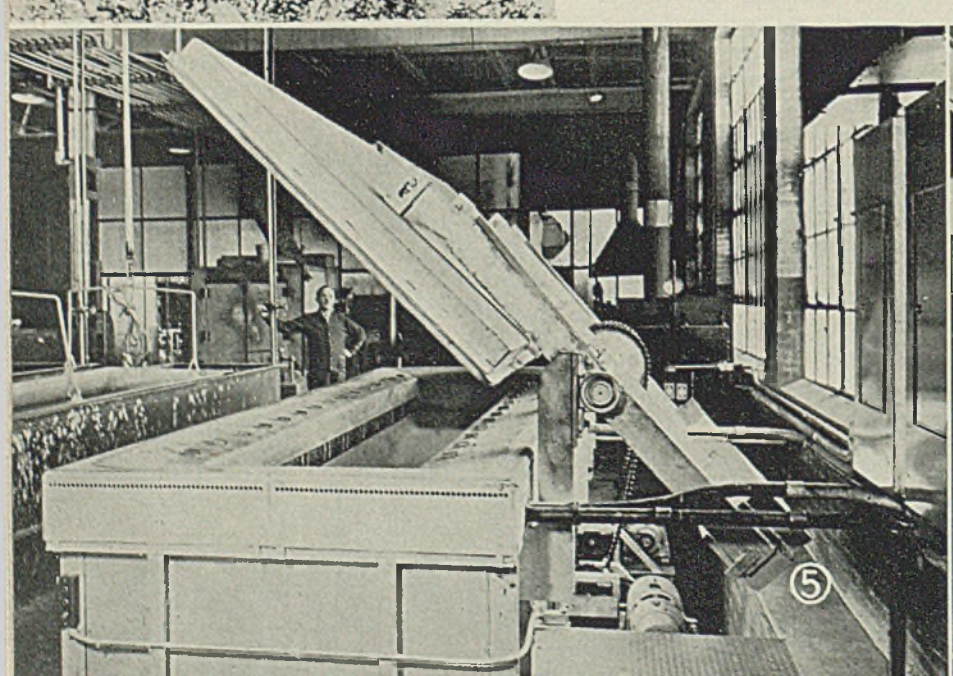
Fig. 3—Pearlite formed as a result of slow cooling a high carbon steel from a temperature of 1292 degrees Fahr. Note the "colonial" arrangement. This steel is soft and ductile, has moderate strength. Shown at 600 diameters

Fig. 4—Acceleration of cooling rate in high carbon steel results in fine grained structures of the pearlitic type, but presenting a granular, rather than a lamellar aspect. This structure possesses an excellent combination of strength, hardness and ductility. Frequently it is noted in these structures that the full amount of free ferrite or free cementite has not been rejected, the grains retaining some of either constituent in excess of the eutectoid ratio. Shown at 600 diameters. Bausch & Lomb Optical Co. photo

Fig. 5—Salt bath furnace for work up to 1000 degrees Fahr. Unit has inside loading dimensions 3 x 15 feet, is 4½ feet deep, is rated 200 kilowatts and uses 24 immersion-type heating units. Cover sections are motor operated. Figs. 5, 6 and 10 General Electric photos

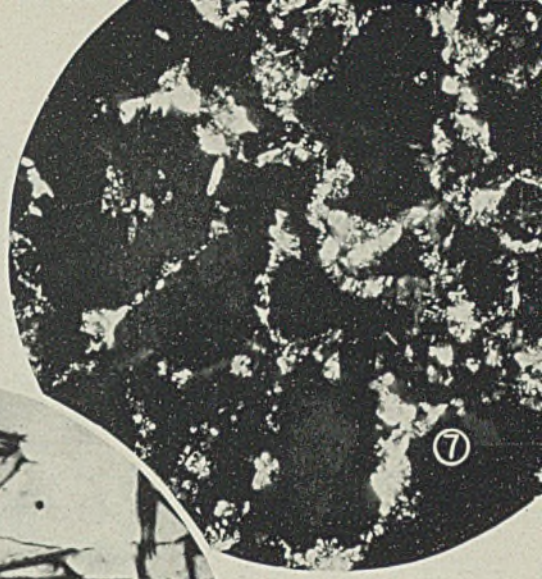
Fig. 6—Electrically heated 2000-kilowatt 550-volt 3-phase car-type furnace capable of a maximum temperature of 1650 degrees Fahr. made for annealing operations

Fig. 7—Cooling rates, which are so fast as to be aptly described as a "slow quench" but still below critical quenching rate, give rise to extremely fine aggregates of iron carbide and alpha iron, of the pearlitic type. Note the slight lamellar effect. Bausch & Lomb Optical Co., photo taken with polarized light at 500 diameters



INGS

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



OF ALL the metals, steel and its many alloys offer the largest opportunity of relating physical character to desired properties through the application and withdrawal of heat. The temperature to which the part is raised, the time during which it is held at that temperature and the manner in which heat is removed, all have a profound effect upon the final result. Even the characteristics of the atmosphere in which these operations are carried on may be of the first consequence.

Thus we are presented with virtually infinite possibilities of variation among a group of factors which defy analytical rationalization but which, fortunately, are susceptible to a species of cumulative integration. From ancient times, man has been acquainted with the phenomena of

Fig. 8—Martensite at 1125 diameters. Note boundaries of original austenitic grains. Quenching rates in excess of critical produce this structure, sharply distinguishable from pearlitic structure produced by quenching rates below critical. Martensite consists of highly supersaturated, strained ferrite in which precipitation of carbides probably has not occurred to any great extent. Steel shown is high alloy type, heated to 2300 degrees Fahr. and quenched in oil. Some intergranular oxidation due to overheating may be observed. Bausch & Lomb photo

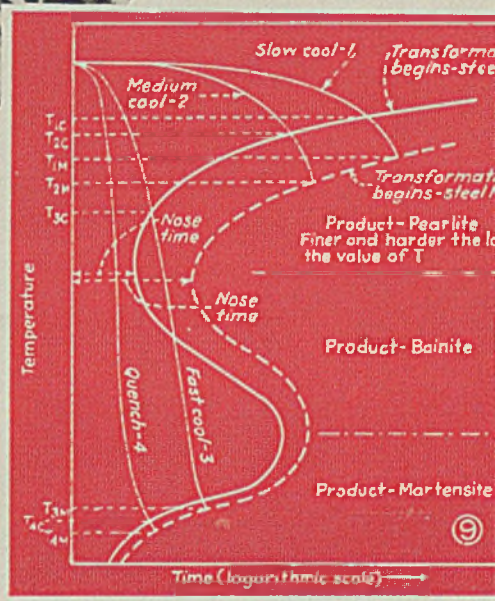
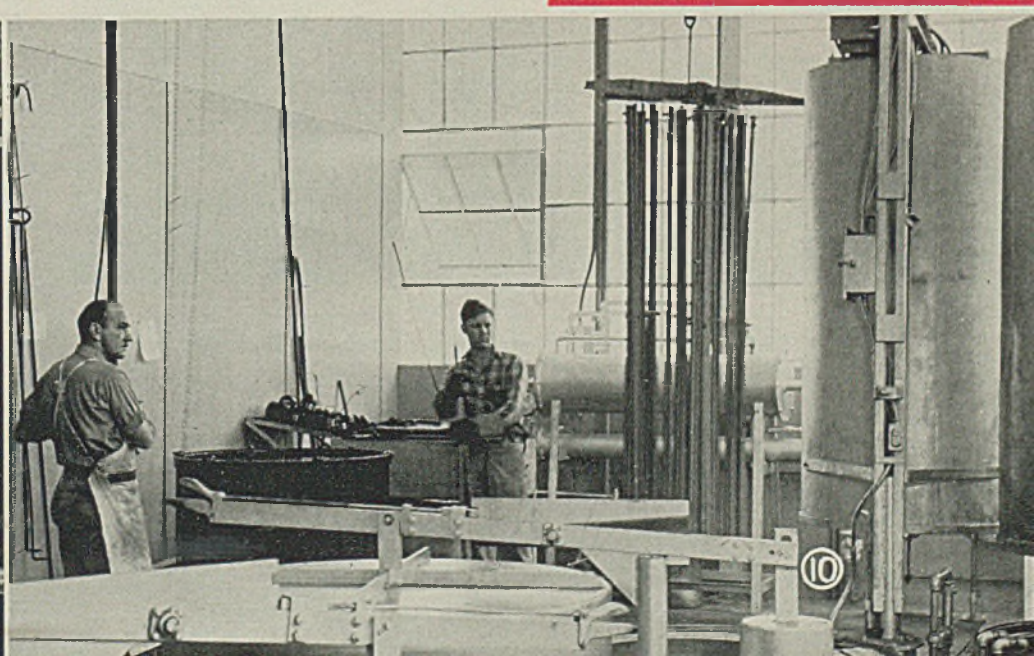
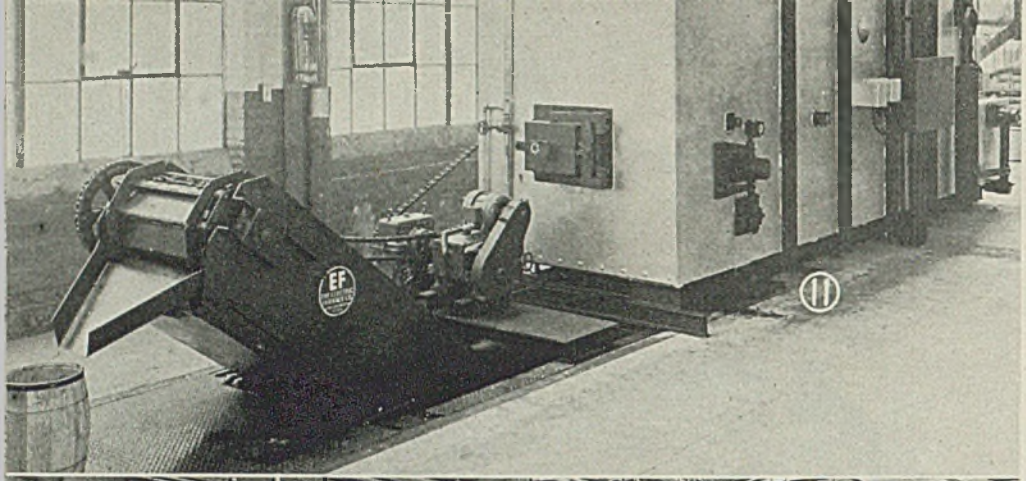
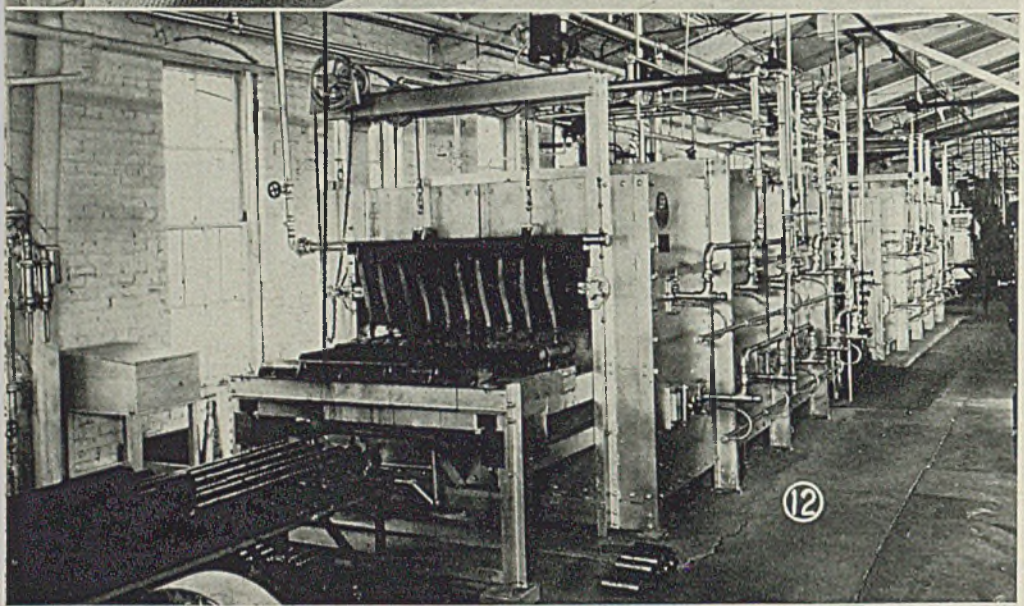


Fig. 9—Diagram exhibiting a plot of time-temperature cooling curves superimposed upon S-curves for two different steels, showing the effects of composition and cooling rates on structure obtained. These curves mark inception of transformation and give no indication of total transformation time. Chart by Research Laboratory, United States Steel Corp.

Fig. 10—Vertical cylindrical furnaces, electrically heated, are 30 inches diameter and 60 inches long inside, have transfer hoods and protective atmosphere for hardening and drawing







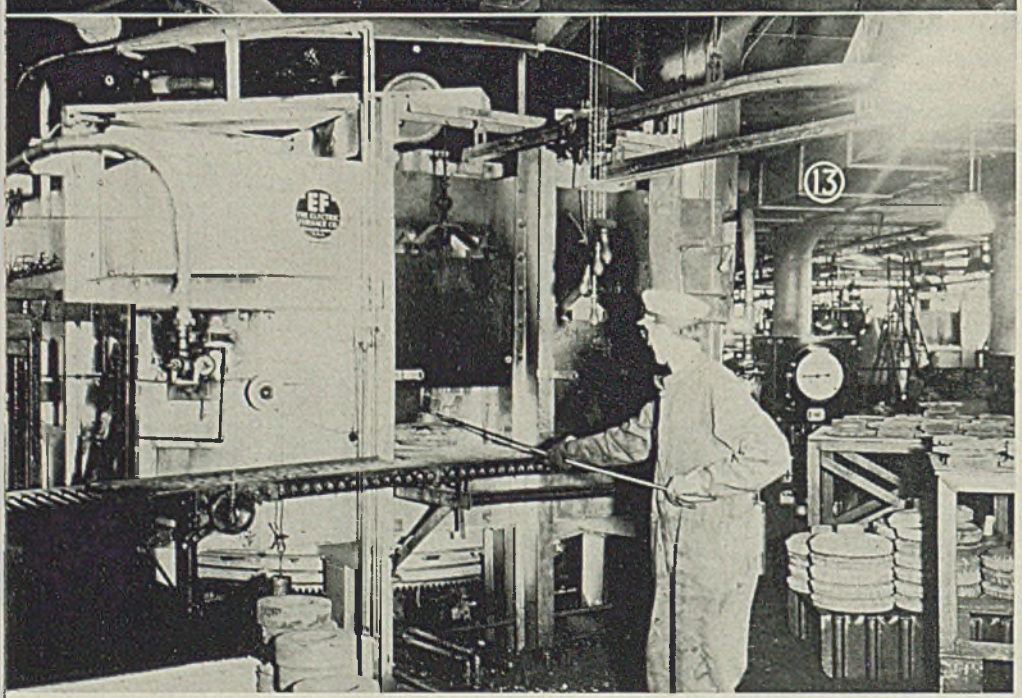


Fig. 11—Belt conveyor type furnace with automatic quench and discharge, controlled atmosphere and suitable for use of oil, gas or electric heat. Figs. 11, 12 and 13 show Electric Furnace Co. equipment

Fig. 12—Special furnace for hardening and tempering shell bodies. Forgings are pushed through tubes filled with a protective atmosphere

Fig. 13—Continuous rotary-hearth furnace, oil fired and designed to treat large forgings of various sizes and shapes

the hardening and tempering of steel; but it has been the privilege of our day and generation to visualize the process in terms of the iron-carbon equilibrium diagram and to witness under the microscope the changes which heat has wrought.

So familiar and specialized have the hardening, tempering, spheroidizing, normalizing and annealing of steel become that we seldom pause to regard them as closely related aspects of the ebb and flow of heat. But that in effect is all that concerns us here. Do we desire to harden a specimen of carbon steel, then we heat it to a cherry red and plunge it into oil or water. Heat has entered the steel and then departed; but the mark of its passage is imprinted in the crystal structure and has changed its character. If instead of plunging the part into a cooling liquid we leave it to cool on the floor of the forge, the "normalizing" influences of convection currents of air give us a softer and tougher fiber; while if we hold the piece just below the critical range, or perhaps alternately within and just without its lower boundary, for a long time, we have something else again—namely, the softness and ductility of spheroidized steel. See Fig. 1.

Nor are the possibilities limited to these familiar operations in which both time and temperature vary over at least a portion of the process. By an extremely rapid quench in the initial stages of the action, followed by the maintenance of steady temperatures during the transformation of the austenitic solid solution, an entirely new field of interest and practical application has opened up to the metallurgist's inquiring gaze. New crystal structures have been discovered and hitherto unsuspected properties of both carbon and alloy steels revealed.

These studies—largely carried out in the Research Laboratories of the United States Steel Corp.—furnish a new basis for a broad general philosophy of heat treatment and have demonstrated the primary influence of the actual temperature of transformation on the character and properties of the various possible structures in any given steel, and of the way in which these structures continuously vary. They have, further, enabled us to determine the influence of alloying elements upon the final results of heat treatment and have contributed to an understanding of the effects of austenitic grain size on the reluctance of steel to be transformed.

In submitting forgings and other steel parts and structures to heat treatment, certain definite objectives involving desired changes in physical structure are in view. As a necessary preliminary to their attainment, we must first consider the

(*Please turn to Page* 110)

IF

SHORTAGES of vital ingredients in product finishes leave you stymied

IF

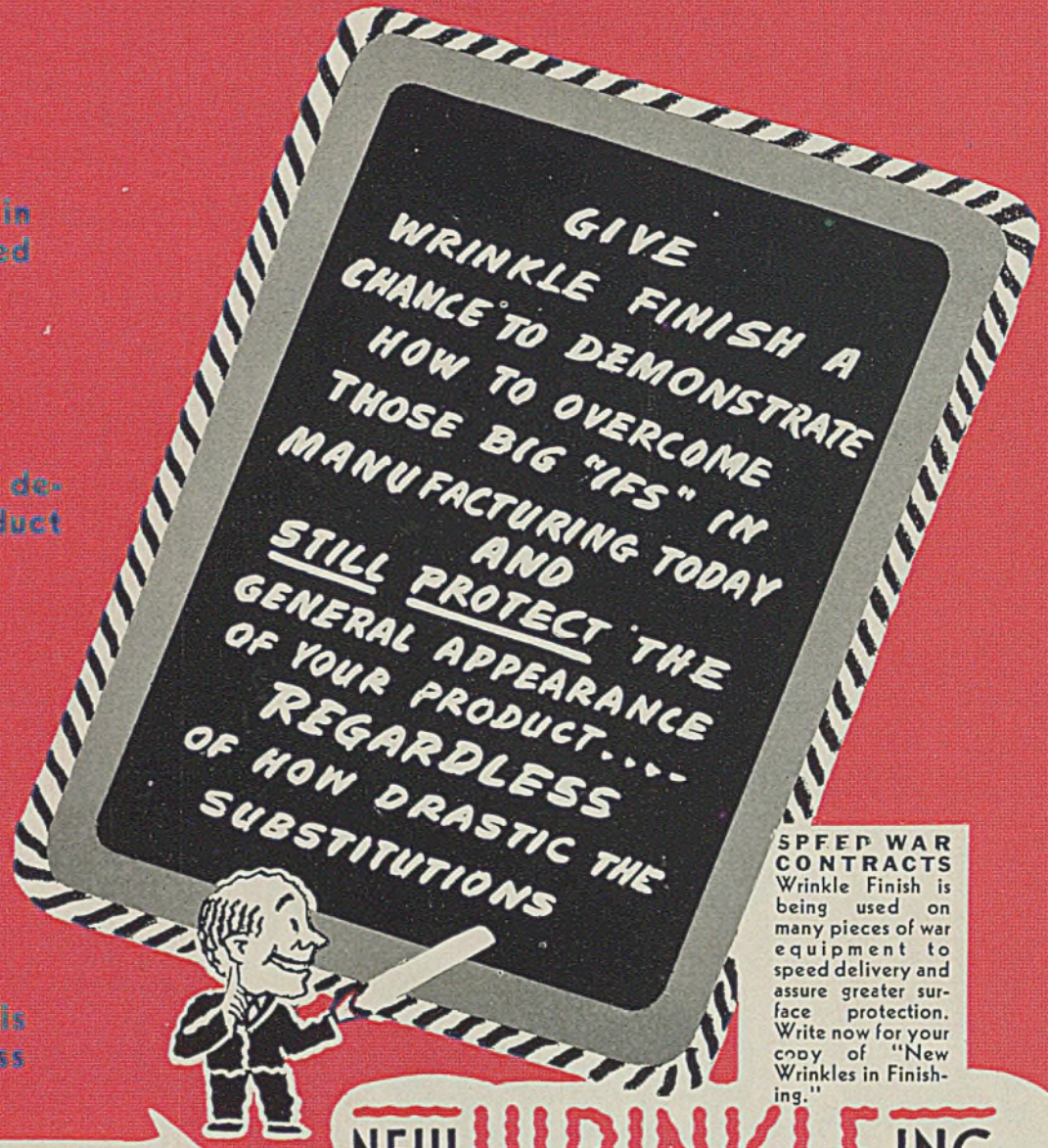
PRIORITIES have affected the design and quality of your product

IF

FREEZE ORDERS have played havoc with your basic raw material specifications

IF

SUBSTITUTION in drastic measure is the only solution to staying in business



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IRON

Its Use and Effect in Making Basic Open-Hearth Steel

By W. C. BUELL, JR.,
J. R. MILLER and H. W. POTTER
Arthur G. McKee & Co.,
Cleveland

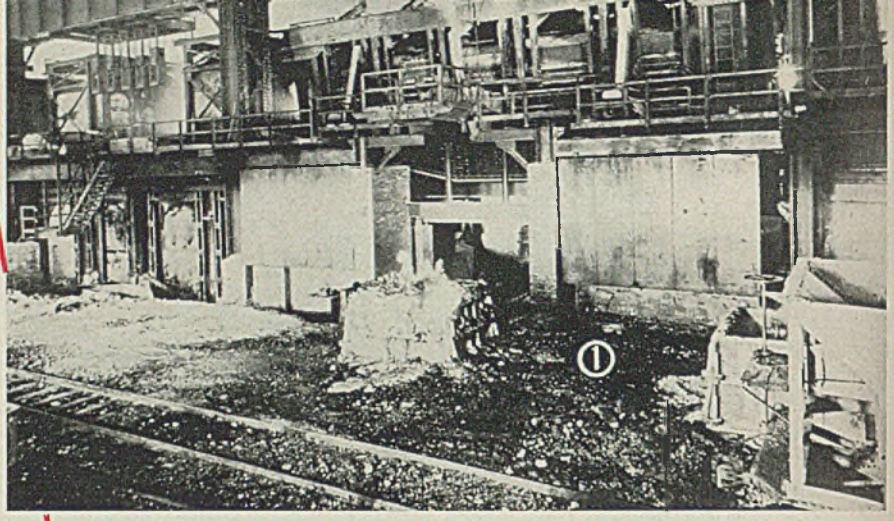


Fig. 1—Tapping side of tilting open-hearth furnace

Importance of iron in American basic open-hearth practice and some of the modifications which are developed by a change in steelmaking methods are explained in the accompanying article. Open-hearth operators may well expect to operate on high iron charges

PIG IRON and iron scrap have always been major constituents of the open-hearth charge. Variations in the amounts of iron have a profound effect upon the entire steelmaking practice. During the past year or so steelmakers have been forced to increase their iron charge in the open-hearth because of the current scrap shortage. Intention here is to point out to some extent how this change of practice affects the industry.

Scrap Export: During the period 1936-1940 inclusive, this country exported more than 10,600,000 tons of iron and steel scrap to Axis countries, mostly Japan.

And, it is now genuinely regretted that our good neighbor policy should be flung back at us in a form diabolically calculated as unfit for human consumption.

Scrap Collection: Other causes have contributed to our present scrap crisis. The Institute of Scrap Iron and Steel Inc., Washington, has explained our low inventory, stating that peddlers and scrap collectors found they were able to make more money in steel mills and other defense industries. With the present governmental restriction on scrap prices, there still is not sufficient incentive to lure these men away from their lucrative war jobs.

It has been suggested that it would be cheaper for the government to subsidize scrap collections up to $10 per ton instead of building new capacity at a capital cost in excess of $100 per ton.

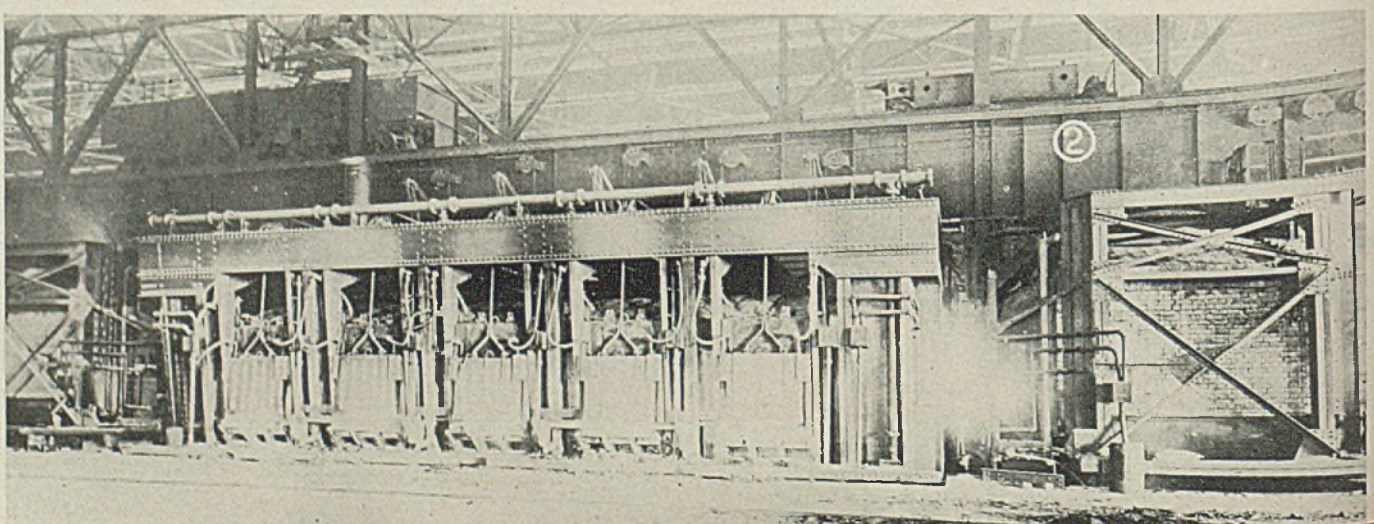
Circulating Scrap: The government order which put a stop to automobile production also dried up a large portion of circulating scrap. Clippings from body stampings, flashings from forgings, and rejections all went into the melting pot. On the other hand, war industries do not present a comparable scrap return. Bullets and shells from MacArthur's guns are scarcely likely to find their way back to American open-hearth furnaces. A light tank, blown to bits in the Libyan desert, will probably stay in the Libyan desert, at least for the duration.

"Home" scrap, that is, scrap produced within a steel plant from ingot to fabricated steel shape usually results in about 28 per cent of ingot weight or about 25,200,000 tons at peak production. Normally, 6 per cent of this material is sold to foundries. No proportionate change in this condition is contemplated.

Local scrap campaigns, while they are a praiseworthy effort, produce only a small fraction of the needed metal. The campaign in Cleveland produced enough scrap to run a steel company producing

Accompanying article was delivered as a lecture by W. C. Buell Jr. to the senior and junior metallurgical students at Case School of Applied Science, Cleveland, March 17, 1942.

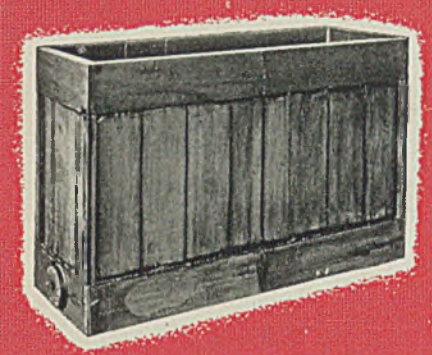
Fig. 2—Platform view of a tilting open-hearth furnace which is the preferential type unit for high-iron charges



STOP LOSSES ... FROM CORROSION AND THERMAL SHOCK

IN EQUIPMENT DESIGNED FOR THE PRODUCTION OR USE OF

Hydrochloric Acid



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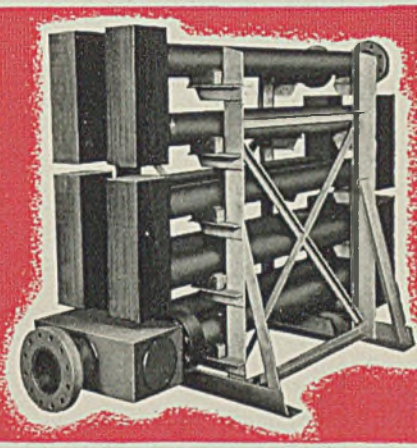
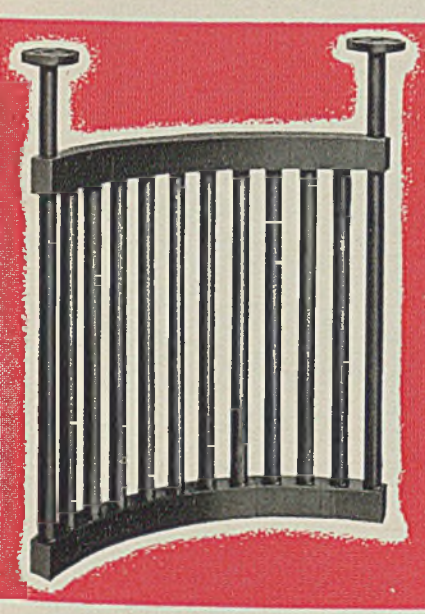
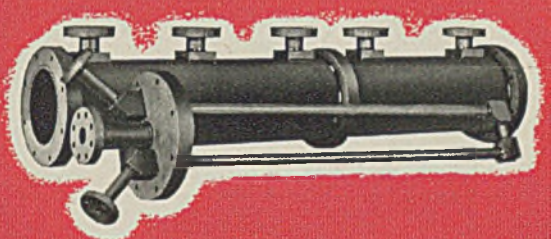
CARBON AND GRAPHITE MATERIALS



FOR THE CONSTRUCTION OF PROCESSING UNITS





*The words "National" and "Karbate" are trade-marks of National Carbon Company, Inc. The trade-mark "Karbate" identifies a line of carbon and graphite base materials impervious to seepage of liquids and gases under pressure.

● Carbon, graphite and "Karbate" materials are used in the construction of equipment for all processes involved in the manufacture or use of hydrochloric acid. This includes absorbing, cooling, rectifying, boiling and condensing units, conveying and circulating systems, vats, tanks and other containers.

These materials are resistant to the action of hydrochloric acid in all phases and concentrations. The excellent heat transfer properties of graphite base materials are of advantage in equipment used for heating, cooling and stripping processes. Good mechanical strength, exceptional resistance to thermal shock, ease of machining, and availability in a wide variety of forms adapt these products to the fabrication of practically any desired type of processing equipment.

EXPERIENCE HAS PROVED THE DURABILITY OF CARBON AND GRAPHITE MATERIALS IN THE PRESENCE OF HYDROCHLORIC ACID AND THE ECONOMY RESULTING FROM THEIR USE

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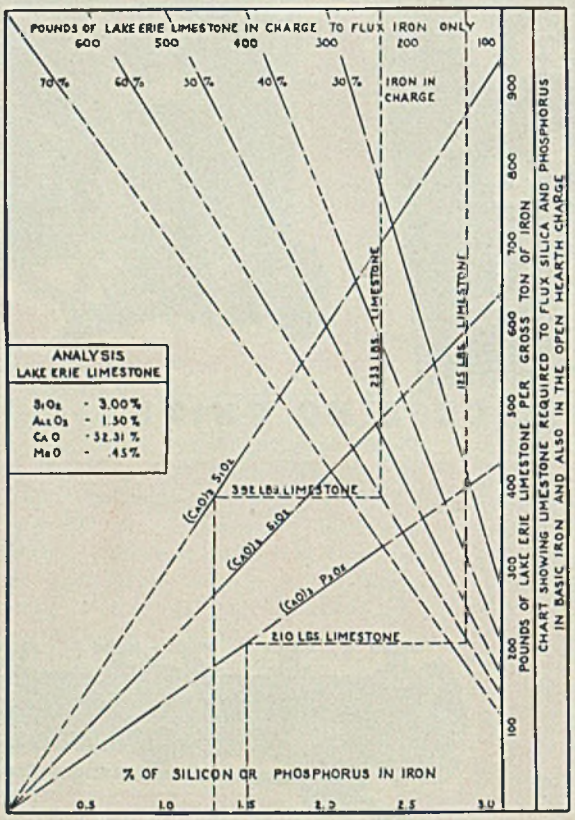
1,000,000 annual tons of ingot for perhaps a day in normal times, and considering that a shop of this size represents only about 1 per cent of the country's ingot capacity, it can be readily appreciated that a scrap shortage produces a major production crisis with a war going on.

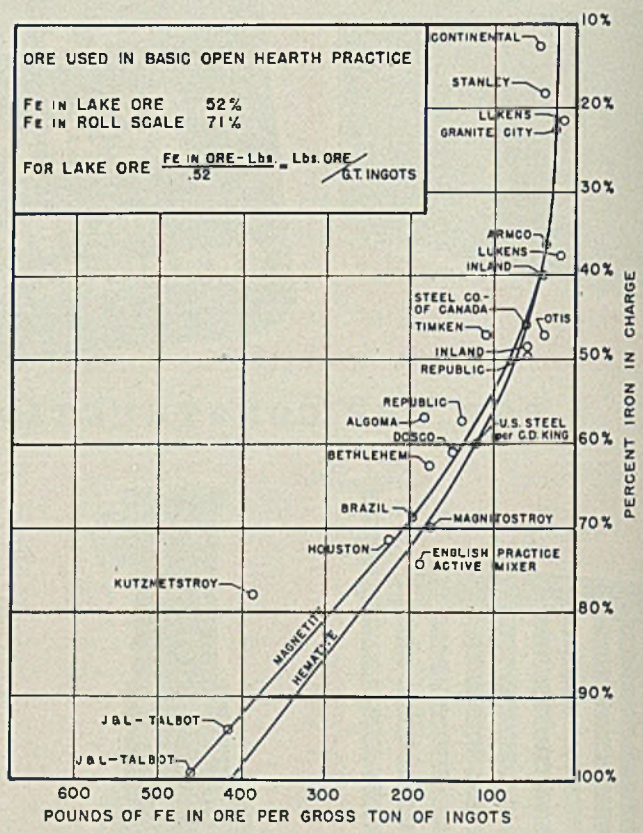
With a diminishing circulating scrap market and an economic end point of collectible scrap not too far out of sight, it becomes apparent that something had best be done immediately.

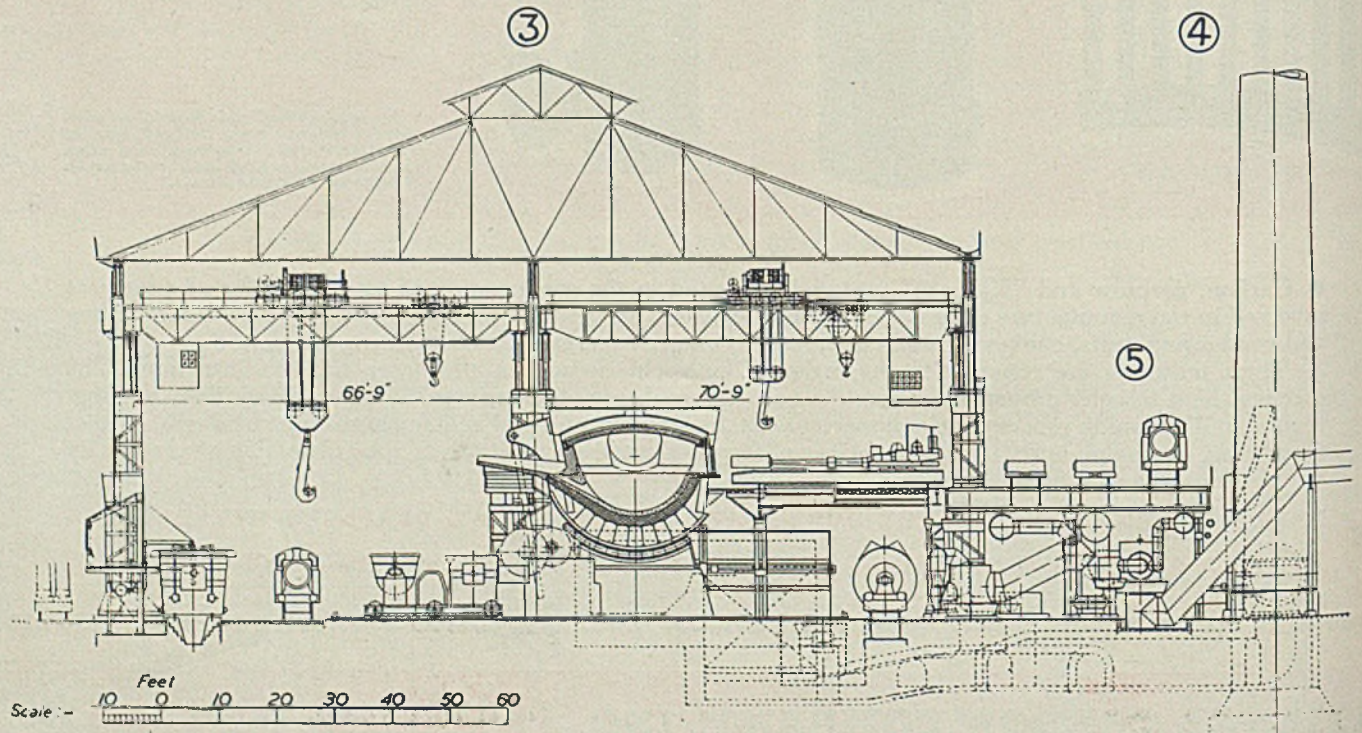
New Blast Furnaces: The blast furnace is the only other source of metal for open-hearth furnaces. The administration has a program well underway for the construction of 23 more blast furnaces which can relieve the crucial scrap situation. These stacks are expected to increase the pig iron capacity of this country by about 9,200,000 tons annually; replacing an equivalent amount of steel scrap. This increase in iron capacity may maintain a war-time campaign of 90,000,000 tons of ingots per year if there is a concerted effort to clean up the auto graveyards, salvage every pound of defense scrap, and thoroughly scour the country for available metal.

Ramifications of Program: Building

Fig. 3—Chart showing limestone required to flux silica and phosphorus in basic iron and also in the open-hearth charge. Fig. 4—Iron ore used in basic open-hearth practice at various plants in the United States and foreign countries. Fig. 5—Section through active mixer at a modern steel plant in Great Britain







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Some of the significant advantages of Elmes air ballasted type hydraulic accumulators are:

(1) Uniform Pressure . . . line shocks eliminated—reducing maintenance on pipe joints, packing etc. (2) No ballast weights required. (3) No large moving parts to wear. (4) No pistons or piston packings to maintain. (5) Floor space conserved. (6) No heavy foundations required. (7) Finger-tip control for variable pressure, if desired. (8) Simple, safe, foolproof. (9) The ideal means for storing liquid under pressure. Design based on years of experience by pioneers in the field.

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Table I—Estimated Cost of Various Grades of Steel

	Process				
	Bessemer	Duplex	Talbot	Monel	Trade heats
Raw materials	$19.60	$19.43	$17.58	$17.55	$17.61
Cost above materials	1.91	2.79	3.53	3.95	3.80
Total before capital charges	21.51	22.22	21.11	21.50	21.41
Capital charges	0.60	1.15	2.08	2.25	2.25
Estimated cost of ingots	22.11	23.37	23.19	23.75	23.66

Table II—Modern English Practice

	% C	% Mn	% P	% S	% Si
Raw iron (to mixer)	3.75	1.36	1.47	0.064	0.88
Mixer iron (from mixer)	3.50	1.09	1.35	0.048	0.52
Reduction	0.25	0.27	0.12	0.016	0.36
Reduction, %	7.00	20.00	8.00	25.00	41.00

$$\text{Reduction of metalloids: } \frac{1.016}{7.524} = 14.00\%$$

more blast furnaces is no simple answer to the problem. Plates, structural and fabricated shapes, and castings and forgings must be made from the present steel supply for the construction of these stacks. Stoves, cast houses, hoists, ladles, boilers, turboblowers, numerous motors, and quantities of piping and wiring, must also be supplied. Nor does the list end with the furnaces alone. The 23 new blast furnaces will require increased handling facilities at the ore mines, coal mines and limestone quarries. The fleet of ore boats operating on the lakes and oceans must be increased. Freight cars, hopper cars and gondolas as well as locomotives to handle the increased tonnage must be built. Unloading facilities must be installed at docks and stock yards.

Increased open-hearth tonnage, additional hot and cold mill capacity and finally the finishing capacity for war production contribute to the ramifications of the problem which is so tremendous that it is small wonder that it can be handled without some criticism.

Change in Iron Practice: Increased iron capacity has a considerable effect on steelmaking. American practice has been built up on a 60:40 charge in the open-hearth, that is: 60 per cent steel scrap and 40 per cent iron, 5 per cent of which has been cold pig or iron scrap. With decreasing amounts of iron and steel scrap available operators are forced to continually raise the iron content of the charge until open-hearth shops may well expect to operate on 70 to 75 per cent iron.

Operating, mechanical, and metallurgical difficulties can be expected from this change of practice. Provisions must be made for the materials handling involved. More hot iron results in more ladles, more or bigger mixers, means for beneficiation and purification of the molten metal, and additional transfer facilities to the open-hearth furnaces.

Metallurgical Considerations: Once in the furnace, the increased iron content causes an increase in the limestone required for fluxing its impurities, as shown in Fig. 3.

Slag control will assist in the oxidation of carbon, manganese, phosphorus and silicon but 85 per cent of this oxidation is carried out by the reduction of lump ore or roll scale, as shown in Fig. 4.

Increase in slag constituents will result in much greater slag volume which in turn will float on the bath in a deeper layer, requiring more fuel to penetrate the thick blanket and will require increased or entirely new facilities for its disposal.

In brief, the changes in practice from 40 to say 75 per cent iron in the charge will result in approximately the following increases in raw materials for steelmaking:

Raw Materials	Tons/Year
Scale and ore	7,500,000
Limestone (or lime as CaO)	2,700,000
Refractories	225,000
Fluorspar	90,000

Stationary and Tilting Furnaces: Present equipment consists to a large extent of stationary open-hearth furnaces which are not too adaptable to high-iron practice. Provision for large slag volumes has to be made by building dolomite dams on door sills, and tapping a run-off slag out through the center door or through wickets in the backwall. Finishing slags must be made up after this point in the heat and the dam retained to hold the new slag, especially in case of foaming.

Tilting furnaces are much more adapted to high-iron heats. Several run-off slags can be taken if desired. Iron heats of 100 per cent can be worked by the Talbot or Monel process or modifications thereof.

While the change in iron content presents many difficulties, none of them are insurmountable. On the other hand there are a number of methods for beneficiating or purifying the hot-iron constituent of the charge before pouring the metal into the open-hearth furnace and these are of substantial benefit in shortening steelmaking time and thus increasing ingot production.

Duplex Process: Molten nonbessemer irons of moderate silicon content can be converted in acid bessemer vessels to a molten material of about the same composition as steel scrap. This material is suitable for charging into open-hearth furnaces either as cold scrap or as a molten charge. If charged in the molten state into large basic open-hearth furnaces of the tilting type, in which, after each tapping, a quantity of refined metal is retained, the metal may be refined and brought to a specified composition. Heats yielding 100 tons of steel ingots may be tapped from such furnaces in from 2½ to 3 hours. By this method of "Duplexing" molten material, about 3000 tons per day of basic steel ingots may be produced from an installation of three 25-ton bessemer vessels and four open-hearth furnaces.

The quality of duplex steel has been the subject of a great deal of contro-

(*Please turn to Page* 100)

Table III—Active Mixer Charge Data (American Adaptation)

	Lbs./N.T. product	% C	% Mn	% P	% S	% Si
Molten basic iron	1820	4.25	1.75	0.300	0.050	1.25
Cold pig iron	37	4.00	1.75	0.300	0.050	1.25
Steel scrap	148	0.20	0.40	0.020	0.040	....
Iron ores as Fe	57	....	0.05	0.060	....	....
Burnt lime	31	....	....	0.034	0.067	....
Charged metallics	2062	3.84	1.63	0.275	0.051	1.13
Mixer metal	2000	3.80	0.90	0.250	0.040	0.60
Reduction from:						
Charged metallics, %	....	1.0	49.8	9.0	21.6	45.9
Raw iron, %	....	10.6	48.5	16.6	20.0	52.0

$$\text{Yield} = 100 \times \frac{2000}{2062} = 97.0\%$$

Average Mixer Charge	Lbs./G.T. of Iron produced
Hot pig iron	1990
Limestone	20
Lime	14
Ore as Fe	51
Steel scrap	87
Skulls—cold pig	138
Slag produced (monosilicate)	60

Every reader of this publication knows of the nation-wide salvage campaign now in progress. But perhaps you have not fully realized its seriousness or its size.

In iron and steel alone, our immediate military needs require 6,000,000 tons of scrap over and above the regularly available supply.

You as an individual have an active interest and a vital part in the success of this drive. Each reader has this double obligation:

1. As a private citizen, he must scour his home from basement to attic, from front entrance to back fence, to round-up and contribute every pound of useless metal.

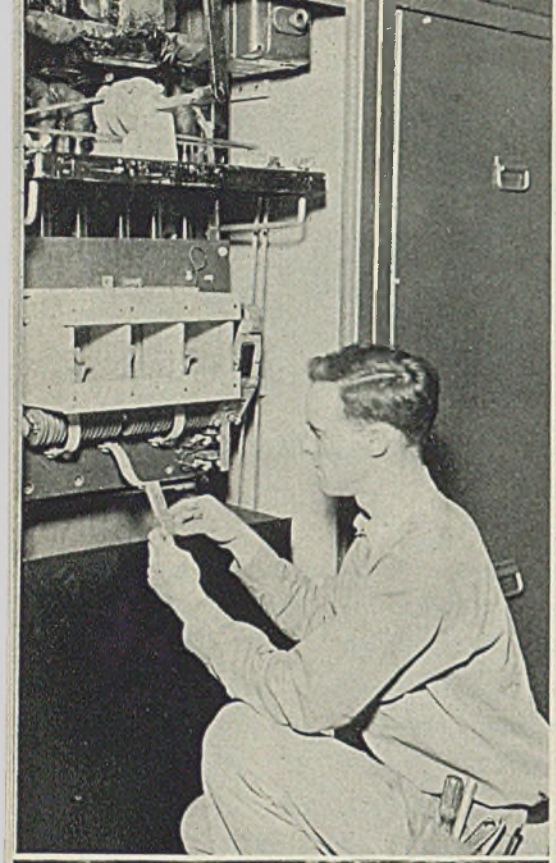
2. As a business man or employee, he must exert all his influence to see that his company or employer contributes everything possible to the campaign.

The scrap is rolling in. But NOT ENOUGH. Six million tons of extra steel scrap are not to be found on the front doorsteps of America.

To do your part to keep munitions going to the fighting fronts, contribute ALL the scrap you can muster.

THE YOUNGSTOWN SHEET AND TUBE COMPANY
YOUNGSTOWN, OHIO

QUALITY YOUNGSTOWN SERVICE



Upper view, replacing a movable contact on a 2300-volt motor starter. Renewal parts should be kept handy at all times so replacements can be made quickly in an emergency

Lower view, this shows how temperature overload relays are inspected at the factory—by immersion. The same method should be employed to check the temperature element in the event a relay does not function properly. Simply immerse it in a pail of water kept at a temperature of 90 degrees Cent. and adjust the relay so it operates at that temperature

How To Select, Install and Maintain

ELECTRIC CONTROL EQUIPMENT

By E. H. ALEXANDER
Engineer
Industrial Control Division
General Electric Co.
Schenectady, N. Y.

ANY EQUIPMENT in daily use and upon which continuity of service depends is sure to require periodic inspection and maintenance. This is especially important now when plants must run at peak capacity and when needed war production depends upon the continuous operation of each and every piece of equipment.

Electric control is no exception to this rule. After operating sometimes thousands of times a day, it is vitally important that controls be inspected regularly and that replacements or repairs be made quickly when necessary. Such inspection and maintenance pays big dividends by helping to keep up continuous production and by preventing costly shutdowns that waste the time of men and machines.

As in all operating equipment, prerequisites to any good maintenance program are the proper selection and installation of the equipment.

Selection: The selection of electric control for a given application depends mainly upon the factors of available power, surrounding conditions, and starting conditions.

The points to be considered regarding available power are: Whether alternating-current or direct-current power is used; if a-c, the number of phases, the voltage, the frequency, and whether a 2, 3, or 4-wire system is to be used.

Complete information on any unusual service conditions should be sent to the manufacturer before selecting control equipment. The following is quoted from the NEMA Industrial Control Standards:

a—The use of apparatus in cooling mediums having temperature higher than 40 degrees Cent. or at altitudes greater than 6000 feet should be considered as special applications.

b—There are further conditions which, where they exist, should be called to the manufacturer's attention. Apparatus for use in such cases may require special construction or protection. Among such unusual conditions are exposure to damaging fumes, operation in damp places, exposure to excessive dust, exposure to gritty or abrasive dust, exposure to steam, exposure to excessive oil vapor, exposure to salt air, exposure to vibration, shocks, and tilting, exposure to explosive dust or gases, and exposure to the weather or dripping water.

If control equipment is to be used under any of the above conditions, apply to the manufacturer for recommendations.

Installation: After the proper control has been selected for the job, the next important step is to install it correctly and make necessary adjustments before putting it into service.

Unpack the equipment carefully as small parts may be thrown away with the packing material. Mount the panel vertically, so that the contactors will open by gravity when power is cut off. Panels should be mounted on a flat surface, and care should be taken not to twist the back when mounting. Copper grounding terminals are provided on open controllers for connecting ground wires to the apparatus. The conduit connection to the cases of enclosed controllers is considered sufficient grounding protection.

The sealing surface of the magnet frame and armature is spread with grease or oil to prevent rusting in shipment. The grease or oil should be removed when the contactor is put into service, but the surface should be wiped occasionally with a thin, rust-resisting oil. Before power is applied, each contactor and relay should be operated by hand to see that the moving parts operate freely and without binding. All electric interlocks should be clean and should make good contact when closed.

Resistor boxes should always be mounted with the grids in a vertical plane, and should be so located that free ventilation is permitted. To keep

heating at a minimum, it is recommended that 6-inch spacers be used between boxes when stacked, and that the stacks be 12 inches apart. Such an arrangement is desirable when continuous or heavy intermittent duty is expected, and essential when boxes are stacked over six high. Slow-burning or noninflammable wire should be used in connecting to resistor terminals, to withstand the heat from the resistor.

Adjustments: Contactors are designed to operate properly if the line voltage is within 85 to 110 per cent of the panel nameplate rating for a-c circuits, and within 80 to 110 per cent for d-c circuits. Wider ranges require special devices.

Where there is a continuous 10 per cent increase in voltage, suitable coils should be ordered, because, with this increase in voltage there is an approximate 50 per cent increase in wattage, which greatly increases the heating of the coil. While this will not cause immediate failure of the coil, the deterioration of the insulation is more rapid and the ultimate life of the coil is shortened. There is also an increase of 20 per cent in the pounding effect, resulting in a more rapid deformation of the armature, crystallization of the magnet parts, breaking of the contact tips, and increased noise.

The armatures should seal when the proper voltage is applied to the coils and should open by gravity when the power is cut off. All contact tips should, when closed, make line contact near the bottom of the face. On opening, the final break will be near the top. The rolling and wiping motions when closing and opening keep the contacts in good condition.

Electrical interlocks are adjusted at the factory to make contact at approximately the same time that the main contactor tips touch, or even a trifle later. For some special applications the interlocks may make contact before the main tips touch but, in general, the above instructions apply. To change the adjustment, loosen the nuts on the front and back of the base and screw the stud in or out to suit the conditions.

Mechanical interlocks are so adjusted that, with one contactor in the sealed (closed) position, there is a very small play on the other contactor. This play must not allow the moving contacts of the second contactor to touch the corresponding stationary tips when the tips of the first contactor are just touching.

General Preventive Maintenance: Now that the control device has been properly selected, installed, and adjusted, the maintenance program itself starts.

A first consideration in keeping control equipment in proper working condition is to prevent an accumulation of dirt, oil, grease or water on the operating parts of the control. It is, therefore, advisable to carry in stock protective paints for the stationary iron parts, and insulating varnish of the proper characteristics for the coils.

Where the air is saturated with moisture, or subject to the action of corrosive gases, it is well to inspect and paint the various control parts from two to four times a year, depending on the severity of the operation conditions.

It is often desirable to add heaters or lamps within the controller enclosure to prevent condensation of excessive moisture. For best results, such heaters should be energized continuously, especially when the controller is not being used.

Circuit breakers or contactors are usually of very rugged construction. Still, it is best to operate them by hand from time to time and check to make sure that all of the clearances are normal and that parts are working freely. Should parts become worn so that adjustments cannot be maintained, new parts should be used. Adjustment and cleaning, as well as renewal of the tips, is necessary and depends on the frequency of operation of each device. In the case of contactors, for example, the armature should be cleaned and checked for free working and the condition of the magnet contact surfaces.

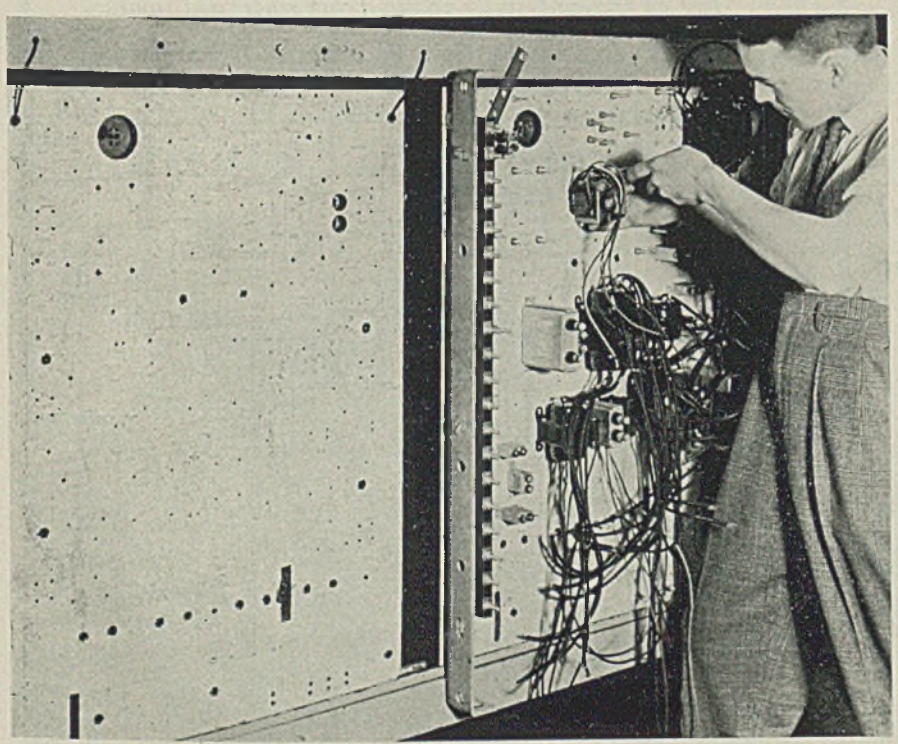
Occasional inspection should be made of all nuts and connection wires on panels and resistors, particularly when subject to vibration. Close inspection of pigtail connections should be made periodically since these are of finely woven wire for flexibility. In extremely corrosive atmospheres pigtail connections have been known to fall apart before there was any apparent indication of failure.

Float switches should be given the best of care, especially if they are of the moving contact type. The tips should be adjusted and lined up properly and, of course, cleaned if any indication of excessive corrosion is noted. The bearings should be made free to operate and any tendency toward binding should be corrected immediately.

In float switches of the mercury contact type, the mercury tubes should be

(*Please turn to Page* 105)

Wiring Templets Aid Production



AN AID to the quantity production of thyratron resistance welder controls at General Electric Co., Schenectady, N. Y., is the pasting of oil-resistant paper wiring templets to the back of the panel. This simplifies drilling of holes in the panel and speeds up assembly by indicating where all parts must go on the panel board. Shown here, a workman is assembling one of the panels; at left is a panel as it comes from the drilling operation. All the worker does is fasten the many parts in their respective places and connect the wires as indicated on the templet. Besides speeding equipment production, this arrangement helps simplify the maintenance job where the control is installed.

"MAN-HOURS"

—the misleading measure of production

It requires but one eye to see that man-hours alone are no measure of production. The thing that counts is how much that man can produce in one hour.

ALTER EGO: Sure. By one method he may produce two or three times as much per hour as by another method.

Take arc welding. This method results in far greater effectiveness. In joining steel, one welder does the work of two, three or four men using other methods. And he does a better job with 15% to 25% less steel.

ALTER EGO: Then it would seem a better measure for a company's contribution to the war effort would be METHOD-HOURS.

True as gospel. Our whole war production has been zoomed by those who grabbed arc welding as the only way to save our national neck.

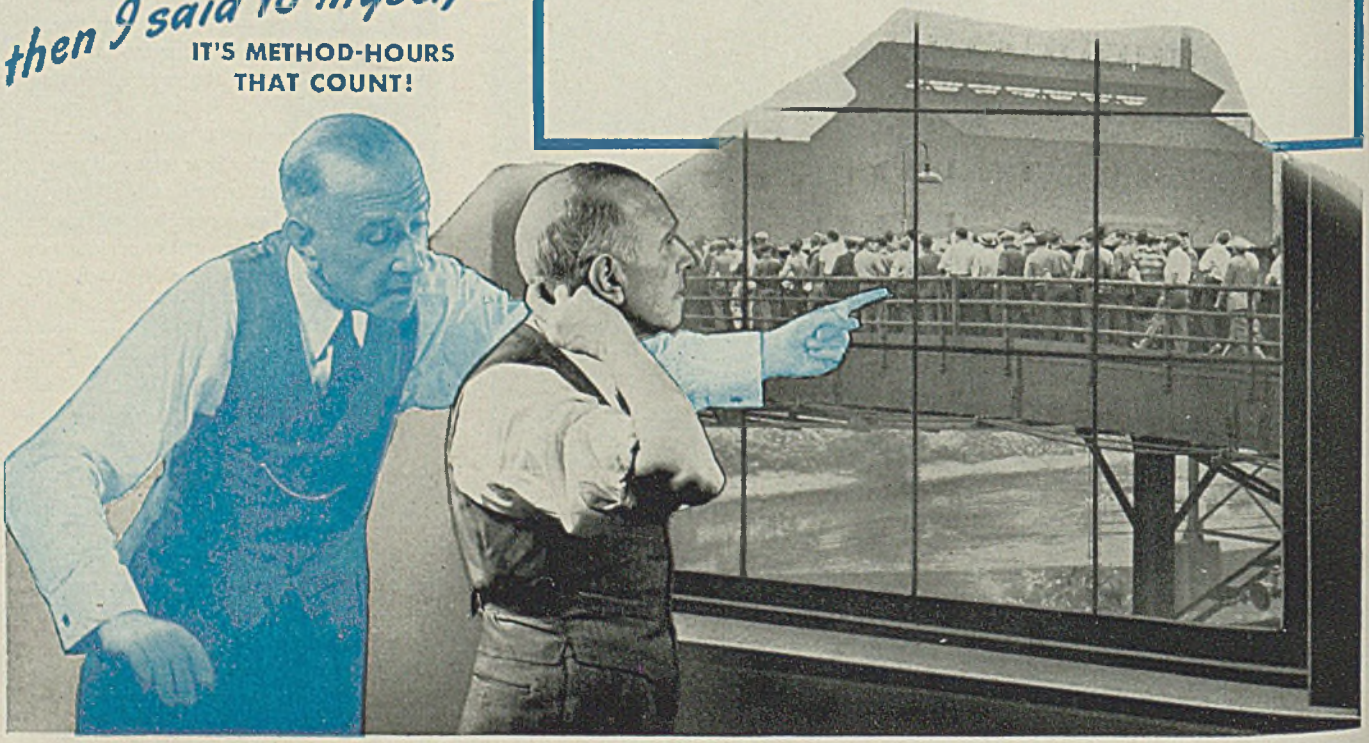
ALTER EGO: And later they'll be schooled in an art to save their individual necks when competitive production again seeks profitable markets.

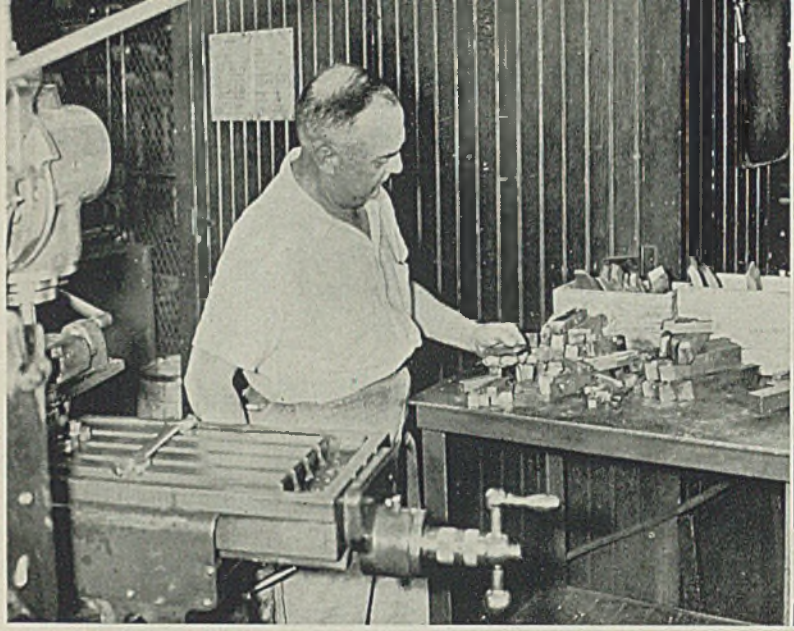
THE LINCOLN ELECTRIC COMPANY
CLEVELAND, OHIO

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

then I said to myself—

IT'S METHOD-HOURS THAT COUNT!





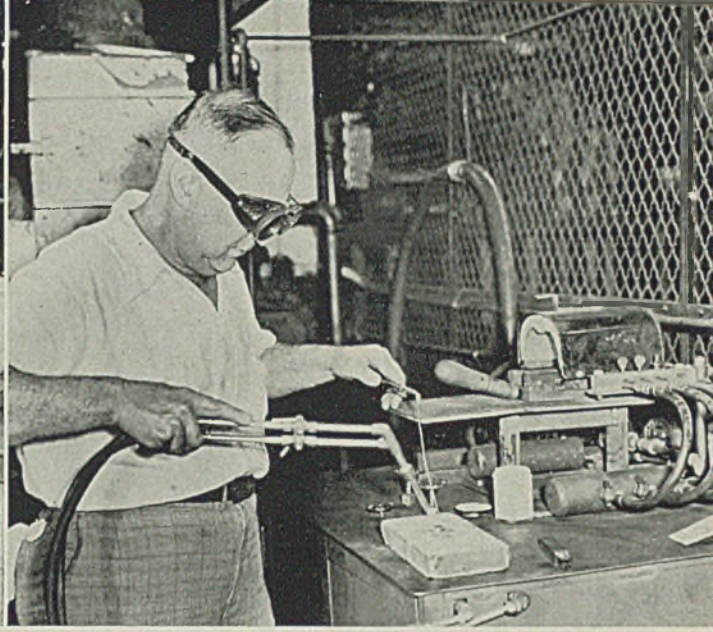


Fig. 1. (left)—Old tool shanks, accumulated over a period of years, are being reclaimed by first cutting off old tip, then cutting tool clearance and milling seats for carbide tip. Fig. 2. (right)—Next new tip is brazed onto shank. Brazing furnace utilizes natural gas and air, was built in plant's own shop, does the job well

RECLAIMING CARBIDE-TIPPED TOOLS

Old shanks are utilized by brazing on new tips to produce new tools. This eliminates delays up to six weeks involved in obtaining delivery of new tools from the factory

THREE-SHIFT operations seven days a week at the Reliance Electric & Engineering Co., Cleveland, have put a premium on the availability at all times of a good supply of tungsten carbide tipped tools.

Between 500 and 600 carbide tools a month are required at a minimum, many of them special tools to do special jobs or to fit special-purpose machines. Examples of the first are the special tools required for boring mill operations on the rocker seats of motor bearing brackets. These tools must be made with special clearances and are not, therefore, readily interchangeable with others should their reserve supply be exhausted.

Examples of special tools for special-purpose machines are to be found in the tapered tool shanks required for several new automatic turret lathes recently put into service. The tapered shanks are needed to prevent the tools from possibly pulling out of the tool holders.

Until very recently, it was possible to get fairly prompt delivery of finished tools directly from the tool manufacturers. Carbide tips are still readily obtainable on 10 days to two weeks delivery. However, deliveries of finished tools have lengthened to as much as six weeks or longer. These longer deliveries have threatened to create real difficulties in the program of all-out production of electric motors for war purposes since it is not always possible, particularly where special tools are concerned, to anticipate requirements that far in advance.

Another factor which has made it advisable for the plant to set up the equipment necessary to make its own carbide-tipped tools has to do with the accumulation over a period of 10 to 12 years of a large quantity of worn tools. On the chance that these might ultimately be useful for some other purpose, they were allowed to pile up and now constitute an invaluable backlog of ready-made tool shanks which can be worked right into the plant's program for building its own tungsten-carbide tools.

Shank sizes to be handled in the tool-making program range from ¼ to 1¼ inches square. Old tool shanks are first taken to a power saw where the old tool ends are cut off. The larger tool shanks, new as well as old, are then put on shapers which machine the necessary clearances for the tool faces.

A milling machine set up in the tool room handles the end milling of the recess for the new carbide tip, preparatory to the brazing operation.

The only new piece of equipment required, a brazing furnace, was designed and built by the plant's own shop force. Mounted on a table-height metal cabinet, the furnace consists essentially of six fish-tail gas tips, three on each side of a furnace hearth which is provided with a hinged and heavily insulated hood. The furnace is as easy to light and ready to use as the gas burner of an ordinary kitchen stove, and its very simplicity is an important factor in securing low-cost brazing.

Natural gas mixed with air in a predetermined ratio in two manifolds, one for each set of three burners, produces such a hot flame that the largest tool shank handled, 1¼ inches square, can be heated cherry red in about 1½ minutes.

In the brazing process, tool shanks and carbide tips are first "tinned" separately with Easy Flo silver alloy. The tips are heated with a hand torch, which likewise uses natural gas as a fuel. While the operator is tinning a tip, the tool shank is getting its first "warm-up" in the furnace.

A small hand vise has been provided for holding the tool shank during the brazing operation. It can be slid easily into and out of the furnace enclosure, thus leaving the operator free to tin the carbide tip while the tool shank is being heated.

Preliminary to being tinned, each carbide tip is polished on the bottom and sides with a diamond wheel. Also, both tool shanks and tips are cleaned by dipping in carbon tetrachloride before flux and brazing alloy are applied.

(*Please turn to Page* 109)

Fig. 8—No longer are storage areas figured in square feet of storage area but in cubic feet of space for with good floors, the unit packaging system permits material to be stored to the ceiling

★

SPEEDING DELIVERIES

. . . . by use of unit packages and mechanized handling equipment

★

By C. M. GODFREY
Clark Tructractor Division
Clark Equipment Co.
Battle Creek, Mich.

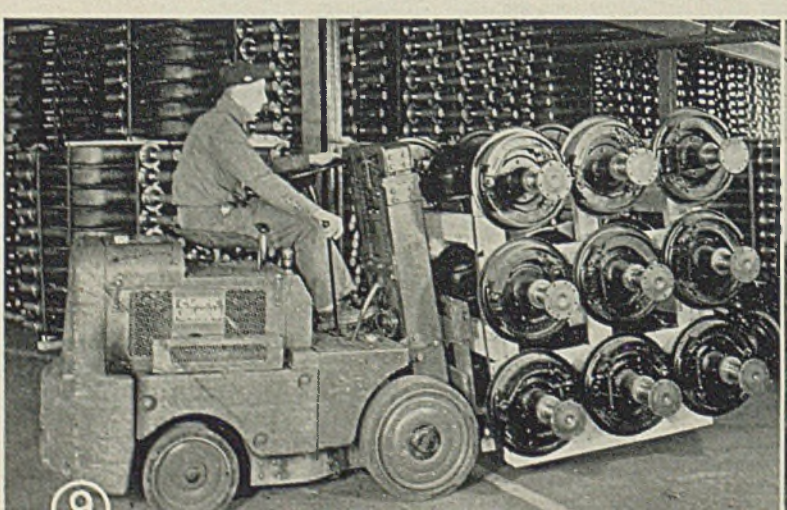
(Concluded from Last Week)

AFTER THE production manager has determined the character of the package, taking into consideration all the factors discussed in the first part of this article, the purchasing agent should embody the packing specifications in the requests for quotations and consider the compliance with his request when awarding the order. To obtain or hold business, the vendor must comply with the requirements of the buyer, so where package specifications are included with the purchase order, every effort will be made to package according to the buyer's wishes. Should the cost of packaging exceed that of the present method of packing, a slight increase in purchase price may be justified where greater savings are made possible later due to improved handling methods.

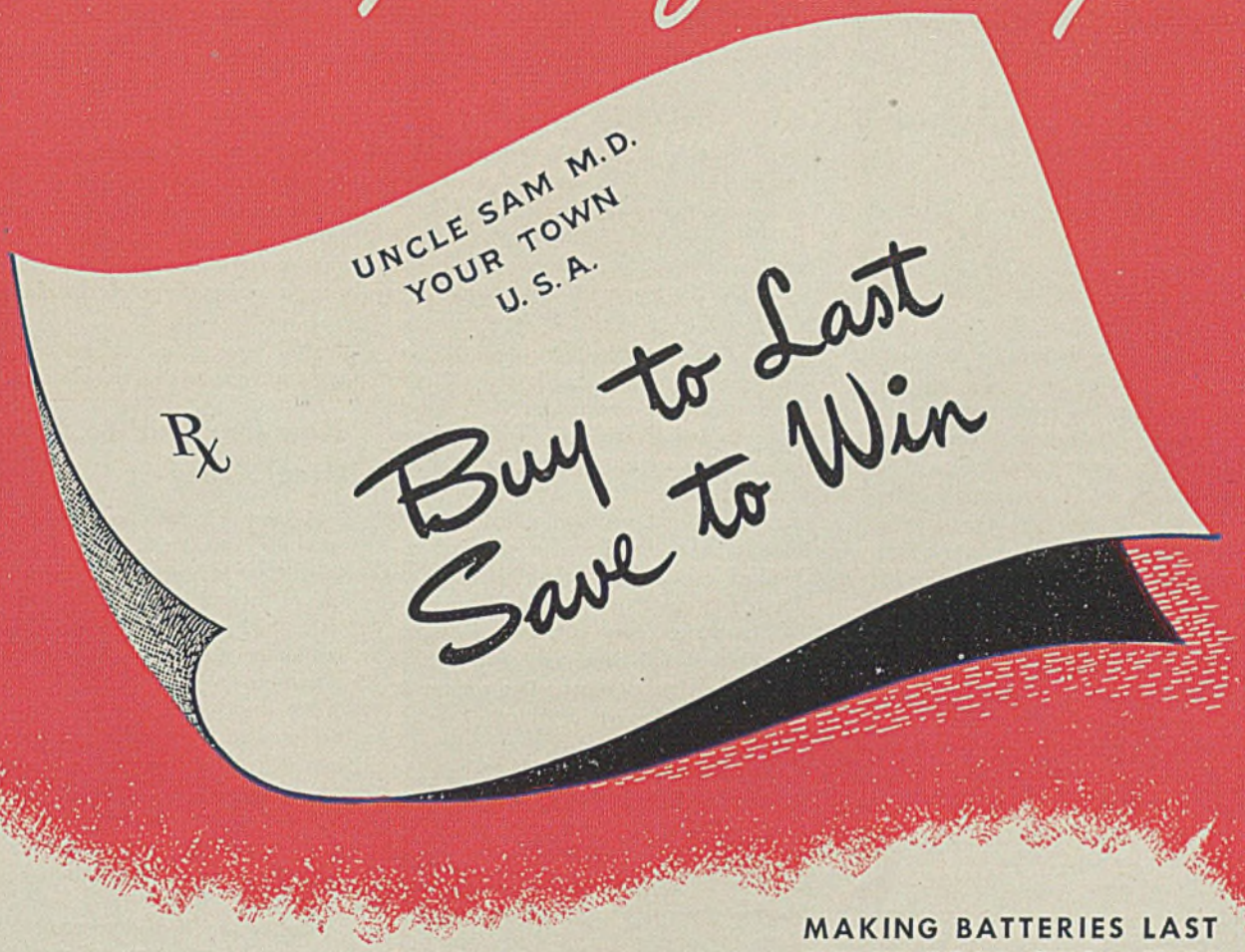
Careful studies should be made by the vendor to assure that comparative packaging cost figures include all handling costs from assembly to loading of the common carrier for transportation. In the few instances where the shipper may find the package not suitable for his present assembly lines, a change in the design of the package can usually be worked out which will make it suitable in both plants. Often after a manufacturing plant has decided to ship to one customer in unit packages, the production manager, traffic manager, or shipping clerk will begin to find other items which could profitably be packaged.

No matter what carrier is employed,

Fig. 9— Note how unit loads of axle castings are stacked to within a few inches of the roof of the storage area shown back of this fork truck handling a unit package of completed axle assemblies. Fig. 10—Unit packages are easily designed to utilize freight car space effectively. And the unit packages are effectively braced in the car by steel straps, yet can be quickly cut for speedy removal as shown here



Prescription for Victory!



Now's the time when a *Save to Win* policy is just what the doctor ordered. An ounce of prevention is better than a pound of cure, when you're caring for vital tools and equipment.

For instance, your long-lived, dependable Exide Batteries will last even longer if given reasonable, normal care. Follow these simple rules and *Save to Win.* That's good medicine for you, and bad medicine for the Axis.

MAKING BATTERIES LAST HELPS STOP THE AXIS!

1. Keep adding approved water at regular intervals. Most local water is safe. Ask us if yours is safe.
2. Keep the top of the battery and battery container clean and dry at all times. This will assure maximum protection of the inner parts.
3. Keep the battery fully charged—but avoid excessive over-charge. A storage battery will last longer when charged at its proper voltage.
4. Record water additions, voltage, and gravity readings. Don't trust your memory. Write down a complete record of your battery's life history. Compare readings.

If you wish more detailed information, or have a special battery problem, don't hesitate to write to Exide. We want you to get the long-life built into every Exide Battery. Ask for booklet Form 1982.

THE ELECTRIC STORAGE BATTERY CO., Philadelphia
The World's Largest Manufacturers of Storage Batteries for Every Purpose
Exide Batteries of Canada, Limited, Toronto

Exide
IRONCLAD
BATTERIES

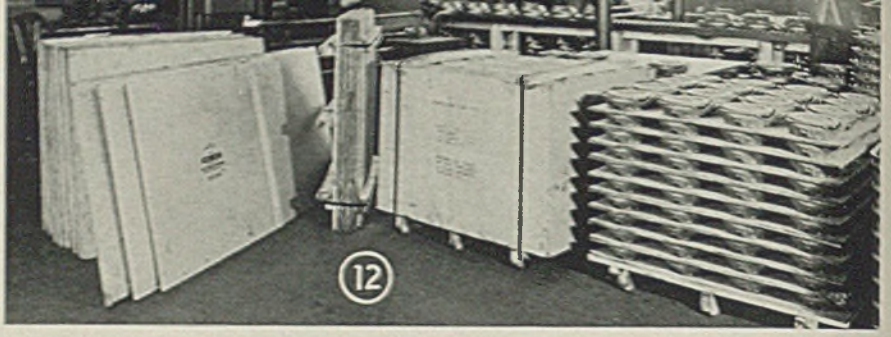


Fig. 11—Large volume of odd-shaped parts such as these castings are readily stored in a small area when unit packaging methods are used. Fork trucks can tier the packages to the ceiling, limited only by condition of the floors over which they must travel

Fig. 12—A large number of parts can be shipped by the unit load Tray-Pak method shown here. A low cost pallet serves as the base, on which the package is built in layers. Placing corrugated board around the four sides, a braced top and steel strapping the whole together makes an efficient unit package. Sections of the package are readily bundled for return to the original shipper and thus can be reused many times. Here 10 layers, 16 units per layer, make up a unit package of 160 clutches

all material shipped must be handled at least twice—loading and unloading. That is the minimum. In some instances, material may be handled ten times between the vendor's production line and the buyer's assembly line. Reducing the number of manual handling operations will speed up deliveries and reduce cost for the carrier.

Regardless of their design and construction, containers which are handled manually will show a higher percentage of damage claims for rough handling in transit than properly designed and constructed unit packages handled at all times by mechanical equipment. Fig. 10 shows a unit package of automobile radiators being loaded into a freight car. These fragile parts used to be packed two to a carton. Now, using a low-cost pallet as a base, the unit package containing 32 radiators is built up in layers, somewhat on the principal of an egg case. Package costs are comparable, but damage claims have been reduced to a minimum.

Since rapid transportation of materials and parts usually determines the choice of the carrier to be employed for handling the shipment, many of the larger transport truck lines with far-sighted executives have realized the advantage of handling unit packages and are installing the necessary equipment to handle these packages when transferring from truck to truck. Thus instead of being tied up for hours while the load is being transferred manually, the truck can be loaded in a matter of minutes by the use of unit packages and power equipment. This is a great advantage over usual methods in loading and unloading operations at the shipper's and receiver's docks. In Fig. 7, Aug. 3 issue, p. 97, cast parts are being loaded by power truck onto a motor truck.

One of the major costs of handling materials and parts in industry is in the receiving department of the buying plant, where it is necessary to unload the carrier and arrange the proper distribution. Usually the first step is to check the incoming material and be assured that the right amount is received. It is much easier to inspect the one unit package than to open scores of containers to check their contents. It is also cheaper to handle one unit package containing 100 items than to handle manually 100 individual containers. One hundred units shipped in less than a carload lot and in 100 containers *may* arrive at the same time, but if the common carrier makes several transfers en route, often shipments get split and delayed in transit.

After the material has been received, inspected and checked, it may be placed in storage. Formerly storage space was classified by square foot area, but today the same storage space must be classified according to its *cubic foot content* because modern equipment permits tiering to the ceiling. Fig. 9 shows how unit packages of axles can be stacked by powered handling equipment to make the most of the space available from floor to ceiling.

The method of warehousing should be made as simple as possible to insure maximum efficiency. The use of unit packages for materials and parts achieves this end. The nature of the packages is such that it is easy for the warehousemen to determine the contents and store them in the proper space. In a warehouse where each item or type of material is distinctive it is also easier to withdraw the parts needed at the assembly line, for unless corrugated or fiber cartons are imprinted with the name of the manufacturer or the product, they look alike, and it is difficult to pick out one or more items where thousands of similar appearing containers are stored. Figs 8 and 11 show storing of unit packages. Note how easily the contents of the packages can be identified.

The advantages of unit packaging and mechanized handling equipment are not limited to one or just a few industries, nor are they practical only for large plants.

For first part of this article see p. 94, Aug. 3 issue, STEEL.

New Control To Aid Steel Output

A new electric arc furnace control recently announced by Allis-Chalmers Mfg. Co., Milwaukee, is reported to increase present efficiency of electric furnace steel production in steel plants and foundries, according to preliminary applications.

For the electrode control the company has applied, to temper pass and reversing mills, its Regulex exciter reported instrumental in reducing operating troubles and maintenance, at the same time providing quick reversing and smooth acceleration—meaning extreme accuracy.

The exciter is said to control arc energy to a constant quantity without use of contact-making devices. Control field windings that measure arc current and volts are part of the fast control element used in this method. With its voltage controlled by the exciter, the small generator supplying power to the electrode motor causes the motor to raise or lower the electrode by uninterrupted Ward-Leonard control.

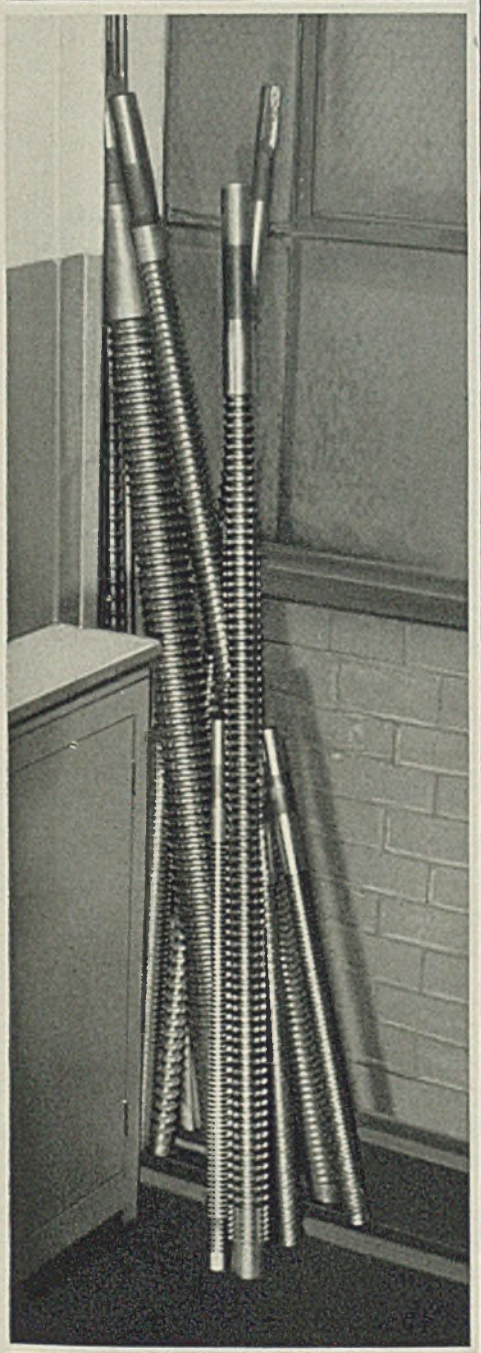
The variable voltage control eliminates high voltage inrushes which, with the elimination of contact maintenance, reduces production delays to a minimum.

Develops High Tensile Strength Solder

A special solder developed for soldering metals such as aluminum, aluminum alloys, die cast, Dowmetal, Alnico, etc., is announced by Lloyd S. Johnson Co., 2241 Indiana avenue, Chicago.

The material is said to be free-flowing and provides unusual tensile strength in sheet metals and extruded aluminum. Corrosion resistant, it retains the color of aluminum and Dowmetal.

THE QUICKEST WAY TO SPOIL GOOD BROACHES . . .



. . . Lean them against each other in a corner

How to get more production with your Broaches------

1. BY PROPER HANDLING

IT TAKES time to recondition a damaged broach. Careless handling of your broaches may tie up production. Here are a few good rules to follow to protect these vital war tools:

(a) Always provide individual storage racks for broaches. These should either be of a material that will protect the teeth from damage or else should be lined with such material. If cutting edges of broaches are allowed to strike against each other they may be chipped or nicked.

(b) Never drop a broach on any hardened surface. Broaches are usually made of high speed steel and may even be tipped with tungsten carbide. You may chip, nick, or even break the teeth.

(c) When broaches are to be stored for any period of time they should be treated to protect them against corrosion.

(d) Equipment for moving broaches from one department to another should have separate compartments to prevent nicking of broach teeth.

COLONIAL broaches are designed to enable you to machine your parts more accurately, quicker, and at a lower tool cost per piece than with virtually any other method of stock removal. Give them a chance to do an all-out job for you. Handle them carefully.

colonial BROACH COMPANY

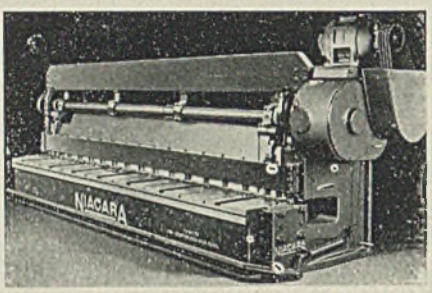
Broaching Machines — *Broaches-Broaching Equipment*

DETROIT . . . . . U. S. A.

INDUSTRIAL EQUIPMENT

Power Squaring Shear

Niagara Machine & Tool Works, Buffalo, announces addition of a new long-length power squaring shear to its series L line for producing accurate cuts over a 20-foot length. Longer cuts



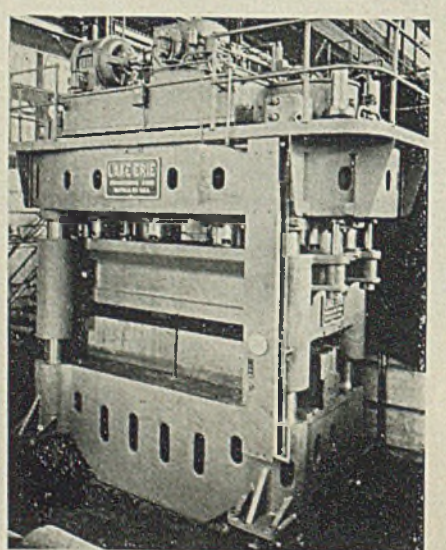
can be made, it is said, by utilizing the gap in the housings.

The massive bed and housings together with triangular section crosshead insure straightness and correct clearance of knives throughout the cutting length. Incorporation of convenient operation and quick gaging features speed up handling of stock and reduce operator fatigue. The shear also is equipped with a self-measuring ball-bearing parallel back gage which measures in increments of 1/128-inch. Drive mechanism of the shear operates on anti-friction bearings and is completely enclosed in an oil-tight case.

Hydraulic Press

Lake Erie Engineering Corp., Buffalo, is offering a new 3000-ton hydraulic press for use in bending armor plate. Relatively large pieces can be handled on its 168 x 53-inch bed.

The press develops ram speeds up to a maximum of 200 inches per minute approach, pressing 12 inches per minute



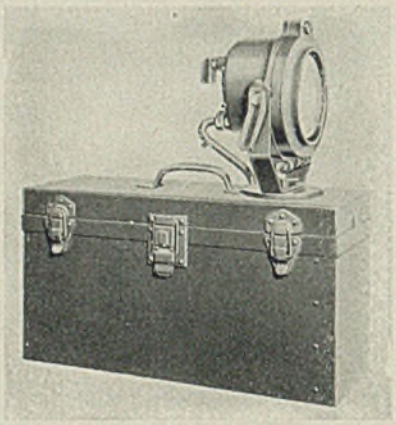
at 3000 tons. It has a stroke of 42 inches. The entire unit is self-contained with a 150-horsepower pump located on top.

Pressure control is provided by a hand lever mounted at right side of press. It is applied equally across the upper platen by four large-diameter rams. This particular press is said to be the largest addition to the company's line.

Portable Floodlight

General Electric Co., Schenectady, N. Y., has introduced a new portable battery-operated floodlight for combustible areas which cannot have installed lighting. It is for use in such places as powder igloo interiors, powder magazines, freight car and warehouse interiors containing combustibles, and during blackouts and other emergencies.

The floodlight consists of a small steel box (19 x 9 7/8 x 20¾ inches) with special dust and vapor-proof lamp



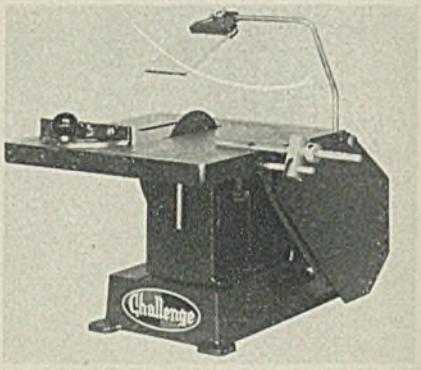
housing mounted on a bracket to allow pointing in any desired direction. A high-efficiency glass reflector, combined with pre-focus positioning of the unit's 50 - candlepower concentrated - filament bulb and a diffusive lens, gives a powerful medium-angle floodlighting distribution.

A 5-cell storage battery with non-spill valves is housed in the box. Exchange of discharged for charged batteries is made possible through a polarized connector permanently wired to the battery terminals.

Cut-Off Machine

Challenge Machinery Co., Grand Haven, Mich., announces an abrasive cut-off machine reported capable of handling any metal—hard or soft, tubular or solid, including hardened tool steel. It features a capacity up to 1-inch round, and an adjustable 15 x 14-inch table.

The machine is equipped with a cut-off wheel, 6 x 1/32 x ½ inches, and an adjustable safety guard above the wheel to protect the operator's eyes. A belt

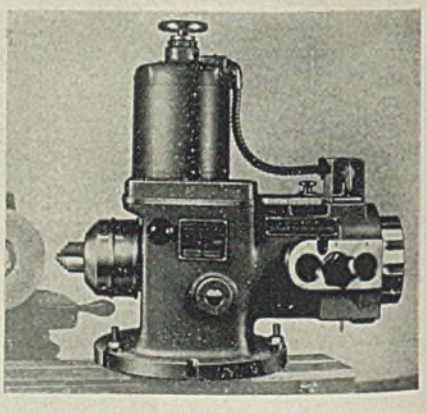


on the side of the unit also is guarded. In addition, an adjustable miter gage is included for the cutting-off operations. The machine can be plugged into any light socket. It sets on a cast iron base and an all-steel stand.

Deep Hole Drill Sharpening Attachment

Pratt & Whitney, Division Niles-Bement-Pond Co., West Hartford, Conn., announces a new deep hole drill sharpening attachment for use on any grinder. It sharpens single lip drills, with straight or helical chip groves, within a diameter range of ⅝ to 2 inches inclusive.

Selective cam action on this attachment is said to make it possible to maintain accurately predetermined drill tip angles and at the same time to provide clean, sharp cutting edges. It clamps on the standard table of a universal cutter grinder, or on other grinders of



similar design. Although developed primarily for sharpening step drills, it has provisions for sharpening with equal efficiency V-shape drills, or other cutting tools of similar shape.

The drill to be sharpened is located by keys in the spindle, which is hollow to accommodate drills of any length, with

BEHIND THE SCENES with DoAll

Metal and alloy parts cut on the DoAll Contour Machine are so smooth and clean that they are all ready for use *without further machining* or finishing. Think of the time this saves!

Then, to add to its versatility, DoAll production engineers have developed valuable *plus* equipment to handle all kinds of heavy work and jobs of irregular shapes—hydraulic work feeds; rip fences; ball-bearing work slides; work holders and guides; supports for long, heavy parts; mitering attachments for cutting tubing and channel stock at any angle; circle cutting fixtures; illuminating magnifying glasses; and others.

Airplane Ambulances

The U. S. Air Corps has a fleet of mobile machine shops for repairing damaged planes right on the spot—the shop goes to the plane. Each "ambulance" contains a DoAll Machine as part of its essential equipment.

For That "Between Meals" Slump

For the past two years, Continental has been distributing free vitamin tablets regularly to employees and since early this spring, they have also provided free drinks during the middle of each morning and afternoon. Here's a typical month's consumption:

Milk	36,755 bottles
Tomato Juice	4,575 bottles
Orange Juice	888 bottles
Total	42,218 bottles

It is estimated that it takes a herd of 26 cows chewing their cud for 30 days to produce the milk. Who says Continental isn't looking out for the farmer?

Kingpin of Speed Controls

The Speedmaster was originally invented to provide infinitely variable speed (6 to 1 ratio) for DoAll Contour Machines. It wasn't long, however, before manufacturers of machinery in other fields discovered that this compact little unit was adaptable to their machines also. Today Speedmasters are controlling machine speeds in plants making hats, textiles, paper boxes, wire and metal products, bakery goods and even for cleaning tons of walnuts. Send for the new 40-page Handbook telling all about the many and varied applications of the Speedmaster.

DoAll SAVES TONS OF METAL

● Uncle Sam tells us that every ounce of metal saved is vital right now. DoAll saves tons and tons by slicing off any metal or alloy as clean as a whistle. Makes no difference whether it's internal or external cutting, this ultra-modern production machine follows a hairline without any waste. Uncut portions of metal or alloy are usable.

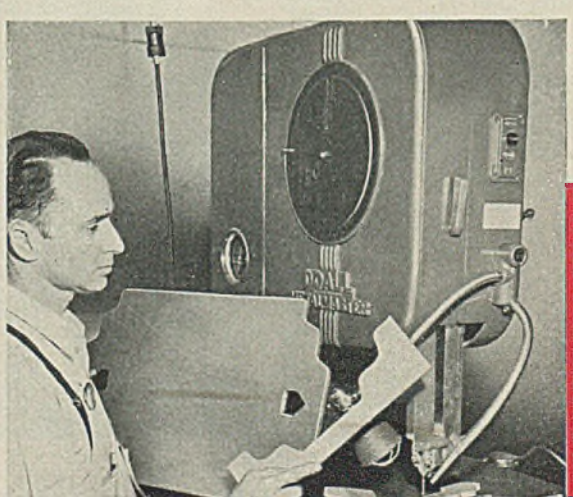
Compare DoAll's economic performance with that of shapers, millers and other machines which reduce tons of metal to chips.

FASTEST METHOD TO REMOVE METAL

In production plants everywhere, DoAll is wrecking former time schedules—doing important sawing and filing jobs in one-half, one-quarter or one-eighth former time.

Let a factory trained man come to your plant with a DoAll and prove its metal and time saving ability to you.

A SIZE FOR EVERY JOB . . . There is a DoAll to do your particular job faster and better. Throat capacities from 16" to 60". Priced from $1000 to $5000, including motors.



New Book

"DoAll on Production" shows DoAlls at work in leading plants. An interesting story told in pictures. Send for copy.

CONTINENTAL MACHINES, INC.

1324 S. Washington Ave.

MINNEAPOLIS, MINN.

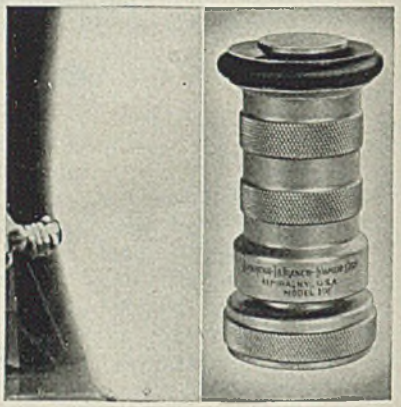
Associated with the DoAll Company, Des Plaines, Ill.

or without shanks. A cylindrical cam attached to the rear of the spindle has three different cam grooves. Selection of cam action is made by insertion of a removable cam roller into the desired groove. A ⅛ to ¼-horsepower 2-speed motor drives the spindle, or it is rotated manually, depending upon the operation. Also available is a deep hole drill sharpener for drills with diameters from $\frac{3}{16}$ to ⅝-inch.

Fire Nozzle

American - LaFrance - Foamite Corp., Elmira, N. Y., announces a new Alfco-spray all-spray nozzle for class A fires (wood, rubbish, textiles, etc.). From the shut-off position, a slight turn of the nozzle tip immediately gives a cone spray of 40 degrees. Further slight rotation produces increasing cones up to full curtain of 150 degrees, with reversal back to shut-off without any intervening straight stream. It prevents any possibility of a solid water stream being applied inadvertently on live electric circuits.

The varying cones also are excellent for putting out heavy oil fires, and for



general cooling purposes. The nozzle, known as model 10F, can be furnished for any 2½-inch hose thread, also for Underwriters' tip thread, 2-inch hose thread, or 1½-inch thread.

In the 40-degree spray position, the capacity of the nozzle is about 95 gallons per minute and 135 gallons per minute at 50 pounds and 100 pounds inlet water pressures respectively. The full curtain capacity at these pressures is approximately 170 gallons per minute and 215 gallons per minute.

Bearing Washer

Ahlberg Bearing Co., 3058 West Forty-seventh street, Chicago, announces an adaptation of a production type bearing washer for industrial plant use to meet drastic restrictions on deliveries so that bearings can be washed and thoroughly dried for periodical inspection and then repacked with fresh lubricant.

The unit is portable and has a sealed compartment to prevent evaporation loss

of the solvent solution. Provision also is made for a compressed air dryer which blows the bearings dry and clean, making the whole operation complete and easy. The unit weighs only 10 pounds and is said to handle a full range of bearing sizes.

Additional unit for repacking the cleaned bearing with fresh grease is a

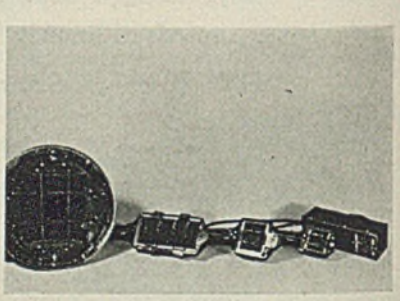
second development announced by the company. With 5 pounds of clean lubricant in its base the bearing is simply placed on top of the unit, a lever forcing the clean grease completely through the bearing without waste, and without danger of dirt being carried in the lubricant.

Soldering Irons

Hexacon Electric Co., 161 West Clay avenue, Roselle Park, N. J., announces a new line of Hatchet industrial electric soldering irons. Each of these include the handle offset to reduce fatigue and give better balance, insuring better soldered joints. It also features replaceable elements, and includes the same appointments as the plug tip irons offered by the company.

Black-Light Lamp

Ultra-Violet Products Inc., 5205 Santa Monica boulevard, Los Angeles, has introduced an improved line of Mineralight black-light lamps for miners. The new lamps in the line feature higher ef-



ficiency, greater intensity of ultra-violet rays, as well as other advantages such as built-in regular flash light with selector switch, self-contained lamp and transformer, etc.

Metal Parts Washer

Sturdy-Bilt Equipment Corp., 1441 South Sixty-fifth street, Milwaukee, announces a new metal parts washer for soaking, washing, drying and preparing of metal parts, either machined or fin-

WE CAN ··· WE MUST ··· WE WILL ··· *Franklin D. Roosevelt*

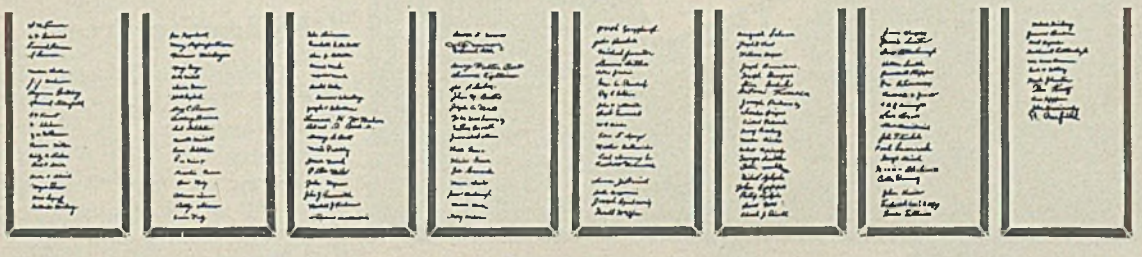
LEVINSON STEEL EMPLOYEES PLEDGE

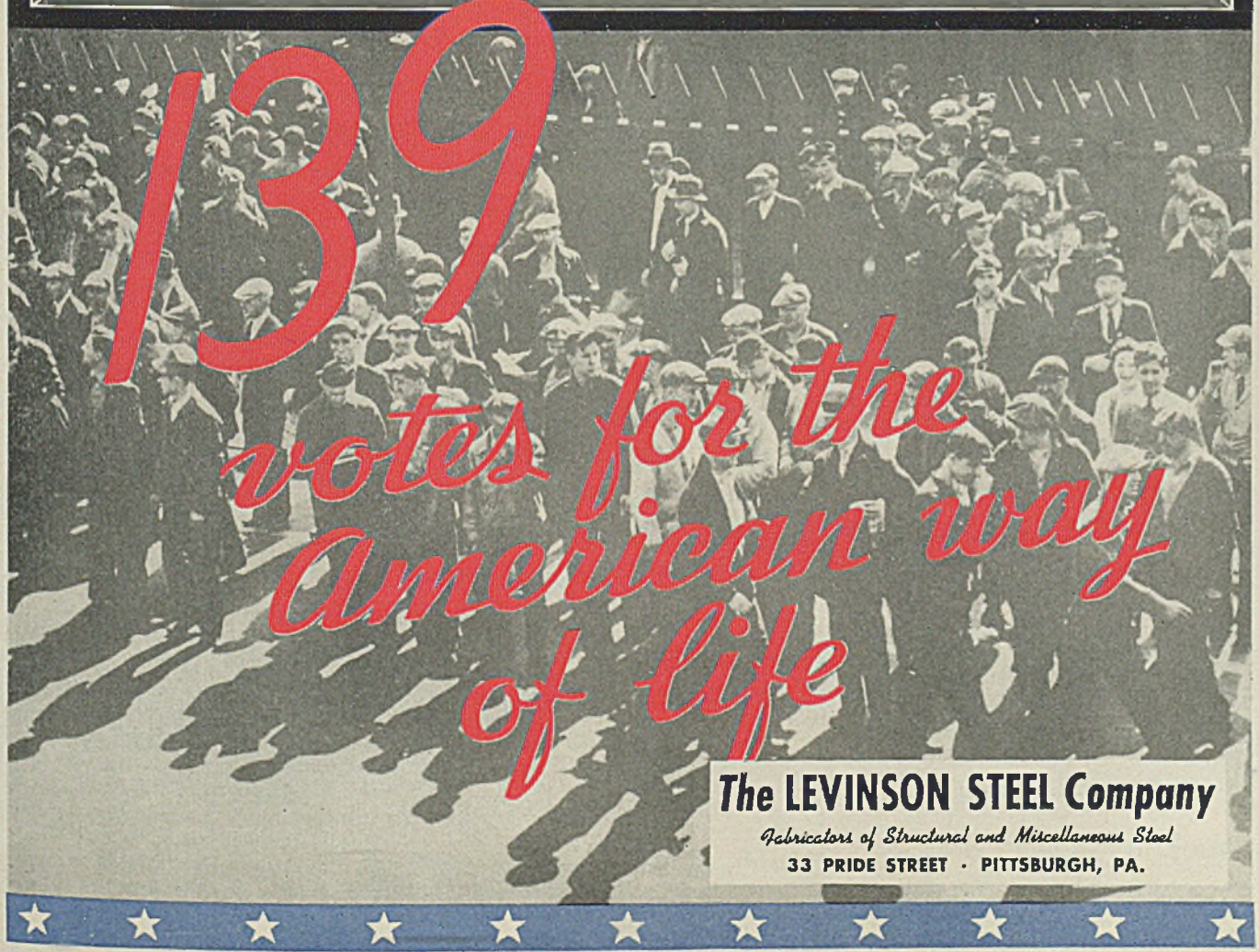
Every executive and every employee of The Levinson Steel Company pledge their full co-operation in our united war effort, until final victory is won.

We will work and sweat and sacrifice; we will produce in ever increasing abundance, without let-up and under any and all conditions until the brutal, sinister, unscrupulous influences of Hitler, Mussolini and Hirohito disappear.

In order to insure the continuation of our American way of life; in order to maintan our freedom of speech, freedom of religion, freedom to work and play and enjoy God's blessings with dignity and respect,...

WE, THE UNDERSIGNED, REPRESENTING THE ENTIRE LEVINSON ORGANIZATION, HAVE PLEDGED 100% SUPPORT OF THE WAR BOND PROGRAM.





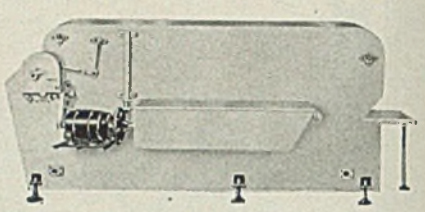
The LEVINSON STEEL Company

Fabricators of Structural and Miscellaneous Steel

33 PRIDE STREET · PITTSBURGH, PA.

ished. It is particularly suitable for cleaning small parts such as shell cartridges and munition parts.

The washer provides a long dormant soak besides the customary method of hydro washing. Parts are loaded and

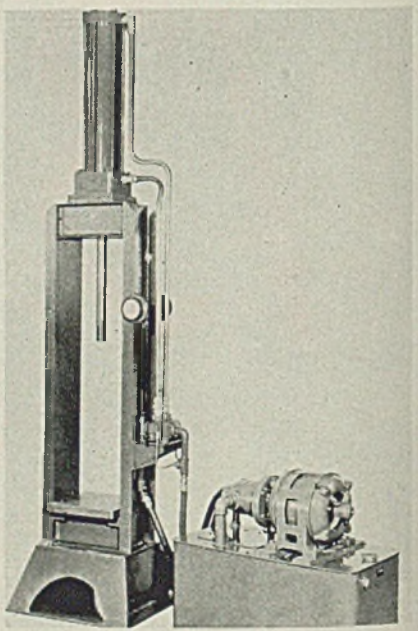


unloaded at a conventional platform—one operator is all that is needed for both loading and unloading. A simple "chip-remover" scraps chips into a receptacle at one end. This "basket" is easily removed to be emptied—the chips if of scarce metals can be salvaged.

Hydraulic Press

Hydraulic Machinery Inc., 10421 Grand River, Detroit, has introduced a fully hydraulic press suitable for varied industrial uses. It is of welded steel construction mounted on a flared base 30 x 30 inches. Its height overall is 139 inches.

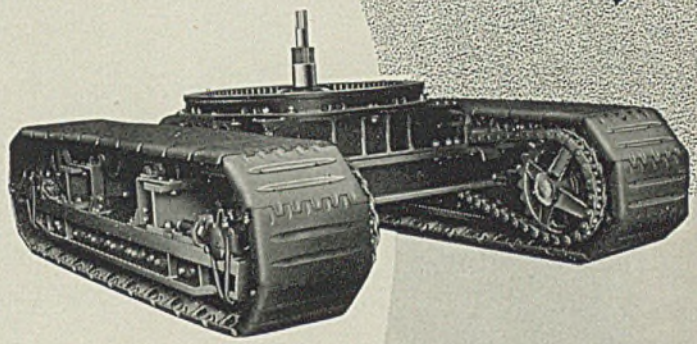
Other features are: 25-ton pressure; 30-inch stroke; 60-inches of daylight; 4.4 inches per second (closing speed);



0.8-inch per second (high pressure speed); 5 inches per second (opening speed); 18 x 18-inch platen; combination pump, relief, check and unloading valve; 7½-horsepower, 1200 revolutions per minute, 3-phase, 60-cycle motor and manually-operated control valve.

Hydraulic power unit, shown adjacent to press also may be installed in another room, building or other convenient place.

A CRAWLER DESIGN that speeds up handling!



OVER brick, over concrete, over gravel, over dirt, you can put this crawler with smooth precision, spotting your machine right where you want it in narrow aisles, alongside trucks or loading platforms. Northwest Differential Steering gives you positive traction on both crawlers while turning as well as when going straight ahead. Both crawler belts travel under full power *all the time.*

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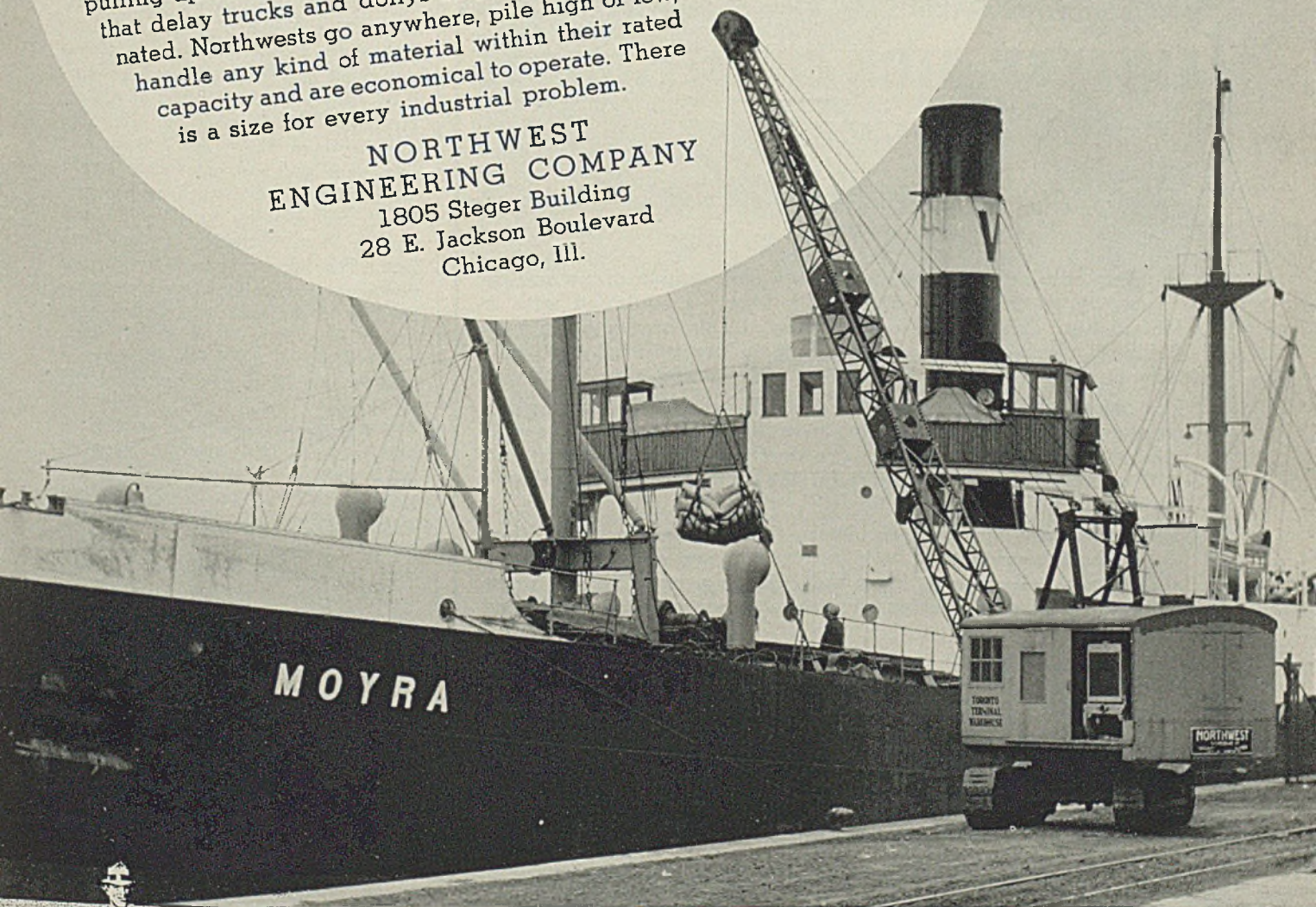

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Iron — Its Use

(*Continued from Page 82*)

versy. As steel for common purposes it passes the tests, meets all ordinary specifications and is satisfactory in service. For certain specific purposes, however, particularly those involving severe treatment in fabrication and manufacturing operations, or in service, it exhibits peculiarities resembling in some measure those of bessemer steel which render the latter unfit for certain services. There appear to be two sources of these untoward peculiarities, the introduction of nitrogen in the bessemerizing process and the lack of action in the open hearth for elimination of oxides and gases. However, recent improvements in control of both bessemer and open-hearth phases of the process may result in improved physical characteristics.

High-iron practice has the advantage of converting the additional 7,500,000 tons of ore used in the open hearth directly to 3,500,000 tons of steel. This ore otherwise would have to be processed by the blast furnaces.

Synthetic Scrap Process: A modification of the duplex process has been practiced for the past two years at a large Pittsburgh open-hearth shop. Here hot iron has been blown down to mild or soft steel and cast into ingot molds. Stripped ingots are charged into the open hearth as soon as possible to save sensible heat. Teaming of the blown metal has been practiced in order to provide a more uniform bessemer operation, as in the operation of the open-hearth shop there is often an interval when none of the furnaces are at a stage of the heat when hot metal can be charged.

It has been suggested that there is likely to be an elimination of objectional dissolved gases such as nitrogen and hydrogen by their effervescence during solidification of the ingots, but difference has been noticed between this "synthetic scrap" process and duplex, so far as the quality of the finished product is concerned.

Ore and Hot Metal Processes: Up to a 60 per cent iron charge, the basic open-hearth process may be operated successfully along conventional lines. Reasonably good steel can be so produced and, except for the effect of a larger quantity of eliminated metalloids originating from such large amounts of pig iron, differs little from steel made from the so-called "trade heat" charge of 50 per cent iron.

When the charge contains a larger proportion of pig iron than about 60 per cent, special methods must be employed in the elimination of the metalloids. Two distinct processes have been employed in the United States for working high-iron heats. These processes are

designed to control the reactions and modify their physical effects in the furnace.

The first, based on the Talbot process, is carried out in large furnaces of the tilting type in which the heat is built up upon a residuum of refined metal by the addition, in increments, of the molten pig iron with sufficient iron oxide and lime with each increment for the satisfaction of the products of its refinement. After the heat is built up to the desired amount it is finished and tapped, leaving a residue of refined metal for the next heat. Deoxidizing and alloying materials are added to the ladle to avoid waste.

The second, the Monel process, may be carried out in stationary furnaces. A large part of the iron oxide is charged with the limestone or lime and covered by the scrap and cold pig iron. As the lime comes up the reactions proceed with moderate activity. In this type of heat all of the steel is tapped out; if desired additions may be made before tapping.

In both of the foregoing processes it is difficult to remove completely the larger amount of oxides produced in refining the pig iron. Nitrogen, however, is not introduced into the metal as it is in processes that include bessemerization. In the Monel process, since some deoxidation can be carried on in the furnace, there is a better opportunity of removing the oxides than in the Talbot process where deoxidizing must be done in the ladle. In neither process can the removal of oxides take place to the same degree that it does with heats made from charges diluted with larger amounts of steel scrap.

Summary of High-Iron Practice in United States: Of the processes at present employed in the United States in the production of steel from charges that comprise a large percentage of pig iron, each results in steel having certain deleterious characteristics. The acid-bessemer and duplex steels contain more nitrogen and oxides, and the Talbot and Monel steels more oxides than steel made by the scrap-iron process in basic open-hearth furnaces. In the case of bessemer steel the detrimental effects of the oxides and of nitrogen are increased by the presence of phosphorus.

Table I shows the relative estimated cost of each of these various types of steel based on certain assumed prices of pig iron and scrap, therein stated, compared with the cost of basic open-hearth steel from "trade heats".

These estimates are intended as a comparison only and do not reflect the practice of any particular plant or any particular time. Also any changes in the costs of pig iron and steel scrap would change the estimates, but this should not affect the comparison except in the case of the "trade heat" in which the ratio

of steel to iron is high. These estimates indicate the comparatively low cost of bessemer ingots.

However, if the cost estimates were continued through heating and rolling operations and the average costs of finished steel products determined for the various kinds of steel, such comparison undoubtedly would be different than that of the costs of the ingots, since steel contaminated by oxides and other impurities does not roll as well as steel not so contaminated. The losses in costs of preparation for processing are greater.

The Active Mixer: Another process by which high iron-heats may be made, as well as heats with the iron containing excess amounts of the metalloids, involves the use of the so-called "active mixer". In this apparatus certain refinements of the molten pig iron are accomplished before it is charged into open-hearth furnaces.

English Practice: The active mixer is employed in England for the purpose, primarily, of reducing the silicon content of the pig iron. The practice is well established in its use there and considerable data are available regarding the operation of the mixer and the reductions of the metalloids in the pig iron accomplished thereby. A cross section through the mixer in a modern plant is shown in Fig. 5. A review of published metallurgical data with respect to English practice is presented in Table II.

Description of Active Mixer: The mixer is a long open-hearth furnace of the tilting type. Usually the hearth holds about 600 tons of metal and such a mixer serves about 6 open-hearth furnaces. These mixers are fired in much the same manner as open-hearth furnaces, but with a lower fuel rate, and can, if desired, be somewhat simpler with respect to the design of regenerating elements. Because of relatively low operating temperatures the refractories in these mixers last about two years.

Adaptation of Active Mixer Process: American pig iron does not, as a rule contain metalloids in the large amounts in which they occur in the English pig irons. Our basic irons, however, are apt to contain more silicon than is desirable in high-iron charges in the basic open hearth. This usually results from the effort of the blast furnace operator to keep the sulphur of his pig iron within bounds. Production in the blast furnace of basic pig iron to desired specifications for high-iron practice in the open hearth presents difficult problems and there is no doubt that the cost of such pig iron is higher than it would be if specifications could be made less rigorous. It should be possible to do this if the iron were to be processed in active mixers before introduction into open-hearth furnaces. This is an important

consideration in evaluating the usefulness of the active mixer.

Metallurgical Considerations: Calculation of the metallurgy of active mixer processing as applied to pig iron produced in the United States and based on data from English practice, is given in Table III.

Usually the reductions in the percentages of the metalloids from pig iron to mixer metal are accomplished partly by oxidation and partly by dilution with steel scrap. For instance, the carbon is reduced largely through dilution; the silicon and manganese largely by oxidation; while the sulphur and phosphorus reductions, the former by combination with slags and the latter less than half by dilution and the balance by oxidation, occur due to the presence of the basic mixer slag. At English plants, up to about 1000 tons of scrap per week often are melted in an active mixer. It is possible to obtain satisfactory results without charging any steel scrap by adding a greater amount of iron ore and lime; but the active mixer provides a means of melting pit and skull scrap and other undesirable forms of steel scrap.

The active mixer can be operated in such a manner that the processed metal drawn from it has a uniform composition from ladle to ladle. This should be of considerable help to the open-hearth melter enabling him to avoid irregularities which result in longer heat time, more bottom repairs and poor quality of product. Also the early removal of excess amounts of the metalloids gives the metal a chance to clear itself of the products of the oxidations.

Thermal Considerations: Metal processed in the active mixer has a higher temperature than that of molten pig iron, usually by about 150 degrees Fahr. This elevation of temperature is accomplished in the mixer by the use of a comparatively small amount of fuel. To raise the temperature of a corresponding amount of metal in an open-hearth furnace would require considerably more fuel because of the higher general temperature of the open hearth.

Furthermore, the temperature of the processed metal entering the open-hearth furnace may be kept uniform from ladle to ladle. This is not the case with molten pig iron when charged into the open hearth either direct from the blast furnace or when taken from an inactive, conventional type mixer. Uniform temperature of the charged metal is advantageous, especially so in the case of high-iron charges, from the standpoint of the open-hearth operations just as is the greater uniformity of the composition of metal taken from an active mixer.

Advantages of Processed Metal: By processing pig iron before charging it into open-hearths, ingots can be made from high-iron charges that are superior

in quality to those produced by any of the processes that are or have been in use in the United States for making steel from such charges, and, with the single exception of acid-bessemer steel, at a competitive cost.

A comparison of the estimated costs of ingots made from "trade heat" charges by the use of the active mixer and by the conventional open-hearth practice indicates a difference of about $1.00 per ton in favor of the active mixer practice. Steel of equally good quality should result from either practice.

The capital cost of an open-hearth plant including active mixers is only about 83 per cent as great as that of a conventional open-hearth plant of the same capacity. Eight conventional furnaces may be replaced by six furnaces and one active mixer.

The problems of the blast furnace operator should be greatly simplified by the introduction into the steel plant of active mixers. He would not be required to produce iron low both in silicon and sulphur, but rather to control the sulphur alone. This should result in fewer off-casts and less general trouble.

Cold Metal Shop Cupola Practice: Another new process has appeared within the last year or so in two open-hearth shops in this country. Because of the scarcity of pig iron and iron scrap, cold metal shops have been obliged to charge coal or coke in order to have a desired 0.60 or 0.70 per cent carbon in the bath at melt. Two of these companies use a cupola to produce the iron component of their charge from iron scrap and steel scrap or entirely from steel scrap.

This process has several advantages. Scrap iron can be obtained much easier and at less cost than pig iron. The product can be desulphurized in the ladle, giving the furnace operators better quality.

The charging of the hot metal into the open-hearth furnace results in about two hours reduction in heat time with resulting savings in ingot costs, and increased production at about 30 per cent of cost of equal open-hearth capacity.

Operation of Process: In the cupola process, iron and steel scrap, coke and limestone are charged into the cupola from thimbles on charging buggies. The resulting metal and slag are tapped off continuously, the iron flowing to a holding ladle and the slag to a cinder ladle. When an iron charge is required, the taphole is temporarily plugged and the holding ladle tilted to fill the transfer ladle which is set on a scale platform. Soda ash is added while the transfer ladle is being filled. After the evolution of fumes has ceased, the crane picks up the transfer ladle and pours the metal into the furnace through a refractory lined pouring spout which has been positioned by the charging machine.

From this point, steelmaking follows the usual "trade heat" practice.

The foregoing comments have shown the importance of iron in our American basic practice and some of the modifications which are developed by a change of our steelmaking methods.

Develops Test for Color Blindness

A new color perception test, worked up by American Optical Co., Southbridge, Mass., was approved recently by the surgeon general of the United States Navy and is now being used officially by both Navy and Army. Devised to detect color blindness, it is easy to operate and detects those men with faulty color perception.

Many workers such as inspectors, research men, truck drivers and railroad men should have faultless color perception for safety and efficiency, the optical concern points out. In most cases, it should be remembered, the victim of color blindness is not only unaware of his condition but will not be convinced unless given an authorized test.

Bound in blue cloth with gold lettering, the 46 test plates of the perception test are arranged so that malingerers are quickly detected and ordinary blue and green cases of color blindness may be discovered by using not more than two or three charts. Extent of the weakness of color perception is indicated by a single reading of several key plates.

Introduces Quick-Acting Paint Remover

A noninflammable fast-acting wax-free paint remover, Turco Stripper L-595, recently introduced by Turco Products Inc., Los Angeles, is reported suitable for use with complete safety near welding machines, electrical apparatus, grinding wheels and other equipment which generate heat and sparks.

According to the maker, the product will not injure polished aluminum alloy, anodized aluminum alloy, Alclad, polished steel, cadmium-plated steel, stainless steel, polished copper or magnesium alloy. In addition, no after cleaning is necessary.

The paint remover is said to act so rapidly that the "lifting action" starts almost immediately upon application. Varnish, lacquer and some enamels require a maximum time of 5 minutes for complete removal, while the most obdurate baked enamel requires not more than 15 minutes, according to the manufacturers.

Hard Surfacing Alloy Saves Vital Metals

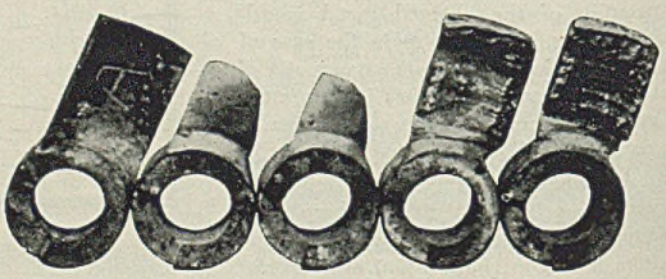
Metals worn away during manufacturing processes are usually nonreclaimable. Of equal importance is the loss of efficiency, when parts become badly worn, slowing production.

Wall-Colmonoy Corp., Buhl building, Detroit, points out one way to salvage some of this metal with the aid of a product it has developed—Colmonoy No. 6, a hard surfacing alloy.

With the product, worn pug knives, for example, can be salvaged and pressed back into service, and the life of new ones can be extended considerably, it is reported.

Accompanying illustration shows at left a new pug knife of high-alloy steel weighing 24 pounds. The next two knives show evidence of three months' service. On these, over half the blade material has been worn away—wasted. In addition, the knives have had a constant and progressive loss of efficiency over the three-month period. The two knives at right are of the same material, but the blades were covered with Colmonoy, of which 1½ pounds were welded on each blade. These already had been in service over a year when this picture was taken, and they are still operating efficiently.

Worn knives, according to the company, can be recovered by cutting off the stub blades, welding on new low-carbon steel blades and hard-surfacing with Colmonoy. By doing this, the company states, 24 pounds of high-alloy steel can be saved by using approximately 5 pounds of low-carbon steel and 1½ pounds of hard-surfacing alloy.



Comparison of knives with and without the application of Colmonoy

(*Continued from Page 85*)

held tightly in place, and if inspection shows that the tubes are becoming dark, it may be an indication of air leakage and the tubes should be renewed.

Trouble Shooting: Troubles are bound to occur in the best of control equipment. Knowing what to do about them when they do occur will save much precious production time. The remainder of this article will discuss some of the more common types of trouble which the maintenance force encounters with control devices, show the causes of such troubles, and explain how to stay one jump ahead of them. If the fundamental cause of each trouble is understood the remedy will quite likely be apparent, and ways will be found to lessen the resultant trouble.

Contactors: A contactor has several bolted or spring-closed contacts. Excessively high resistance at these contacts is the cause of the very high temperatures, such as 100 to 200 degrees Cent., that may be reached when the contactor is carrying rated current or less. The most likely point of high resistance is at the contact where the movable tip makes contact with the stationary tips.

However, high resistance may occur at any of the several bolted joints on the contactor. Therefore, if one of these devices begins to develop an excessive temperature, a millivoltmeter should be used to determine which of the several joints has a high-voltage drop across it. An a-c millivoltmeter is now available that can be used for checking the voltage drop on a-c contactors.

When the copper contact or contacts that have excessive drop across them have been located, correction can be made by opening the contact and removing the oxide with a file (not with sandpaper or carborundum paper). It is unusual to find a high resistance in a bolted joint unless the contactor has previously reached very excessive temperatures. However, when excessive resistances are found in joints the cause should be removed.

Since high resistance will most commonly be found in the active contact, it is a very simple matter to inspect these tips weekly or monthly. If the temperature is unduly high, the tips should be given a few strokes with a file.

The foregoing comments apply particularly to copper contacts because they oxidize readily, and the copper oxide formed has a very high resistance. A file will remove the oxide and reduce the resistance to a low value again. Depending on various conditions, it may take a short or long time for the formation of sufficient oxide to cause excessive heating under ordinary types of service.

However, if sulphur gas is present, a high-resistance film will develop quite rapidly. To prevent this action, the contactor should be mounted in a tightly gasketed enclosing case, or immersed in oil.

Sometimes it is not practicable to keep the resistance of contacts low by filing them. When it is desired or necessary to maintain a low resistance of the active contact without servicing, a silver face can be brazed to the two tips so that the contact is made through that metal. Silver will oxidize and the oxide has a higher resistance than the pure metal, but when heated, silver oxide has the unusual property of reverting back to the metallic form. Therefore, silver contacts are self-purifying.

Electrical interlocks may fail to make circuit because of oxidation where copper contacts are used. Sometimes such failure occurs because dirt gets between the contacts. By using one hemispherical and one flat tip made of silver, both of these troubles will be overcome. The point of the hemispherical tip will make contact without trapping dirt particles between it and the flat tip, and the use of silver will overcome the oxide trouble

occasioned by oxidation when copper contacts are used.

For Severe Service: Excessive wear on the contact tips of a contactor indicates that it is operated frequently. For conditions of this kind, silver should not be used for the contacts, because it does not have the ability to stand up under this severe service as well as copper.

If the service is unusually heavy, and if the root-mean-square of the current is not more than equivalent to three-fourths of the contactor's rating, the tip can be faced with a certain alloy that will last several times longer than copper tips. The cost of this material is quite high, but its use is sometimes warranted.

Let Contact Tips Stay Rough: Some maintenance men have the erroneous impression that contact tips that have been roughened by service should be kept smoothed up so that they will carry the load. A roughened tip will carry current just as well as a smooth tip.

Of course if a large projection should appear on a tip because of unusual arcing, it should be removed. However, a tip that has been roughened by ordinary arcing need not be serviced. If a copper tip becomes overheated, this condition indicates that oxide has developed and should be removed.

A large percentage of contactor coil troubles can be traced back to heating. Therefore, if the temperature can be reduced coil troubles can be greatly decreased. Since the heating of a d-c coil will vary as the square of the voltage, and the heating of an a-c coil will vary about as the cube of the voltage, it follows that coils should be wound for the voltage that exists on the line. If the ambient temperature is high, this precaution is all the more important.

Preventing Coil Burnouts: When an a-c magnet, such as a solenoid, is supplied with constant-voltage excitation, it requires a large inrush of current to close the armature. When the armature closes the coil current drops to a normal value. Sometimes armatures may not close because of excess friction or for some reason and the large inrush current may burn out the coil within a few seconds.

Such mishaps can be prevented by the use of a thermal cutout to protect the coils. When the thermal cutout opens because the armature fails to close, it is merely necessary to replace a small link made of two pieces of metal held together by a low-melting-point solder.

Resistors are important auxiliaries and are encountered in many types, such as porcelain-tube, enameled resistors, open-wound, wire resistors, strip-wound, cast-grid, etc. Some types are more likely to develop certain kinds of trouble than others.

Cast grids are usually assembled and held together by being clamped on a tie rod. The current passes from one grid unit to another across a ground face. When too much current, say several hundred amperes, is made to flow across these ground surfaces, they may develop high resistance and destroy the joint.

To overcome this difficulty, these joints should be cleaned and the current path paralleled. This procedure will reduce the current in the middle joints, where the trouble usually occurs or is most likely to develop.

Edge-wound or strip resistors usually have their terminals either brazed or welded to the strip, which prevents excess resistance from developing at this joint. In order to provide an adjustable contact on this type of resistor, a clamp type of terminal is sometimes furnished. However, since the resistor may become quite hot at this point, a bad contact is very likely to develop. Therefore, if one does develop, the best cure is to braze the terminal at the proper position.

The high-resistance cast grids that have a small cross-sectional area sometimes give trouble because of breaking, especially if they are mounted on machines that vibrate severely. The best correc-

tion for this trouble is to use an edge-wound resistor, which is nonbreakable. This type is made of corrosion-resisting material that is capable of withstanding very high temperatures without scaling.

Relays: The function and importance of relays is too well known to need discussion here. To cover all the relays used would be an endless task because there are many varieties of them. A number of relays have been designed to operate as a function of time. The one that was designed first to operate on a time basis was the dashpot type. Movement of a solenoid is retarded by means of a dashpot, giving a time-current relation that is called an inverse-time characteristic.

The kind of trouble that is inherent in a dashpot was the primary reason for the development of the other types of timing relays. A dashpot is essentially a close-fitting device that is easily affected by dirt, gumming of the oil, and corrosion of the close-fitting parts. Also the torque of the magnets varies with the position of the solenoid armature in its coil.

If trouble is experienced due to tripping while starting a motor or shortly after getting up to speed, there are three things that can be done:

A heavier oil may be used if the relay almost holds.

A starting contactor can be used that does not include the overload relay in the circuit. After the motor is up to speed, the running contactor can close and the starting contactor can open, connecting the overload relay into the circuit. This is a rather complicated method, but it is sometimes used.

The final alternative is to replace the dashpot with a temperature type of overload relay. This is one of the reasons why the temperature-type overload relays were originally developed.

Temperature Overload Relay: Since the function of a temperature overload relay is to protect a motor under all ambient temperatures, its final temperature should be the same as that of the motor—which is 90 degrees Cent. This means that a motor can have a 50 degree Cent. rise in a 40 degrees Cent. ambient.

Therefore, the relay should just trip if placed in a 90 c ambient, or in a pail of water held at that temperature. If a relay does not function correctly, it should be immersed in a pail of water kept at 90 degrees Cent. and adjusted so that it will. The adjustment should not be made by bending the thermoflex strip. If this method of checking or adjustment does not provide the necessary degree of protection to the motor, it can be assumed that the size of the relay heater is not correct.

A temperature overload relay does not need any such maintenance attention as outlined for dashpots, but its use does involve the observation of certain precautions. Since it is sensitive to temperature, it should not be put in a strong draft, such as that from a window or a circulating fan. If it is necessary to place it in such a position, it should be shielded by a cover.

Conversely, a temperature overload relay should not be located above a source of heat, such as steam pipes. In brief, the relay should be in an ambient temperature that does not differ greatly from that of the motor.

Time Delay Relay: The third type of relay is used for controlling the rate of acceleration of motors and for many other functions where a short-time-delay is needed. In the escapement type of relay, a pendulum is used as the governing means, which makes it necessary to mount the relay in a definite position with respect to the motion of the pendulum.

It is not always possible, however, to mount the relay in the proper position, and when it is in the out-of-true position it is less dependable. Shortening the pendulum makes it possible to tip the

relay further from the vertical, but the shorter pendulum results in a shorter time delay.

To overcome this limitation a new design that has a balanced pendulum has been made available. The variation in time is obtained by changing the length of the stroke. In principle the two devices are the same, but mechanically they are quite different.

If the old-type escapements fail to time properly, their mounting position should be checked. However, if the application is such that it is difficult to mount and keep the relay in the proper position, balanced type should be tried.

When Corrosive Gases Are Around: Corrosive fumes in many plants such as those manufacturing rayon, coke, sulphuric acid, nitric acid, chlorine, and so on, rapidly attack the metal parts of control devices and render them inoperative.

To overcome this trouble all the operating parts are frequently immersed in oil in a container capable of withstanding the corrosive atmosphere. The container is made either of cast iron or of heavy boilerplate steel, which is given a protective coating of a paint.

When it is impracticable to oil-immerse a given type of control, the equipment is enclosed in a heavy case with a tight, gasketed cover. The enclosing case is protected with a suitable corrosion-resisting paint.

Know the Equipment: Control equipment can be quite simple or very complex, and the job of the maintenance man is easier if he has available instruction books and wiring diagrams covering every piece of control and every circuit for which he has responsibility. Extra coils and contact tips should be kept on hand as well as a complete list of spare parts. Maintenance is simplified considerably if the maintenance man makes a practice of becoming thoroughly familiar with all electric equipment installed.

Osborn Suggests How To Conserve Brushes

Because of the shortage of bristles, Osborn Mfg. Co., Cleveland, offers the following suggestions for conserving brushes:

When not in use, brushes should be kept suspended in a solution of turpentine and linseed oil.

Paint or any other vehicle in which brushes are used should not be permitted to harden in the bristle, since this makes cleaning more difficult.

Never immerse a brush in water, especially those brushes that are made with 45 per cent hair. If it is cleaned in turpentine or lacquer thinner and then washed in soap and water, all the soap should be rinsed out, the bristle combed straight and the brush wrapped in a paper or a cloth and thoroughly dried.

Because oil and water do not mix, a brush washed in water and used again before it has dried thoroughly will be spoiled when dipped in paint, varnish or a paint vehicle.

Use of the right type of brush for the specific job is important. Do not abuse the pure-bristle brushes now in use as brushes made under the new government regulations are not as efficient as those made entirely of bristles.

If you have some old pure-bristle brushes that are badly worn but could be cleaned and used, we suggest that you use them for they still may be more effective than the new brushes.

According to R. O. Peterson, manager, technical department, who released the above suggestions, the federal government recently ruled that all paint and varnish brushes using the longer bristles must be diluted with at least 45 per cent hair or other materials.

The order is due to a scarcity of bristles, obtained from hogs raised only in Russia and China. The bristles have a special peculiarity which enables them to hold paint and permit it to spread properly. This is a "flag" or multiple-spreading end of the bristle, which has not been successfully duplicated artificially.

Reclaiming Tools

(*Concluded from Page 87*)

As soon as the tool shank has reached a cherry red temperature the recess to receive the tip is also tinned. The carbide tip is then dropped into place, a small amount of brazing alloy distributed along the meeting edges of tip and shank to insure a good contact, and the assembly returned to the furnace to be brought up to a uniform brazing temperature of about 1400 degrees Fahr.

Tool Cooled in Vise

The operator then removes the tool from the flame, but allows it to remain in the vise until the brazing material has solidified. This occurs at about 1175 degrees Fahr. The tool is then removed from the vise and allowed to complete its cooling slowly in a steel pan filled with powdered lime.

It is estimated that the total time for making a finished tool, including machining as well as brazing operations, will not exceed 20 minutes for a ¾-inch tool bit. Or to put it another way, tools which require as much as six weeks to secure from the tool manufacturer can now be made available in a day, or a day and a half at the most. In addition, the tool-making program, as already indicated, has made it possible to reclaim, rebuild and put into immediate service hundreds of old tools accumulated over a period of years.

Develops New Lens For Aluminum Welders

A new welding lens for aluminum welders, the Burt-Weld lens, which filters out the blinding glare of the hydrogen torch and burning flux used in the welding of aluminum, is announced by B. F. McDonald Co., 1248 South Hope street, Los Angeles. It was developed, after months of exhausting research, by Dr. R. C. Burt, scientist, affiliated with the engineering department of Lockheed Aircraft Inc. in co-operation with the Corning Glass Works.

The lens developed so completely eliminates glare that the first Lockheed foreman who tried it thought his welding torch had gone out, it is reported.

Aluminum welders now see through the new lens only a pale cone of flame at the tip of the welding torch. The aluminum welding rod and the working puddle of aluminum are both clearly visible.

The achievement of stopping glare, while not interfering with vision, came about through spectroscopic analysis of the aluminum welding flame. This indicated which rays were undesirable, and subsequent experiments revealed a combination of light filters which not only eliminated undesirable rays, but passed sufficient light of other wave lengths to provide good visibility of the work. From the absorption curve of this filter combination, it was possible to select two glass filters, which combined, gave the desired results that led to the development of the lens.

Ships Abrasive Drills In Plastic Packages

Abrasive drills used in the manufacture of military equipment are shipped and stored satisfactorily when packaged in transparent strips fabricated of Pyralin cellulose nitrate plastic, it is reported.

Strips of the tough, pliable plastic are cut to hold 12 drills of the same size, drills with large heads being reversed. The plastic is said to assure a neat packing job, and affords the necessary protection for the drills. Such packages are being made by Boutwell, Owens & Co. of Leominster, Mass., for the Norton Co. from Pyralin produced by the plastics department of E. I. Dupont de Nemours & Co. at Wilmington, Del.

Heating Steel Forgings

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structure condition of the steel before treatment. It should be borne in mind that those physical properties which are permanently retained are not only related to the chemical composition and microstructure of the part but also to its macrostructure. Hence the extent of dendritic segregation has an important bearing on the final result.

Broadly speaking, all heat treatments may be classified according to whether the steel is heated to some temperature above the critical range and thereafter allowed to cool in some predetermined manner or whether the temperature attained lies below this level.

As is well known, all carbon steels, when heated above the critical range, consist of solid solutions of the carbide of iron, Fe_3C, in gamma iron. On slow cooling this solid solution is transformed to aggregates of pearlite and ferrite, or of pearlite and cementite, according to whether we are dealing with hypo-eutectoid or hypereutectoid steels. If this transformation took place under all circumstances, it would be impossible for us to secure that wide range of properties which result from the partial transformation of the solid solution into martensite and its modifications induced by tempering on the one hand; or into the finer varieties of pearlite, on the other, depending on whether the critical velocity of quenching is or is not exceeded. Thus the iron-carbon alloys are sharply distinguished from all other metals and alloys by the readiness with which their physical characteristics may be related to desired specifications by heat treatment.

It has long been known that grain size has an important bearing on the response which steel makes to heat treatment and upon the physical properties which result from such treatment. For the purpose of clarifying discussion, it may be noted that there are only two types of grains that have any practical influence on the properties of steel, namely austenitic grains which are stable above the critical range and ferritic grains, existing at normal atmospheric temperature. These two systems are not independent since it is possible to observe the history of the steel before cooling to normal temperatures in the ferritic pattern displayed under the microscope.

As far as the relation between austenitic grain size and heat treatment is concerned, we know that the maximum degree of refinement occurs on passage through the critical range and that the higher the temperature reached and the longer the time at that temperature, the larger the austenitic grains tend to become. However, the maximum degree of refinement attained by any given sample is influenced by pre-existing structure, and further, the rate of grain growth is not constant for all steels but rises rapidly in the "coarse grained" steels and tails off toward a limit; whereas in "fine grained" steels, the rate of grain growth is small in the early stages of heating through the stable austenitic range and, later, rises abruptly to high levels.

Normalizing Discloses Patterns

We also note that the size of the austenitic grains attained at maximum temperatures is not affected by changes in the cooling rates from those temperatures and, further, that rapid passage through the transformation range inhibits slight tendencies to further growth. In practice it is generally safe to assume that, unless the cooling rate is abnormally slow, the pattern impressed on ferritic structures observed at normal temperatures by pre-existing austenitic crystals has a direct relation to the maximum temperature attained in the heating process. These patterns are most commonly and most easily disclosed by normalizing since (at least in hypoeutectoid steels and especially those of some 0.30 to 0.35 per cent carbon) the ferrite tends to separate out at the boundaries of the austenitic grains, forming a network or print of prior forms. See Fig. 2. Within these boundaries the pearlite gathers in areas whose extent, for a steel of any particular composition, has a direct relation to the rate of cooling through the critical range. Within these areas or "patches", "colonies" may be detected,– "colonies" being defined as regions in which the pearlite consists of similarly oriented lamellae.

Among those properties of steel which are affected by the size of the austenite grains are the hardenability and machinability. Generally speaking the coarser the grain, the deeper the effects of the quench penetrate. Rough cuts are more easily taken on coarse grained steel, but fine-grained finishes better.

However, it should be observed that for any given austenitic grain size, the size of the ferritic grains which form within the original austenitic grain boundaries influences the hardness, toughness and strength at ordinary temperatures– the smaller these grains, the harder, tougher and stronger the steel. Deep drawing qualities, creep strength and electrical properties are also affected. With certain interesting exceptions, the size of the ferrite grains appears to be related to the size of the austenitic grains if the cooling rate is held constant. But

if this rate is increased, the ferrite may separate out along the crystallographic planes of the austenitic crystals, giving rise to the well known Widmanstatten structure, in which the ferrite is definitely of finer grain than if the steel be allowed to cool more slowly.

In the heating of steel for hardening, it is customarily recommended that we do not heat much above the top of the critical range because by so doing we coarsen the structure without material increase in the hardening power. Further, the danger of warping and cracking increases with rise in temperature above the minimum level required. It should be borne in mind that since the width of the critical range varies with steels of different composition, the temperature to which the steel must be heated varies likewise.

Heat Influences Strength

Practically it is necessary to raise the temperature some 50 to 100 degrees Fahr. above the upper limit of the range on a rising temperature, although it is sometimes desirable to take advantage of the fact that the upper limit of the range is lower on a falling temperature. This method of hardening on a falling temperature has the slight disadvantage of appreciably coarsening the structure, but there is, of course, less danger of cracking the piece.

In view of the prevailing tendencies toward the application of induction and resistance heating for hardening, the influence of the time during which the piece is held at temperatures above the upper limit of the critical range is of considerable interest. It is believed that the tensile strength, at least, of both hypo and hypereutectoid steels—particularly alloy steels—increases with increase in the duration of heating since the solution of the carbides is not instantaneous. Indeed, it is known that the carbides or oxides of the special elements added to carbon steel remain undissolved and unagglomerated over considerable time and temperature ranges, this characteristic, incidentally, being held responsible for inhibition of grain growth.

The mechanics of all varieties of cooling operations are readily visualized by means of the diagram shown in Fig. 9. It may first be observed that an increase in the cooling rate results in lowering of the lower limit of the critical range. It used to be assumed that this lowering of the transformation temperature was gradual, but investigations eventually revealed the fact that this phenomenon, while at first gradual, became quite sudden for a particular velocity called the "critical speed of quenching" or "critical cooling rate." Further research indicates that this critical rate varies for steels of different grain size and composition, especially if alloying elements are present.

When the cooling rate is sufficiently slow, transformation occurs at the normal temperature of around 1292 degrees Fahr., and the pearlitic structures characteristic of annealed steels appear. See Fig. 3. With acceleration of the rate of cooling, the pearlite grain becomes finer and finer, the transformation temperature dropping the while more and more rapidly until its eventual disappearance at relatively high levels and its reappearance at much lower temperatures. This discontinuity marks the boundary between structures of the pearlitic type and those of the acicular or martensitic type.

In years gone by, fine-grained structures of the pearlitic type and those resulting from the tempering of martensite were similarly identified as troostite and sorbite, but it now would appear desirable to discard these terms entirely because of their application to distinctive structures.

Thus we note that there are only two readily distinguishable mechanisms by which austenite transforms, and they relate, for any particular specimen, to the temperature of that portion of the austenite undergoing transformation. The first of these, characteristic of annealing and normalizing operations, involves the

simultaneous formation of ferrite and carbide layers directly from austenite by a steady encroachment of roughly parallel plates or lamellae upon the receding austenite boundary. The latter, generally known as the acicular reaction, characteristic of hardening steel, is marked by the successive abrupt formation of flat plates of supersaturated ferrite along certain crystallographic planes of the austenitic grains.

During this action the supersaturated ferrite begins to reject carbide particles (rather than lamellae) at a rate which depends on the temperature of transformation. If this temperature of transformation lies below some 300 degrees Fahr. as a result of a very rapid quench in a cool bath, the steel, if immediately lowered to atmospheric temperature, exhibits the familiar martensitic form and consists of highly supersaturated, strained ferrite in which, in all probability, the precipitation of the carbides has not occurred to any large extent. See Fig. 8.

Preheating Precipitates Carbon

If this martensite be reheated as in tempering operations, a multitude of carbide particles are precipitated in forms known as troostite and sorbite (if coalescence of the particles has proceeded far enough as a result of reheating). But no amount of reheating, short of a return to the austenitic condition and subsequent cooling through the critical range, will produce a lamellar distribution of the ferrite and the carbide, characteristic of the pearlitic reaction.

By way of exemplifying the nature of the facilities required, one or two illustrations of more modern developments in the field of heat treatment will be given. In Fig. 6 is an electrically heated 2000-kilowatt 550-volt 3-phase car-type furnace capable of maximum temperature of 1650 degrees Fahr. This type of furnace is particularly adapted to annealing.

Fig. 5 exhibits an electrically heated salt-bath furnace, having a maximum operating temperature of 1000 degrees Fahr. and using 24 immersion-type units. Salt baths of this type are especially employed in tempering operations and have the great advantage of securing uniform heating of the steel and offering protection from scaling. Such tempering baths are commonly composed of sodium nitrate and potassium nitrate, either alone or mixed in various proportions, best determined by the manufacturer of the furnace. After the tempering operation the work is usually quenched in hot water to remove the salts. Tempering baths should not be heated above 1100 degrees Fahr. since decomposition sets in at this temperature.

Fig. 10 shows an interesting layout, including two tempering furnaces and

two vertical cylindrical electric furnaces for the heating of tubular parts prior to the quench in the oil tank. One of the major problems of heat treating thin-walled tubular parts has been the excessive cooling during transfer to the quenching tank. In this case, the transfer is accomplished by bringing a transfer hood over the furnace by means of a high-speed hoist and pulling up the charge quickly inside the hood. The latter is then quickly positioned over the oil bath and the charge rapidly dropped. Thus cooling off is minimized and scaling during transfer largely avoided.

Uses Three Types of Fuels

Speaking of scaling, this particular arrangement is provided with "atmosphere gas converters" which maintain an inert atmosphere in the furnace. A typical analysis of such an inert atmosphere is 20 per cent carbon monoxide, 2 hydrogen and the balance nitrogen. This is produced by burning fuel gas within a chamber under carefully regulated conditions of pressure and fuel-air ratio, then passing the products of combustion through a surface cooler where most of the moisture is removed. If all of the moisture must be removed to reduce the hydrogen content of the product, an activated alumina drier may be used. Thereafter, the gases pass through incandescent charcoal, which converts any carbon dioxide and water vapor into carbon monoxide and hydrogen. Filtration to remove all charcoal dust and subsequent metering complete the process.

Fig. 11 shows a chain-belt-conveyor type furnace which may be arranged to use oil, gas or electric heat under conditions of atmosphere control. The product is loaded directly on heat-resisting cast link conveyors which carry it through the furnace and deliver it through a sealed chute to the quenching medium (or directly from the furnace, if required). Furnaces of the type shown are capable of handling a wide variety of products from aircraft parts and tractor links to small tools and spring clips.

For the specialized purpose of hardening and tempering shell bodies, the furnace shown in Fig. 12 may be employed. The forgings are pushed through the hardening and tempering furnaces in parallel rows in tubes filled with non-scaling atmosphere. Automatic quenching is carried out between the furnaces without the work contacting the air. This particular installation is equipped with 10 conveying tubes, but recently completed arrangements provide for 15.

Fig. 13 shows a continuous rotary-hearth type furnace designed to heat treat large forgings of special shapes and sizes. This furnace is oil fired.

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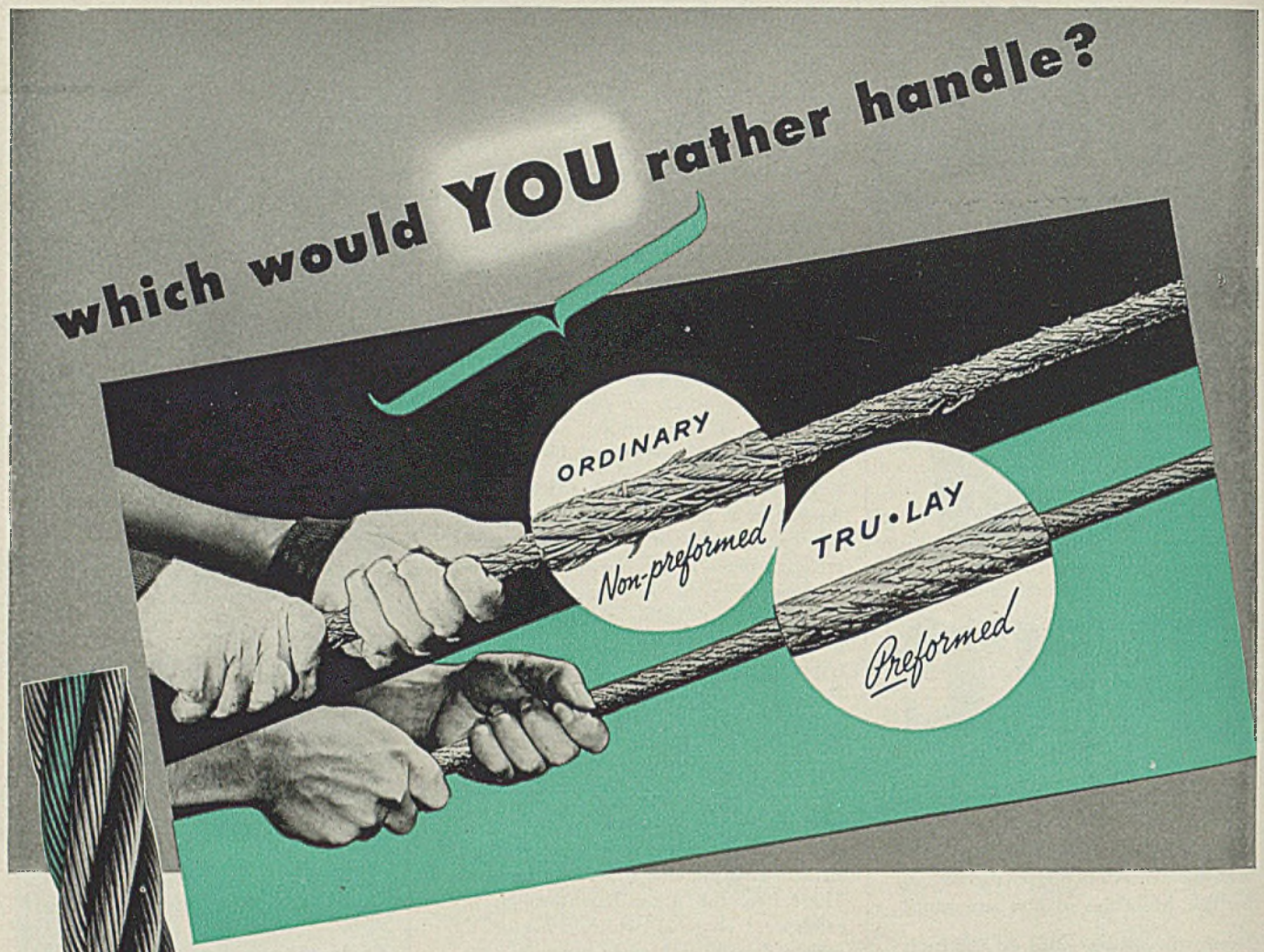

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