orkers put finishing touches on first pilot model stoves in reconverting plant. Page 96

STEEL

The Magazine of Metalworking and Metalproducing

FEBRUARY 14, 1944

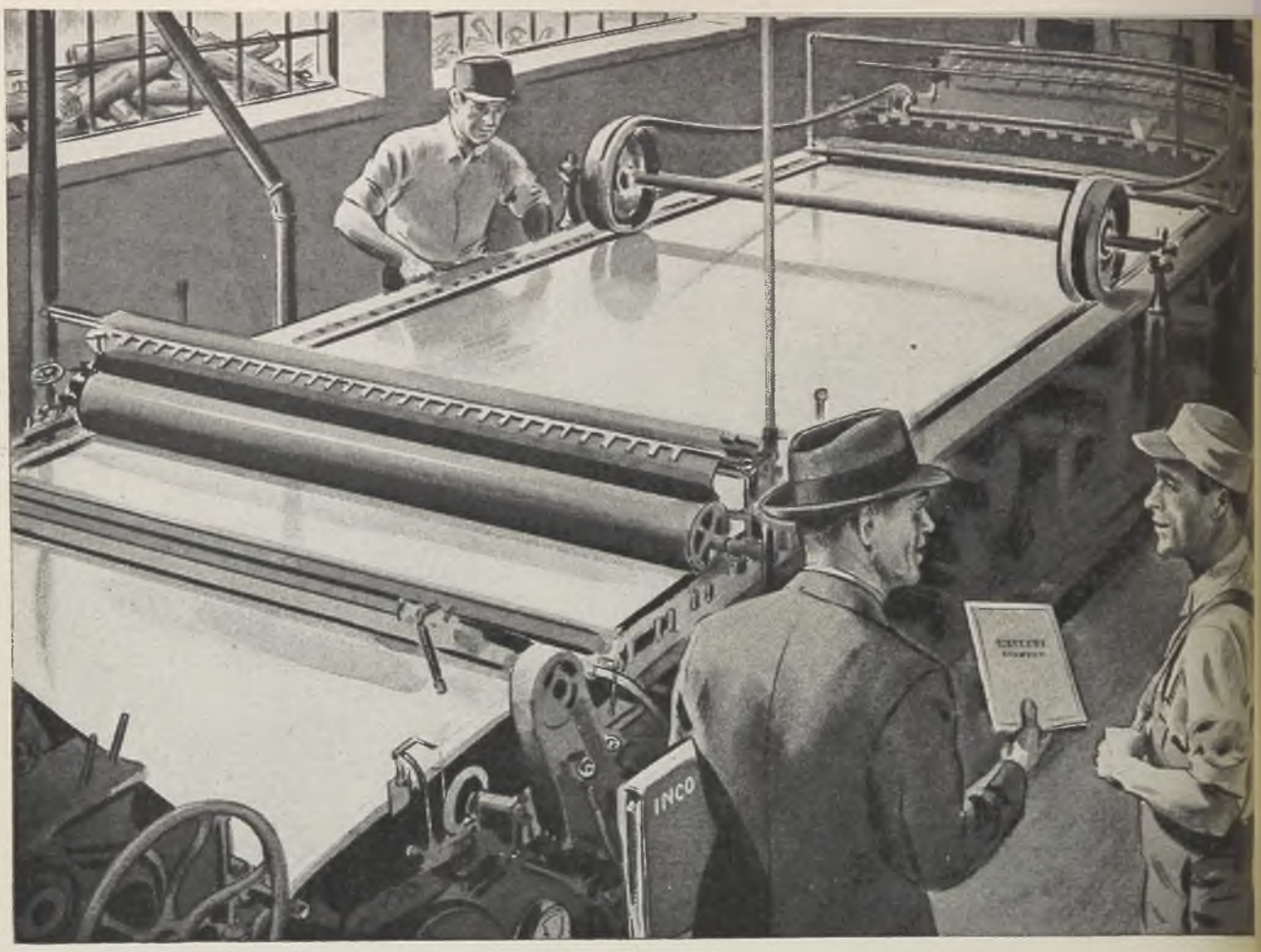
Volume 114—Number 7

NEWS

TECHNICAL

FEATURES

MARKETS



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STEEL
February 14, 1944

Postwar Taxes for Industry

In a meeting on "America Dreams and Plans" arranged by the New York Times, Wendell L. Willkie on Feb. 2 delivered an address dealing chiefly with federal fiscal policy which merits the close attention of every taxpayer and particularly of individuals concerned with the taxes paid by industrial corporations.

Few newspapers carried the Willkie speech in full. Those which reported it in part or commented upon it emphasized his proposal to increase taxes now, even to the extent of lowering the cost of living. His views on postwar budgets and postwar taxes on private enterprise—of direct interest to industrialists—were not widely quoted.

Stated briefly, Mr. Willkie's program for postwar taxation for industry calls for a simple corporation tax; elimination of the excess profits levy, the declared value excess profits tax and the capital stock tax; a consideration of incentive taxation; liberalization of the present provisions by which businesses carry forward losses of two years only and an attempt to iron out the "double taxation" feature whereby dividend money is taxed at the source and again when it reaches the stockholder.

Mr. Willkie suggests that the postwar corporation tax should be a "single, ungraduated tax applicable to the net income of all corporations earning more than a given amount per year—say $25,000 or $50,000. The rate on corporations earning less should be somewhat lower."

In proposing elimination of the declared value excess profits and capital stock taxes, he refers to them as the "guessing game tax" and contends that they "accomplish no constructive purpose."

He suggests consideration of incentive taxes on the ground that business and industry need to be stimulated to adopt policies that will expand employment and advance the welfare of society. He urges liberalization of the loss carry-over provision in the interest of stability.

Mr. Willkie said that he put forth these tax suggestions, "not as a comprehensive plan but as illustrations of the kind of measures necessary in order to preserve a system operated by free men on their own initiative—a system that will unleash the energies of our citizens, that will give them a chance to go ahead, that will allow the establishment of new industries and will raise the living standards of the people."

The nation's fiscal policy is one of the weakest elements in our present internal economy. Industry will hope that Mr. Willkie's one-man crusade will point the way to a more constructive policy.

DON'T UNDERESTIMATE: Is it possible that American manufacturers generally are underestimating the difficulties of reconversion from a wartime to a peacetime basis?

We ask the question because returns from a questionnaire sent out by the editors of this publication show that about three quarters of the companies reporting declare they can reconvert "immediately", providing that the necessary materials and equipment are available. The results of this study will be presented in detail in forthcoming issues.

Meanwhile, a company of moderate size, having completed its war work and having spent six months in the process of reconverting to the manufacture of stoves, reports it is encountering unexpected difficulties. Not only is it handicapped in obtaining equipment, but it is confronted with serious problems in renegotiating labor contracts. The peacetime operations involve job classifications and work schedules differing drastically from those effective

(OVER)

on war work. The adjustments entail consideration of numerous delicate issues.

Don't take the reconversion job too lightly. Possibly some of the manufacturers who think they can change over "immediately" have not given due consideration to all of the problems. Watch the experience of those few who are getting a head start in reconversion. —p. 96

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BETHLEHEM'S 9000: As time goes on more and more men discharged from the armed services will be seeking jobs in industry. From every conceivable standpoint, it will be desirable that employers go to extraordinary pains to make certain that these men are placed in the kind of work to which they are best adapted.

Already Bethlehem Steel has 9000 ex-service men —4000 of whom are former Bethlehem employes— in its steelworks, shipyards and mines. Personnel officials are watching each case closely in an effort to develop from day-to-day experience the best possible policies for use when demobilization takes place on a large scale.

Some of the returning employes have taken up old jobs where they left off. Others have had to be trained for jobs other than those they held before the war. Malaria cases require special attention. Ex-Seabees are in high favor because they are well trained and have acquired the will to get things done. Rates of turnover and of absenteeism among ex-servicemen do not seem to differ much from those of other employes. —p. 74

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RUNS TRUE TO FORM: OPA is studying the financial reports of major steel producers and when the work is finished will have, according to Price Administrator Chester Bowles, "the most complete survey ever made of steel industry costs."

The study is to be used by OPA for guidance in determining steel prices. On the basis of preliminary information, OPA officials believe that no general increase will be authorized but they hint that piecemeal price advances in certain items may follow closely the completion of the survey.

This prediction ties in nicely with recent government policy. Employes have had two wage increases aggregating 25 per cent since prices were frozen. The unions are trying hard to break the "Little Steel" wage formula. Producers are pinched between rising costs and the price ceiling. The government attitude is to be lenient on wages and as tough as possible on prices. A "piecemeal" price rise would run true to form. —p. 69

THERMIT'S WAR ROLE: War has brought forth an unusual demand for stern frames for ships, freight car underframes of special design, extra long rolls, heavy crankshafts, etc. Many of these parts are too large or heavy to be forged or cast in one piece economically. Therefore, they must be fabricated and this involves the joining of heavy sections.

In working out a production technic for this work, engineers recalled that for many years thermit welding has been used for repairing heavy sections such as locomotive frames, machine frames, housings, pinions, etc. Why not adapt this process to production?

This has been done. In some instances the volume of work is such that permanent patterns can be used instead of the wax patterns usually employed in repair work. The repetitive nature of production also has ushered in other shortcuts and simplifications rarely afforded the thermit process when used for intermittent repairs. —p. 102

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WILLIAM J. FILBERT: In every field of endeavor and in every organization there are persons who render outstanding service but who, for numerous reasons, remain more or less in the background while others stand out in front to receive publicity and acclaim for the achievements of the group. Sometimes a man who works largely behind the scenes in this manner wields a powerful influence among his associates.

Such a man was William J. Filbert, who passed away Feb. 4. For 30 years he was comptroller of the United States Steel Corp. and during a large portion of this period the influence of his administration of the accounting and fiscal affairs of the corporation and of his counsel on many of its problems extended far beyond the ordinary scope of the office to which he held title. Only in the later years of his activity in the corporation did he begin to receive public recognition for his great contributions to the steel industry.

For the most part Mr. Filbert served inconspicuously, but he served exceedingly well. —p. 94

E. L. Shaner

EDITOR-IN-CHIEF

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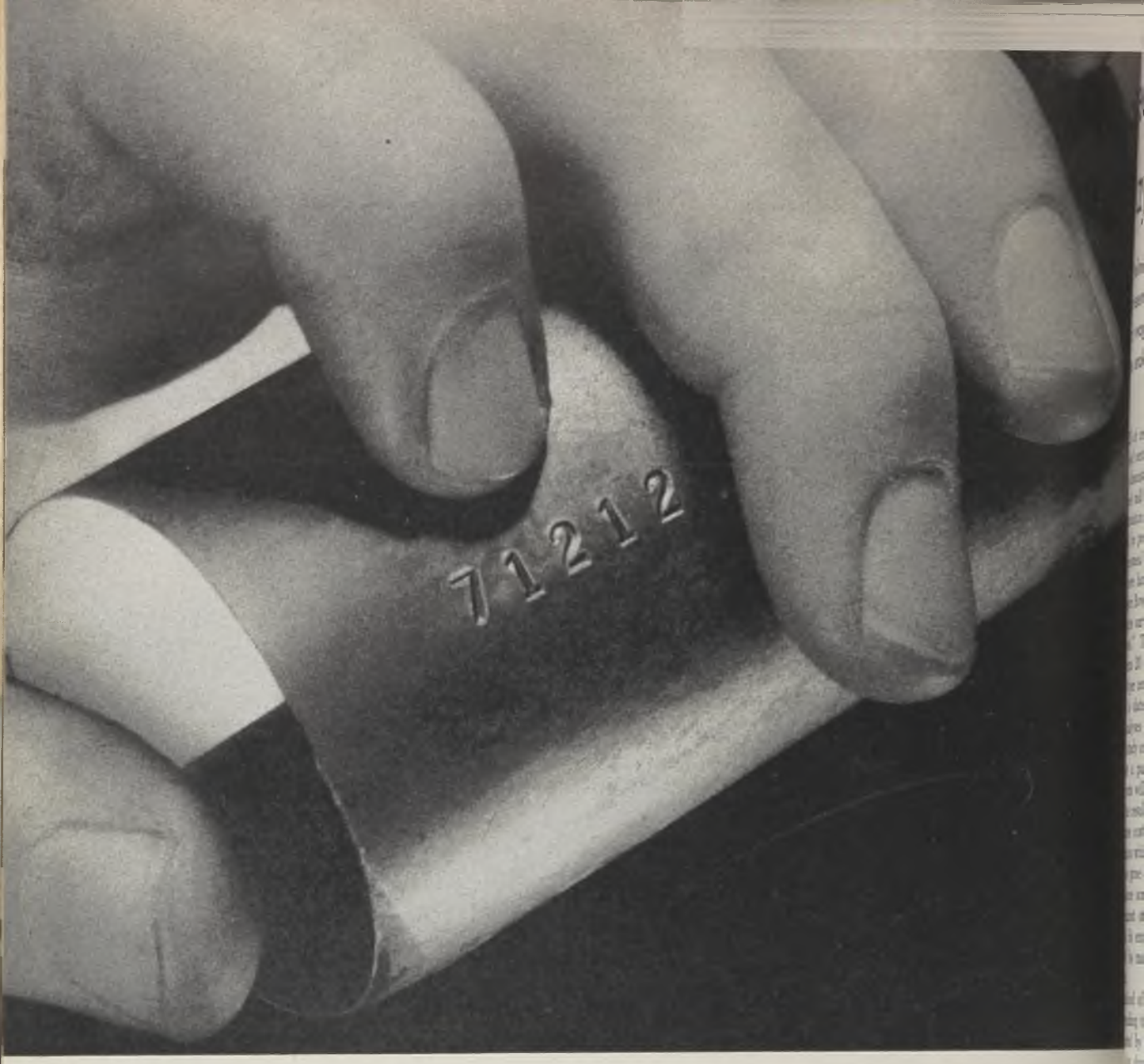

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Piecemeal Price Rises May Follow OPA Survey

Preliminary information indicates general increase unlikely at present. Study coincides with campaign of United Steelworkers for wage increase. Similar investigation of alloy steel costs will be undertaken soon

WASHINGTON

PRICES of certain steel products may be increased next month when the Office of Price Administration completes its survey of steel mill costs, although preliminary information indicates no general increase will be permitted at present.

The piecemeal changes in the price structure were hinted by Price Administrator Chester Bowles in announcing "the most complete survey ever made of steel industry costs." The study covers financial data from 20 major producers, representing 90 per cent of tonnage capacity, from 1936 to date, in addition to steel mill cost analyses for November 1943. The current study covers only carbon steel products, but a parallel investigation of alloy steel costs will be undertaken soon.

"Should the results of the survey indicate that some costs have increased beyond realization while costs of some other products have gone down, it may be possible to balance some individual ceiling increases against other decreases," Mr. Bowles said. He emphasized that no decision would be made before the study is completed.

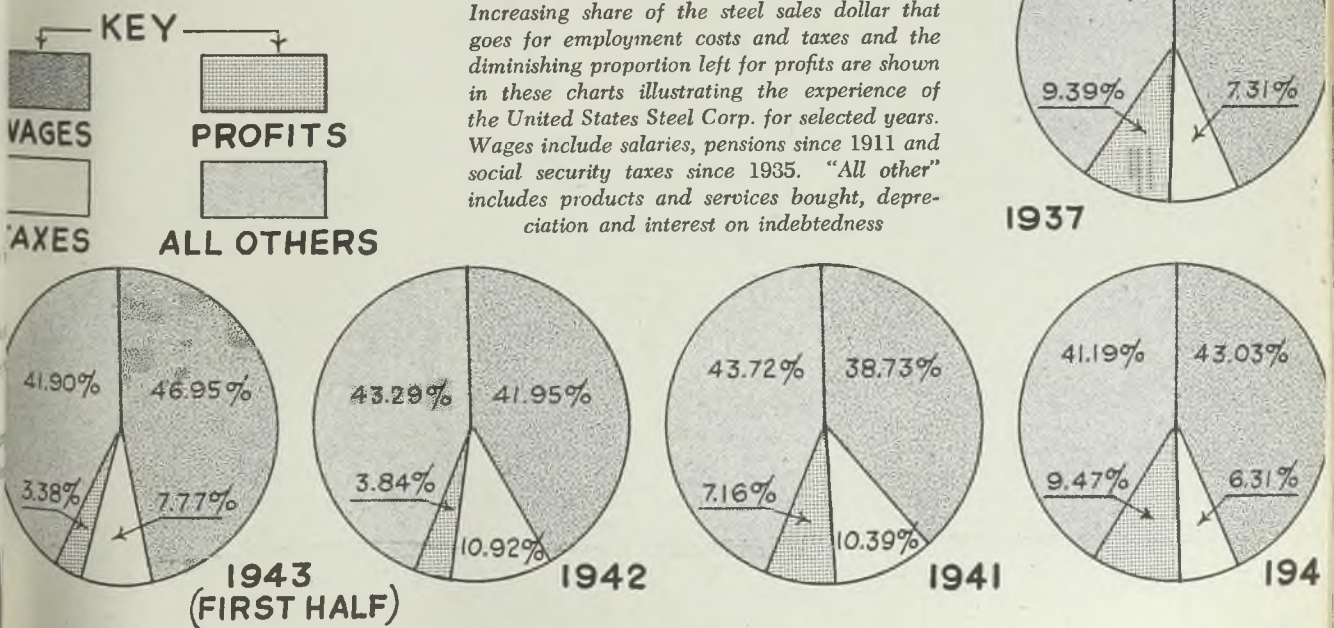
The likelihood of any price increases in steel spreading to other commodities was discounted by the OPA chieftain. "We know that, should increases in some steel prices be found necessary, this will not require any price increases for other basic materials in the industrial price area. In wartime price control, the maximum price of each commodity must be fixed and adjusted by applying general standards to the particular situation in the particular industry. Wartime price control obviously takes no account of the 'sympathetic,' 'bellwether,' or speculative influences which sometimes lead to simultaneous movements in the prices of several commodities under normal peacetime conditions."

The OPA cost study coincides with the campaign of the United Steelworkers of America to obtain wage increases and other concessions which, if granted, would further increase steelmaking costs sharply. The National War Labor Board now is considering the union's demands, having voted to take jurisdiction over all steel wage disputes.

Earnings statements of steel producers generally are reflecting the effects of increased labor and general costs and frozen steel prices. Since prices were frozen in the spring of 1941, steelworkers have been granted two pay increases aggregating 25 per cent of the basic rates in effect when the price ceiling was ordered. Thus,

How Steel's Dollar Is Divided

Increasing share of the steel sales dollar that goes for employment costs and taxes and the diminishing proportion left for profits are shown in these charts illustrating the experience of the United States Steel Corp. for selected years. Wages include salaries, pensions since 1911 and social security taxes since 1935. "All other" includes products and services bought, depreciation and interest on indebtedness



in spite of capacity operations, earnings generally have declined since the outbreak of the war and for many companies are below normal peacetime years.

For example, the United States Steel Corp. reported a 1943 net income of slightly more than $63 million on a production of approximately 30 million tons of steel. In 1937, the corporation earned $95 million on a production of about 20 million tons. Employment costs in 1937 were only $447 million, compared with last year's payroll of $869 million.

The increasing proportion of the steel sales dollar that is consumed by employment costs and taxes—at the expense of profits—is illustrated in the accompanying charts, which are based on the experience of U. S. Steel. Employment costs, including wages, salaries, pensions and social security taxes, now are taking 47 cents of each sales dollar, compared with 28 cents in the corporation's first full year, 33½ cents during the first World war, 37 cents in 1929. Taxes, which amounted to little more than a half cent in 1902, took nearly 11 cents in 1942, and about 8 cents last year. Earnings which amounted to more than 21 cents in 1902 and 9½ cents in 1937 now account for barely more than 3 cents of the sales dollar.

The steel industry's ability to absorb the vastly increased costs since the freezing of prices has been due chiefly to the building up of manufacturing operations to full capacity and the resulting economies from such great production. That operation, however, cannot be repeated and any further increases in costs likely would consume the modest profits producers now are reporting and leave them with deficits.

Recession in Operations Probable

Furthermore, as demands for munitions decrease, some recession in operations is probable; with costs at present levels, such recession would not have to be great to drop below the "break even" point, and handicap the industry in preparing for return to a peacetime economy.

As Enders M. Voorhees, chairman of the finance committee of the United States Steel Corp., recently told the Senate Finance Committee, "a full order book must bear the costs of a lean order book. Depression losses are boom costs."

The cost study now under way was started in co-operation with OPA's steel mill products industry advisory committee when the United Steelworkers announced their campaign to break the "Little Steel" wage formula last December. At that time, leaders in the industry announced that if employment costs were increased by the granting of any considerable part of the union's demands they would have to seek a compensating increase in steel prices.

The cost information on carbon steels is being supplied by the following companies: United States Steel Corp. (all five operating subsidiaries); Bethlehem Steel Corp., Republic Steel Corp., Jones & Laughlin Steel Corp., Youngstown Sheet & Tube Co., Inland Steel Co., Wheeling Steel Corp., American Rolling Mill Co., National Steel Corp., Pittsburgh Steel Co., Sharon Steel Corp., Colorado Fuel & Iron Corp., Lukens Steel Co., Alan Wood Steel Co., Wisconsin Steel Co., Continental Steel Corp., Keystone Steel & Wire Co., Granite City Steel Co., Mahoning Valley Steel Co. and National Supply Co.

Members of the general steel products advisory committee are: Avery C. Adams, United States Steel Corp.; J. W. Anderson, Sheffield Steel Corp.; Homer Butts, Niles Rolling Mill Co.; Norris J. Clarke, Republic Steel Corp.; James A. Henry, Weirton Steel Co.; Paul Mackall, Bethlehem Steel Co.; J. L. Neudoerfer, Wheeling Steel Corp.; N. H. Orr, Colorado Fuel & Iron Corp.; L. M. Parsons, Jones & Laughlin Steel Corp.; A. C. Roeth, Inland Steel Co.; W. E. Watson, Youngstown Sheet & Tube Co.

Data for the cost study for alloy steel will be obtained from the following companies: Carnegie-Illinois Steel Corp., Bethlehem Steel Corp., Republic Steel Corp., Wisconsin Steel Co., Rotary Electric Steel Co., Copperweld Steel Co., Crucible Steel Co. of America, Andrews Steel Co., Youngstown Sheet & Tube Co.

Members of the alloy steel advisory committee are: W. H. Colvin, Rotary Electric Steel Co.; A. T. Galbreath, Crucible Steel Co. of America; Frank L. Gibbons, Carnegie-Illinois Steel Corp.; W. J. MacKenzie, Youngstown Sheet & Tube Co.; Martin H. Schmid, Republic Steel Corp.; Rufus S. Tucker, Bethlehem Steel Corp.; S. D. Williams, Copperweld Steel Co.; H. H. Ziesing, Midvale Co.

"We know that, should increases in some steel prices be found necessary, this will not require any price increases for other basic materials in the industrial price area. In wartime price control, the maximum price of each commodity must be fixed and adjusted by applying general standards to the particular situation in the particular industry." . . . . **Chester W. Bowles**, price *administrator, OPA.*

AFL Members of War Labor Board Ask Junking of "Little Steel" Formula

FOUR American Federation of Labor members of the War Labor Board last week launched a new attack on the administration's wage stabilization policies. The members—George Meany, Mathew Woll, Robert Watt and James Brownlow—petitioned the board to request the President to modify his stabilization order, junk the "Little Steel" formula and adopt a new "realistic figure based upon the actual cost of living."

Their demand was based on a contention that price controls have fallen so far short of goals that "the only recourse left to workers is to obtain wage rate increases.

Labor's acceptance heretofore of the wage formula has "apparently been misinterpreted in the halls of Congress," the AFL men said.

The "Little Steel" formula supposedly limits wage increases to 15 per cent above the levels of January, 1941. The WLB adopted it originally in the summer of 1942 on its own initiative and on the grounds that the increase in the cost of living between January, 1941, and May, 1942, amounted to 15 per cent. Several rulings by the WLB have been widely interpreted as circumventions of its own formula.

The Congress of Industrial Organizations also is conducting a campaign for junking of the formula.

Provides Renegotiation Appeals

Forty per cent normal and surtax rate on corporate income retained. Social security rate frozen at 1 per cent. Excess profits tax rate raised to 95 per cent

WASHINGTON

CONGRESS last week completed action on the new general revenue bill which adds $2,315 million additional taxes but falls more than $8 billion short of the additional revenue requested by the administration last October. The new bill, Senator George (Dem., Ga.) estimates, will bring total revenue for a full year's operation to $40,840,200,000.

Final vote in the House was 238 to 101 and since there was no particular fight against the measure on the floor, many observers believed the President would allow the bill to become law without his signature.

Although the total revenue to be realized by the measure will be far below the administration's wishes, the Roosevelt forces won a long battle over changes in the contract renegotiation law.

As it stands now, a six-member price adjustment board would be created to handle renegotiation of war contracts, and its work would be subject to review by the Court of Tax Appeals. Cases already settled cannot be appealed. The section relating to renegotiation embraces standards for determining what are excess profits and provides that all items allowed as deductible for income and excess profits tax purposes be allowed as items of costs in renegotiation.

Declines Senate's Recommendation

The House refused to accept a Senate recommendation that reconversion problems should be considered and that profits after taxes should be the basis for renegotiation. An amendment to exempt machine tool builders from renegotiation also was defeated.

A Dec. 31, 1944, deadline for renegotiation is established in the bill, with six months' leeway given the President.

Other provisions of the bill of particular interest to industry:

The 40 per cent normal and surtax rate on corporate income retained. Treasury had proposed it be raised to 50 per cent.

Excess profits tax rate raised from 90 to 95 per cent. A large part of this would have been recovered through renegotiation. Corporations will get a postwar refund of 10 per cent of the amount they pay in excess profits taxes.

Social security taxes were frozen at 1 per cent. Rate on payrolls was scheduled to advance to 2 per cent Jan. 1.

Credit allowed on invested capital over $200 million was retained at 5 per cent. The rate for $10 million to $200 million was set at 5 per cent, for $5 million to $10 million at 6 per cent, and for under $5 million the rate is unchanged at 8 per cent.

The last-in-first-out inventory method of computation was made to include taxable years beginning with 1941. The bill continues existing treatment of partially worthless bad debts, and permits corporate contributions to veterans' organizations to be deducted.

The bill permits corporations emerging from receivership or bankruptcy to use the capital structure of the predecessor company for tax purposes, and certain reorganized companies would not have the basis of their property reduced by the amount of indebtedness canceled in the receivership process. The effect is to provide this relief for 1943 and subsequent years, and to provide for no gain or loss to the shareholder upon the receipt in 1943 of new securities for the old securities. Surtax credit for dividends paid on preferred stock of public utilities would not include "any amount distributed in the current taxable year with respect to dividends unpaid and accumulated in any taxable year ending prior to Oct. 1, 1942."

The bill retains the provision calling upon such organizations as labor unions for reports on their financial activities, under perjury penalties.

Present, Past and Pending

■ STRIKES COST 13,500,200 MAN-DAYS IN 1943

WASHINGTON—During 1943, 3750 strikes involving 1,900,000 workers cost a total of 13,500,300 man-days, according to Secretary of Labor Perkins.

■ COMPLETES LST CONTRACT AHEAD OF SCHEDULE

PITTSBURGH—American Bridge Co. has completed a Navy contract for 40 LSTs ten days ahead of schedule, and is starting on a large new order of the invasion vessels for delivery this year.

■ POSTWAR PROVING GROUND TO BE ESTABLISHED

KENOSHA, WIS.—Nash-Kelvinator Corp. has purchased a large tract of land here for establishment of a model proving ground for postwar development of automotive designs.

■ MEXICO TO INSTALL MODERN STEEL MILL

MEXICO CITY—A modern steel mill will be installed in Aguascalientes by the American Railroad Mission of Rehabilitation for the manufacture of equipment for the Mexican railways.

■ ENAMEL WARE INCREASE DOUBTFUL

WASHINGTON—Possibility of increasing production of enamel ware remains doubtful, pending development of military operations in Europe, according to WPB officials.

■ BELL AIRCRAFT PLANS TWO NEW MODELS

BUFFALO—Production of "two new models" will be started here by Bell Aircraft, which is winding up production of the P-39 Airacobra, now termed "an old model." One of the new models is expected to be a vastly improved version of the Airacobra.

■ ASK INCREASED SHEET ALUMINUM OUTPUT

WASHINGTON—War Production Board last week called on aluminum sheet producers to step up production. Officials say the projected 60 per cent increase in airframe weight of planes in 1944 creates increased demand and that output is near the critical state.

■ STEEL INSTITUTE WILL MEET MAY 25

NEW YORK—Fifty-third general meeting of the American Iron and Steel Institute will be held May 25 at the Waldorf Astoria hotel here. Program will include morning and afternoon sessions with a dinner in the evening.

■ PROPOSES PIPELINE TO TAP ARABIAN OIL

WASHINGTON—A government-financed pipeline from the Persian Gulf to the Mediterranean, a distance of 1000 to 1200 miles, to tap unexploited Arabian oil fields has been proposed by Harold L. Ickes as head of the Petroleum Reserves Corp. Senate investigation of the plan has been asked.

■ CHICAGO FOUNDRY WORKERS STRIKE

CHICAGO—Approximately 2500 foundry war workers in 26 plants left their jobs Feb. 7 on a three-day strike in protest against refusal of the War Labor Board to approve a 6-cent hourly wage increase which had been negotiated by the union and the foundry owners.

Early Legislative Action Sought

Special Senate committee recommends prompt and equitable settlement of terminated contracts. Advances property and plant disposal plan. Would set up new board to develop policy

SPECIAL Senate Committee on Postwar Economic Policy and Planning, of which Senator George (Dem., Ga.) is chairman, last week recommended to Congress that immediate consideration be given legislation to facilitate and guide industrial demobilization.

Declaring in its statement of general policies that the paramount consideration in handling all demobilization problems should be the preservation and strengthening of the American system of free competitive enterprise, the committee proposed that a contract termination policy be quickly established followed by the creation of an Office of Demobilization, and the shaping of definite policy for disposition of government-owned surplus plants and property.

With respect to contract cancellation, it proposed speedy settlement procedure, procedure which would assure contractors immediate payment of 100 per cent of claims for finished goods and direct inventory costs, and up to 90 per cent of all other claims. Settlement of claims on what the committee called an overall basis was recommended, with claims arising from prime contracts and related subcontracts handled together. Further, the government could purchase the rights of subcontracts. The report explains that the settlement of claims on an overall basis would be something like "renegotiation in reverse."

As recommended in the George committee's report, terminated contract settlements would not be subject to review by any government agency except where fraud is involved. When the government and the contractor fail to agree on a final settlement, the contractor would be given the right to appeal to an independent tribunal, either to a board of arbitration, a special review board created by the proposed Office of Demobilization, or to the United States Court of Claims. However, if a contractor elects to take his case to the arbitration board or the special review board he would be denied access to the Court of Claims.

In recommending its settlement procedure, the committee also proposed that contractors overstating their claims be penalized up to 1 per cent per month of the amount of overstatement. The government would be required, on the other hand, to pay a contractor 3 per cent interest on claims not paid within 60 days.

The committee also proposed that the personal financial liability upon disbursing officers for over-payments be eliminated as the amounts recoverable are relatively small and liability tends to slow down procedure. Penalties, however, would still apply in cases of fraud.

To keep plants in operation during the readjustment period, the committee recommended that contracting agencies be authorized to make direct loans to contractors and subcontractors and that loans by public and private financing institutions be guaranteed.

The committee maintained that government plants (involving investment of $15 billion) no longer needed for national defense should be disposed of in such way as to effect greatest economic use but that the effect of disposal upon the general economy be given first consideration in determining proper disposition.

All plants suitable for peacetime production and not needed for national defense, the report goes on, should be sold where this is possible without causing ruinous over-production in any industry. The plants, the report said, might be leased for a period sufficiently long to determine the effect of their operation upon the peacetime economy.

In basic industries, the committee takes the position that plant disposal authority be withheld until the nation's postwar for-

(*Please turn to Page* 182)

CHAMP WOMAN WELDER: Vera Anderson, 20-year-old welding instructor at the Ingalls Shipbuilding Corp. yard at Pascagoula, Miss., recently defended successfully her title as world's woman welding champion. Miss Anderson also was chosen one of the ten outstanding women of the year by the Associated Press and also by a national woman's magazine. She appeared on the program of the National Association of Manufacturers Convention last December

New Contract Termination Bill To Be Introduced in Senate Soon

Senator Murray tells delegates to annual meeting of Screw Machine Products Association of new measure aimed at facilitating equitable and prompt settlements; also to provide necessary interim financing

AN OMNIBUS war contract termination bill to be introduced shortly in the Senate to provide machinery for reconversion of war material producers to peacetime operations was discussed in New York recently by Sen. James F. Murray, Montana, chairman of the subcommittee on contract termination of the Senate Committee on Military Affairs.

Speaking at the annual meeting of the National Screw Machine Products Association at the Waldorf Astoria hotel, he said the bill in addition to supplying legislation for prompt and equitable settlement of all claims up to 90 per cent arising from terminated war contracts will permit adequate financing for small business during the period between termination and final settlement of the contracts.

He declared that the Baruch-Hancock uniform termination clause does not modify in any way the need for comprehensive legislation, and added that the bill calls for the creation of a director of contract termination. This director, he explained, would co-ordinate the operations of all government contracting agencies on problems of interim financing, defective contracts and appeals —questions which have not yet been settled by the Baruch-Hancock committee. At the same time, he added, the proposed legislation would clarify the relations between the contracting agencies and the general accounting office by maintaining the present functions of that office.

At a panel meeting of the association, Tell Berna, general manager, National Machine Tool Builders Association, stated he did not believe exports would provide the answer to the machine tool surplus. The only country likely to take any appreciable quantity of such tools is Russia, he said.

He did not share the optimism expressed in some quarters that China would provide a good outlet. China's primary interest, he said, will be such tools as hoes and spades, rather than cylindrical grinders and milling machines.

England and Australia, he remarked, face a surplus problem similar to this country's.

Hot Dip Galvanizers To Meet in Chicago

Annual meeting of American Hot Dip Galvanizers Association Inc. will be held at the Blackstone hotel, Chicago, Feb. 24 and 25.

Speakers include representatives from the Zinc and Conservation divisions, War Production Board; E. V. Gent, secretary of American Zinc institute; F. W. R. Pride, general counsel, Navy Price Adjustment Board; and Wallace G. Imhoff, technical director of research of the association. A. T. Baldwin, Hanson-Van Winkle-Munning Co., Matawan, N. J., will talk on galvanizing fluxes.

Attendance at this meeting will be by invitation only.

Metals Society Celebrates Silver Anniversary

Fourteen of the 29 members who signed applications in Cleveland 25 years ago forming the first chapter of the American Society for Metals, one of the three largest technical societies in the country with more than 18,000 members, were present at the silver anniversary of the society last week in Cleveland.

Dr. Marcus A. Grossman, president of the society and director of research, Carnegie-Illinois Steel Corp., spoke on the "Hardenability of Steel and Effect of Alloys."

The history of the society was outlined by Joseph V. Emmons, metallurgist, Cleveland Twist Drill Co., Cleveland. He is the inventor of a development in tool steel which made many high-speed tools possible despite the lack of tungsten.

Steel Founders' Meeting At Chicago Well Attended

Forty-second annual meeting of the Steel Founders Society of America at Edgewater Beach hotel, Chicago, Feb. 9-10, attracted more than 350 registrants to hear a comprehensive discussion of both managerial and technical subjects of concern to the steel casting industry.

Thornton Lewis, Public Service Branch, Readjustment Division, Army Service Forces, explaining contract termination procedure, stated further adjustments are in prospect and that eventual refinement of the process should minimize what disruption will result from wholesale contract termination at the conclusion of the war.

Wilfred Sykes, president, Inland Steel Co., addressed the Thursday luncheon meeting.

Scrap Procured from 30 Nations

Imports by Foreign Economic Administration not for stockpiling but for current remelting, Benjamin Schwartz, chief of Scrap Metals Section, tells scrap men

SCRAP metals were procured in 30 countries for the steel mills and metal refiners of the United States during 1943, under direction of Foreign Economic Administration, Benjamin Schwartz, chief, Scrap Metals Section of FEA, told a meeting of the New York chapter, Institute of Scrap Iron and Steel, at the Pennsylvania hotel, New York, recently.

Mr. Schwartz, formerly director general of the institute, also stated that lack of scrap metals in Germany will soon make itself felt as a strong contributory factor in the collapse of that country.

"Before the war the U. S. was a scrap exporter to the world," declared Mr. Schwartz, "but during the war emergency the flow of scrap was reversed for the first time. In the postwar period it is expected that scrap exports will be resumed from this country.

"Scrap is imported, not for stockpiling, but for current remelting. The program is geared to the domestic scrap situation, and as scrap supplies in this country reach a balanced position, it is expected that the necessity for scrap imports will diminish rapidly.

"Military scrap requires special handling in theaters of operation and is not included in the movement of commercial sources of scrap from the 30 countries mentioned.

"In 1918 German steel production dropped sharply on account of the lack of scrap. The scrap situation in Germany today is becoming critical. Although German army salvage units have been efficient in utilizing battlefield scrap, the initiative and the opportunity for continuing this undertaking is now being denied to them.

"The scrap resources of the world are a vast mine of metals above the surface of the earth, supplementing the diminishing veins of iron ore beneath. Our program has been to translate into scrap, the obsolete and the obsolescent, the abandoned and the sunken instruments of our steel civilization, and through the remelting process, into potent weapons for the destruction of our enemies. The scrap has been acquired through outright donations, commercial purchases or reverse lend-lease. It has served a threefold purposes—as a strategic material, as an instrument of economic warfare against the enemy, and as vital ballast for returning ships."

Bethlehem Steel

By B. K. PRICE
Associate Editor, STEEL

This ex-marine, a veteran of the Guadalcanal campaign, formerly was a truck driver. He was hired by Bethlehem as a laborer and chainman and then was upgraded to the position of brakeman

WHILE still too early for industry, or government, or any other interested agency or person, to be able to fully appraise all the problems which eventually will be involved in rechanneling ex-service men into civilian work, experiences are accumulating, which not only are proving currently helpful, but are providing information which will stand in good stead when demobilization assumes truly important scale.

Recently, Eugene G. Grace, president, Bethlehem Steel Corp., Bethlehem, Pa., remarked at a press conference that his organization is now employing approximately 9000 ex-service men, of whom close to 4000 are former employes. With Bethlehem not only the second largest steel producer in the country, but the largest shipbuilder, this observation was of special interest.

What has been the general experience of Bethlehem in recruiting and properly placing these men? What measures are being taken for their training? What has been the attitude of the men? How about turnover? Absenteeism?

These and other questions were subsequently put up to personnel executives at certain of the company's leading plants.

A breakdown of the re-employment figures reveals that of the actual total of 8984, 334 saw combat, 319 of the latter having been honorably discharged because of physical or mental disability and 15 for other reasons. Of the overall total, 3810 were former employes, of which 63 had been in combat, with 57 released because of physical or mental disabilities. Of the general total, the steel division is employing 1944, of whom 1304 are former employes; the shipyards, 6980, of whom 2372 are former employes; and the mines, 150, of whom 134 are former employes.

So far, many of the former employes have been put right back on jobs where they left off. They know the work, and the great majority up to this time have returned hale and hearty. Still others, and especially many of those who were not former employes of the company, have had to take different jobs than they previously held in civilian life, and consequently have had to take special training. In many instances they have been brought in as helpers and have thus been given their initial training in that way, under the most practical circumstances possible. They are given the occupational rate of pay, and are stepped up as rapidly as their ability permits.

Certain others are put in apprenticeship classes, depending upon types of work and plant. For instance, at least one Bethlehem shipyard has such classes for three departments—hull, welding and burning, all other departments taking on men as helpers.

Application of ex-service men are given special consideration and study. A personnel man at one of Bethlehem's large steelmaking units said that each is treated as an individual with no set plan of action prevailing. This, he explained, is necessary to permit flexibility and to recognize individual problems and treat them as such. Records are reviewed and other information sought to determine the applicant's employment history.

Naturally, whenever possible, the fullest degree of his previous employment is utilized, as well as any specialized training received while in military service, and in arriving at a job selection the medical department is called upon to review the medical history and general health of the individual. Often, more frequently than not, the medical department counsels with the employment interviewer prior to final selection of a job.

The supervisor of the department to which the applicant is to be assigned is given the benefit of all discussions and findings of all parties concerned up to this point. The supervisor then assumes the primary obligation of seeing that the new man is given every reasonable help and consideration, and of keeping the medical and personnel departments informed of any unusual developments. In some cases, the medical department may require a periodic check-up. Adjustment interviews are always available.

Where ex-service men are not fit to return to their former respective lines of work, they usually adjust themselves to their new duties fairly readily, it is found. There is a satisfaction in knowing that despite their disabilities they can hold down a job, and in many cases a job that promises to be as good, if not better than they ever had, even though different. In various cases men are given work which they will likely never leave to go back to their old jobs, assuming that in time they will be able to do so, if they care to.

Take the case of one man, who returned from military service with an injured heel. He previously had been a molder at one of the Bethlehem plants, but the nature of his ailment was such that doctors advised that he keep away from moisture as much as possible—and the pouring floor of the average foundry is obviously not the driest spot conceivable. The heel, the doctors said, might trouble him for as long as 10 years. So, upon his return from the service last November he was put to work in a ma-

its Returned Soldiers Into Jobs

Second largest steel producer now employing about 9000 ex-service men, many former employes. Experience gained now in channeling veterans into civilian work seen as providing basis for policy in demobilization period. Pulse of real problem just beginnina to be felt

chine shop, as a "learner" on a Gridley automatic. Today, he is ranked a class A Gridley operator. His seniority rights still hold over in the foundry department and will still be holding 10 years from now, but his buddies in the machine shop are betting he will never go back.

Some cases are appearing where the men may later be ready for a return to civilian work, but are not ready yet.

Interestingly, in the treatment of malaria cases, where the men are subject to periodic chills, it has been found necessary, at least at one plant, to send the men to a hospital, as the plant dispensary is not permitted to have quinine or the synthetic quinine, which of necessity is now being generally used.

Figures developed so far on turnover among ex-service employes fail to show much variation from average one way or the other. However, it is apparent that turnover among those who were formerly employed by the company is less than those who were not.

Conclusive figures are not yet available on the question of absenteeism. Certainly many ex-service men, however, come back with a strong appreciation of the importance of their work to the war effort, especially those who have been abroad, and are demonstrating it. A particular example is that of an ex-service man, who had been wounded during the Aleutian islands campaign, and upon receiving his discharge had obtained a job at one of Bethlehem's east coast shipyards as tacker ship fitter. During a recent emergency there, he took over and operated a tower crane for 100 consecutive hours.

Men in the Seabees are regarded highly by many a practical mill man. The men in that branch, they point out, are trained, in construction and repairs, to get things done, and often under the most adverse conditions.

Up to now, the problem, in the experience of Bethlehem, has been primarily with men discharged from military service because of age or slight disabilities. "We are just beginning to feel the pulse of the real problem," one personnel executive remarked. "The actual picture is now taking form as discharged veterans return to civilian life."

A veteran of the North African campaign, this discharged serviceman prior to his induction worked as a molder in the roll foundry at Bethlehem. After being rehired, he received special training and now operates an automatic grinding machine

War Growth Reflected in Big 1943 Gains

Blast furnaces now rated at 67,391,270 tons and steelmaking facilities at 93,652,290 tons. January ingot output up

PIG IRON and steelmaking capacity of the United States was increased sharply during the last half of 1943 as a result of completion of a substantial part of the emergency wartime construction program, according to the American Iron and Steel Institute.

Rated as of Jan. 1, 1944, total blast furnace capacity stood at 67,391,270 tons, nearly 3,000,000 tons above the July 1, 1943, level and nearly 12,000,000 tons or 21 per cent above capacity as of Jan. 1, 1940.

Annual steelmaking capacity was increased 2,771,000 tons during the last half of 1943, being rated at 93,652,290 tons as of Jan. 1, 1944, more than 12,000,000 tons or 15 per cent above the level of Jan. 1, 1940.

Open-Hearth Capacity Up

Capacity of open-hearth steel furnaces is now rated at 82,223,610 tons per year, compared with 79,867,450 tons July 1, 1943. Annual electric furnace steel capacity was increased to 5,350,880 tons as of Jan. 1, from 4,935,960 tons as of July 1 of last year. Rated bessemer steel capacity of 6,074,000 tons per year was unchanged during the last half of 1943. Crucible steel furnace capacity of 3800 tons annually likewise showed no change during the period.

The bulk of the increase of 2,771,000 net tons in steel ingot capacity of the United States in the last half of 1943 was contributed by United States Steel Corp., which recorded a gain of 2,236,300 net tons to 33,567,000 net tons on Jan. 1 last from 31,330,700 net tons as of July 1, 1943, it was pointed out in financial circles last week.

The corporation's position in the industry also moved ahead during the period. Whereas on July 1, 1943, United States Steel Corp. had 34.1 per cent of the total capacity of the country, the figure rose to 35.8 per cent as of Jan. 1, 1944.

Production of steel ingots and castings during January of this year was equivalent to 95.7 per cent of capacity, rated as of Jan. 1.

A total of 7,595,202 tons of steel was produced during the month, equivalent to an average of 1,714,493 tons per week. January production was at a higher level than in December, 1943, when 7,265,777 tons were produced, an average of 1,643,841 tons per week. Steel operations in December averaged 94.3 per cent of the capacity rated as of mid-year 1943.

In January a year ago, steel production totaled 7,423,977 tons, equivalent to 96.8 per cent of the capacity as of Jan. 1, 1943. During January of last year steel output averaged 1,675,841 tons a week.

STEEL INGOT PRODUCTION STATISTICS

	Estimated Production—All Companies								Calculated weekly production, all companies	Number of weeks in mo
	—Open Hearth—		—Bessemer—		—Electric—		—Total—			
	Net tons	Per cent of capac.	Net tons	Per cent of capac.	Net tons	Per cent of capac.	Net tons	Per cent of capac.	Net tons	
Based on reports by companies which in 1942 made 98.3% of the open hearth, 100% of the bessemer and 87.6% of the electric ingot and steel for castings production										
1944										
Jan.	6,776,733	97.3	439,424	85.4	379,045	83.6	7,595,202	95.7	1,714,493	4.43
Based on reports by companies which in 1942 made 98.3% of the open hearth, 100% of the bessemer and 87.6% of the electric ingot and steel for castings production										
1943										
Jan.	6,576,524	97.8	478,058	85.9	369,395	95.4	7,423,977	96.8	1,675,841	4.43
Feb.	6,031,363	99.3	447,843	89.1	344,532	98.6	6,823,738	98.5	1,705,934	4.00
March	6,787,630	100.9	503,673	90.5	381,219	98.5	7,672,522	100.0	1,731,946	4.43
1st qtr.	19,395,517	99.3	1,429,574	88.4	1,095,146	97.5	21,920,237	98.4	1,704,529	12.86
April	6,510,563	99.9	481,810	89.4	382,532	102.1	7,374,905	99.3	1,719,092	4.29
May	6,669,436	99.1	483,024	86.8	398,057	102.9	7,550,517	98.4	1,704,406	4.43
June	6,202,640	95.2	453,599	84.1	384,645	102.6	7,040,884	94.8	1,641,232	4.29
2nd qtr.	19,382,639	98.1	1,418,433	86.7	1,165,234	102.5	21,966,306	97.5	1,688,417	13.01
1st hlf.	38,778,156	98.7	2,848,007	87.6	2,260,380	100.0	43,886,543	98.0	1,696,426	25.87
July	6,556,531	96.8	466,288	90.6	393,342	94.0	7,416,161	96.3	1,677,864	4.42
Aug.	6,699,850	98.7	484,957	94.0	407,224	97.1	7,592,031	98.3	1,713,777	4.43
Sept.	6,646,702	101.4	480,635	96.4	391,241	96.6	7,518,578	100.8	1,756,677	4.28
3rd qtr.	19,903,083	99.0	1,431,880	93.6	1,191,807	95.9	22,526,770	98.4	1,715,672	13.13
9 mos.	58,681,239	98.8	4,279,887	89.5	3,452,187	98.5	66,413,313	98.1	1,702,905	39.00
Oct.	6,891,753	101.6	513,521	99.5	413,787	98.7	7,819,061	101.3	1,765,025	4.43
Nov.	6,542,942	99.6	440,941	88.2	390,564	96.2	7,374,447	98.6	1,718,985	4.29
Dec.	6,509,923	96.2	390,930	75.9	364,924	87.2	7,265,777	94.3	1,643,841	4.42
4th qtr.	19,944,618	99.1	1,345,392	87.9	1,169,275	94.0	22,459,285	98.1	1,709,230	13.14
2nd hlf.	39,847,701	99.0	2,777,272	90.8	2,361,082	94.9	44,986,055	98.3	1,712,450	26.27
Total	78,625,857	98.9	5,625,279	89.1	4,621,462	97.4	88,872,598	98.1	1,704,499	52.14

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

Percentages of capacity operated in 1944 are calculated on weekly capacities of 1,572,755 net tons open-hearth, 116,182 tons bessemer and 102,350 tons electric ingots and steel for castings, total 1,791,287 net tons; based on annual capacities as of Jan. 1, 1944, as follows: Open-hearth 82,223,610 net tons, bessemer 6,074,000 tons, electric 5,350,880 tons.

Consider Further Cut in Steel Expansion Program

War Production Board officials last week were reported considering cutting new open-hearth steel facilities and blast furnace at the plant of the Pittsburgh Steel Co. at Monessen, Pa., under the government's steel expansion program. The project involves investment of $7,500,000 and is being financed by the Defense Plant Corp.

Steel Corp. Shipments Show Gain in January

Finished steel shipments by the United States Steel Corp. in January totaled 1,730,787 net tons, an increase of 11,163 tons over December shipments of 1,719,624 tons.

Rustless Reports Profit Of $2,236,492 in 1943

Preliminary 1943 net profit of Rustless Iron & Steel Corp., Baltimore, is placed at $2,236,492, equal to $2.32 a common share. In the preceding year the company earned $2,644,557, or $2.76 a share. Postwar provision last year totaled $240,000, against $400,000 in 1942.

National Steel Has 1943 Net Profit of $11,698,362

Net income of National Steel Corp., Pittsburgh, is placed at $11,698,362, before final audit. This represents $5.30 a share on capital stock, and compares with $11,920,867, or $5.41 a share, in the preceding year. Federal income tax provisions amounted to $26,350,000 last year, against $30,300,000 in 1942.

Pittsburgh Steel's 1943 Net Income Is $1,734,222

Pittsburgh Steel Co, Pittsburgh, reports preliminary 1943 net profit of $1,734,222, equal to $10.65 per share on capital stock, compared with $2,488,074, or $15.33 a share, in the preceding year. State and federal tax provisions last year totaled $3,140,000, against $5,850,000 in 1942.

Industry To Get Self-Controls Mar. 1

War Production Board revises order M-293. Seeks to assure that delivery requirements on critical components and parts used in more than one war production program are met

CONTROL over production scheduling will be returned to industry on March 1. Changes in scheduling procedures were adopted by the War Production Board for the purpose of assuring that delivery requirements of certain critical items are met, L. R. Boulware, WPB operations vice chairman, and J. A. Krug, program vice chairman, announced last week.

The items which are affected are components and parts which are used in more than one—in most instances, many—war production programs.

The new scheduling procedure will provide an instrument with which industry may, in co-operation with WPB, stand ready to meet any demands that military needs may place upon it.

Manufacturers of essential products covered by the new procedure, as established under order M-293, will be able to freeze their delivery schedules and carry on production to meet schedules of the most needed war products without having orders placed with them which would necessitate revision of production plans.

Only WPB will have authority to order a revision in a manufacturer's frozen delivery schedule.

WPB will require reports on production of the items covered by M-293 only in those instances where it is absolutely essential that delivery schedules be available for breaking bottlenecks, or assuring that production delays do not occur, or in instances where changing program requirements necessitate frequent revision of schedules.

It will be necessary for purchasers to obtain permission from WPB to place purchase orders for some highly critical items and for manufacturers to accept orders for them.

The amended order spells out specific controls which WPB may exercise in individual plants in any instance where a production bottleneck actually occurs. Specific information may be required of such plants which will be filed on appropriate forms and used as the basis for eliminating production delays.

The vertical method of obtaining statements of dates on which deliveries are required has been eliminated from the new order. This will tend to reduce substantially paper work which has been required in connection with present scheduling procedure.

POSTWAR PREVIEWS

INDUSTRIAL DEMOBILIZATION—Early legislative action to formulate a contract termination and surplus property disposal program and to create an Office of Demobilization recommended by Senate Special Committee on postwar Economic Policy and Planning. See page 72.

CONTRACT TERMINATION—Omnibus act will be introduced soon in Senate to facilitate equitable and prompt settlements, speed reconversion to peacetime production. See page 73.

RE-EMPLOYING VETERANS—Bethlehem Steel is fitting ex-service men into suitable jobs; now employs 9000. Experience gained now in channeling veterans into civilian work seen as providing basis for policy in demobilization period. See page 74.

DECENTRALIZATION—Department of Commerce officials believe inquiries on postwar plant location presage considerable industrial decentralization. See page 78.

PUBLIC WORKS—Huge program should be planned now to span gap during reconversion, West Coast industrialist believes. See page 80.

SURPLUS PROPERTY—Clear-cut government policy on disposal of surplus equipment wanted by industry. Estimated 500,000 machine tools owned by government. Most legislative proposals designed for political appeal. See pages 81, 85.

RECONVERSION—Cleveland metalworking company finds difficulties, opportunities in return to civilian goods manufacture. See page 96.

FUTURE STEELS—Wartime advances in steel metallurgy emphasize desirability of reducing alloy contents, of special additives containing boron, of improved processing techniques and lower surface-finishing costs. Other trends include selection for hardenability and machinability and use of single series of three-alloy NE steels. See page 104.

DRAWBENCH BOOM—Large demand for tubular shapes for war machines instrumental in bringing the drawbench to forefront as quantity finishing medium. Improvements in mandrel loading, feeding material on rod and handling finished product will tend to tighten its hold on this field. See page 124.

Carbon Steel Allocated For Farm Machinery Program

Volume of farm machinery production authorized for the year beginning July 1, 1944, is approximately the same as for the current fiscal year but the schedules, as established in orders L-357 and L-257, may be altered at any time should circumstances require it.

The entire program will use about 1,200,000 tons of carbon steel (of which more than 1,000,000 tons are tentatively earmarked for the American farmer). The tentative breakdown of this 1,200,000 tons of carbon steel is approximately 88 per cent for the domestic farmer, 5 per cent for military and industrial needs, 7 per cent for export. This does not include United Nations Relief and Rehabilitation Administration.

Quota percentages for 400 kinds and types of machines are given in schedule B, limitation order L-257, corresponding to schedule A in effect at present.

Exports to Canada are dealt with in a separate schedule (X-18). Quotas for complete units are based not on weight but on the number of units of items; those for attachments and repair parts, on net shipping weights. In both cases, the base is one-half of the amounts shipped in 1940 and 1941. A total of 152 items of machinery and equipment is listed in the schedule with quota percentages varying from 25 per cent for farm electric plants to 543 per cent for farm wood-sawing machines. Other high percentages include: Electric fence controllers, 255; windrowers and swathers, 224; one-row potato planters, 259; potato diggers, 172.

Schedule X-12 lists 57 countries and areas for which the quota is nil. Farm machinery for these enemy occupied countries, whose liberation by the United States is expected, will be needed. Special provision for the production of such machinery will be made as and when requirements are determined. Thirty thousand tons of carbon steel have been earmarked for this program.

Industry Heading West?

PACIFIC Coast offices of the Department of Commerce report they are receiving many inquiries from major eastern manufacturers who are considering the establishment of branch manufacturing or assembly plants at West Coast locations. From the south, southeast and southwest reports to the department are to the effect many chambers of commerce in those areas are being swamped with such inquiries. These sections all have been industrialized by the war; they have large new plants, large numbers of skilled workers and big increases in population and there is a growing determination in them that they make goods at home that before the war were brought in from the north and east with high freight charges. Officials in the department expect a great deal of industrial decentralization in the peacetime period.

Army Complains

As a result of a claim by the Army that the recent War Production Board order allowing increased production of bakery machinery and equipment was hurting war production, the WPB has launched a survey to determine whether this claim is justified. Members of the industry's advisory committee contend the present bakery machinery program is essential and does not impede their production of war goods.

Getting Independent

Both Houses continue to become increasingly firm in resisting pressure from the administration and elsewhere. This was well demonstrated when it was decided to retain in the tax bill the provision under which labor unions would have to furnish financial statements. Last week there again was intense resentment when Rep. Ross Rizley (Rep., Okla.) read into the record charges by the CIO and certain other labor organizations that members of Congress acted as "Hitler's agents" when they voted contrary to the wishes of those organizations. It is clear that by such tactics labor leaders are not adding to the number of their friends in the House and the Senate.

Numerous Inconsistencies

R. J. Thomas of the CIO and George Meany of the AFL, the two labor members of the President's Committee on the Cost of Living, in a minority report, recently claimed the cost of living has advanced 43.5 per cent since Jan. 1, 1941, instead of 23.4 per cent as reported by the Bureau of Labor Statistics. They put out their report without giving the public member, William H. Davis, chairman of the War Labor Board, and the two industry members, George K. Batt, vice president, Dugan Bros., Newark, N. J., and H. B. Horton, treasurer, Chicago Bridge & Iron Co., Chicago, an opportunity to make any comment on the report.

Preliminary study of the report, evidently aimed at picturing labor in a bad plight, indicates it was not prepared with any great care as to accuracy of details. It attempts to prove that the BLS index, showing a 40 per cent increase in the cost of food, is wrong because Commerce Department figures on expenditures for food show a 70 per cent increase in the same period. The report makes no allowance for the fact the Commerce Department figures cover all retail sales in food stores—cigarettes, beer, soap, sanitary tissues, wines, liquors and many other items not in the class of food. The report contains numerous inconsistencies and unsound statistical deductions.

REALISTIC VIEW

Walter Janssen, chief, Metals and Minerals division, Department of Commerce, says users of metals should realize surplus stocks do not necessarily mean an abundance is available for production of civilian goods.

Many factors beyond control of industry should receive a realistic view before civilian production is resumed, he states. Quantities of metals and minerals released represent only a small percentage of the amount which must be retained for the war effort. Release of this surplus does not assure unlimited production of the end product in which the commodities can be used.

Mr. Janssen suggests that the industrialists' wish to take advantage of the opportunity to start civilian production may not be matched by an equal desire on the part of the consumer to buy now.

Spring Is Coming

Information for manufacturers of garden tools: Slogan of the War Food Administration and the War Manpower Commission is "Grow More in '44." The goal is 22,000,000 Victory gardens, compared with last year's 20,000,000. This year's Victory garden campaign will be opened in April.

Wholesale Re-use

Approximately 400 used, 18-gage, 55-gallon, steel oil drums now are being returned each day by the Army for reuse. The program has been so balanced that these containers, on the average, are returned to the oil refineries within 90 days. This makes it possible to use each drum four times a year. Facilities have been installed at various locations to repair the damaged drums.

International Cartels

Manufacturers concerned with foreign trade will be much interested in the latest expression of the Department of Justice on the subject of international cartels. It is contained in a monograph by Dr. Corwin D. Edwards, chairman, Policy Board, Antitrust Division. Copies may be had by writing to the Senate Committee on Military Affairs which has had it printed in the form of a 78-page pamphlet entitled, "Economic and Political Aspects of International Cartels." It sets forth the Justice Department's view of international arrangements entered into by a large number of American companies, charging such offenses as establishing monopolies, transmission of military secrets to foreign countries, price control, allocation of markets, etc.

Eureka!!!

A new idea to prevent loss of farmer purchasing power due to failure of crops is being explored by a House Agriculture Committee's subcommittee headed by Rep. John W. Flannagan Jr. (Dem., Va.). The plan under discussion envisions a federal crop insurance system to cover wheat, cotton, corn and tobacco and later, after the pattern has been developed, other crops.

Will Be Kept Moving

Problem of providing enough workers to move 90,000,000 tons of iron ore down the lakes this season has been referred by the War Manpower Commission to Robert P. Goodwin, regional director at Cleveland. This action was taken as a result of a warning by the Iron and Steel Transportation Industry Advisory Committee on Jan. 28 that the shortage in ship crew personnel is more serious than generally appreciated, and that movement of 90,000,000 tons of ore will require full operation of all available vessels. Washington WMC spokesmen feel Mr. Goodwin will be able to divert enough men from less essential work to fill the gaps. But if these efforts are not sufficient there always remains the possibility of requesting the return of needed men from the armed services. The carriers will be kept moving.

More Work for Baruch

Bernard M. Baruch, head of the War and Postwar Adjustment Unit, Office of War Mobilization, has accepted the invitation of Chairman William M. Colmer (Dem., Miss.) of the new House Committee on Postwar Economic Policy and Planning to work with that committee in an advisory capacity. "Mr. Baruch," said Mr. Colmer recently, "will advise and consult with us whenever we call upon him." The committee now is discussing formation of its staff and the matter of the amount of money it will ask to finance its task of formulating reconversion and postwar economic controls.

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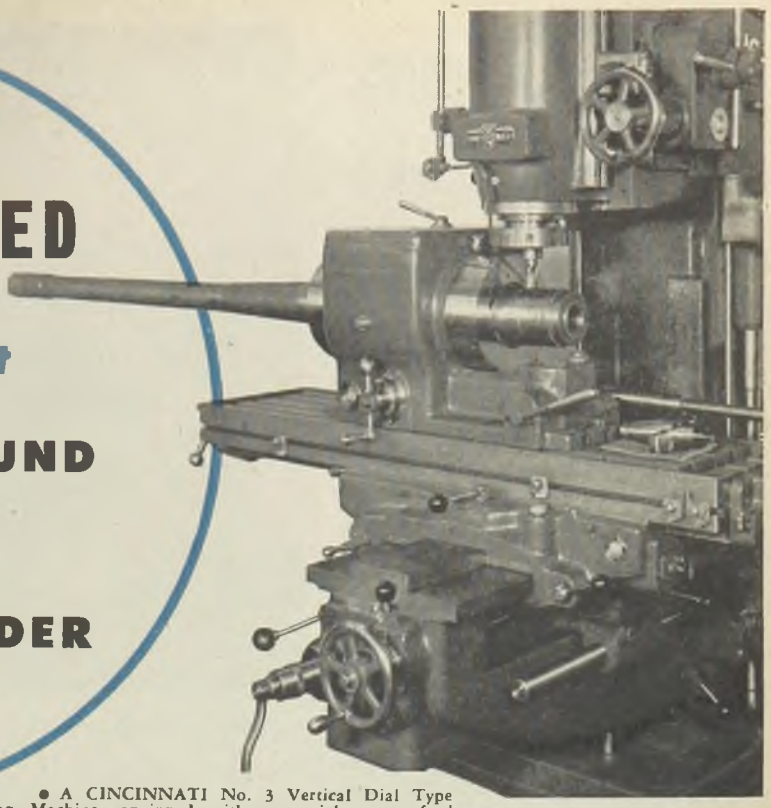

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THIS type of job, like many others in the average shop, requires a change in spindle speed (cutter speed) to obtain any semblance of production, finish and cutter life. The part requires a milled relief around the main diameter at the large end. A 1-13/64" diameter end mill, running at 188 r.p.m., mills the principal portion of the relief. This leaves too large a radius at the end of the cut, so it is then removed with a .407" diameter cutter running at 550 r.p.m.

• CINCINNATI Vertical Dial Type Milling Machine. The Dial Types are made in plain, universal, and vertical styles, Nos. 2, 3, and 4 sizes, medium speed and high speed ranges. Complete engineering specifications may be obtained by writing for catalog M-970-2.

> With CINCINNATI Quick Change Collets, the cutters are changed in a few seconds, and with the exclusive Dial Type feature of power speed and feed change from the front operating position, the speeds are changed as desired in a few clicks of the speed dial . . . without taking a step.

This one Dial Type feature alone is worthy of your most serious consideration when selecting new milling machine equipment. There are a host of other Dial Type features, too, some of which are tabulated in Sweet's Catalog File for Mechanical Industries. All of them, along with complete engineering data, will be found in catalog M-970-2, a copy of which may be had for the asking.

CINCINNATI

THE CINCINNATI MILLING MACHINE CO. CINCINNATI, 9 OHIO, U.S.A.

TOOL ROOM AND MANUFACTURING MILLING MACHINES . . . SURFACE BROACHING MACHINES . . . CUTTER SHARPENING MACHINES

Kaiser Urges Public Works As Stopgap

West Coast industrialist recommends big program testifying before House committee. Says reconversion of industry will be difficult and complex

HENRY J. KAISER . . . . . *Makes recommendations*

THE JOB of reconverting industry to peacetime production, no matter how speedily it is done, will be a difficult and complex problem, Henry J. Kaiser, West Coast industrialist, told the House Committee on Public Buildings and Grounds at a recent hearing.

To fill in the gap to the greatest possible extent, he recommended that a big public works program be prepared. Plans should be made now, he said, so that work on the various projects could be started without delay in order to minimize unemployment after wholesale termination of contracts.

"I do not propose federal spending," he explained. "What I have in mind is a revolving fund under which states, counties and communities could borrow money now to enable them to prepare blueprints of public works projects and improvements. They would repay this money with reasonable interest."

Mr. Kaiser said that, based on his own engineering experience, plans for public works coming to say $8,000,000,000 could be drawn up at an aggregate expenditure of somewhere between $60,000,000 and $100,000,000. That would cover all preliminary surveying, engineering and the preparation of plans and specifications. He recommended that the authority to make such loans be confined to one government agency which not only would handle business details involved in making these loans but which would be asked to undertake a campaign aimed at encouraging states, counties and communities in making postwar public works plans "now," and which also would concern itself with encouraging such entities to make arrangements "now" for financing execution of these plans.

When committee members expressed the fear that creation of an agency of this type might bring the danger that the administrator might exercise his powers to socialize industry and take the government into competition with industry, Mr. Kaiser said he would recognize such a danger only if there were a large amount of unemployment which would cause the public to demand reforms.

"It is essential that we plan for a huge amount of production and employment after the war," he said. "Our people are not going to be satisfied with anything less than that."

He said that in planning on a large scale we must plan to keep a lot of women in manufacturing plants. "We are making surveys which have not yet been completed but we already have some answers as to the problem facing us. At one of our plants 60 per cent of the women employes say they want to keep on at their work after the war, 20 per cent say that they want to leave their present jobs for other types of employment, and only 20 per cent say that they want to get back into their homes. So there is no danger at all in overdoing our planning; the danger would come from underdoing."

Advocates Self-Liquidating Projects

When committee members expressed their fears of a big government spending program coming on the heels of a big war debt, Mr. Kaiser said that he does not recommend a large government-spending plan and further increase of the debt. What he has in mind are government loans to finance self-liquidating projects "like the RFC Golden Gate bridge" enterprise.

"In the first year of production the automobile industry expects to sell 50 per cent more cars than it ever before has sold in a year," said Mr. Kaiser. "That means that we will have to build a lot more roads and improve others; otherwise these cars will have no way of going places.

"But during the period of transition a lot of people would be rendered idle; if our war contracts were terminated today a quarter of a million people in Kaiser plants would be made idle, and would remain idle until we could reabsorb them. A big highway program would provide a vast amount of employment during this period, not only on the roads, but at many plants making materials and equipment, on the railroads and elsewhere.

"And then the benefits would revert back to the automobile industry," he explained. "By building and improving roads more people would feel urged to buy cars—thus again furnishing a lot of employment."

Mr. Kaiser said one of the principal new activities that should be encouraged in the postwar era is a vast expansion in our health maintenance facilities; there is a huge potential business in sight in this field.

"Government loans should be available for provision of such facilities but all these projects should be self-liquidating," he said. "There will be no trouble about that at all. At Fontana we have hospital facilities; there we have 70,000 people, and hospital treatments, including minor cases, run to some 150,000 a month for the employes and their families. They pay every cent of what it costs—and they love it. And it pays big dividends in increasing production efficiency. At Fontana we produced in January plates at 26.25 per cent over our rated capacity.

"Our state of health," he continued, "is going to have a bearing on our status in world trade after the war. It makes a lot of difference in final costs if people are healthy and strong and able to turn out a good job of work. We have every right to expect a big foreign trade after the war—both export and import—and this health angle is going to be much more of a factor than most industrialists have realized heretofore."

Clear-cut Government Policy on Surplus Tool Disposal Needed

Builders groping in dark with respect to planning in absence of definite government program. Forty-six bills introduced in Congress covering disposal of estimated 500,000 machines. Association advances plan

RANKING high in the list of postwar problems receiving increasing attention of industry and government is that concerned with redistribution and disposal of an estimated 500,000 government-owned machine tools.

Interest in the matter is keen and thinking varied, as evidenced by the fact that no less than 46 bills have been introduced in Congress dealing in whole or in part with the problem. None of these measures, however, has received universal approval, and it is increasingly evident that the uncertainty surrounding the question will continue until such time as thinking on the subject jells much more than it has up to now.

Meanwhile, the machine tool industry is compelled to grope in the dark with respect to its postwar planning in the absence of clear-cut government policy respecting the disposal of war tools, a matter which has greatest bearing on postwar tool marketing.

Normal 20 Years' Output

Expressed in terms of production the estimated war surplus of 500,000 government-owned machine tools represents more than ten times the entire output of the machine tool industry in the boom year, 1929. It is about 40 per cent of the number of machine tools in use in this country during 1939, and is 28 per cent of all the machines in use in this country today. It is nearly twenty years' normal production of the industry.

Several efforts have been made recently to explore the more optimistic possibilities of the situation. It is estimated, for example, that of the postwar surplus of 500,000 machines, about 100,000 are too specialized for peacetime use, such as special shell turning lathes, rifling and a host of other single purpose machines. Another 100,000 tools might be retained in government arsenals, navy yards, and other productive capacity for war materiel, including facilities held in grease as standby reserve. Perhaps another 50,000 could be applied in retooling, modernization, and replacement of obsolete machines in prewar arsenals, navy yards, and repair establishments.

The federal Office of Education has an ambitious program for retooling the machine shops of technical, vocational and trade schools, and it is estimated this program could account for another 100,000 machines. This would leave 150,000 units in the government pool, and some believe private industry will require at least 300,000 units to meet normal replacements and obsolescence in the immediate postwar period. However, many machine tool interests think these estimates are too high, especially in that they disregard the inevitable release of a portion of private industry's wartime machine tool purchases, which represent over 100,000 units.

A large portion of the government controlled equipment has been acquired by war contractors through Emergency Plants Facilities contracts or Defense Plant Corp. leases. Under the first form of contract, the user originally buys the equipment with his own funds and the government buys it back on the installment plan at cost less a charge for depreciation.

F. S. BLACKALL JR.

"The government has yet to make clear its own plans on the disposal of government owned machine tools," Frederick S. Blackall Jr., president and treasurer, Taft-Peirce Mfg. Co., Woonsocket, R. I., states.

"If any policy has yet been reached, it has not been made public as to what extent, for example, the government will maintain shadow and standby plants in the postwar era, to what extent it proposes to replace obsolete equipment in arsenals, navy yards, etc. from government machine tool pools, to what extent it will equip trade schools and colleges, or what it will do with the obsolescent equipment in all these fields, if it decides to replace it with war-produced machinery."

The DPC contract is a straight rental proposition. In both forms of agreement, however, the user has an option to buy the equipment, either on a scheduled depreciation basis, or at a price to be negotiated with the government upon termination.

Many tool builders feel that generous allowances should be made for depreciation and obsolescence for used machine tools in the postwar period and that the government should be willing to take as much as 50 per cent loss on new tools, so that these tools will be put to use as soon as possible. It is also suggested that existing loan facilities, both public and private, should be made available for financing such purchases on a long term basis.

The National Machine Tool Builders' Association's Committee on Planning recently made the following recommendations concerning the postwar disposal of machine tools:

(1) Each of the armed services should be allowed to decide for itself from time to time which of the facilities and equipment it owns are surplus. This decision must take into account the need for ample reserves of plant and equipment to be carried by that service over into the postwar years. It is desirable to have these decisions made as promptly as possible, beginning now.

(2) To maintain continuity of employment, such surplus equipment should be moved from its present location quickly to make room for production of the civilian needs of the nation as soon as, and to the extent permitted by, the material situation and military considerations.

Many Inefficient Machines Used

(3) For the same reason these machines should be put to work somewhere. They are of value to the nation only when they are in operation, affording wages to the operator and income to the owner. There are plenty of old inefficient machines in American shops that could be replaced to advantage. One survey in 1940 placed these inefficient machines of over 10 years old at 70 per cent of the total. This percentage has declined in recent years, but still remains large, estimated at 50 per cent of the existing machine tools.

(4) It follows that a simple, quick way of pricing these machines and shifting the title is needed. The contractor should be urged to exercise quickly any option he may have to buy a government-owned machine. But he must first know the price. The committee suggests: (A) The price to be for the machine "as is and where is," with a standard equipment originally furnished, not including shipping or packing charges required to move it. (B) Prices to be the following percentage of original invoice price f.o.b. point of manufacture: 75 per cent, less an additional 1 per cent of the invoice price for each month from date of original shipment by the machine tool builder to date of present sale. (C)

(*Please turn to Page* 184)

PRIORITIES–ALLOCATIONS–PRICES

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

INSTRUCTIONS

STEEL PAILS: Paint, varnish and lacquer industry may procure 5-gallon steel pails for civilian use under certain conditions. Request for containers must be made on WPB-3233.

STAINLESS STEEL: Rules governing replacement of stainless steel rejected by a customer for nonconformity with specifications or for other defects have been made identical with those rules governing replacement of other types of steel. The producer must make the replacement in preference to all other orders for similar material, without seeking additional allotment, excepting in cases where WPB or the customer gives specific instructions to the contrary. If any portion of rejected steel can be used by the producer to fill another authorized controlled material order or for permissible delivery under any other WPB order, it may be so used.

BOILERS: Applications for authorization to produce boilers for stock of the types under scheduling jurisdiction of the WPB Power Division should be made by letter addressed to the War Production Board, Washington 25, reference M-293, table 8.

CMP REGULATIONS

CONTROLLED MATERIALS: A manufacturer is permitted to use surplus material to fill an authorized production schedule other than the one for which the material was acquired originally, if he changes the original allotment account.

A consumer of controlled materials may keep such materials and class A products received in a common inventory. In withdrawing from this inventory, he does not have to charge these products or materials against his allotment account.

Manufacturers operating under several production schedules do not have to maintain separate records for each schedule, if the usual records indicate that the production on each schedule is substantially in proportion to the amount of the allotments received for each schedule, and that their aggregate production of any product does not exceed the aggregate of the production schedule authorized.

Consumers of controlled materials must charge their allotment accounts with materials acquired under priorities regulation No. 13, unless that regulation indicates that such a charge is unnecessary.

Consumers are required also to check their allotments the first of each month, and if they find they have been allotted more controlled materials than they need, returns of the excess must be made by tenth of the same month.

At the end of each calendar quarter, a consumer of controlled materials must determine whether he has used his entire allotment by placing authorized controlled material orders or making allotments to secondary consumers; he must return any excess by the tenth day after the close of the quarter. (No. 1)

MRO SUPPLIES: Farm labor camps, operated as part of the War Food Administration's migratory labor programs, have been made eligible to use the AA-2 preference rating to obtain maintenance, repair and operating supplies. The camps are eligible also to obtain copper, steel, and aluminum in controlled materials forms and shapes for MRO purposes. (No. 5A)

CONSTRUCTION: Method of assigning a preference rating and allotment symbol F-6 to an approved construction project has been established. The symbol and rating may be used to purchase controlled materials and other construction materials without reference to calendar quarters, in amounts required to complete the project. Application form WPB-617 has been revised and a new authorization form GA-1456 supplants CMPL-224. (No. 6)

L ORDERS

RAILROAD RAILS: Railroads have been relieved of paper work in connection with obtaining used rails for replacement on the ties. Administration of order L-88 has been turned over to the Steel Division which will maintain control of used rail of rerolling and scrap grade. Users of relayer grade rails are freed from control by the order on the sale, transfer or other disposition of this grade. Also, users of relayer rail are freed from the necessity of turning in used rail after the receipt of new.

While persons wishing to sell, transfer or otherwise dispose of reroll or scrap grades must first secure authorization of the WPB. this restriction does not prevent any person from using any grade of used rail in his own tracks. (L-88)

HEATING TANKS: Sale of plumbing and heating tanks to consumers for replacement purposes no longer requires an A-10 or better rating, all control over distribution being placed under order L-79. Users wishing to purchase for other than replacement purposes must apply to the local WPB office for a preference rating. Home owners apply on WPB-2631; industrial or commercial users, on WPB-541. (L-199)

FILES: A list of types and sizes of files which may be manufactured for export, other than to the Dominion of Canada, has been issued. These files may be sold only to fill purchase orders placed for Lend-Lease or orders which have been approved by the Foreign Economic Administration. List of standard files which may be manufactured has been revised. Completion or sale of any files for which the producer had materials on hand Feb. 3, 1944, or sales from inventories on hand as of that date are permitted. Producers may manufacture files which are distinguished by some unusual feature of design or manufacture, or are used for special purposes, without specific WPB authorization; but total quantity of such special files to be manufactured in any quarter must not exceed 5 per cent of the producer's average total quarterly production of all files for the year 1942. (L-216)

MINING EQUIPMENT: Manufacturers of mining equipment have been relieved of the necessity of filing monthly reports on schedules for 40 items of equipment but they must submit a report at any time requested by WPB. Requirement for substitution and conservation of critical materials has been eliminated. (L-269)

ELECTRODES: Limitation order L-318, which had set standards for manufacture of all spot welding electrodes, has been revoked. Manufacturers of electrodes now are free to produce any type required by their purchasers but will continue to function under the applicable CMP regulations covering their industry. (L-318)

INDEX OF ORDER REVISIONS

Subject	Designations
Construction	CMP No. 6
Controlled Materials	CMP No. 1
Electrodes	L-318
Equipment, Mining	L-269
Files	L-216
Mercury	M-78
MRO Supplies	CMP No. 5A
Pipe	M-21
Rails, Railroad	L-88
Ratings, Split	PR No. 3
Tanks, Heating	L-199
Price Regulations	
Saws	No. 136

M ORDERS

PIPE: Cast iron soil pipe and fittings have been freed from all restrictions formerly imposed by order M-21. Delivery of iron products was prohibited previously except on ratings of A-10 or better. Cast iron soil pipe remains subject to order L-79. (M-21)

MERCURY: All restrictions on mercury, imposed by order M-78, have been removed. The order was revoked because of the improved supply-demand position in respect to the metal. (M-78)

PRIORITIES REGULATIONS

SPLIT RATINGS: When two or more preference ratings (split ratings) are assigned to the same production schedule, they must be split proportionately in applying them to each class of production material required. This application is on a class-of-item basis and must be followed in all instances where more than one preference rating is assigned to one production schedule. WPB has fixed a base rating which it will assign for ordering production materials that go into each finished product group. The same base rating will be assigned to each production schedule covering the same product group. However, higher ratings may be assigned to a portion of the production schedule by WPB. (No. 3)

PRICE REGULATIONS

SAWS: Scaffolds and masonry saws have been added to the list of articles covered by the regulation establishing maximum prices of machines, parts and machinery services. The revised order also provides that all industrial machines or parts not specifically excluded from the regulation are covered by it. Farm machines and parts are excluded. Exemption from coverage of certain hand tools has been rewritten so that it applies only to hand tools that are not specifically listed as being covered by the regulation. (No. 136)

Personnel Changes Announced by WPB, OPA

SEVERAL important appointments have been announced recently by the War Production Board, reflecting the shifting of many administrative duties from Washington to regional and field offices, and by the Office of Price Administration, in keeping with its policy of staffing operating branches with experienced business men.

Wade T. Childress has been named deputy vice chairman for operations WPB, by L. R. Bouleware, operations vice chairman. He has served with WPB and predecessor agencies since May 1941, in various capacities, including regional director in Kansas City, deputy

vice charman for field operations in Washington, and deputy vice chairman in charge of area production urgency operations in the executive office of the chairman.

Harcourt Amory has been appointed deputy vice chairman for field operations and will assist Donald D. Davis, WPB vice chairman, in the direction and supervision of the field offices. This action reinstates the position of deputy vice chairman for field operations, which was abolished last September.

David J. Winton, Minneapolis, has been appointed to succeed F. P. Heffelfinger as director of the Minneapolis region of WPB. Mr. Winton will serve as chief deputy until Mr. Heffelfinger resumes his duties as vice president of the F. H. Peavy Co., Minneapolis, on or about May 1. Mr. Winton has been associated with WPB since April, 1942, when he was appointed chief of the Pulp and Paper Branch and subsequently special assistant to the director general for industry operations. Since May, 1943, he has served as chairman of the timber products mission to Great Britain.

Arthur G. Eaton has been appointed head of the Government Division, WPB, succeeding Maury Maverick, now a WPB vice chairman and chairman of the Smaller War Plants Corp. Mr. Eaton's business career has included positions with Dodge Bros. and Aluminum Industries Inc., both of Detroit.

Edward J. Dtegen, Washington, has been detailed from the Department of Commerce to the WPB where he will act as director of the Container Division after Feb. 15 when resignation of E. F. Tomiska from that position is effective. Mr. Tomiska is returning to the Western Electric Co., Kearney, N. J.

Chester Bowles, price administrator, has appointed Karl Mathiasen of Fanwood, N. J., as price executive of the Building Materials Branch, replacing Neil Staebler who has accepted a commission in the Navy.

Steel Drums Being Returned For Limited Civilian Use

Steel is now available for drums for arsenical insecticide shipments, as the result of military contract cancellations, according to the War Production Board.

C. P. Given, packaging officer of the Chemicals Bureau, WPB, has announced that steel drums were to be returned to civilian use. He estimated the shift from fiber containers would require about 3000 tons of steel and said that permission would be granted for use of only minimum gages, 26 gage being agreed on for 100-pound drums. Because of the thinness of the new steel drums, their reuse will not be expected.

Three months' supply of drums will be authorized at a time, but manufacturers will be expected to use the fiber now on definite order before switching to steel. Applications should be made on form WPB-3233.

Finished Product Output Under CMP Tops Gain in Raw Materials Supply

Proper channeling of materials to production has helped accelerate output of war goods says W. C. Skuce, director, CMP Division, WPB

W. C. SKUCE

UNITED STATES industry is producing relatively more finished products for war and essential civilian purposes from available raw materials today than it was prior to the announcement of the Controlled Materials Plan in November, 1942, W. C. Skuce, director, CMP Division, War Production Board, announced last week.

Materials are being distributed under CMP in an orderly manner, permitting high efficiency in the use of available resources, Mr. Skuce said. The measure of success is found in the fact that, under its procedures, production of finished products has shown substantially greater percentage increases than the supply of basic raw materials themselves.

For example, from the time CMP was originally announced to the end of 1943, the quarterly production of airplanes of all types increased 80 per cent, from 14,380 to 25,953 planes per quarter. The quarterly delivery of deadweight tonnage of merchant vessels increased 81 per cent during the same period, from 2,924,000 to 5,295,000 deadweight tons per month.

The combat tank program has been met consistently since the inauguration of the plan, although it does not show the increases reflected in aircraft and merchant vessel production due to a reduction in the program itself. Combatant ship production increased 257 per cent in terms of displacement tons from 156,506 tons per quarter to 559,220 tons per quarter during this same period.

At the same time that output of these finished products was increasing by these large percentages, the available supply of the controlled materials was increasing also, but by much smaller margins. For example, aluminum supply during the fourth quarter of 1943 increased 36 per cent over the fourth quarter of 1942; available copper increased only 5 per cent, and quarterly supply of carbon steel increased 7 per cent, while supply of alloy steel decreased 21 per cent.

"Comparison of percentage increases in supply of controlled materials with the increased output of major military and essential civilian end products indicates that proper channeling of materials to production has helped accelerate war output," Mr. Skuce said.

"Major accomplishments of CMP which have permitted this increased production are: Provision of realistic end-product programs which are feasible within the available supply of basic raw materials; provision of balanced flows of materials and parts to assembly lines for final fabrication into complete items.

"Experience has demonstrated that CMP provides the mechanics for both balancing and timing war production and, consequently, has aided in increasing output of war products."

Pointing out that industry has been largely responsible for successful operation of CMP to date, Mr. Skuce requested continued close co-operation through the following measures: Keeping well trained, high caliber executives on the CMP problems of industry and assuring that they have adequate authority; assuring that CMP personnel who are lost through the draft or other reasons are quickly replaced with competent employes who have had adequate training in CMP operations; keeping WPB and claimant agency officials advised of problems which develop in connection with CMP or other material problems; assuring that allotments of materials are passed on to suppliers promptly and that excess allotments are returned; avoiding overallotments of materials and over-statements of requirements.

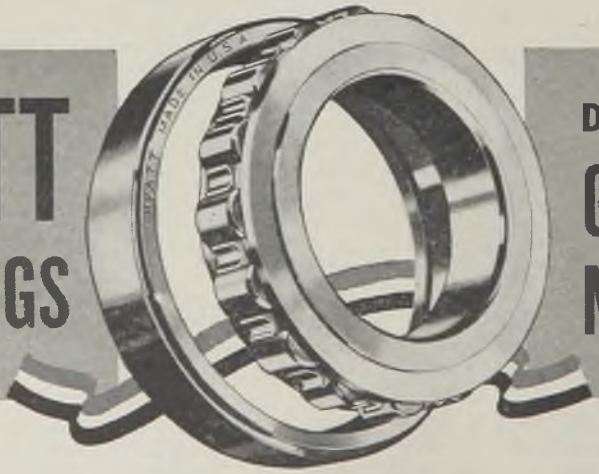
Motor Grader Sales Banned For Non-Military Use

Total 1944 requirements for motor graders are 30 per cent higher than the entire 1943 output, which amounted to 3607 units, War Production Board announced recently. Pending a determination of how many can be manufactured this year, no motor graders will be released for non-military use until further notice. The supply of steel and other controlled materials is adequate, but the difficulty is encountered in obtaining component parts, such as transmissions, gears and universal joints.

All of Hyatt's Production  now goes into planes  our men fly ... into tanks  they drive ... into ships  they sail ... into guns  they man ... into equipment  they need to win.

HYATT ROLLER BEARINGS SERVE SILENTLY, ACCURATELY, EFFORTLESSLY WHEREVER GEARS, SHAFTS, AND WHEELS TURN

HYATT BEARINGS



DIVISION OF GENERAL MOTORS

HYATT BEARINGS DIVISION • GENERAL MOTORS CORPORATION • HARRISON, NEW JERSEY

Surplus property disposals heavily coated with political frosting, designed to draw votes but generally unworkable. Many purport to aid small business and returning servicemen. Government may realize only 10 to 20 per cent on some war plants

PLANS for disposal of surplus materials, parts and inventories accumulated in scores of war production plants, reviewed in some detail in earlier issues of STEEL, nearly all have the unfortunate characteristic of being coated with generous portions of political frosting, some of it so thick that it obscures the real purpose of any such plan—the equitable disposal of surpluses through normal trade channels to avoid dumping at sacrifice prices and at the same time to bring a fair return to the government owners.

The political sugaring usually applied involves the inclusion of provisions to make such surpluses available first to small business, or let returning servicemen have the first crack at it, or to place disposition in the hands of the "palace guard," or some similar proposal which is at once unworkable yet magnetic in its popular appeal or vote-getting aspects. Since legislation covering the problem must be introduced by congressmen, the explanation for the sugar-coating is obvious.

The magnitude of surpluses even now is not even faintly appreciated by most people. One company will prepare a mimeographed list of a hundred or so items which it has in inventory and for which it has no use. This will be circularized to the trade and the recipients will give it a casual glance and throw it aside. By itself, the list may not amount to much, particularly when placed alongside billion-dollar contracts for war material, but collectively these surpluses involve staggering amounts of material.

A buyer at one of the truck plants in this district has in his office a stack of these surplus reports a couple of feet high, and he has not found the time to read even one. He continues to place purchase orders for material in the usual manner through his accustomed sources.

The million or more dollars worth of surplus Studebaker aircraft engine tools which the Air Forces recaptured here after almost letting go of them for firesale prices still rest in their packing cases, untouched and apparently unwanted. Recently, another engine builder was called to Detroit and beseeched to look them over to see if he could use a few of them.

The time and effort which hundreds of companies expend in compiling surplus material reports, plus the mechanics of preparing a list of possible buyers and mailing copies, must be enormous, and as far as is known the results of such direct mail solicitations are picayunish. Furthermore, if these vast hordes are to await the passage of legislation enabling their disposal, they may be in for a long siege.

It has occurred to some industry people and to representative sales interests handling such materials that a simple solution to the disposition of many surpluses would be an order—doubtless another directive—permitting such material to be returned to the original supplier, vendor, or manufacturer on a consignment basis. This would eliminate by one stroke the large amount of clerical work involved in contractors trying to handle their own disposal departments. It would place the surpluses in the hands of those best qualified to catalog and list them for resale, since they were the original suppliers. It would assure the most rapid movement of usable surpluses into manufacturing channels, with a minimum of cost to the original buyer—the government.

Cut in Employment Inevitable

It may be argued that loading down the original vendor with such surpluses might slow down his plant operations and result in layoffs. This is an entirely unrealistic approach, for nearly everyone knows the present supercharged rate of manufacturing employment cannot be maintained much longer. Hence, what is the sense of continued subsidization of peak production with surpluses staring manufacturers in the face?

Obviously, on certain specialties, on used equipment and machinery and on fabricated subassemblies, the return on a consignment basis would not work. But on a large percentage of standard types of surplus materials, from nuts and bolts to aluminum sheet, the logical policy is to return it to the original supplier who will then know where the material is, how much is available, and the price it can reasonably be expected to bring. Plants now biting their collective fingernails over what to do with huge stores of surpluses could rest a little easier, knowing that disposal was in the hands of experts.

The concern being radiated from many sides over the plight of small business and its need for special consideration is another baby-kissing act. It is common knowledge that small businesses, employing from two to 200 persons, are the backbone of industrial employment in this country. But they cannot rightfully expect the government to underwrite their postwar future. Their best future will be, as it always has been, to align themselves as subcontractor with some larger manufacturer.

There will be hundreds of them, organized on a shoestring in the booming days of 1941 and 1942 and now rolling in a wealth of war orders, who will cry to high heaven that they did their part in wartime and hence must be guaranteed the right of survival in the postwar period, even if it means at the expense of the public purse. Cry as they may, however, the only ultimate answer will be for them to justify their right to ex-

SOLLY, NO LAUNDRY: This group of Chinese workers in a Detroit plant of Hudson Motor Car Co. builds the sturdy wings for the Curtiss-Wright Helldiver. There are 135 Chinese workers employed at this plant. The Navy announced recently that the Helldiver which they help build has met its first battle tests successfully

WARTIME NECESSITY: This unique auto-rail car permits the Canadian Pacific railroad to keep a keen eye on the condition of railroad tracks. A 1929 seven passenger Packard, it has been mounted on flanged wheels and equipped with a miniature pilot and is operated on train orders. The speedometer registers 115,000 miles. The car carries its own jacking and turntable apparatus

istence on the basis of going out and getting the business, or else fall over the brink.

Around Detroit, for example, are literally hundreds of tool shops, die shops, special engineering services, alley machine shops and the like, all started since the advent of war and now making good money. Seventy-five per cent of them will fold up unquestionably. It will do no good to offer them government surpluses of materials, before approaching the big fellows. There is just no normal justification for their existence. The smart operators have already discovered this and are making efforts to sell out their holdings.

A case in point is a small tool shop in the Flint, Mich., area, started in 1940 by a former toolmaker at the Buick plant. In four years he built his own business up to the point where his original investment of a few thousand dollars has grown to better than $80,000 clear profit for himself after selling out. He told a friend, "After all, I'm 65 now, so I'm taking my $80,000, buying a boat and going fishing for the rest of my life."

Some surprises may be in store for Jesse Jones and his DPC when they begin to delve into the matter of selling war-built plants for private manufacturing after the war. Many of these structures were built hurriedly, with overtime engineering and overtime construction labor, plus relatively high-cost materials. One estimate is that many cost close to $10 per square foot. This contrasts with a peacetime average industrial building cost of around $3 a square foot. So, even if the government should offer these plants at half price, they would still cost a manufacturer 65 per cent more than his normal expenditure for new construction. On this basis, the government will be lucky to realize better than 10-20 per cent of its original cost in these war babies. A similar situation prevails in the case of machinery and equipment, though perhaps the disparity is not quite so great.

Military Truck Schedules Revised

Cutbacks in military truck schedules resulting from reapportionment of production between various types has meant release of about 800 at the Dodge division of Chrysler. Dodge supplies both ¾-ton and 1½-ton units of the 4 x 4 and 6 x 6 types. Further reductions in military requirements for 1944 are expected to affect other producers—Chevrolet for example, and possibly Ford and Willys on their Jeep lines.

Passing of William B. Mayo on Jan. 31 removed another of the former pillars of the Ford Motor Co. empire. Mr. Mayo joined Ford in 1912 after 26 years' association with Hooven-Owens-Rentschler Co., Hamilton, O., being vice president of the latter when he transferred to the motor industry. He supervised construction of the Ford Highland Park power plant, then the vast Rouge plant and numerous assembly plants throughout the country. He aided in electrification of the Ford-owned Detroit, Toledo & Ironton railroad, supervised construction of Ford ore boats and helped design and build the Ford airport. Mr. Mayo also held many important civic posts in Detroit. He retired from the Ford organization in 1932, but was often seen with Ford officials in later years.

Vague rumors are heard in various quarters of an impending deal involving purchase of the Hudson Motor Car Co. by the Henry J. Kaiser interests, the latter having organized the Michigan Kaiser Co. No confirmation is available from either party.

They Say:

"It is impossible to determine now the time necessary for the automobile industry to convert to former peacetime production standards after the war ends. Nobody's opinion is worth a nickel until we know better the way the war is going to end. We must know the relationship of the products needed at the last minute before we can tell how we are going to convert."—**Charles F. Kettering,** vice president and director of research, General Motors Corp.

* * *

"We cannot loaf our way back to prosperity, particularly in a postwar world where we face the need of carrying a very heavy burden of taxation. From certain persons has come the suggestion of a 30-hour week with 40 hours' pay immediately at the close of the war. . . The aim is to create more jobs by spreading the work. But it is simply a suggestion to lower the living standard of the whole nation, and that includes labor. . . Only by producing more can we have more to divide."—**Paul G. Hoffman,** president, Studebaker Corp., South Bend, Ind.

* * *

"Beyond the precautions necessary to preserve our effective manpower and womanpower, and the individual structure by which they live, every other dollar in every income group, corporate and individual, must be taxed and ruthlessly taxed, for the preservation of the American future."—**Wendell L. Willkie,** 1940 Republican nominee.

* * *

"I want to see a real gold standard world again. . . I don't want international monetary co-operation in ordinary times. It prolongs unsound tendencies, as in 1924-29, and then it breaks down in crises, as in 1931. . . The more I see of governmental economic policy, the more I trust the automatic forces of free markets."—**Benjamin M. Anderson,** former economist for the Chase National bank.

VICTORY IS MADE UP OF *Little things*

THE struggle for final victory, just as quickly as it can be accomplished, is the first and foremost concern of all of us at this moment. It is a hard, grim business which must be cleaned up before we may renew interrupted relations and turn to more pleasant tasks.

Final victory is made up of many component parts—many of them relatively small compared to the overall effort, yet none the less vital to the success of the effort.

Mechanized war equipment is dependent upon adequate and effective protection for the various bearings involved in it—safeguarding which keeps out dirt, dust, grime, water, and keeps in the life giving lubricant. We are working 100% to provide Milpaco Oil Seals to do this important job.

In spite of all the efforts we are making and all of the expansion of facilities in our plant, we are unable, at the moment, to supply Milpaco Oil Seals to all of our old customers. We are greatly concerned over this situation but find ourselves unable to relieve it. We ask you to bear with us and assure you of our desire to supply you with Milpaco Oil Seals again just as soon as possible.

Mechanized Equipment provided with Milpaco Oil Seals for Bearing Protection incl

JEEPS

TRUCKS

TANKS

MILPACO *Oil Seals*

LEATHER PRODUCTS COMPANY

January aircraft production up 5.4 per cent from December, raising total output since Pearl Harbor to 143,000 units. Proportion of tactical types rises. Increasing emphasis placed on output of heavy, four-engine bombers

AIRCRAFT output in January was above schedule, the Aircraft Production Board reports. In numbers, the 8789 total acceptances were substantially the same as for December, with weight of airframes produced, however, increasing by 5.4 per cent from 85,700,000 to 90,300,000 pounds. Plane production since Pearl Harbor totals 143,000 units.

Results were particularly gratifying to the Aircraft Production Board, C. E. Wilson, its chairman stated, as the most marked acceleration was in the urgently needed combat planes. The increase in these types, particularly in heavy four-engine bombers and long range fighters, substantially balanced the planned decreases in trainers and older tactical models which, as reported earlier in the month, had been reduced in the schedule to approximately 78 per cent of December acceptances.

Most remarkable feature of the January record was the fact that practically every company in the country met or exceeded its schedule; only a few plants were slightly under schedule, with the vast majority a little above.

The board emphasizes the tremendous increase in the proportion of tactical aircraft in the schedule, the percentage now being 82 per cent of the total, with 89 per cent of these combat types. In both categories January acceptances exceeded schedules and also December deliveries. Increasing effort and continuous improvement in manufacturing efficiency will be necessary to maintain this pace.

SINCE PEARL HARBOR

AIRPLANES  **143,000**

Metals Supply for Aircraft Improved

Steady improvement in the supply-requirements position of ferroalloys, alloy steel, aluminum, magnesium, copper, beryllium-copper and zinc has resulted in revisions of aircraft conservation policies. Improvement is due to cutbacks in the programs of the armed services, better control over distribution and use, past conservation measures, and other factors, according to the Operating Committee on Aircraft Materials Conservation, War Production Board.

A continued favored position is dependent upon the future progress of the war, the committee reports, and constant surveillance is required to maintain it.

BLACK WIDOW: Watching a test flight of the new Northrop P-61 night fighter, (described in STEEL, Feb. 7, p. 114) are, left to right: John K. Northrop, president and chief of design for Northrop Aircraft Inc.; Lieut. Gen. William S. Knudsen, director of production for the United States Army; and LaMotte T. Cohu, general manager of Northrop

All of the commonly used ferroalloys are in ample supply for aircraft use. In the case of columbium, there is a very limited supply; consequently, the committee recommends that it should not be used except where necessary.

Any expansion of demand for stainless steel must be considered carefully for the reason, the committee points out, that this product uses such a high percentage of nickel and chromium. Otherwise, alloy steel is in ample supply, excepting where facilities for sheet, plates, and seamless tubing are involved. The supply of tool steel exceeds the current demand.

The general improvement in availability is not reflected in the same degree for all products of magnesium. New uses for forgings are discouraged. However, the following forms are currently available: Extrusions (shapes, rod, bar, and tubing); sheet, strips and plate; castings (particularly permanent mold and die castings).

New uses of some aluminum products for military use are encouraged in view of the improved supply situation. It is still desirable, however, that the use of secondary instead of primary aluminum be continued in castings and powders wherever consistent with required performance. New uses of permanent mold casting products of aluminum are discouraged. It is recommended that consideration for new uses be given to the following: Sheet, strip, plate and foil; rod, bar, wire and cable; tubing shapes (rolled and extruded); rivets; sand and die castings.

Copper, as a metal, is in a fairly satisfactory supply situation and it is recommended that all previous uses of copper and copper-base alloy materials, for which substitution to some previously less critical material was made, be reviewed with the idea of reverting to such copper material.

Sufficient capacity exists for producing commercial brass sheet and strip to cover most nominal necessary reconversions. Military requirements for copper-base alloy rod are somewhat increased, but brass mills can handle some additional volume, particularly in sizes over ½-inch. Brass mill capacity is available for tubing in sizes under 4 inches, except for alloys which are extruded, and for copper products with the exception of copper tubing over 4 inches and small size thin wall tubing. Copper wire and cable capacity is available with the exception of cords and cable involving fine wire and stranding.

Casting capacity is available for the production of foundry products, but there is a limited supply of scrap of the proper grade to produce high copper content castings of 80 per cent or higher copper. Yellow brass castings are in relative easy supply.

Recent additional cutbacks in the small arms ammunition program will create a somewhat larger surplus of zinc than originally predicted, but the creation of this surplus during 1944 is

TOOLS LEAD A DOUBLE LIFE

SUNICUT

increases tool life 100%... improves finish of parts

Tools can't take a holiday . . . not when there are guns to make, and bombers to build, and other war material to produce. But tools were taking holidays . . . far too many . . . for regrinding and resharpening at one of the largest mid-west war plants.

Production quotas were a headache to machine tool operators and foremen because the frequent "time-outs" for tool changes cut down the output. In addition the finish of the parts was not up to par. Many grades and brands of cutting oil were tested and tried, but all failed to correct the condition. So they called a Sun Doctor of Industry — a cutting oil expert — who studied the problem and recommended a change to Sunicut, the transparent, sulphurized oil.

Tools double parts produced for tool grind on many operations before they need changing . . . and the finish of the parts is everything that could be desired. Sunicut succeeded where the others failed.

Output is stepped up in this war plant because the high heat-absorbing and metal wetting properties of Sunicut permitted longer tool life and finer finish. How about investigating the production-boosting possibilities of Sunicut in your plant? A Sun Oil Engineer will be glad to discuss it with you. Write

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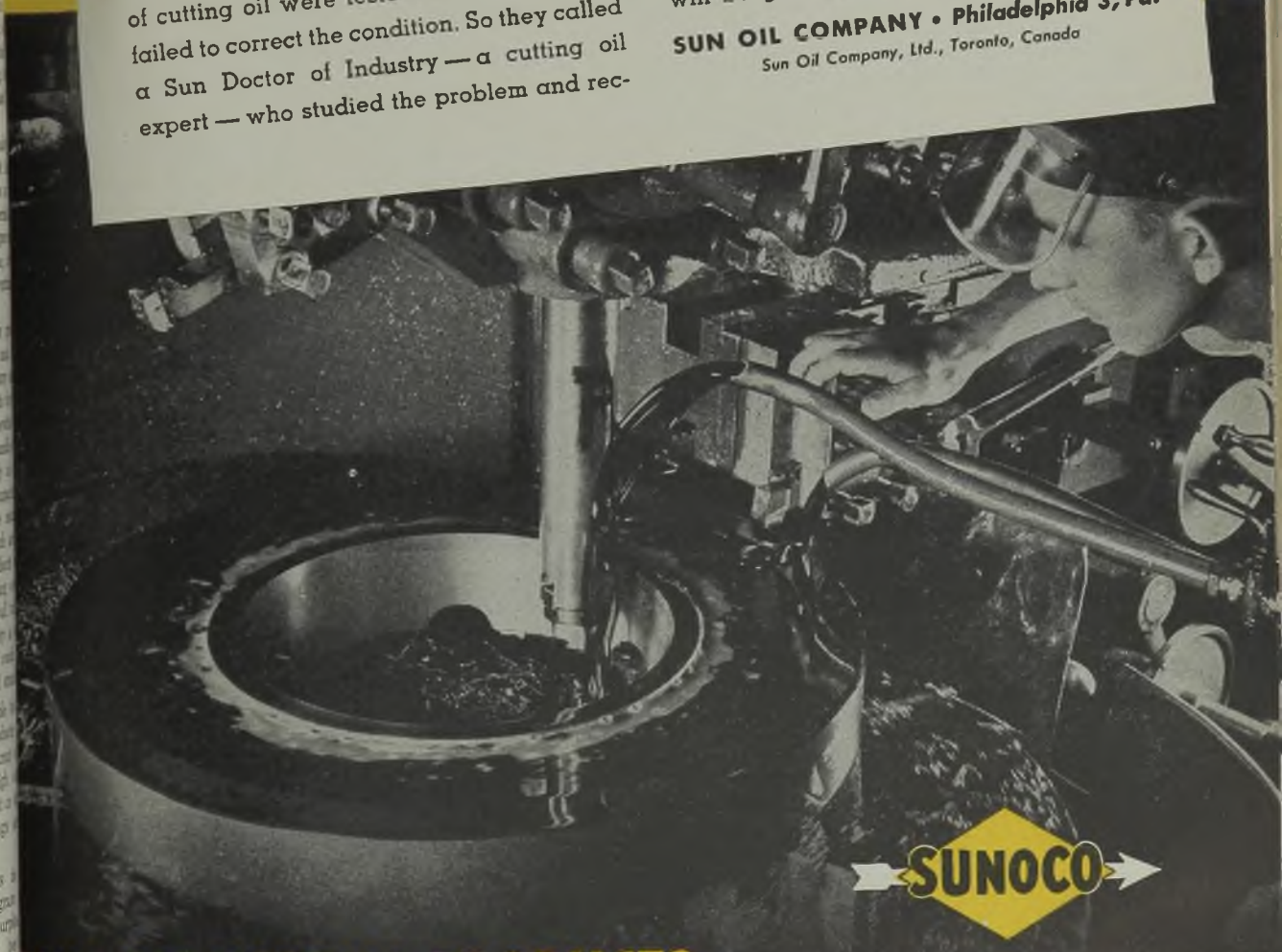
Sun Oil Company, Ltd., Toronto, Canada



SUNOCO

SUN INDUSTRIAL PRODUCTS HELPING INDUSTRY HELP AMERICA

dependent upon continuance of production at present levels under increasing difficulties and of the small arms ammunition program remaining at a reduced level.

Reconversion to, and new uses for, zinc for sound military purposes are encouraged by the committee. Its use as a substitute for cadmium must be continued and even increased; the output of the latter is wholly dependent upon the production of zinc.

The supply of beryllium copper is now adequate to meet essential aircraft requirements, although supplies do not permit indiscriminate use.

Buick Division To Build New Cargo Plane Engine

Buick division, General Motors Corp., is tooling to manufacture a new cargo plane engine of the Pratt & Whitney twin-row Wasp type. The engine, a 14-cylinder radial developing 1200 horsepower, is comparable in most parts with the Pratt & Whitney R-1830-43 being mass produced by Buick for B-24 Liberator bombers.

The new production will be carried on in the same plants at Flint, Mich., and Melrose Park, Ill., in which the bomber engines are manufactured, with many of the parts and subassemblies being produced on the same machines and assembly lines. Additional machines to accommodate the design changes are being installed and early production of the new engine is anticipated.

Improved Test Methods Save 279 Pounds Alloy Steel per Engine

IMPROVED method for handling test coupons on heat-treated steel forgings, developed by engineers of Chevrolet Motor division, Army Air Forces, and Pratt & Whitney Aircraft, has saved 279 pounds of alloy steel per engine.

Formerly, in the case of the steel propeller shafts for the 14 cylinder radial engine, test coupons were cut from a sample forged as an extra part of each shaft. After the forging was heat treated, the sample, weighing 16 pounds, was cut from the forging and a small test bar machined from the sample. The remainder of the sample was unused. Chevrolet metallurgists tackled the problem of continuing the vital hardness test control without the subsequent loss of material from which test coupons were taken.

Tests were made in the case of the propeller shaft, crankshaft and master connecting rod, and a new plan of handling tests on these parts was submitted to the Army Air Forces and to other manufacturers producing these parts. Approval was granted to make the necessary changes in test methods and the new practice submitted to other producers for their adoption.

Upon the arrival of a shipment of steel at the Chevrolet forge plant, estimates are made of the number of forgings this shipment will produce. A sufficient amount of bar stock from the same heat is forwarded to the manufacturing plant and cut into test coupons, one for each forging made. In this way, ten test coupons are now supplied from the same amount of steel formerly used for one test coupon, at a considerable saving in the cutting and machining required by the old method.

The new practice has meant a total steel saving of not less than 34 pounds per job for the propeller shaft and crankshaft. In the case of the master rod, permission was granted by the Army Air Forces to test one sample for each 10 rods, after the uniformity of the heat treatment was established. Amount of steel allowed for machining on the cylinder sleeve also was reduced as part of the program, with a saving of 10 pounds per cylinder. Changes in design and forging practice resulted in savings in steel and labor in lesser amounts on other aircraft engine parts.

Altogether, the savings to date amount to 279 pounds per engine, a saving of more than two freight carloads of steel for every 1000 engines produced.

Bell Aircraft's Surplus Materials Offering Large

Just an inkling of the enormous quantities of surplus materials and parts in the hands of many aircraft companies is provided by a recent listing circularized by the Materials Disposal department, Bell Aircraft Corp., Buffalo. It was explained the listing, conservatively estimated to cover materials worth at least $1,250,000, did not include all inventories, and would be supplemented weekly with additional items. Summary of the three-page list shows the following choice items:

Thirteen types and sizes of 24SO and ST aluminum and alclad sheet, bulking to the staggering total of 2,610,189 pounds.

Thirteen types and sizes of round alloy steel bars—4130, 4140, 8740, 3140—totaling 584,449 pounds.

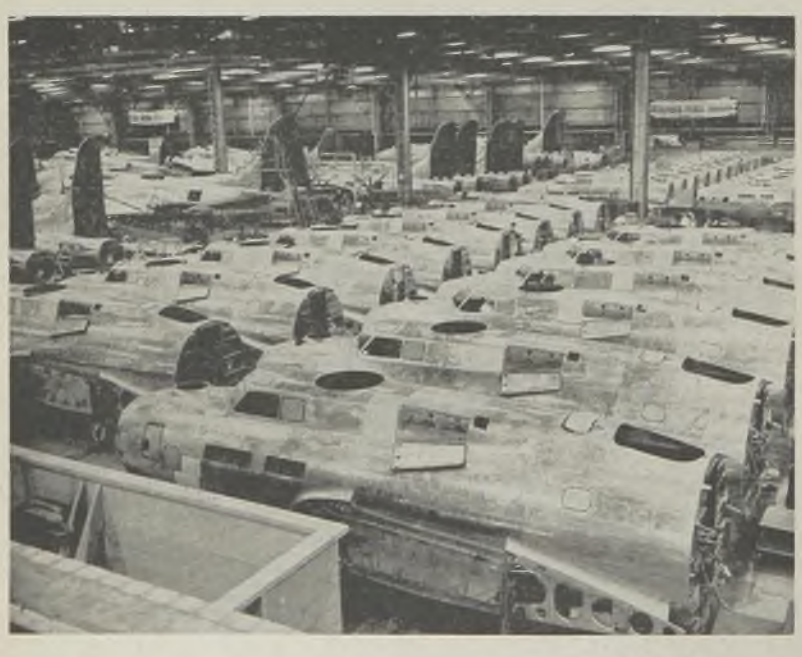
Eight types of X4130 steel tubing, ranging from 7/16 to 1⅛-inch diameter amounting to 81,765 feet.

Seven types of carbon steel and stainless steel sheet and strip totaling 397,316 pounds or nearly 200 tons.

Six varieties of steel tubing, ranging from ¾ to 2-inch diameter, weighing 151,296 pounds.

Miscellaneous items including 124,293 elastic stop nuts, 37,427 electrical plugs, 36,863 pounds of aluminum and alclad strip, 41,127 pounds of magnesium alloy sheet.

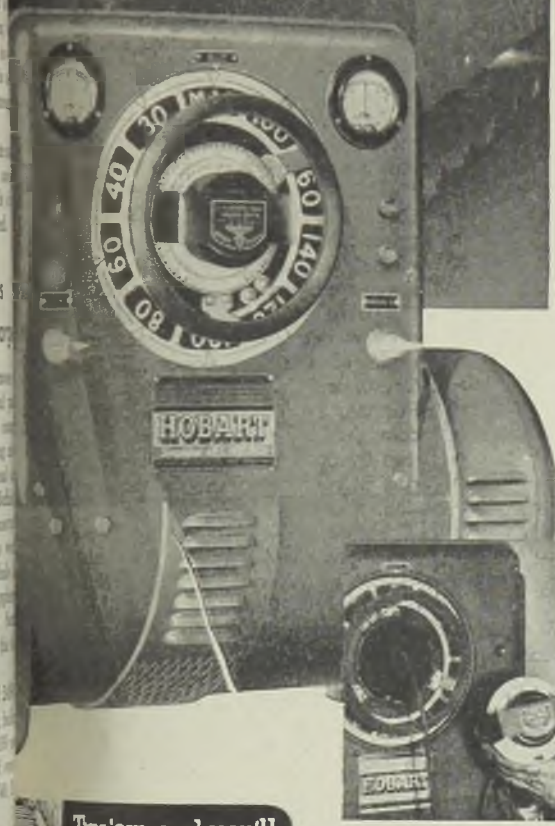
R. J. Lewis is manager of the Bell Material Sales department, and can be addressed at 2050 Elmwood avenue, Buffalo.



HIGHER AND HIGHER: Production of Boeing Flying Fortresses during 1943 was 146 per cent higher than the previous year's output, an achievement which was accompanied by a reduction in cost and man-hours per plane. Scene shows a small portion of the plant's final assembly area where the big bombers are fitted out for combat

HOBART

"Simplified" Arc Welders have a way of MAKING GOOD on any job.



— they make good because they have more good built into them. Hobart Welders have exclusive Remote Control, two-way ventilation, are single unit in construction, give you 1,000 combinations of heat and current. No other welder can offer as much. You owe it to yourself to investigate Hobart Welders NOW! Available for immediate delivery to help you with your present production problems.

PLAN NOW for post war! This new welded design service is a most outstanding contribution to help you design your new products with the help of welding. No production man, engineer, or designer can be without it. The initial pages FREE. Write for them today.

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☐ Practical Design Sheet ☐ Welder's Vest Pocket Guide ☐ Complete Hobart Welder Catalog

☐ Am interested in _____ welder at once.

Name _____

Address _____

H. M. COMSTOCK

Who has been named engineering sales representative in southern California for Kropp Forge Co., Chicago, and Kropp Forge Aviation Co., noted in STEEL, Feb. 7, p. 117.

ROBERT H. CLYMER

Who has been elected vice president in charge of yard and plant operations, Luria Bros. & Co. Inc., Philadelphia, noted in STEEL, Feb. 7, p. 116.

W. PAUL EDDY JR.

Who has been appointed materials engineer, Pratt & Whitney Aircraft division, United Aircraft Corp., East Hartford, Conn., reported in STEEL, Feb. 7, p. 117.

William S. Wheeler, formerly vice president and general manager, Pennsylvania Engineering Works, New Castle, Pa., has been elected president, succeeding **W. H. Lewis,** who is retiring after serving as president for more than 19 years. Mr. Lewis remains with the organization as board chairman. Other new appointments are: **Clark Rossiter,** vice president and general manager; **P. M. Pattison,** vice president and secretary; **A. L. Davis,** treasurer, and **H. L. McFeaters,** chief engineer.

—o—

D. M. Morewood has been appointed assistant to E. G. Plowman, vice president in charge of traffic, United States Steel Corp., Pittsburgh, and he is succeeded as assistant traffic manager, United States Steel Corp. subsidiaries, eastern district, by **R. N. Shields. R. F. Holtz** has been named assistant to traffic manager, eastern district, and **R. J. Dods** is general supervisor, traffic department, eastern district.

—o—

John W. Humphrey has been appointed assistant to the general superintendent, Youngstown district, Carnegie-Illinois Steel Corp., Pittsburgh. **Arno L. Billeter** succeeds him as superintendent of the corporation's Vandergrift, Pa., plant, and **Albert J. Berdis** succeeds Mr. Billeter as assistant to the general superintendent of the Irvin works. **Klauss Egge** has been made chief engineer at the Irvin works.

—o—

H. V. Waterman, Hendrie & Bolthoff Mfg. & Supply Co., Denver, has been elected president of the newly-established Colorado chapter, American Steel Warehouse Association Inc. **J. H. Singleton,** C. A. Crosta Inc., Denver, has been elected vice president of the Colorado chapter, and **A. M. Hays,** Hendrie & Bolthoff Mfg. & Supply Co., is secretary-treasurer. Mr. Waterman is also chapter director.

—o—

G. H. Tobelman has joined Wolverine Tube division, Calumet & Hecla Consolidated Copper Co., Detroit, as manager of the eastern territory, with offices in New York. For the past 11 years Mr. Tobelman has been associated with Bridgeport Brass Co., Bridgeport, Conn., as sales manager of the Eastern division. **C. E. Rinaman** will manage the Boston territory for Wolverine; **W. C. Gernhart** will be Philadelphia manager; **F. R. Meier** will cover greater New York, and **A. S. Kingerley** continues in New Jersey.

—o—

John C. Hines has been appointed special assistant, specializing on spark plugs, to the general sales manager, AC Spark Plug division, General Motors Corp., Detroit. **Alpheus S. Holmes** holds a similar post, specializing on oil filters, and **Richard E. Merrell** is special assistant specializing on fuel pumps, speedometers and related items. **Eugene B. Powell** has been named regional manager at Philadelphia, succeeding Mr. Hines; **Harold L. Wardrop** succeeds Mr. Powell as Los Angeles regional manager; **James F. Kingsley** succeeds Mr. Holmes as regional manager in New York; **William F. Parker** takes Mr. Kingsley's place as regional manager in Atlanta, Ga., and **Edgar H. Francois** succeeds Mr. Merrell as Chicago regional manager.

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William A. Patterson, president United Air Lines Inc., has been elected a director of Stewart-Warner Corp., Chicago, filling the vacancy caused by the death of Frank A. Ross, senior vice president of Stewart-Warner Corp.

—o—

Robert Wier Jr., sales manager, Winchester Repeating Arms Co., division of Western Cartridge Co., East Alton, Ill., has been appointed sales manager of the Ammunition division of Western Cartridge Co. Thus, Mr. Wier will direct sales activities of Western's Ammunition and Winchester divisions, making his headquarters in New Haven, Conn. **George M. Davis,** who has been acting sales manager for Western at East Alton, has been named executive assistant to Mr. Wier.

—o—

Frank A. Hiter, vice president and director, Stewart-Warner Corp., Chicago, has been named senior vice president. He has also been named to direct Division I of the corporation, which comprises all products made in the Diversey plants, Chicago. **George L. Meyer Jr.** has been appointed director of Division II, which includes products of the Stewart Die Casting plant, Chicago, and those of the Bassick Co., Bridgeport, Conn., subsidiary of the corporation. Formation of these new divisions, each comprised of related products, is a first step by Stewart-Warner in keying its organizational setup to postwar reconversion.

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Walter C. Ahlers, formerly assistant district manager in Detroit for SKF Industries Inc., Philadelphia, has been appointed Detroit district manager, succeeding **Robert H. Hirsch,** resigned.

—o—

Frank S. Spencer, formerly associated with the Sub Contract division. General Electric Co., River works, Lynn, Mass., has been appointed sales manager, Manufacturing division, Warren Bros. Roads Co., Cambridge, Mass.

—o—

Gordon F. Ives has been appointed advertising manager, Walter Kidde & Co. Inc., Bloomfield, N. J., replacing **C. E. Gischel,** who has been appointed director of product development in charge of postwar planning.

—o—

W. T. Darcy, manager of the Renewal Parts division, Industrial divisions, General Electric Co., Schenectady, N. Y., adds to his present duties management of nation-wide GE service shop sales.

—o—

Howard G. Jones has been appointed New York representative having full charge of the New York office, Vulcan

MYRON M. EICHER

W. J. CREIGHTON

B. S. CHAPPLE JR.

J. P. LAWRENCE

Iron Works, Wilkes-Barre, Pa. Mr. Jones succeeds **Thomas Mac Lachlan,** who recently resigned to join H. K. Porter Co. Inc., Pittsburgh, as general manager of the New York office.

—o—

Myron M. Eicher has been appointed works manager, Jessop Steel Co., Washington, Pa., succeeding **Harry Wilson Jr.,** who recently was named vice president in charge of operations. Prior to joining Jessop Steel Co. in 1942 as head of the scheduling department, Mr. Eicher was chief clerk in the Scheduling division at Crucible Steel Co. of America's Midland, Pa., plant.

—o—

John O. Chesley, who organized the Sales Development division of Aluminum Co. of America in 1927, has been appointed railway sales manager for the company, and **Frank C. Barrows Jr.,** Detroit district sales manager since 1929, has been named automotive sales manager. **Charles M. Whelan** succeeds Mr. Barrows as Detroit district sales manager.

—o—

Francis S. Norton has been named general traffic director, Fisher Body division, General Motors Corp., Detroit, succeeding **C. A. Sullivan,** who has retired after 26 years as general traffic director.

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Clyde MacCornack, vice president and general manager, Phoenix Bridge Co., Phoenixville, Pa., has retired after 40 years' association with the company. Mr. McCornack also has resigned as first vice president of the American Institute of Steel Construction Inc., New York.

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Ross C. Little, formerly assistant manager of the Zanesville, O., plant of American Rolling Mill Co., Middletown, O., has been named manager of the Zanesville plant, succeeding **A. F. Murphy,** who is retiring.

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Henry Ford II has been named vice president in charge of sales, Ford Motor Co., Dearborn, Mich.

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Donald A. Sutherland has been appointed field engineer in charge of sales and sales promotion activities, McCulloch Engineering Corp., Milwaukee.

—o—

William J. Creighton, formerly financial vice president, Jones & Laughlin Steel Corp., Pittsburgh, has been named executive vice president, and **Adam J. Hazlett,** previously manager of strip and sheet sales, has been appointed general sales manager. Mr. Creighton is also a director of the corporation and a member of its executive committee. Mr. Hazlett is a former president of Eastern Rolling Mill Co., Baltimore.

—o—

H. H. Barnes has been appointed director of the Proving Ground section of General Motors Corp. at Milford, Mich., succeeding the late Ernest E. Wilson. Mr. Barnes has been associated with General Motors for 25 years.

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Clyde L. Reece, formerly head of the International News Service office in Detroit, has joined the public relations staff of Chrysler Corp., Detroit.

—o—

Harold W. Buus, for some time on leave of absence from Stearns Magnetic Mfg. Co., Milwaukee, has resumed his former position as supervisor of technical operations in the company's Laboratory division.

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Raymond C. Franklin has joined the sales force of Continental Screw Co., New Bedford, Mass., representing the company in Delaware, Maryland, the District of Columbia and in neighboring parts of Pennsylvania and New Jersey.

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George Russell has been appointed assistant treasurer of General Motors Corp., Detroit, and **Roy E. Hammond** has been named assistant comptroller.

—o—

E. B. Dunkak has been named manager of the newly-formed Process division, Davison Chemical Corp., Baltimore.

—o—

W. W. Radcliffe and **E. C. Elstad,** members of the machine tool panel of the Cincinnati Ordnance district, have received Army Ordnance Department citations, and letters of recommendation have been awarded by the Army Ordnance Department to **J. F. Jewett, J. C. Mullen** and **Arthur C. Pletz,** also members of the district's machine tool panel.

—o—

Bennett S. Chapple Jr. has been appointed assistant to the president, Firth-Sterling Steel Co., McKeesport, Pa. Previously Mr. Chapple had been assistant manager of sales, New York district, Carnegie-Illinois Steel Corp., Pittsburgh. Mr. Chapple's other former associations include: Insulated Steel Construction Co., Middletown, O., and American Rolling Mill Co., Middletown.

—o—

J. P. Lawrence, former vice president and general manager, American Monorail Co., Cleveland, has been named president, succeeding **H. M. Miller,** who has become board chairman.

—o—

William E. Harrison has been appointed assistant fuel engineer for Lukens Steel Co. and its subsidiaries, By-Products Steel Corp. and Lukenweld Inc., Coatesville, Pa.

MARTIN J. BERLYN

Who has been appointed vice president in charge of engineering, American Bosch Corp., Springfield, Mass., as reported in STEEL, Feb. 7, p. 116.

WILLIAM J. FILBERT

GEORGE L. DUMBAULD

William J. Filbert, 78, senior director, United States Steel Corp., Pittsburgh, and member of its finance committee, died Feb. 4 in New York after a brief illness. Mr. Filbert, who for more than 40 years had been recognized as an outstanding authority on corporate accounting and finance, was born at Palatine, Ill., Nov. 4, 1865. He began his business career in 1881 in the purchasing department of the Chicago & Northwestern Railway Co., Chicago.

Mr. Filbert was serving as auditor of Federal Steel Co. in 1901 when that company was merged with others to form United States Steel Corp. He was made assistant comptroller of the new corporation, and a year later became comptroller. For the next 30 years Mr. Filbert occupied that post.

In 1919 he was elected a director of the corporation; in 1932 he retired as comptroller and was elected vice chairman of the finance committee, and in 1934 he became chairman of the finance committee. Upon his retirement in 1936, he was named a general consultant to the executives of the corporation, remaining a member of the finance committee and retaining his directorship.

Mr. Filbert was the first secretary of the American Iron and Steel Institute, which in 1931 awarded him the Gary Medal for outstanding service to the steel industry, and in 1935 elected him an honorary vice president.

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William H. Freiburger, 52, general superintendent, National Smelting Co., Cleveland, died Feb. 5 in that city.

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James A. Nolan, 54, New York state representative for Carpenter Steel Co., Reading, Pa., died Jan. 17 in Rochester, N. Y. Mr. Nolan had been associated with the company for 33 years.

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Charles F. Niemann, 74, president and treasurer of Parkersburg Iron & Steel Co., Parkersburg, W. Va., since 1906, and prominently identified with business interests in Pittsburgh, died Feb. 4 in Pittsburgh after a brief illness.

—o—

George L. Sargent, 81, retired president and director, Sargent & Co., New Haven, Conn., died there Feb. 5.

—o—

A. H. D. Altree, who had been associated with American Bosch Corp., Springfield, Mass. for 21 years, and who retired in 1930 as vice president, died recently.

—o—

George L. Dumbauld, 61, vice president-treasurer, Blaw-Knox Co., Pittsburgh, died suddenly in Glenshaw, Pa. Feb. 3. Mr. Dumbauld, who had been identified with the growth and development of Blaw-Knox Co. for 24 years in official capacities, joined the company in 1920 as comptroller. He was elected a director in 1929, treasurer in 1930 and vice president and treasurer in 1936.

—o—

Henry P. Engeln, 73, founder and president of the Engeln Electric Co., Cleveland, until his retirement five years ago, and a pioneer in the manufacture of X-ray apparatus, died Feb. 7 in Cleveland.

—o—

John A. Camm, 64, president of Camm Blades Machinery Co., Milwaukee, died Feb. 4 in that city. For many years Mr. Camm had been sales manager of Kearney & Trecker Corp., Milwaukee.

—o—

John K. Peet, 33, owner of Peet Hickory Co., Corinth, Miss., died there Feb. 3.

—o—

Victor Wagini, 67, owner of the City Iron Works, Portland, Oreg., died Jan. 30 in that city.

—o—

William Theile, 51, chairman of the board and president, Catalin Corp. of America, New York, and vice president, Atlantic Investing Corp., New York, died Feb. 4 in that city.

—o—

Charles Copeland, 76, former secretary and director of E. I. du Pont de Nemours & Co., Wilmington, Del. died there Feb. 3 after a long illness.

—o—

William B. Mayo, 78, who was chief engineer for Ford Motor Co., Dearborn, Mich., from 1913 to 1932, died Jan. 31 in Detroit. Following his retirement from the Ford Co. Mr. Mayo served for a time as president of United Aircraft Corp., and at the time of his death he was president, Chicago, Duluth & Georgia Bay Transit Co.

—o—

George H. Hartel, 75, senior member of Hartel Bros. & Co., South Boston, Mass., died in West Newton, Mass., Feb. 4. Mr. Hartel was a charter member of the Boston chapter of the American Society for Metals.

—o—

George A. Burman, 76, vice president, Wolverine Foundry Supply Co., Detroit, died in that city Feb. 3. In the foundry business in Detroit for 30 years, Mr. Burman had been associated with the Wolverine company since its organization in 1938.

—o—

E. J. Moore, 66, vice president and director, Turner Construction Co., New York, died there Feb. 1.

—o—

Thomas F. Collins, 39, one of the original staff and organizer of the purchasing department, Buffalo Arms Corp., Buffalo, died Feb. 1 in that city.

—o—

Harry T. Hamilton, 63, assistant to the president, New York Trust Co., and formerly manager of the Montezuma Copper Co., Nacazari, Mexico, from 1914 to 1924, died Feb. 6 in Summit, N. J. Mr. Hamilton was a director of the Mining and Metallurgical Society of America and of the American Institute of Mining and Metallurgical Engineers.

—o—

Damon de Blois Wack, 36, executive vice president, National Bearing Metals Corp., St. Louis, subsidiary of American Brake Shoe Co., New York, died Feb. 1 in St. Louis. Mr. Wack had been vice president of American Brake Shoe Co.'s Pacific Coast division before joining National Bearing Metals Corp. in 1941.

—o—

Allen J. Witherell, 82, retired president of Kester Solder Mfg. Co., Los Angeles, died recently in that city.

—o—

Alva L. Grinnell, who for many years was district manager in Detroit for Rustless Iron & Steel Corp., Baltimore, and who recently was appointed special representative on special assignments, died Feb. 3 in Detroit.

—o—

Robert W. Thomas, 40, treasurer and a director of Thomas Machine Mfg. Co., Pittsburgh, died Feb. 6 in Glenshaw, Pa. After graduating from the University of Pittsburgh in 1926 Mr. Thomas joined the Thomas Machine Mfg. Co., which was founded by his father, and served in various capacities, becoming widely known throughout the machine tool industry.

—o—

Harry N. Omer, 43, assistant sales manager for Great Lakes Steel Corp., Detroit, died in that city Feb. 3 after a long illness.

Steel Production Resumed After 18 Months Idleness

Chapman Price Steel Co. remained idle due to drain of semifinished steel allocated for foreign shipment

CHAPMAN Price Steel Co., Indianapolis, division of Continental Steel Corp., resumes production Feb. 14 after the plant had been idle for more than 18 months, Fred T. Lawrence, works manager, announced last week.

"This shutdown was on account of the heavy drain of semifinished steel in the form of billets and rods, allocated for foreign shipment from the steel plant at Kokomo," Mr. Lawrence said. "This necessitated closing down one finishing division of the corporation until such a heavy demand for semifinished material eased off."

Production will be resumed according to arrangements with the War Production Board on orders for shipment under the regulations of CMP. Half the hot mill will begin production about Feb. 14 and the other half will begin about Feb. 28.

During the shutdown the Chapman Price plant at 3000 Shelby street, Indianapolis, was used by the Air Service Command as a storage depot.

BRIEFS . . .

Virginia Road Builders' Association, Washington, has become an affiliate of the American Road Builders' Association.

—o—

Crosley Corp., Cincinnati, announces appointment of the Dutton-Lainson Co., Hastings, Nebr., as distributor for its products in central Nebraska.

—o—

Tungsten Carbide Tool Co., Detroit, announces it has made price reductions on its standard stock line of single-point, diamond ground tools.

—o—

Detroit Tap & Tool Co., Detroit, announces that it has a six page bulletin, CB-43, ready for distribution which lists more than 50 standard blanks for thread milling cutters.

—o—

A. B. Farquhar Co., York, Pa., announces that as of Jan. 1, 1944, the limited partnership of the A. B. Farquhar Co. Ltd. is dissolved, the firm becoming a corporation under the laws of Pennsylvania known as the A. B. Farquhar Co.

Continental Gin Co. Awarded Fourth Star

Continental Gin Co., Birmingham, Ala., recently was awarded the fourth star to its Army-Navy pennant. Original "E" was granted in October, 1941, the first star added in May, 1942, second star in October, 1942, and the third star, April, 1943.

The company converted its facilities from manufacture of cotton ginning machinery to production of war goods. It has also manufactured conveying, elevating and power transmission equipment for the nation's magnesium and aluminum plants, as well as equipment for other basic industries.

Charcoal Blast Furnace To Be Moved to Texas

WITH charcoal output in this country at low ebb, a charcoal blast furnace, with daily capacity of 100 tons, will be established at Rusk, Tex. The Defense Plant Corp. will supply the $2,379,000 required and will lease the furnace and auxiliary equipment to the McCrossin Engineering Co., 120 Wall street, New York, headed by Col. E. F. McCrossin. Ralph H. Sweetser, New York, will act as consulting engineer.

Project involves the dismantling and removal of a stack at Pembroke, Fla., originally set up to produce elemental phosphorus from phosphate rock and blast furnace coke. The furnace was built with German capital, but did not prove commercially successful and has not been in operation since 1932. In fact, the furnace saw very little actual service, and all that is needed to make it an effective producer of charcoal pig iron, engineers assert, is a different hearth jacket. The hoisting and blowing equipment of the furnace is electrically operated.

The accompanying photo shows the stack under construction in Florida.

The development at Rusk will also include the installation of the carburizing and charcoal by-products chemical plant formerly operated by the Delta Chemical & Iron Co., Wells, Mich. Dismantling and removal of this and the blast furnace will get under way soon. In addition to 100 tons of charcoal iron daily, the plant will also have capacity for producing a corresponding amount of charcoal by-products.

Proposed project is being established in an area where hard wood supply is abundant and where there is ample iron ore for the purpose. The ore is a brown ore which lies in a formation peculiar to that particular section in Texas—the South Basin of the iron ore reserve of East Texas. It is a hydrated iron oxide called limonite, lying in a secondary deposit from Weches sand.

The establishment of this furnace is coming at a time when active capacity for producing charcoal in this country is at the lowest point in more than 100 years. Production last year dropped sharply from 102,000 gross tons produced in 1942.

Last year the Wells stack went out in January, to be followed last fall by the closing down of the Antrim, Mich., furnace, leaving only one charcoal furnace in operation in the north, that of the Newberry Lumber & Chemical Co., Newberry, Mich., with an annual capacity of 29,000 tons.

The only other furnace in the country producing charcoal iron is the Wrigley stack of the Tennessee Products Co., Lyles, Tenn., which is now said to be running on part coke and part charcoal, with an annual production of around 24,000 tons.

GRANT H. HOWELL

One of the first engineers in the nation to handle the problem of reconverting from production of war goods to civilian stoves is Grant H. Howell, factory superintendent, Grand Home Appliance Co., Cleveland. Reconversion in this medium-size metalworking plant is total for none of the government-owned machinery used to produce tank armor plate is adaptable for the manufacture of its civilian product.

Manufacturer Returning To Peacetime Production Meets Many Problems

Cleveland company resuming stove construction plagued by delays in obtaining equipment. . . Reconversion offers opportunity to modernize plant layout for more efficient operations

By JOSEPH M. KURTZ
Assistant Editor, STEEL

RECONVERSION from war to peacetime production won't be easy for many manufacturers. Even where changeover should be relatively simple because facilities in use for war production are adaptable to peacetime goods manufacture, there is considerable detail associated with reconversion which will not be overcome without a headache or two for management.

In those companies whose war activity is totally different from their normal peacetime operations, reconversion will present problems which will test management's ingenuity and resourcefulness to the utmost.

Already many firms are learning that reconversion will take more than a flip of the finger. An instance of this is the experience of the Grand Home Appliance Co., Cleveland, one of the first medium-size metalworking plants in the nation to reconvert its facilities from tank armor plate to the manufacture of its normal product, civilian stoves and ranges.

This company has stripped its plant from wall to wall of most of the government-owned war equipment to permit installation of its own machinery to manufacture stoves. In the course of reconverting, it has been plagued with hundreds of problems and bottlenecks. When its war contracts were canceled last June, the company assigned its engineers to study the plant layout. The layout finally evolved differs widely from that used during its prewar operations. Newly employed engineers contributed a number of ideas for designing the production line which hold promise of bettering the company's prewar production practice.

To double check its engineering staff for mistakes that might have occurred, the management obtained the services of outside engineers who went over the blueprints with a fine tooth comb. Then the engineering department notified the purchasing department of equipment needs. Much of the needed equipment still has not been received and in some cases improvisation has been necessary. As a matter of fact, a company official points out that the sequence of installation of machinery has been delayed due to the lack of even such small items as the proper size bolts.

Most of the government equipment has been moved out but some still remains. None of the government-owned equipment is suitable for producing stoves.

What about labor contracts signed to apply to its wartime production? A company official pointed out that one of the major problems encountered, and one which most war plants throughout the country will face when the war ends, is the renegotiation of labor contracts. Operations required in producing tank armor plate differed much from the operations required to manufacture civilian stoves. Therefore, the company finds it necessary to renegotiaate its labor agreements setting up new wage scales and rates for the various jobs which will exist under the new production plan. There will be fewer press operators used. A company official said a scale of hourly rates must be worked out which will permit the company to compete favorably in a highly competitive postwar market.

Another troublesome problem was obtaining War Production Board's approval on the type of range to be manufactured. The research and development department suggested a number of new models, including several postwar "dream" models. The model finally selected and approved by WPB embodies no substitute materials. The company believes that it cannot afford to produce a "victory" model embodying substitutes, and thus destroy a trade name established over many years.

The WPB limited the amount of metal for use in each unit coming off the production line. The maximum metal content was set at 100 pounds. Company engineers created a range which they regard as superior to ranges produced before the war. These are four-burner ranges with an oven, compactly built for small kitchens. The company plans to continue production of this model after the war ends.

The three important reconversion steps taken by the Grand company which it suggests to others contemplating reconversion are:

(1) Reclaim tools and dies of prewar products anticipating a government rul-

ing that the company must manufacture its prewar product; (2) prepare plans to modernize prewar products by revamping tools and dies used before the war, and (3) keep pushing the development of "dream" models so as to be prepared to move into production on them when the opportunity arises and when government restrictions have been removed.

Before the war, the company's production setup was not designed for the most efficient method of operation. It had become antiquated. It did not permit straight-line production. Under its present setup the straight-line production system is expected to save thousands of dollars through elimination of lost motion, thus boosting daily production with the same number of man-hours.

When the company received orders from the government to prepare its facilities for production of tank armor plate virtually all of its peacetime machinery was stripped from the plant, with the exception of its presses. Heavy presses, flame cutters, grinding and drilling equipment were installed. With reconversion to production of civilian stoves, the engineering department found in studying the inventory of prewar machinery stored away that about 75 per cent of it is usable in the new plant layout.

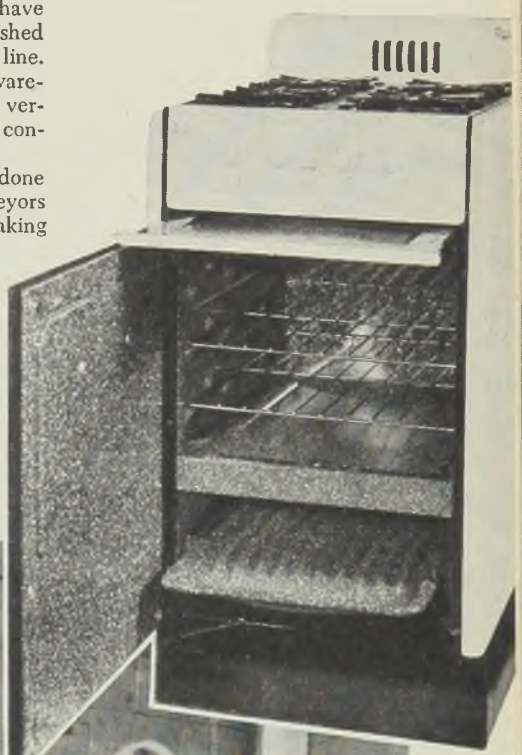
Greater emphasis has been placed on materials handling equipment in the new layout and several new conveyor systems have been installed.

Steel supplies are shuttled into the storage room on a conveyor and then sent to the shearing department. After the steel has been sheared, it is directed to the press room and spot welding department. From there, parts to be enameled are conveyed to the annealing department and then returned to the assembly plant by conveyor. Then assembly operations are completed on a newly-installed slat conveyor. At one point in the assembly operation where the stove rests on its back, the conveyor is about a foot higher than the following conveyor where the stove is propped on its legs to permit final assembly operations. The higher level of the first conveyor facilitates the assembly work since the workmen do not have to bend over the stove. The finished stove is crated on the conveyor line. From there it is carried to the warehouse in an adjoining building by a vertical elevator and gravity roller conveyors, all automatically operated.

Japanning of the metal is still done mechanically with overhead conveyors running directly through the baking oven. There has been no change in this particular process of production from that used before the war. The greatest single change within the plant has been the installation of the straight-line assembly. All steel is now handled by a monorail system.

Among the newer installations are power screw drivers for driving sheet metal screws in the subassembly work and the socket wrenches. The socket wrench is installed on an overhead, electrified track within easy reach.

Offices have been relocated to facilitate production. The purchasing department, production department, and the office of the factory superintendent, Grant H. Howell, adjoin the factory. Previously these were scattered throughout another building.



Workers below are shown putting the finishing touches on the first pilot models to come off the production line at the Grand Home Appliance Co., one of the first companies in the nation to switch from war production to the manufacture of stoves, their normal peacetime product. Right, above, is a closeup view of the four-burner stove which does not contain an ounce of substitutes

War Production Board's "Facts for Industry" Data

HEAT TREATING FURNACES

(Thousands of Dollars)

	Shipments	Orders Received (Gross)	Unfilled Orders
1942			
Jan.	$ 5,346	$11,477	$ 40,452
Feb.	6,777	19,817	52,081
March	7,149	22,974	66,453
April	8,080	21,497	79,050
May	10,632	17,192	89,106
June	9,044	21,598	100,150
July	10,179	18,137	106,606
Aug.	9,739	10,534	106,411
Sept.	9,600	11,299	105,272
Oct.	10,850	7,474	88,345
Nov.	11,581	7,509	83,012
Dec.	11,453	4,668	74,972
1943			
Jan.	11,709	5,536	74,859
Feb.	10,846	4,870	71,193
March	13,469	5,750	62,980
April	12,109	4,633	55,916
May	10,904	4,687	48,405
June	12,000	3,868	40,173
July	9,743	4,280	36,029
Aug.	9,689	3,948	30,148
Sept.	7,476	4,581	26,990
Oct.	6,010	4,864	25,463

MECHANICS HAND TOOLS

(Thousands of Dollars)

	Shipments	New Orders	Unfilled Orders
1939	$25,000	.....	.....
1940	28,000	.....	.....
1941	45,720	.....	.....
1942	73,339	.....	.....
1942			
Jan.	4,506	$13,908	$26,797
Feb.	4,627	5,518	27,339
March	5,529	9,771	31,384
April	5,616	9,499	35,497
May	5,693	9,121	39,898
June	5,842	6,857	40,831
July	6,898	7,402	41,823
Aug.	6,328	8,398	44,175
Sept.	7,061	11,842	49,451
Oct.	7,277	9,799	50,905
Nov.	6,505	10,609	54,901
Dec.	7,475	9,729	56,371
1943			
Jan.	6,887	8,480	57,149
Feb.	7,253	8,802	59,293
March	8,517	11,570	60,082
April	8,418	9,777	60,788
May	8,419	8,635	61,464
June	8,670	7,729	58,587
July	7,844	9,489	60,415
Aug.	8,640	7,964	59,686
Sept.	8,059	6,866	55,757
Oct.	8,425	9,076	55,681
Nov.	8,486	7,308	52,478

MAGNESIUM INGOT

(Millions of Pounds)

Month	Primary 1942	Primary 1943	Secondary 1942	Secondary 1943
Jan.	5.0	20.7	0.3	1.1
Feb.	4.7	21.4	0.4	1.2
Mar.	5.2	26.1	0.5	1.5
Apr.	5.0	27.3	0.6	1.7
May	5.3	30.4	0.5	1.7
June	5.3	30.3	0.6	1.6
July	6.6	33.4	0.6	1.7
Aug.	6.9	34.5	1.0	2.1
Sept.	8.2	32.6	1.0	2.5
Oct.	11.7	35.6	0.8	2.7
Nov.	15.9	...	0.7	...
Dec.	18.2	...	0.9	...
Year	98.0	...	7.9	...

CUTLERY

	Production (thousands of dollars)	Shipments (thousands of dollars)
July, 1940, to June, 1941		
Quarterly Ave.	$5,130	.....
1943		
1st quarter	.....	$5,363
2nd quarter	3,299	3,296
3rd quarter	4,467	4,145

DOMESTIC ICE REFRIGERATORS

	Production	Shipments
1939-1941		
Quarterly Ave.	50,000	.....
1943		
1st quarter	152,000	118,000
2nd quarter	190,000	195,000
3rd quarter	195,000	178,000

METAL CUTTING TOOLS

(Thousands of Dollars)

Month	Shipments	New Orders	Unfilled Orders*
1942			
Aug.	$31,662	$34,453	$136,583
Sept.	32,149	33,313	135,950
Oct.	35,739	37,297	142,893
Nov.	33,986	30,068	139,747
Dec.	36,611	29,564	133,181
1943			
Jan.	34,235	30,496	130,995
Feb.	37,499	35,813	131,010
March	41,454	40,577	135,023
April	40,319	35,334	125,630
May	37,052	29,163	115,830
June	36,291	27,717	105,903
July	33,490	31,801	100,812
Aug.	33,084	26,552	92,951
Sept.	32,353	24,948	87,136
Oct.	32,131	25,797	78,634
Nov.	29,598	25,225	73,659

*Close of month

RAZOR BLADES

	Production (thousands of blades)	Shipments (thousands of blades)
1940		
Total	2,374,408	.....
Quarterly ave.	593,602	.....
1941		
Total	3,066,269	.....
Quarterly ave.	766,567	.....
1943		
1st quarter	650,720	651,393
2nd quarter	688,661	671,252
3rd quarter	672,965	672,859

DRY CELL BATTERIES

Production (thousands of cells)

	Radio	Flashlight	No. 6 Type	Hearing Aid	Railroad Lantern
1940					
Total	480,438	362,236	13,284	10,436	9,854
Quarterly Ave.	120,110	90,559	3,321	2,609	2,464
1943					
First quarter	209,773	77,174	3,579	14,426	6,075
Second quarter	170,815	85,664	4,311	14,694	5,133
Third quarter	185,660	73,410	5,257	13,804	7,042

Shipments (thousands of cells)

1943					
First quarter	205,086	80,585	3,737	12,746	6,060
Second quarter	176,254	91,675	4,101	16,209	6,116
Third quarter	185,079	80,502	5,401	14,945	6,380

ALUMINUM CASTINGS SHIPMENTS

(Thousands of Pounds)

	Sand Castings: Heat-Treated: Cylinder Head	Sand Castings: Heat-Treated: Other	Sand Castings: Non-Heat-Treated	Sand Castings: Total	Permanent Mold Castings: Heat Treated	Permanent Mold Castings: Non-Heat-Treated	Permanent Mold Castings: Total	Die Castings: Cold Chamber	Die Castings: Goose Neck	Die Castings: Total	Total Castings
1942											
Jan.	NA	*8,129	4,331	12,460	3,563	316	3,879	NA	NA	3,594	19,933
Feb.	NA	*7,828	4,055	11,883	3,557	306	3,863	NA	NA	3,965	19,711
March	NA	*9,145	4,584	13,729	4,016	369	4,385	NA	NA	5,161	23,275
April	NA	*10,393	4,834	15,227	4,041	442	4,483	NA	NA	5,154	24,864
May	NA	*10,940	4,672	15,612	3,909	520	4,429	NA	NA	3,969	24,010
June	NA	*11,728	4,797	16,525	4,148	620	4,768	NA	NA	4,132	25,425
July	4,730	7,897	5,260	17,887	4,070	475	4,545	NA	NA	4,511	26,943
Aug.	5,993	8,207	5,102	19,302	4,604	448	5,052	NA	NA	4,746	29,100
Sept.	6,349	8,518	4,848	19,715	5,432	562	5,994	NA	NA	4,916	30,625
Oct.	7,357	9,062	5,411	21,830	5,841	639	6,480	4,418	1,036	5,454	33,764
Nov.	7,465	8,907	4,758	21,130	5,713	573	6,286	4,049	889	4,938	32,354
Dec.	8,403	9,074	4,711	22,188	5,865	614	6,479	4,473	911	5,384	34,051
Total	NA	*150,125	57,363	207,488	54,759	5,884	60,643	NA	NA	55,924	324,055
1943											
Jan.	8,875	9,032	3,968	21,875	5,808	598	6,406	4,036	767	4,803	33,084
Feb.	9,039	8,918	4,082	22,039	5,950	566	6,516	3,944	880	4,824	33,379
March	10,974	9,997	4,338	25,309	7,268	680	7,949	4,519	958	5,477	38,735
April	9,963	9,973	4,360	24,296	6,919	667	7,586	4,301	882	5,183	37,065
May	10,415	10,039	4,524	24,979	6,988	679	7,667	4,157	887	5,044	37,690
June	9,710	9,544	4,825	24,079	6,244	642	6,886	4,367	965	5,332	36,297
July	10,372	9,737	4,563	24,672	6,411	710	7,121	4,635	728	5,363	37,156
Aug.	10,393	10,202	4,871	25,376	6,442	736	7,178	4,751	866	5,617	38,171
Sept.	11,466	10,719	5,028	27,213	7,158	801	7,959	4,786	886	5,672	40,844

NA—Not Available. *Includes cylinder head castings.

Fewer Steelworkers in December

Number on payrolls declined to 605,000 lowest since February, 1941. Average for all of 1943 was 626,000 monthly. Year's payrolls show increase

THE NUMBER of employes in the steel industry continued to decline in December reaching a total of 605,000 for the month, the lowest number employed since February, 1941, according to the American Iron and Steel Institute.

The number employed in December compared with 611,000 employes in November and 633,000 in December 1942. Over the whole of 1943, the industry employed an average of 626,000 against average employment of 647,000 in 1942 and 633,000 in 1941.

Payrolls of the steel industry in December totaled $140,203,000, bringing the year's total to the record figure of $1,649,227,000. In 1942, steel payrolls totaled $1,467,059,000 while in 1941 they amounted to $1,301,348,000. The December payroll was slightly lower than the November total of $141,467,000.

Wage-earning employes in the industry earned an average of 116.1 cents per hour in December against 116.4 for November and 109.4 cents in December 1942. Over the whole year 1943, wage earners averaged 113.5 cents per hour against an average of 105.6 cents per hour in 1942 and 95.9 cents per hour in 1941.

Wage earners worked an average of 43.2 hours per week in December, compared with 44.8 hours per week in November and 40.2 hours per week in December a year ago. Throughout 1943, the work-week averaged 43.0 hours as against 38.9 hours in 1942 and 38.6 hours in 1941.

Steel and Iron Made for Sale in December

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

DECEMBER - 1943
PERIOD

		Number of companies	Items	Annual Capacity Net tons	Production for Sale—Net Tons: Current Month: Total	Current Month: Per cent of capacity	Current Month: Shipments: Export	Current Month: Shipments: To members of the industry for conversion into further finished products	Year to Date: Total	Year to Date: Per Cent of capacity	Year to Date: Shipments: Export	Year to Date: Shipments: To members of the industry for conversion into further finished products
Steel Products	Ingots, blooms, billets, slabs, sheet bars, etc.	45	1	xxxxxxx	728,068	xxx		238,202	8,551,651	xxx		2,484,068
	Heavy structural shapes	10	2	5,412,580	360,681	78.6		xxxxxxx	3,871,909	71.5		xxxxxxx
	Steel piling	4	3	338,000	3,287	11.5		xxxxxxx	37,045	11.0		xxxxxxx
	Plates—Sheared and Universal	22	4	9,489,140	1,157,127	143.8		13,950	12,966,878	136.6		48,625
	Skelp	7	5	xxxxxxx	57,802	xxx		43,089	777,366	xxx		479,256
	Rails—Standard (over 60 lbs.)	4	6	3,629,260	198,024	64.4		xxxxxxx	1,933,595	53.3		xxxxxxx
	Light (60 lbs. and under)	6	7	309,690	12,192	46.4		xxxxxxx	162,275	52.4		xxxxxxx
	All other (Incl. girder, guard, etc.)	2	8	102,000	1,494	17.3		xxxxxxx	21,639	21.2		xxxxxxx
	Splice bar and tie plates	13	9	1,120,270	57,123	60.2		xxxxxxx	629,920	56.2		xxxxxxx
	Bars—Merchant	40	10	xxxxxxx	621,769	xxx		90,232	7,184,229	xxx		968,827
	Concrete reinforcing—New billet	15	11	xxxxxxx	37,662	xxx		xxxxxxx	422,452	xxx		xxxxxxx
	Rerolling	16	12	xxxxxxx	6,079	xxx		xxxxxxx	79,561	xxx		xxxxxxx
	Cold finished—Carbon	23	13	xxxxxxx	146,839	xxx		xxxxxxx	1,772,662	xxx		xxxxxxx
	Alloy—Hot rolled	20	14	xxxxxxx	172,759	xxx		24,331	2,927,252	xxx		408,984
	Cold finished	19	15	xxxxxxx	28,799	xxx		xxxxxxx	447,515	xxx		xxxxxxx
	Hoops and baling bands	5	16	xxxxxxx	3,735	xxx		xxxxxxx	84,140	xxx		xxxxxxx
	TOTAL BARS	63	17	14,719,525	1,017,642	81.6		114,563	12,917,811	87.8		1,377,651
	Tool steel bars (rolled and forged)	17	18	200,840	11,875	69.8		xxxxxxx	177,327	88.3		xxxxxxx
	Pipe and tube—B. W.	15	19	2,231,040	113,718	60.1		xxxxxxx	1,326,084	59.4		xxxxxxx
	L. W.	8	20	845,400	47,221	65.9		xxxxxxx	560,048	66.2		xxxxxxx
	Electric weld	8	21	1,149,250	65,000	66.7		xxxxxxx	1,014,492	88.3		xxxxxxx
	Seamless	15	22	3,082,400	164,334	62.9		xxxxxxx	2,165,044	70.2		xxxxxxx
	Conduit	7	23	190,000	3,218	20.0		xxxxxxx	54,492	28.7		xxxxxxx
	Mechanical Tubing	11	24	597,800	66,015	130.3		xxxxxxx	750,366	125.5		xxxxxxx
	Wire rods	22	25	xxxxxxx	94,790	xxx		16,915	1,200,548	xxx		222,926
	Wire—Drawn	41	26	2,356,550	165,898	83.9		3,511	1,299,773	84.9		50,625
	Nails and staples	19	27	1,116,640	61,125	64.6		xxxxxxx	800,897	71.7		xxxxxxx
	Barbed and twisted	15	28	482,280	20,361	49.8		xxxxxxx	243,103	50.4		xxxxxxx
	Woven wire fence	16	29	778,060	28,111	42.6		xxxxxxx	263,537	33.9		xxxxxxx
	Bale ties	12	30	128,420	6,322	58.2		xxxxxxx	104,961	81.7		xxxxxxx
	All other wire products	8	31	78,220	4,119	62.1		xxxxxxx	58,007	74.2		xxxxxxx
	Fence posts	11	32	112,065	5,979	62.9		xxxxxxx	50,451	45.0		xxxxxxx
	Black plate	11	33	339,700	36,250	125.9		50	354,959	104.5		135
	Tin plate—Hot rolled	4	34	483,620	-			xxxxxxx	10,597	2.2		xxxxxxx
	Cold reduced	10	35	3,841,340	127,670	39.2		xxxxxxx	2,094,121	54.5		xxxxxxx
	Sheets—Hot rolled	25	36	xxxxxxx	532,752	xxx		27,678	6,015,959	xxx		215,257
	Galvanized	14	37	xxxxxxx	76,728	xxx		xxxxxxx	823,753	xxx		xxxxxxx
	Cold rolled	14	38	xxxxxxx	151,239	xxx		xxxxxxx	1,549,636	xxx		xxxxxxx
	All other	15	39	xxxxxxx	28,549	xxx		xxxxxxx	354,902	xxx		xxxxxxx
	TOTAL SHEETS	28	40	13,497,570	789,268	69.0		27,678	8,744,250	54.8		215,257
	Strip—Hot rolled	22	41	3,201,690	131,312	48.4		16,018	1,550,296	48.4		189,377
	Cold rolled	39	42	2,059,740	84,650	48.5		xxxxxxx	1,155,252	56.1		xxxxxxx
	Wheels (car, rolled steel)	5	43	424,320	20,386	56.6		xxxxxxx	247,749	53.6		xxxxxxx
	Axles	6	44	453,470	16,396	42.7		xxxxxxx	164,847	36.4		xxxxxxx
	Track spikes	11	45	308,350	9,964	38.1		xxxxxxx	136,463	44.3		xxxxxxx
	All other	5	46	xxxxxxx	17,259	xxx		xxxxxxx	200,468	xxx		xxxxxxx
	TOTAL STEEL PRODUCTS	460	47	xxxxxxx	5,654,691	xxx		474,036	67,278,221	xxx		5,087,960
	Pig iron, ferro manganese and spiegel	27	48	xxxxxxx	737,417	xxx		332,000	9,132,709	xxx		4,527,154
	Ingot moulds	5	49	xxxxxxx	81,425	xxx		xxxxxxx	1,005,416	xxx		xxxxxxx
Iron Products	Bars	10	50	170,110	8,640	59.9		563	99,004	58.2		4,287
	Pipe and tubes	2	51	106,000	8,016	89.2		xxxxxxx	87,052	82.1		xxxxxxx
	All other	1	52	56,000	923	19.4		-	13,960	24.9		-
	TOTAL IRON PRODUCTS (ITEMS 50 to 52)	11	53	xxxxxxx	17,579	xxx		563	200,016	xxx		4,287

Reconversion Plans Not Hampering Production

SLOW military progress in Italy seems ample warrant for the recent governmental frown toward substantial immediate reconversion schedules. Obviously we are not ready for full-scale invasion while progress in Italy is so spasmodic, and no possible deterrent to home-front output of military goods can be allowed.

Thus far the agitation for reconversion has had no noticeable effect upon production figures, which continue to reach high levels. Bituminous coal production, construction volume, and petroleum output all scored moderate gains, and both money in circulation and bank clearings recorded strong increases.

TRUCK PRODUCTION—Trimming back of military vehicle output, to allow manufacture of an additional 100,000 civilian trucks now critically needed for domestic transportation, is well under way. Schedule for "half-trac" models, 27,000 of which were to have been built for military use this year, was first cut back to 17,388 and finally to about 2700 units.

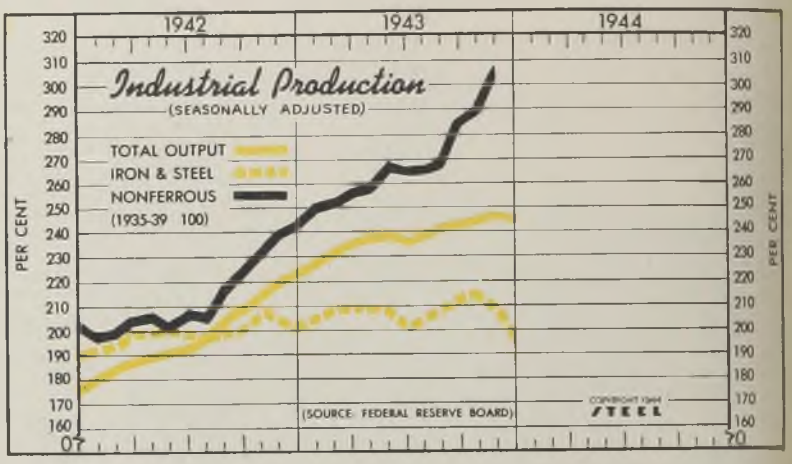
Cutbacks on light military trucks have also been effected, and around 34,700 military vehicles have been removed from the 1944 program. These revisions would provide for roughly a third of the desired increase in civilian units. Approximately 81,000 of the latter vehicles have been authorized and are under production.

INDUSTRIAL CORPORATIONS — Nation's 25 largest corporations, ranked by total assets, hold combined assets of $14,700,000,000, or about $2,000,000,000 more than when we entered the war. They employ about 3,000,000 persons, have about 1,600,000 stockholders of record, and distributed around $500,000,000 in dividends during 1942. The top three corporations showed approximately 900,000 employes, with average compensation of $2500 a year compared with $2000 average remuneration in preceding year.

MANPOWER—Spotty complexion of the manpower situation is not altered by the War Manpower Commission's hopeful estimate for the first six months. With the armed services due to secure their additional 800,000 enrollees by midyear, munitions makers are likely to continue at present payroll levels.

RAW MATERIALS—War Production Board officials and others in the government are keenly interested in a plan to conserve vital domestic raw materials through foreign purchases, the idea being that such imports would increase our resources and also provide broader overseas markets for our manufactured products. The plan has been publicized with restraint to avoid a flood of opposition from U. S. business men in the fields affected.

INDUSTRIAL PRODUCTION—Decline of the Federal Reserve Board's index for December reflected lower output of steel and chemicals. Delivery of merchant vessels was largest on record, and number of aircraft accepted slightly exceeded that of November.



Federal Reserve Board's Production Indices

(1935-1939 = 100)

	Total Production		—Iron, Steel—		—Nonferrous—	
	1943	1942	1943	1942	1943	1942
January	227	181	204	192	250	197
February	232	183	208	194	252	199
March	235	186	210	200	256	204
April	237	189	209	199	257	205
May	238	191	208	200	266	200
June	236	193	201	198	264	206
July	239	197	203	196	264	205
August	242	204	209	197	267	216
September	243	208	213	199	284	223
October	247	215	214	207	289	230
November	247	220	209	204	304	239
December	245	223	199	200		242
Average	239	199	207	199		214

FIGURES THIS WEEK

INDUSTRY	Latest Period*	Prior Week	Month Ago	Year Ago
Steel Ingot Output (per cent of capacity)	100.0	99.0	96.5	97.5
Electric Power Distributed (million kilowatt hours)	4,524	4,524	4,568	3,960
Bituminous Coal Production (daily av.—1000 tons)	2,133	2,112	1,725	1,917
Petroleum Production (daily av.—1000 bbls.)	4,396	4,395	4,366	3,853
Construction Volume (ENR—unit $1,000,000)	$35.5	$33.2	$21.6	$81.8
Automobile and Truck Output (Ward's—number units)	17,745	18,250	18,090	17,195

*Dates on request.

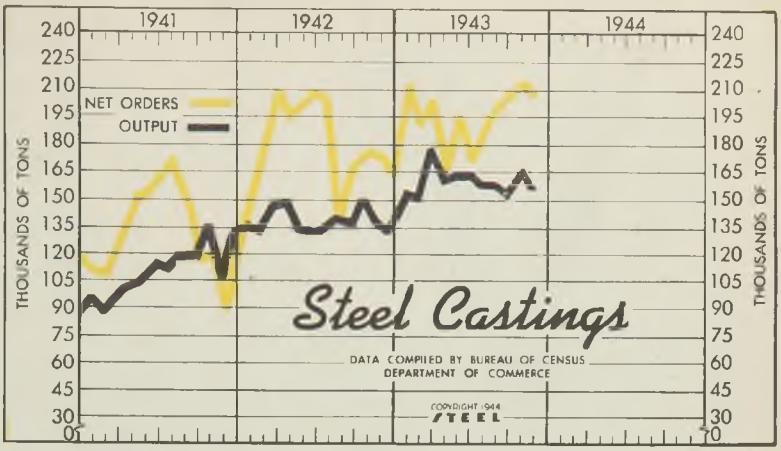
TRADE				
Freight Carloadings (unit—1000 cars)	814†	811	763	765
Business Failures (Dun & Bradstreet, number)	33	24	31	82
Money in Circulation (in millions of dollars)‡	$20,534	$20,387	$20,436	$15,666
Department Store Sales (change from like week a year ago)‡	+14%	+4%	+22%	+1%

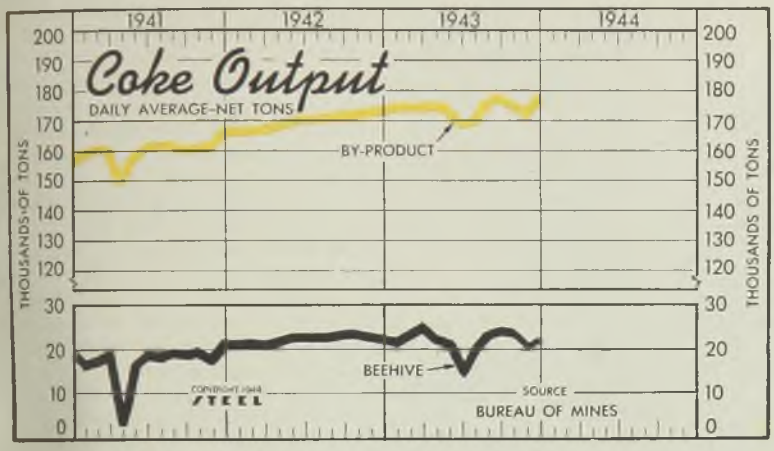
†Preliminary. ‡Federal Reserve Board.

Commercial Steel Castings

(Net tons in thousands)

	—Orders—		—Production—	
	1943	1942	1943	1942
Jan.	213.1	150.5	154.7	134.8
Feb.	191.2	179.9	151.5	133.7
Mar.	202.7	211.1	176.5	146.5
Apr.	165.8	191.2	161.4	149.6
May	192.5	199.6	163.8	131.5
June	171.7	208.9	163.9	132.0
July	187.2	202.3	158.7	135.7
Aug.	200.6	141.2	158.8	139.2
Sept.	214.1	177.5	157.8	139.8
Oct.	211.3	179.5	163.9	152.1
Nov.	209.3	173.3	158.7	140.4
Dec.		172.3		143.9
Total		2,187.3		1,679.2





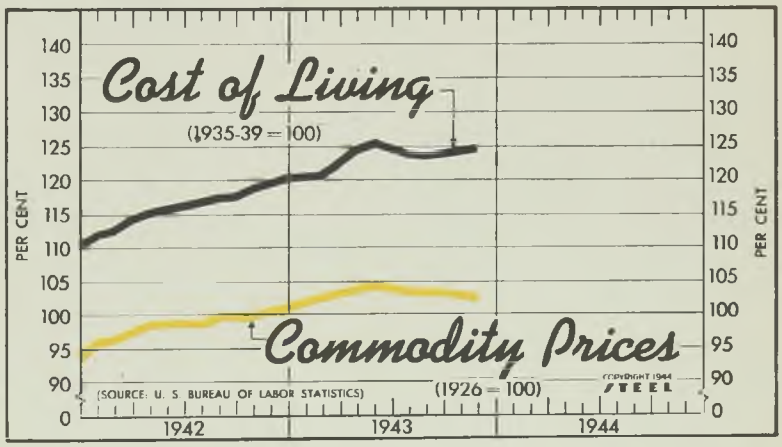
Coke Output
Bureau of Mines

(Daily average—Net tons)

	—By Product—		—Beehive—	
	1943	1942	1943	1942
Jan.	174,044	168,508	21,440	20,874
Feb.	175,107	168,414	23,991	21,771
Mar.	175,051	167,733	24,369	21,032
Apr.	175,857	168,960	22,932	21,843
May	174,240	170,187	21,270	22,571
June	168,735	170,593	14,055	22,487
July	169,936	170,400	20,009	22,300
Aug.	176,396	171,443	23,102	22,333
Sept.	178,090	172,110	23,637	23,106
Oct.	175,492	172,211	23,495	23,148
Nov.	171,594	173,029	20,421	22,106
Dec.	179,042	173,163	22,818	22,000
Average	174,465	170,549	21,795	22,122

Wholesale Commodity Price—
Cost of Living Indexes

	—Commodities— (1926=100)			—Living Cost— (1935-39=100)		
	1943	1942	1941	1943	1942	1941
Jan.	101.9	96.0	80.6	120.6	112.0	100.8
Feb.	102.5	96.7	80.6	120.9	112.9	100.8
Mar.	103.4	97.6	81.5	122.8	114.3	101.2
Apr.	103.7	98.7	83.2	124.1	115.1	102.2
May	104.1	98.8	84.9	125.1	116.0	102.9
June	103.8	98.6	87.1	124.8	116.4	104.6
July	103.2	98.7	88.8	123.8	117.0	105.3
Aug.	103.1	99.2	90.3	123.2	117.5	106.2
Sept.	103.1	99.6	91.8	123.9	117.8	108.1
Oct.	103.0	100.0	92.4	124.4	119.0	109.3
Nov.	102.9	100.3	92.5	124.1	119.8	110.2
Dec.	103.2	101.0	93.6	124.4	120.4	110.5
Ave.	103.2	98.8	87.3	123.5	116.5	105.2



FINANCE

	Latest Period*	Prior Week	Month Ago	Year Ago
Bank Clearings (Dun & Bradstreet—millions)	$10,837	$9,556	$9,742	$9,106
Federal Gross Debt (billions)	$178.7	$172.5	$170.3	$115.9
Bond Volume, NYSE (millions)	$94.2	$72.6	$72.4	$63.8
Stocks Sales, NYSE (thousands)	4,265	3,716	4,429	5,136
Loans and Investments (millions)†	$50,287	$49,892	$49,734	$41,591
United States Government Obligations Held (millions)†	$36,575	$36,352	$36,109	$28,567

†Member banks, Federal Reserve System.

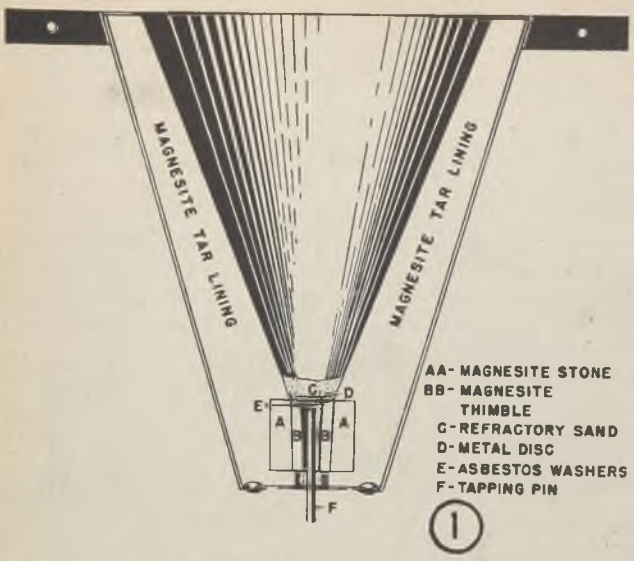
PRICES

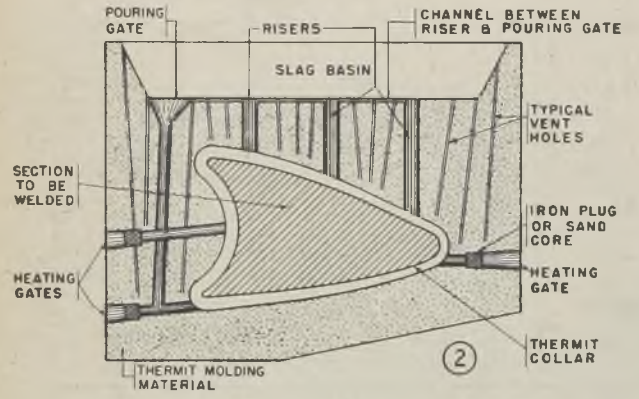
STEEL's composite finished steel price average	$56.73	$56.73	$56.73	$56.73
Spot Commodity Index (Moody's, 15 items)†	248.9	248.3	247.6	244.3
Industrial Raw Materials (Bureau of Labor index)‡	112.7	112.3	112.3	108.3
Manufactured Products (Bureau of Labor index)‡	100.4	100.4	100.3	100.3

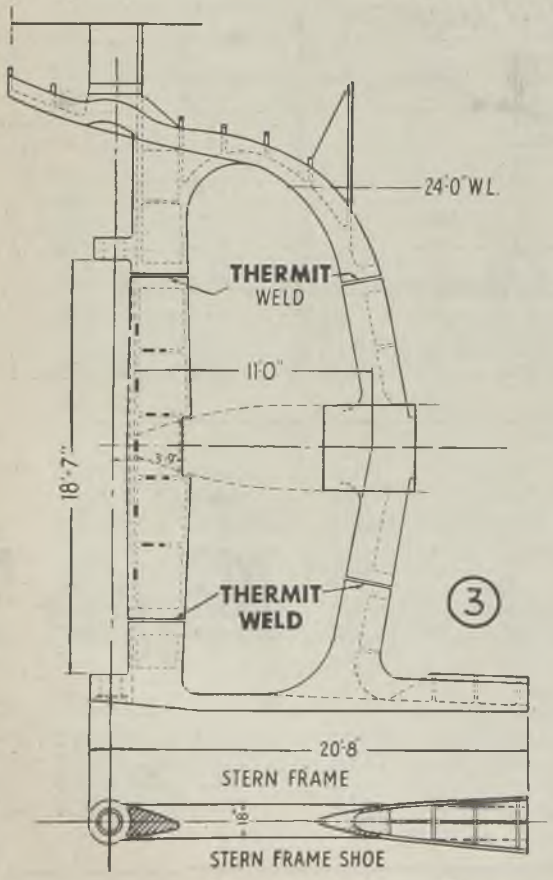
†1931 = 100; Friday series. ‡ 1926 = 100.

THERMIT

Process long used for repair work now finding increasing applications as regular production tool in fabrication of heavy assemblies







THERMIT WELDING long has been used in repairing heavy steel sections such as machine frames, housings, pinions, crankshafts and other large parts. More recently, however, the exigencies of war have been responsible for the use of the process in new applications on a production basis, these including the fabrication of ship stern frames, freight car sections, crankshafts, rolls and heavy assemblies of various types.

Although the thermit process is well known, it might be well to review its basic principles before describing some of the newer applications. In a few words, it involves the pouring of thermit steel at extremely high temperatures around the parts to be joined which are held in a mold.

The material from which the steel is made is a mechanical mixture of metallic aluminum and processed iron oxide. To this mixture may be added various elements or oxides of elements for alloying and steel punchings to increase the yield of steel. Thermit is inert at all ordinary temperatures and may be handled and stored with complete safety. It will not ignite even when subjected to the heat of ordinary fires. One hundred pounds of material will produce sufficient metal to weld a section 6 x 10 inches.

A special ignition powder generating a temperature of 2800 degrees Fahr. is required to effect the thermit reaction which produces metallic iron (or, more properly, steel) by combining the aluminum with the oxygen of the iron oxide, resulting in an aluminum oxide which floats to the top of the mold as a slag. The chemical formula for the basic reaction is as follows:

(thermit) (iron) (aluminum oxide)

$$8\ Al + 3\ Fe_3O_4 = 9\ Fe + 4\ Al_2O_3$$

The thermit reaction takes place in a crucible designed for the purpose. Cross section of a typical crucible is shown in Fig. 1 which also indicates the type of lining used and general design features. Regardless of the amount of thermit used, the reaction requires only about 30 seconds with the metal reaching a temperature of approximately 4559 degrees Fahr. As soon as the reaction ceases, the metal of course settles to the bottom and is immediately tapped off into a mold surrounding the parts to be welded.

Chemical composition of the thermit steel usually runs about 0.25 to 0.35 per cent carbon; 0.40 to 0.60 manganese; 0.09 to 0.20 per cent silicon; 0.03 to 0.04 sulphur; 0.04 to 0.05 per cent phosphorus and 0.07 to 0.18 per cent aluminum.

The metal is completely deoxidized and since it is at a temperature approximately twice that of usual molten steel, it quickly fuses with the parts to be joined and forms a weld which is both dense and sound. Tensile strength of the weld metal usually is about 70,000 pounds per square inch and yield strength around 45,000 pounds. No internal stresses are sent up since the weld is poured all at one time.

As previously indicated, the parts to be joined are held in a

Fig. 1—This cross-sectional diagram shows the type of crucible required for producing steel from finely divided metallic aluminum and iron oxide for use in making thermit welds. Figs. 1—7 courtesy Metal & Thermit Corp., New York

Fig. 2—Sectional diagram of mold and stern frame section for a ship indicate how gates and risers are positioned, as well as the opening for preheating the parts to be welded prior to pouring the thermit steel

Fig. 3—Positions of four welds in the stern frame for a C-2 cargo vessel are shown clearly in this sketch

WELDING

...in production work

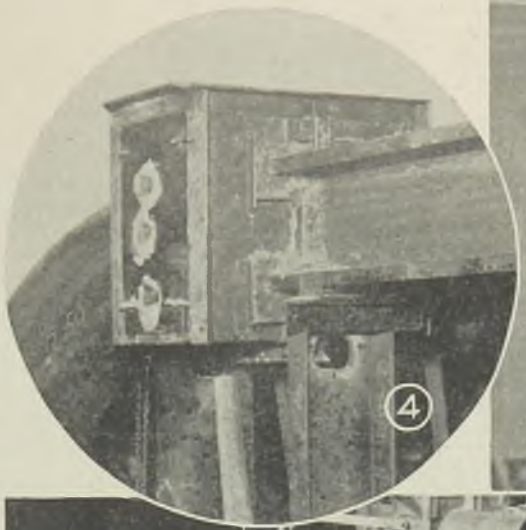
mold, a typical setup being shown by the sectional diagram, Fig. 2. In this case, sections of a ship stern frame are being joined. The general procedure is as follows:

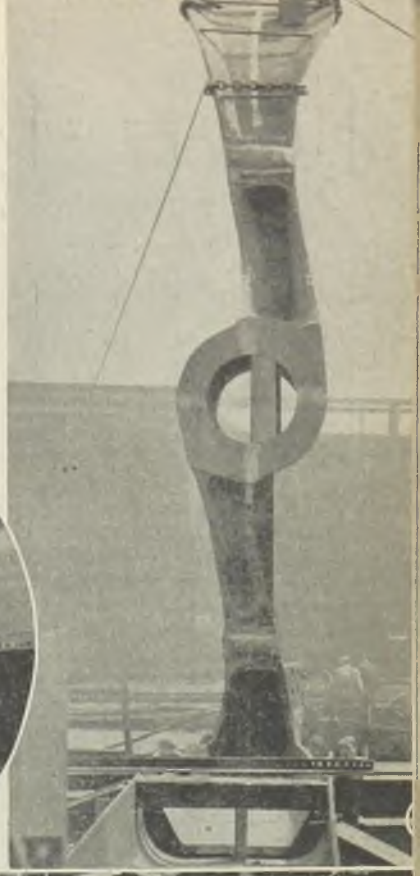
After aligning the parts to be welded, a parallel-sided gap is cut by oxyacetylene torch at the point where the weld is to be made. The width of this gap depends upon the size of the section to be welded.

Next, a wax pattern of the shape of the weld and collar around the weld is formed. A mold box then is built around the wax pattern and rammed with a special molding material. Gates and risers are arranged in the manner indicated in Fig. 2.

Sections to be welded are preheated through the preheating gates shown in Fig. 2 by means of a specially designed preheater burning water-white kerosine which has been atomized by compressed air. The flame is applied until the sections attain the desired degree of "redness" and, at the same time, the wax

(*Please turn to Page* 134)





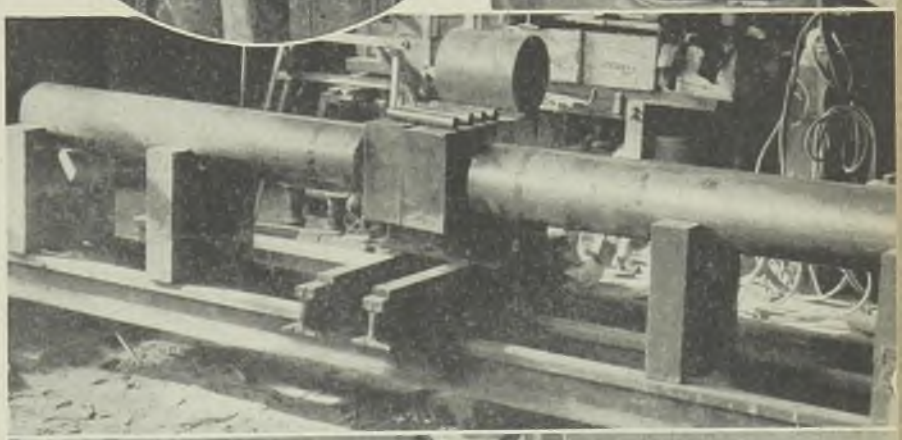


Fig. 4—Two H-beam sections for a railroad car here are shown with the mold for the thermit weld in position. Twenty-eight welds were required for this car and permanent patterns therefore were used in place of the usual wax pattern

Fig. 5—Finished stern frame is shown here in position for a cargo vessel under construction in a large shipyard

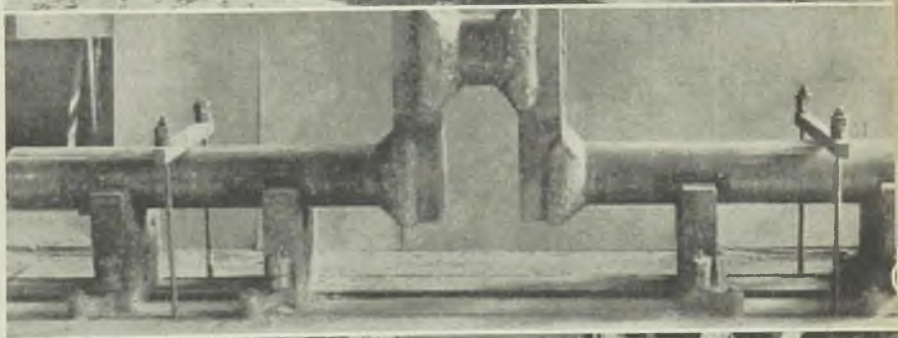


Fig. 6—Possibilities for the thermit process in regular production work are indicated in the fabrication of a large crankshaft from these heavy steel sections

Fig. 7—The steel sections shown in Fig. 6 have been welded into a homogeneous crankshaft. The weld collars may be entirely machined off if necessary

Fig. 8—Two 25-ton castings were joined by thermit welding to form this huge shipyard plate bending roll which is 38 feet long and 31½ inches in diameter. The roll is hollow, having a rough core diameter of 19 inches. Photo courtesy Electric Steel Foundry Co., Portland, Oreg.

Effects of Wartime Developments On Future Steels

THE WAR has intensified and accelerated certain types of scientific work, particularly those which help to translate fundamental knowledge into usable tools for engineers. Steels are participating in this intensification, and engineering practices are being improved thereby.

An important aid in these accelerated studies has been the ignoring of normal peacetime competitive barriers, with resultant free interchange of information[1].

Some of the more important wartime developments pertaining to steels have been made along the following lines:

A—*Fatigue endurance*
B—*Heat treatment*
C—*Castings*
D—*Welding*
E—*Alloy evaluation*
F—*Hardenability*
G—*Special addition agents*
H—*NE steels*

Most of these developments were under way before the war began, but wartime progress in all these phases of steel metallurgy has been so rapid as to justify classing them as wartime developments.

Many other advances in fabrication of steels have also been made, but, since they are not strictly metallurgical in nature, they are not included here.

The above developments will be briefly summarized and discussed, primarily from the standpoint of the engineer. The very fact that this is a review of some metallurgical accomplishments signifies that it will not be instructive to metallurgists, most of whom have contributed to and are well aware of these advances. Predictions (guesses) will be made as to how our future practices with respect to steels will be affected.

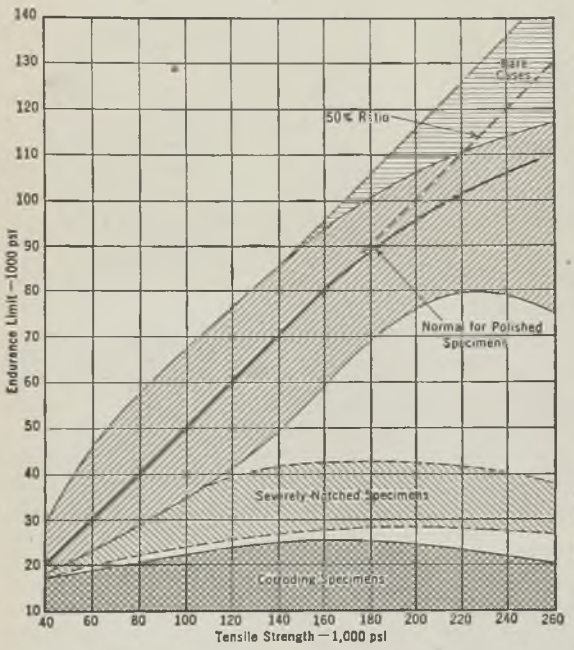


Fig. 1 (Left)—Diagram indicating general behavior in fatigue of steel of polished, notched or corroding specimens, in relation to tensile strength. Applicable to ordinary corrodible steels[2]

Fig. 2 (Bottom)—Large continuous pusher-type cycle annealing furnace. Inside dimensions, 50 feet long by 8 feet wide. Gas fired, radiant tube burners, above and below hearth. Five automatically controlled zones, operable as any number of zones up to five. Second zone equipped with cold air pipes as well as burners, permitting its use as rapid cooling zone if desired. Capacity, 3500 to 4000 pounds per hour. (Courtesy Surface Combustion Corp.)

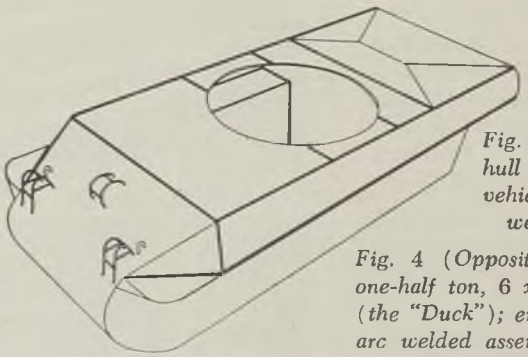
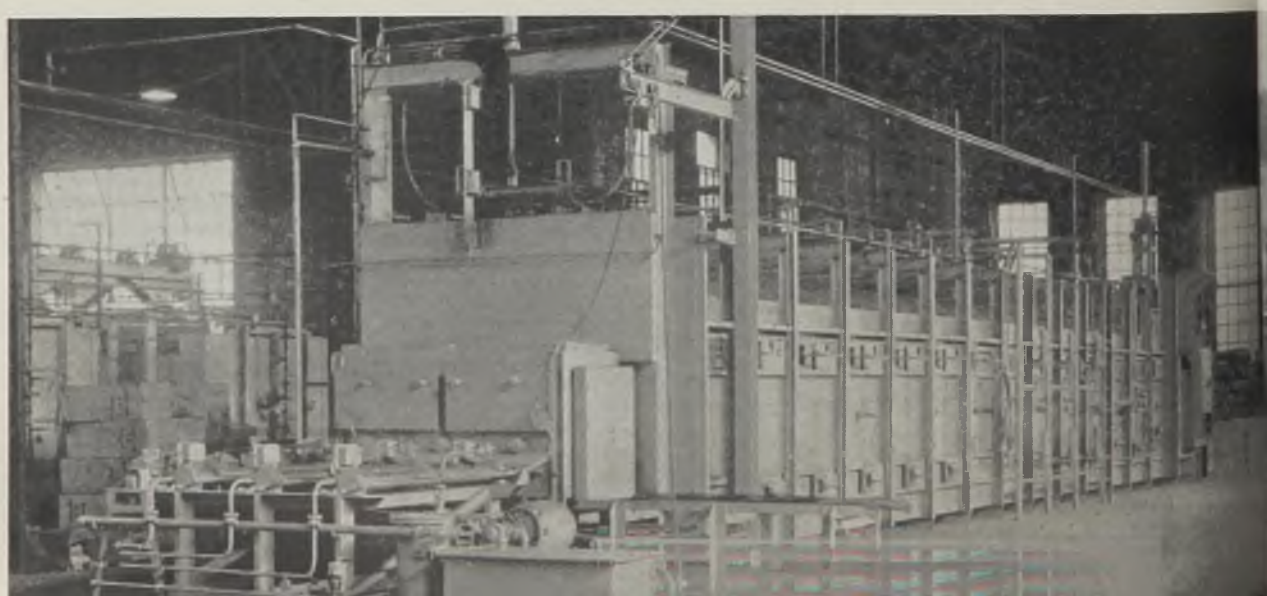


Fig. 3 (Left)—Sketch of hull of military combat vehicle; example of all-welded armor plate

Fig. 4 (Opposite page)—Two and one-half ton, 6 x 6 amphibian truck (the "Duck"); entire hull a spot and arc welded assembly of sheet metal



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FUTURE TRENDS IN STEEL METALLURGY

Important wartime advances in steel metallurgy have been made in fatigue endurance, heat treatment, castings, welding, alloy evaluation, hardenability as a primary requirement, special addition agents and NE steels. In this report, also presented before the Society of Automotive Engineers, the author discusses recent accomplishments and interprets them in terms of near-future trends:

1—Toward reduction in alloy contents of steels.
2—Away from deep-hardening in parts subjected to bending or torsional stresses.
3.—Toward elimination, by designers, of stress raisers.
4—Greater use of applied compressive stresses to surfaces.
5—Toward lower surface-finishing costs.
6—In direction of shorter, cheaper and more precise annealing, and better machinability.
7—Greater use of dry cyaniding and hot quenching, and less distortion in heat treatment.
8—More widespread applications of steel castings, in high-production parts.
9—Vastly increased use of resistance and arc welding, in primary structures.
10—To design for welding from inception (not after detailing).
11—More intelligent specifying of materials by engineers.
12—More intelligent and economical selection of steels by metallurgists.
13—Approaching use of hardenability specifications.
14—Greater use of special addition agents containing boron, possibly eventually in all alloy and some carbon steels.
15—Continued segregation of alloy steel scrap according to composition.
16—During the war, toward elimination of NE 9400 series and use of a single series of three-alloy NE steels.
17—After the war, away from three-alloy NE steels (unless modified by timely price reductions and sustained efforts to conserve critical materials).
18—Toward postwar reversion to nonferrous metals in most applications for which steels have recently been substituted.

We must remember, however, in predicting, that the war is far from finished, that developments which we discuss are not yet complete, and that therefore the influence of each development on postwar steels will depend upon (a) future progress made during the war, (b) status of each development during the period in which we return to what we shall then call normal economic conditions, and (c) the nature of those postwar "normal" conditions.

The reader should have no trouble in distinguishing between fact and fancy. Statements concerning past and present situations are, unless qualified, believed to be fact. Discussions of future events are of course merely conjecture, and should be classed as one man's present opinions.

Fatigue Endurance

For a long time many of us have naively made stress calculations on the basis of published fatigue endurance limits based on rotating beam tests of smooth and uniform bars, and even on the basis of arbitrary percentages of ultimate tensile strengths. We have saved face by picking large factors of safety out of the air, and tacking them on our formulas. Engineers can't be blamed for this—they have been doing the best they can with the scanty information on behavior of metals furnished to them by metallurgists and mechanical researchers. As a result, we must rely on performance, in simulated or actual service, for our only reliable guidance.

However, some light is beginning to glimmer through the fog. Certain trends and developments indicate progress is being made as result of long and intelligent studies of both fundamentals and specific applications.

It has been found, in certain parts free or practically free from stress concentrators, that fatigue endurance can be improved by increasing hardness way beyond limits previously thought practicable because of toughness limitations. In order to do this, at least one of two conceptions had to be revised in each case:

1—*Toughness Is Essential.* It might be difficult to call to mind a part which has been rejected solely because it was too tough. By negative inference, we have concluded that toughness is necessary in nearly every part. It is nevertheless true that some parts need little or no toughness in the steel. Whenever this is recognized, higher elastic limit and ultimate strength, at least near surfaces, and greater fatigue endurance may be utilized with resultant improved performance or weight reduction.

2—*Parts Must Be Hardened Throughout.* We formerly specified (and still do, too frequently) high-alloy steels for highly stressed parts, hardened them throughout, and tempered them to as high hardnesses as were consistent with required toughnesses. If toughness really is required, it is often possible, particularly if the part is to be subjected primarily to torsional or bending stresses, to use lower alloy or carbon steel, so as to retain a tough, shock-resisting interior, and to

harden only the outer highly stressed portions of the part to higher hardness than would be possible with deep-hardening steel, thus improving fatigue life at no sacrifice of overall toughness. Contrary to an idea held rather widely, the highest hardenability steel available may not be the best (as has been repeatedly demonstrated in many production automotive and other applications, notably by Ford, Chrysler and Timken-Detroit Axle).

However, all parts cannot be handled this way. Some really must be hardened throughout. Unless range of repeated stress is reduced thereby, increasing hardness and strength beyond certain limits *throughout* such parts of irregular section may actually lower fatigue endurance, due to notch effect. As indicated in Fig. 1[2], through-hardened parts having stress raisers (or subject to corrosion) can sometimes be improved in fatigue endurance by going in the opposite direction. First, the designer should try to remove sources of stress concentration. In cases where that has been impossible, it has frequently been found helpful to lower hardness of the part, in order to permit some stress equalization through plastic flow. In this connection, greater knowledge concerning relative notch-sensitivity of materials is needed.

Another means of improving fatigue resistance is to improve surface finish. This is merely one way of eliminating stress raisers, and represents action which can be taken by engineer and production man. The value of smooth surfaces has long been appreciated, but cost considerations often prevent adoption except in the more efficient utilizations of materials such as in many aircraft and a few automotive parts.

It has been asserted by Almen[3] that fatigue failures occur only in tension. To increase fatigue endurance on this basis, initial compressive stress may be imparted to outer portions of parts to be highly and repeatedly stressed in tension. Such stresses can be introduced by shot-peening, rolling, cold-drawing, nitriding, some other types of case-hardening, etc. Use of one of these processes, especially shot-peening, may also eliminate necessity for expensive finishing operations, some of which, incidentally, may be imparting to surfaces of parts tensile stresses which actually tend to offset intended benefits of high surface finish. Also, a roughened surface, such as produced by shot-peening, may in some cases improve performance because of its better retention of lubricant than that of a smooth surface.

Some future effects of these recent developments in improving fatigue endurance may be:

1—Reduced alloy content in steels for many heat-treated parts in which deep hardening is found unnecessary or undesirable.

2—More intense fight by designers against stress concentrators in highly stressed parts.

3—Great increase in use of shot-peening and other applications of compressive stress to surfaces, and lowered cost of finishing many highly stressed parts.

4—Further study of notch sensitivity with relation to composition and structure, on which more precise data are needed.

TABLE I

SUGGESTED MECHANICAL PROPERTY SPECIFICATION RANGES

Class	Hardness			Tensile Strength (psi)
	Rockwell	Brinell Diameter	Brinell Hardness	
1	B93-99	4.40-4.00	187-229	92,000-110,000
2	B96-102	4.20-3.85	207-248	100,000-118,000
3	C18-26	4.10-3.75	217-262	103,000-125,000
4	C20-28	4.00-3.70	229-269	110,000-128,000
5	C23-30	3.90-3.60	241-285	115,000-135,000
6	C25-32	3.80-3.50	255-302	121,000-143,000
7	C28-35	3.70-3.40	269-321	128,000-152,000
8	C30-36	3.60-3.35	285-331	135,000-157,000
9	C32-38	3.50-3.25	302-352	143,000-168,000
10	C35-40	3.40-3.15	321-375	152,000-180,000
11	C37-42	3.25-3.05	352-401	167,000-196,000
12	C40-45	3.15-2.95	375-429	180,000-214,000
13	C42-46	3.05-2.90	401-444	196,000-223,000
14	C45-49	2.95-2.80	429-477	214,000-247,000
15	C48-52	2.85-2.70	461-514	235,000-275,000
16	C50-54	2.75-2.65	495-534	261,000-291,000
17	C52-56	2.70-2.60	514-555	
18	C55-59	2.60-2.50	555-601	
19	C57-61	2.55-2.45	578-627	
20	C60-63			
21	C62-65			

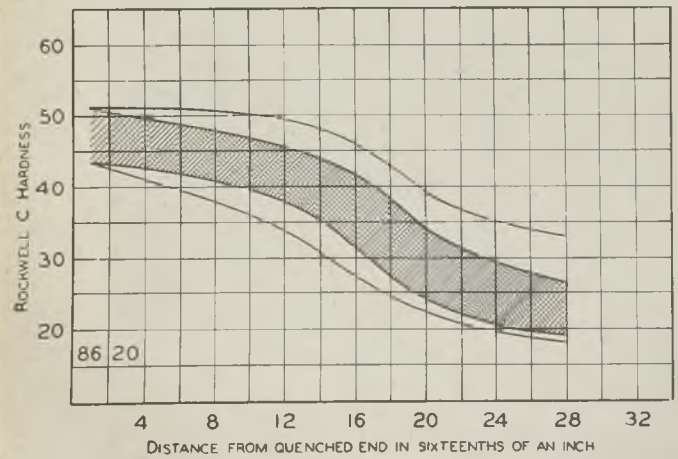
Heat Treatment

Determination and study of transformation characteristics (during cooling from above the critical temperatures) of steels of various compositions has paid big dividends in revealing many possibilities for improving heat treating processes.

Fig. 5 (Lower left)—Summary of end-quench hardenabilities of production open-hearth heats of NE 8620 steel, purchased for use in truck transmission gears. Spread in 30 heats shown by lowest and highest curves. Shaded band indicates range considered desirable for satisfactorily uniform results in these applications (Courtesy E. O. Mann, Chevrolet)

Fig. 6 (Below)—End-quench hardenabilities of steels listed in Table II. Lower band indicates range of hardenability of 3 heats treated with special addition agent "A." Upper band indicates range of 4 heats treated with agent "B"

Fig. 7 (Opposite page)—A, original, and B, designs of welded joint. Steels listed in Table II treated with special addition agent "A" welded satisfactorily by automatic arc process with ferrite electrode in joint A, but steels treated with agent "B" cracked under same welding conditions. Either type of steel welded satisfactorily by same process in joint B



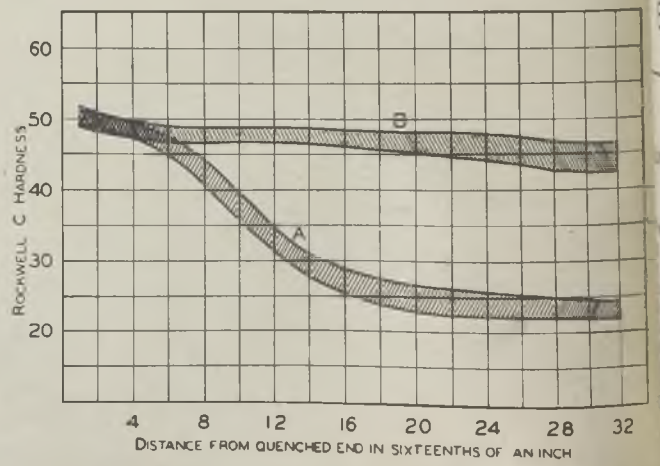


TABLE II
PLATE STEELS

Chemical Composition (%) Carbon	Man-ganese	Molyb-denum	Special Addition Agent
0.24	1.56	0.33	A
0.26	1.59	0.22	A
0.28	1.66	0.27	A
0.24	1.78	0.35	B
0.25	1.73	0.31	B
0.25	1.75	0.28	B
0.29	1.77	0.28	B

All Heats: Nickel .04-.07%
Chromium .01-.04%
Grain Size 7-8

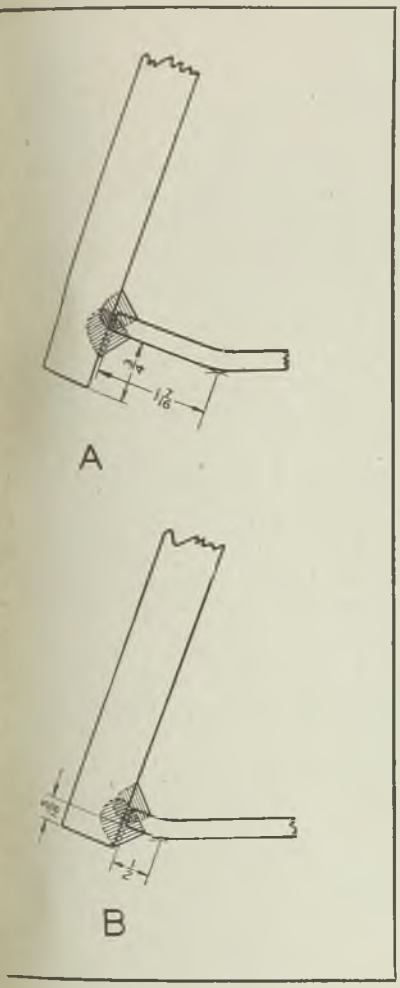


TABLE III
NOMINAL CHEMICAL COMPOSITIONS OF SEVEN SPECIAL ADDITION AGENTS

	1	2	3	4	5	6	7
Manganese			8.0		20.0		
Silicon		37.5		37.5	25.0	3.0	42.5
Vanadium	25.0	10.0					
Titanium	15.0	10.0	20.0	10.0	15.0		
Zirconium		6.0	4.0	4.0			
Aluminum	10.0	6.0	13.0	7.0	15.0		
Boron	0.2	0.5	0.5	0.5	1.5	11.0	3.5
Calcium				10.0			
Iron	Bal.	Bal.	Bal.	Bal.	Bal.	Bal.	Bal.

1—Grainal 1, Vanadium Corp. of America; 2—Silver 3, Electro Metallurgical Co.; 3—Grainal 79, Vanadium Corp. of America; 4—Silcar 3, Electro Metallurgical Co.; 5—Bortam, Titanium Alloys Mfg. Co.; 6—Ferro-Boron, Molybdenum Corp. of America; 7—Borosil, Ohio Ferro-Alloys Corp.

TABLE IV
NOMINAL COMPOSITIONS OF PRESENT STANDARD NE STEELS (%)

Series	Carbon	Manganese	Silicon	Nickel	Chromium	Molybdenum
1300	0.30-0.50	1.75	0.28	.	.	.
°4700	0.19	0.60	0.28	1.05	0.45	0.25
°5200	1.02	0.35	0.28	.	0.50-1.45	.
8600	0.14-0.50	0.80-0.88	0.28	0.55	0.50	0.20
8700	0.20	0.80	0.28	0.55	0.50	0.25
9200	0.55-0.60	0.85	2.00	.	0-0.32	.
†9300	0.10-0.17	0.50	0.28	3.00	1.20	0.12
9400	0.15-0.50	0.95-1.35	0.28	0.45	0.40	0.12
9500	0.37-0.50	1.35	0.50	0.55	0.50	0.20

°For bearings only. †For aircraft use only.

TABLE V
CARBON CONCENTRATION IN CASES OF CARBURIZED STEELS

Preliminary data on average carbon contents (in percentages) of outer 0.0025-inch of steel test bars after carburizing in nonburning compound for 8 hours at temperatures indicated.

	——1650° Fahr.——		——1700° Fahr.——	
	Direct Quench	Box Cool	Direct Quench	Box Cool
4620	1.06	0.81	1.07	0.94
8620, 8720, 9420	1.47	1.62	1.15	1.10

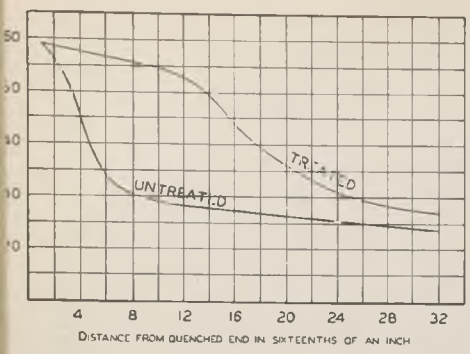
TABLE VI
COMPOSITION LIMITS OF SOME 0.40 PER CENT CARBON LOW-ALLOY STEELS

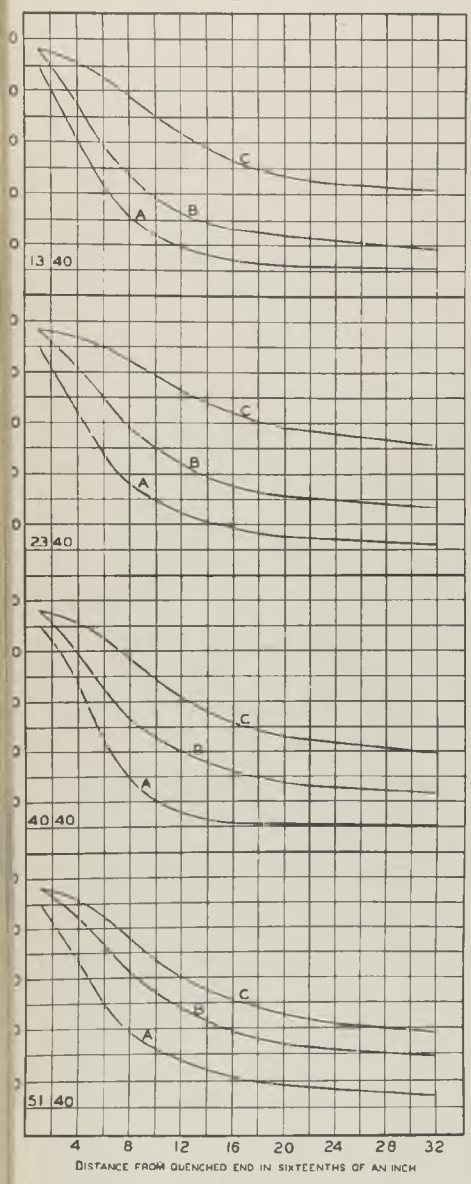
For each steel: "A" represents all elements at low limits; "B" all specified elements at high limit with no unspecified elements present; "C" all specified elements at high limit plus maximum permissible amounts of unspecified nickel, chromium and molybdenum. "Critical Diameter" means maximum diameter in which each steel will harden, with ideal quench, to 50 per cent martensite structure at center, calculated by Grossmann's method[23].

		Chemical Composition (%) Carbon	Manganese	Silicon	Nickel	Chromium	Molyb-denum	Critical Diameter
1340	A	0.38	1.60	0.20	.	.	.	1.57
	B	0.43	1.90	0.35	.	.	.	2.12
	C	0.43	1.90	0.35	0.25	0.20	0.06	4.03
2340	A	0.38	0.70	0.20	3.25	.	.	1.81
	B	0.43	0.90	0.35	3.75	.	.	2.74
	C	0.43	0.90	0.35	3.75	0.20	0.06	4.75
4040	A	0.38	0.75	0.20	.	.	0.20	1.40
	B	0.43	1.00	0.35	.	.	0.30	2.45
	C	0.43	1.00	0.35	0.25	0.20	0.30	3.90
5140	A	0.38	0.70	0.20	.	0.70	.	1.91
	B	0.43	0.90	0.35	.	0.90	.	2.97
	C	0.43	0.90	0.35	0.25	0.90	0.06	3.83
3140	A	0.38	0.70	0.20	1.10	0.55	.	2.43
	B	0.43	0.90	0.35	1.40	0.75	.	4.13
	C	0.43	0.90	0.35	1.40	0.75	0.06	4.92
3141	A	0.38	0.70	0.20	1.10	0.70	.	2.66
	B	0.43	0.90	0.35	1.40	0.90	.	4.47
	C	0.43	0.90	0.35	1.40	0.90	0.06	5.33
3240	A	0.38	0.40	0.20	1.65	0.90	.	2.38
	B	0.43	0.60	0.35	2.00	1.20	.	4.38
	C	0.43	0.60	0.35	2.00	1.20	0.06	5.22
4640	A	0.38	0.60	0.20	1.65	.	0.20	1.93
	B	0.43	0.80	0.35	2.00	.	0.30	3.54
	C	0.43	0.80	0.35	2.00	0.20	0.30	5.15
8640	A	0.38	0.75	0.20	0.40	0.40	0.15	2.72
	B	0.43	1.00	0.35	0.70	0.60	0.25	6.08
	C	0.43	1.00	0.35	0.70	0.60	0.25	6.08
9440	A	0.38	0.90	0.40	0.20	0.20	0.08	2.32
	B	0.43	1.20	0.60	0.50	0.40	0.15	5.28
	C	0.43	1.20	0.60	0.50	0.40	0.15	5.28

TABLE VII
ALLOY STEEL PRICE EXTRAS

Steel Type	Extra for Composition (per cwt)
1350	$0.10
3045	0.50
3115-3150	0.70
4023, 4027, 4032-4068	0.45
4119, 4120	0.60
4130-4150	0.55
5120, 5145, 5150	0.35
5130-5140	0.45
8613-8650	0.75
8720	0.80
9415-9440	0.75
9442-9450	0.80





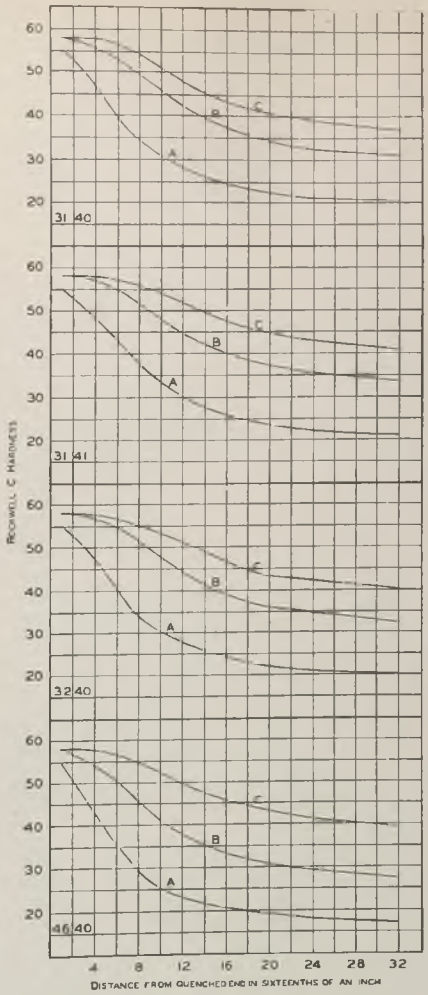


Fig. 8 (Top left)—Increase in end-quench hardenability due to special addition agent. Tests from bars rolled from two ingots of same heat. Treated ingot analysis: Carbon 0.43 per cent, manganese 1.49 per cent; agent added to steel in ingot mold. Untreated ingot analysis: Carbon 0.45 per cent, manganese 1.52 per cent[30]

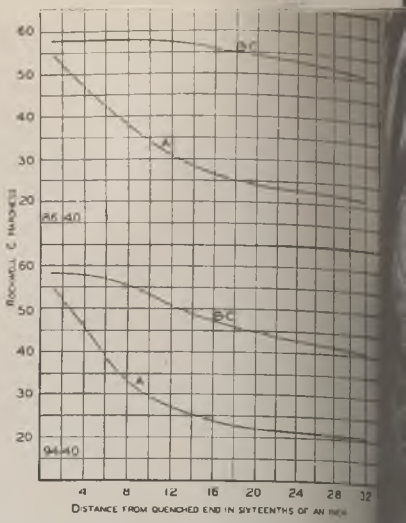


Fig. 9 (Extreme left)—Hardenability curves of single-alloy SAE 1340, SAE 2340, 4040 and SAE 5140 steels, calculated from composition in Table VI

Fig. 10 (Left) — Hardenability curves of two-alloy SAE 3140, SAE 3141, 3240, and SAE 4640 steels, calculated from compositions in Table VI

Fig. 11 (Above) — Hardenability curves of three-alloy NE 8640 and NE 9440 steels, calculated from compositions in Table VI

For example, the principles and rules of annealing have been postulated much more precisely than before[4]. Annealing has in some cases become a more complex procedure than merely heating and slow cooling. The most common cycle for precision annealing of alloy steel is to heat to above the critical temperature, hold at temperature for a short measured time, cool rapidly to a certain subcritical temperature, hold at that temperature for a specified time (usually not more than a very few hours), and cool as rapidly as desired to room temperature. Temperatures and times depend on composition, and are selected by studying transformation characteristics of the steel in question. A modern cycle-annealer is shown in Fig. 2.

Precise annealing has helped to make possible the use of steel for cartridge cases[5], an application formerly considered impracticable. Examples of alloy steel parts, machinability of which has been improved by cycle-annealing, are axle shafts, gears, tank track pins and end connectors, as well as tools of many kinds.

Results of establishment of precise and best annealing cycles will be lower annealing cost, shorter annealing time, more uniform hardness and structure, and better formability or machinability (with longer tool life and smoother finishes).

In hardening and tempering, need in many war products for unusual combinations of mechanical properties, without use of high-alloy steels, has resulted in unprecedented precision control in heat treatment. Examples are tank armor plate, in which combination of high ballistic properties and good weldability is obtained, and armor-piercing shot. Die-quenching of armor[6], with resultant savings in straightening, is a notable contribution to the art of controlling distortion in heat treatment.

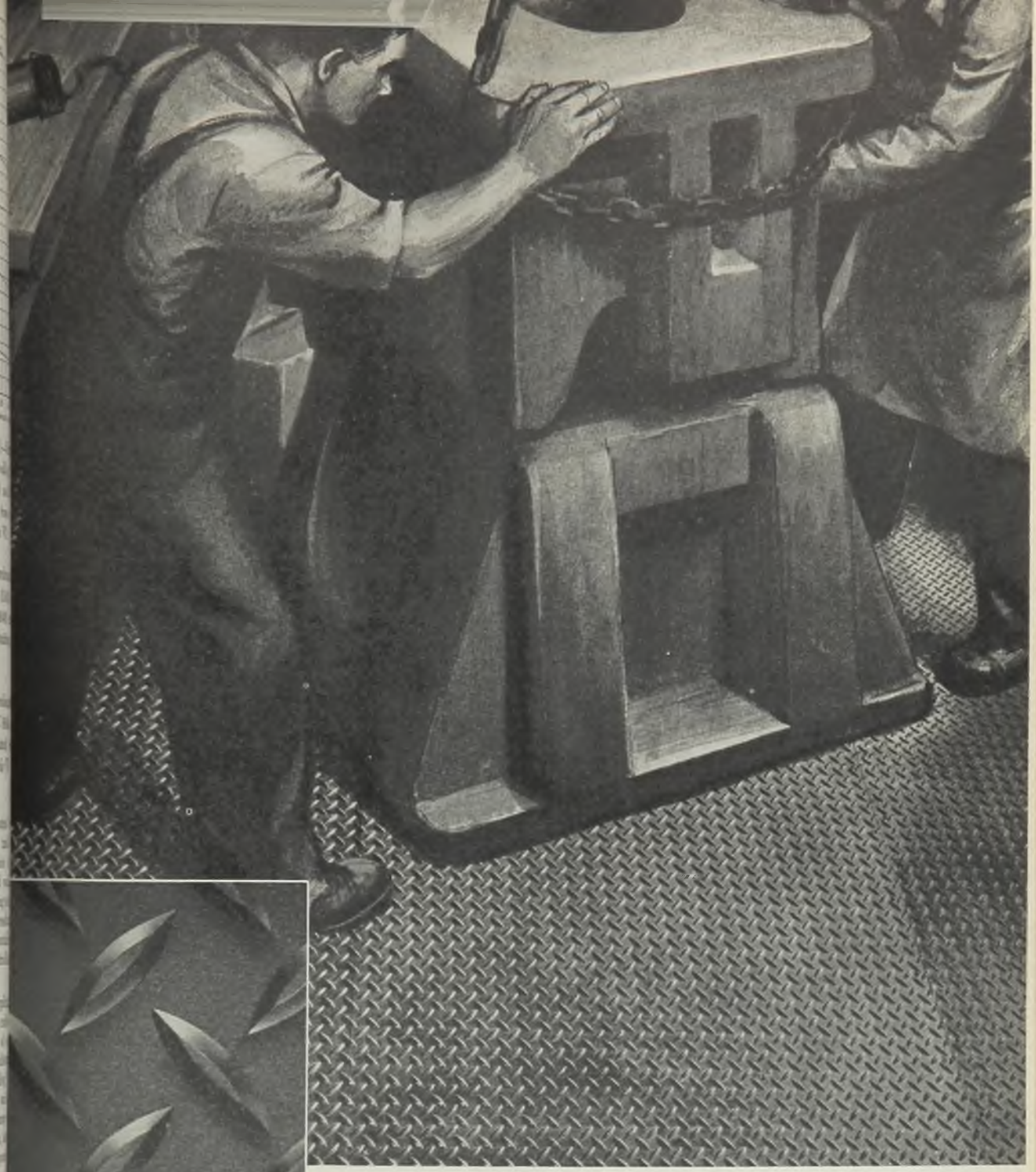
A process which permits application of thin hard cases to ordinary carbon and alloy steels without necessity of quenching and with therefore little distortion is carbon nitriding or dry cyaniding[7,8]. This process has been applied to such parts as steel cylinder liners, oil pump shafts, valve parts, valve push rod ends, harmonic balancer pins, and (with oil quenching) high-carbon steel transmission gears.

Effects of these and other advances in heat treating techniques will be lower manufacturing costs, better and more uniform products, and ability to use less critical and cheaper steels, both for war *materiel* made during the next period of peace and for industrial products.

Castings

Scientific study of foundry problems was started years ago by several large and progressive steel foundries. Developments have been broadened and accelerated during the war, largely because of demand for dependable cast armor and other important parts of military vehicles

(*Please turn to Page* 136)



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AN ENGINEERING APPROACH TO THE SELECTION, EVALUATION AND SPECIFICATION OF

By H. W. GILLETT

METALLIC MATERIALS

In the twelfth and final installment of his report for the War Metallurgy Committee, Doctor Gillett says progress can be made when design engineer, metallurgist and testing engineer meet on common ground. He proposes outline for use in selecting material best suited for a given application and discusses relative merits of various types

CHAPTER X

Selection

WHEN THE minds of the design engineer, the testing engineer, and the metallurgist meet on a common ground, with the designer willing to specify anything that is adequate, without limiting the material to what he used before; the testing engineer ready to plan tests to evaluate adequacy for a specific purpose, and the metallurgist disabused of the idea that data from standard tests are proof instead of just evidence, progress can be made.

Each one will then ask the other some embarrassing questions. The designer will outline the problem of selection of an alternate material, or one of improved properties, for an existing part, by setting down information such as the following:

The size and shape of the part to be made are shown in Blueprint No. —, or Sketch No. —. The shape and dimensions shown could be altered within the following limits——, and the finish could be made ——.

Attempts to improve the part by design changes have indicated ———.

Alternate methods of fabrication tried have indicated ———.

The service involved is —— (temperature range, stress range, corrosive conditions, nature and finish of mating part — etc.)

Materials previously tried were ——, fabricated by —— (methods). Of these, —— were satisfactory, and —— unsatisfactory, because of behavior as to ——.

Failure has occurred by —— (rupture, notch-impact, repeated stress, corrosion, corrosion fatigue, oxidation, attack of gases of following composition.)

The material is wanted to be:

Cheaper.

More readily fabricated by (name process). Present fabricating difficulties are —— (name).

More resistant to —— (fatigue, metal-to-metal wear, abrasion by grit, corrosion by ——, etc.).

Of better load-carrying ability at (give temperature) under static load (if creep involved, give permissible deformation) of —— p.s.i.

There are indications that the necessary improvement is to be sought by —— (e.g., better dimensional stability, more freedom from internal stress, less notch sensitivity in fatigue, different thermal expansivity, harder wearing surface, higher yield strength, different hardenability, different grain coarsening characteristics, use of clad or coated material, etc., etc.).

The decision to be content with evidence of similarity of general properties, e.g., using NE instead of SAE steels of equal hardenability, or to require proof of adequacy by tests that measure the attribute actually required, e.g., by notched endurance tests; and whether to be satisfied with a relatively wide scatter or to test each heat or each lot for its approach to average expectancy, will rest on how vital the part in question is.

Real Service Conditions Govern

Whether the attributes really required are truly evaluated by standard tests, or whether what is actually wanted just came along hand in hand with unnecessary attributes indicated by the tests, will determine whether a special simulated service test is needed. If it is, the feasibility of designing such a test will depend on how accurately the designer can state the service stresses and other conditions.

What hitherto unused materials are proper candidates for consideration can be stated by the metallurgist once he is fully apprised of the real service conditions, but he may often be forced to report that no known material has just the combination of attributes that are properly demanded, and that research to produce an alloy with all those attributes will be long, costly, and have no certainty of ultimate success. As a stop-gap, pending the development of the unknown ideal material, he may well ask, "Why not use the materials we've got, and engineer the necessary properties in by a judicious combination of materials?" This is a sensible question at any time, and particularly sensible now that there is a scarcity of many raw materials.

Conflicting requirements often lead to a search for a material with an unusual combination of attributes perhaps secured, if at all, by the use of an excessive amount of strategic alloying elements. The engineering attack, putting materials together in such fashion that the needed attributes appear at the necessary locations, usually arrives at a better compromise than making the whole object of one material. Alclad duralumin, with corrosion-resistant pure aluminum on the outside and strong alloy on the inside, is an intelligent engineering compromise.

Instead of using a deep-hardening highly-alloyed steel from which to make a massive piece to take high tensile stress, in a side bar of a chain link, several half-inch thick sections of carbon steel, side by side, might do the job. Irregular parts made in several sections and assembled by welding, copper brazing, or silver soldering, may allow putting a more wear resistant section where it is needed. The head and shank of an exhaust valve operate at different temperatures and must resist different types of wear. Selecting each part for its own duty and welding them together may well be worth the extra operation of welding.

Often the interior of a part serves merely as a support, the exterior is the armor against corrosion, wear, or fatigue. The principle involved in use of carburized parts for wear resistance can be applied with far greater speed of production through surface hardening by induction or flame hardening methods. One might find cases where corrosion resistance on an irregular part is required, in which pressing a skin of stainless steel to the desired outside dimensions, copper plating the inside, pressing into this "glove" a previously made "hand" of powdered iron with high porosity and low weight, then copper brazing the glove on tightly, would be much better engineering than hogging the piece out of solid stainless.

Bearings for freight cars are massive pieces of leaded bronze weighing about 25 pounds. When they are slightly worn on the wearing face, they go back

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for remelting. The bulk of the piece serves merely as support for the wearing face. Some two-thirds of the bronze can be replaced by malleable iron, with a vast reduction in the amount of bronze tied up in service[125]. The composite, malleable iron plus bronze piece has the same dimensions as the all-bronze one, and is interchangeable with it.

Bushings cast into zinc die castings, metal reinforcements for fragile plastics, malleable iron connectors for timber, hard facings for oil well bits, expanded metal stiffeners for sheet steel for aircraft, the variety of "clad" metals that extend the old Sheffield plate idea into engineering as well as decorative purposes, are every day examples of the co-operation of materials of different properties in providing a well engineered whole.

Stainless-clad, nickel-clad, copper-clad steels and other combinations are commercial products whose utility was initially limited to those cases where a solid metal, of the necessary surface properties, was too weak, because for the other cases, the production cost was too high to give much saving. The necessity for conservation of strategic metals alters the economic picture, and the development of cladding processes under the conservation urge, will lead to lower production cost.

In many cases the engineer has been deterred from layer construction by knowledge of the early high fabrication and assembly costs and by fear, in the case of clad and plated metals, of poor adherence. But improvements in welding, brazing, plating, etc., and the frequent opportunity to avoid much machining from large section stock are removing the basis for reluctance to use coated metals and built-up parts.

Application of a surface coating by metal spray has a restricted, but real, utility. The production engineer often goes back to the design engineer with a suggestion for lowering production costs through such means, probably more often than the design engineer originally contemplates these means in the hope of putting particular engineering properties just where they are needed and calls in the production engineer to pass on feasibility. When both work together from the start with the aim of combining engineering properties, ease of production and conservation of strategic materials, as they are doing under the urge of war needs, they generally come out with "more, better, and cheaper", as is evidenced by some of the outstanding cases cited in "Tremendous Trifles"[126].

Engineering devices may be used to cut down the service requirements as to resistance to wear and corrosion. Among such engineering devices are oil and air cleaners, likewise crankcase ventilators for the escape of water vapor produced in combustion of gasoline, which, if not removed, becomes liquid water as the engine cools and rusts parts on which it has condensed, if they have been scraped clean or if the film upon them is pervious to moisture. Slushing compounds, the sealing up of aircraft engines, and the provision of absorbents for removing moisture from infiltered air for protection in shipment are other engineering devices. The protection of mufflers and exhaust pipes from corrosion by water condensed from the products of combustion seems to await a commercial solution of the difficulty.

In the oil industry, chemical neutralization of acid liquors is widely applied to protect equipment with which the liquors come in contact.

Another engineering expedient is chemical passivation of steel, as by the use of sodium carbonate solution instead of water in cutting emulsions and in cooling water in general, or by use of chromate [illegible] to protect the boxes in which artificial ice is frozen and which are immersed in calcium chloride solution that would corrode them rapidly without the chromate addition.

In casting about for available materials that might be built into a composite structure or used alone, the metallurgist is likely to bring up some old ones that have been relatively neglected by designers, and some new ones just being developed.

Among the latter are the steels of increased hardenability due to use of boron-containing "finishing" additions, for which steels there are as yet no NE numbers. Certain heat-treatable aluminum alloys containing a little zinc intentionally added, and with a higher strength level than the standard ones, are on the horizon, though they require the amassing of more data on behavior under conditions of corrosion and repeated stress.

That these alloys are only "on the horizon" in spite of the fact that they have long been known, and known as "touchy" alloys, hard to control, and not beyond reproach as to behavior under corrosive conditions[127], is a good example of the importance of amenability to processing. Before 1927, such alloys were known to be capable of giving 75,000 p.s.i. tensile, and it is now known that the strength can be brought to 85,000-90,000 p.s.i. But because of their sensitivity to slight variations in composition and heat treatment, the output of acceptable material of such an alloy from a given mill would probably be only a small fraction of the acceptable output from that mill of the better-understood and less touchy 24 ST, prestretched and specially aged, with 70-75,000 p.s.i. described by Jackman[128].

Cerium for Magnesium Alloys

Moreover, it appears[129] that to make the zinc and magnesium containing alloys resistant to stress-corrosion, it will probably be necessary to age them at such high temperatures as to end up weaker than the specially treated 24 ST. All these difficulties might be overcome with sufficient experience, but rushing into production and use before they are solved is not good engineering. It may be very good business to do intensive research in order ultimately to develop them into dependable engineering materials.

Magnesium alloys that can be used at higher temperatures than the present ones, can apparently be developed by use of considerable amounts of cerium and a sufficiently important use might warrant the cost and difficulty of producing the cerium.

For high temperature service of great severity, alloys containing cobalt, columbium, etc., in generous amounts offer highly interesting properties. Designers are seldom conversant with all these latent possibilities.

It is not suggested that while they are latent and insufficiently proven, the designer should specify them, rather than

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by indicating his interest and pointing out his specific needs, he may accelerate many new developments, much as war needs and war scarcities have accelerated the development of the NE steels and the boron hardenability addition agents.

When a soldered joint is needed, the designer is prone to think in terms of the usual lead-tin solders, but has to seek exception from W.P.B. if he specifies more than 30 per cent tin in the solder. He may not be aware that solders containing little or no tin, from 1 to 4 per cent silver, and perhaps small amounts of other available alloying elements, have strengths superior to the lead-tin solder and are proving so usable that the word solder is likely, in the future, to connote an almost tin-free rather than a high-tin alloy.

It is easier to solder a surface that has previously been tinned, than a bare steel surface. The advent of thin electroplated tin coatings on steel from which tin cans are made, provides a solderable material for other engineering uses at a lower cost and with much less expenditure of tin than when only hot-dipped coatings were available.

Scarcity of zinc for galvanizing led to the development of lead coatings, both the hot-dipped and the electroplated. It is becoming evident that, even though the lead coatings may not be entirely free from pores, the pores are not fatal in most uses, since the corrosion products soon plug up the pin holes and stop the attack. Too thin a coating may fail to hold the corrosion products in place. The relative softness of the lead is a drawback in some applications, but is not serious in others. Thus, lead coating if used in sufficient thickness, serves as an acceptable substitute for galvanizing in a much wider range of use than the chemist or metallurgist of a few years ago would have been likely to anticipate.

Among established or proven materials well known to the metallurgist are high strength cast iron, readily procurable at 45,000 p.s.i. tensile strength, and if the need justifies, up to around 60,000, instead of the 20,000 to 30,000 that is all some design handbooks give it credit for.

When the previously satisfactory cast iron valves for marine service prove unable to stand the shock of "near misses", the designer wishes for a shock resistant cast iron, though he usually expresses this in terms of ductility rather than what he really wants. He neglects the fact that malleable cast iron already exists, and that "quick anneal", pearlitic irons, or possibly even cupola malleable, have toughness that at least makes them candidates for consideration[130].

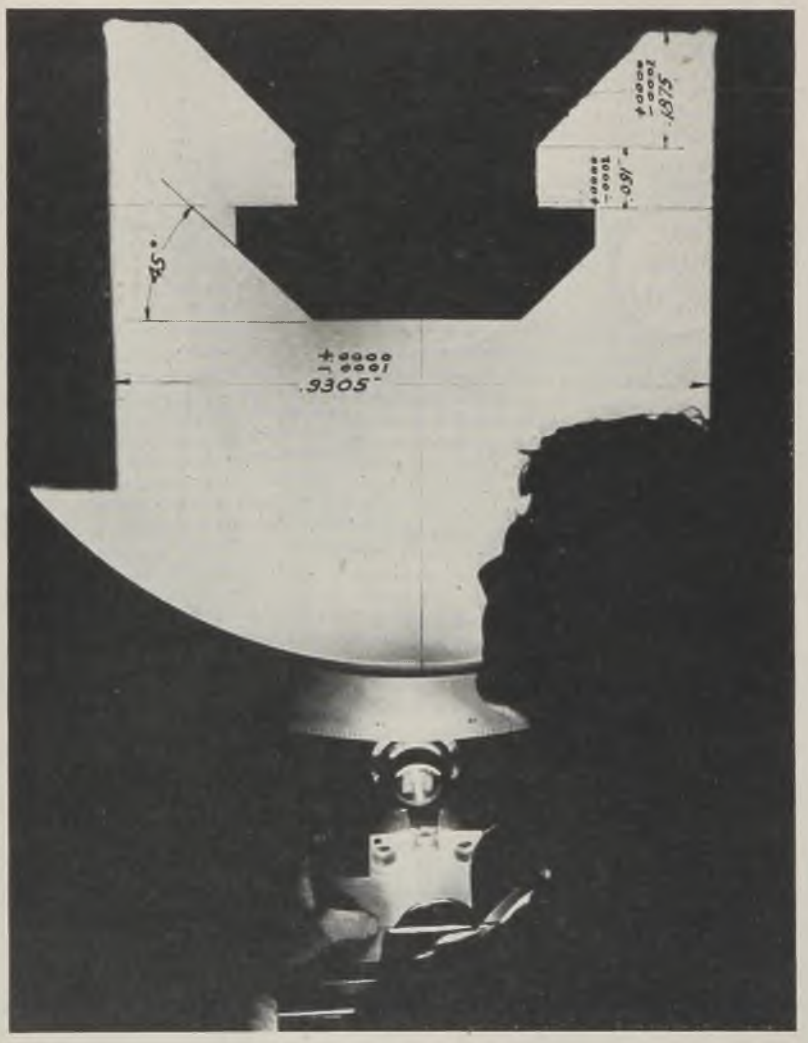
Other Metals and Machinability

When the designer has to pay attention to the demands of the production department for machinability, he may well consider these very easily machinable malleable products, together with their stronger near relations, the Ford crankshaft and allied alloys, also the "graphitic steels" in which machinability and extreme wear resistance in some types of service, are combined with mechanical properties of the general order of other heat treatable steels. A similar combination of improved machinability without appreciable loss of mechanical properties is found in the carbon and alloy steels carrying small additions of lead.

The mild alloy steels of Tables A and B, Chapter II, still class as relatively neglected by designers in general, in spite of their well-demonstrated value.

Where strength is needed beyond that of ordinary normalized, carbon or mild alloy steel, but quenching and tempering are not applicable because of the size of section or complexity of the piece, the precipitation hardened copper steels, carrying about 1 per cent copper, can be made to develop a yield strength of some 10,000 to 20,000 p.s.i. above that of the usual normalizing steels, and this improvement will penetrate to the core of very heavy sections. A tendency toward selective oxidation of iron in preference to copper which tends toward surface checking in hot-working is a drawback that may or may not be serious, depending on conditions.

Another way of getting above the strength level of normalized steel is by



CLOSE TOLERANCES OBTAINED: Since ordinary measuring methods are neither close nor flexible enough to guarantee complete accuracy of the close tolerances required for war production, the Elliott Co. uses an optical comparator. The measuring machine and comparator projects on a ground glass screen an accurate shadow of a tool or part magnified from 25 to 50 times the actual size. Measurements thus can be made within 0.0001-inch.

Illustrated is a part which has been magnified on the screen to 20 times actual size. Dimensions have been drawn in to show the close tolerances required of this production.

For checking the accuracy of tools, tracing paper drawings to scale may be mounted against the glass screen and the shadow of the tool itself used for comparison. Any worn places or inaccuracies can be detected quickly

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nufacturers who intend to keep step with a high level of national sperity — the volume production which means more goods for re people at lowest cost and security of jobs and wages for the atest number of workers — must strive to attain the 50% in- sed output pace. Certainly full advantage must be taken of the erent ability of machine tools to achieve the most with available n-hours, for only with the most modern machine tools can any nufacturer hope to compete successfully over a period of years well as make workers' jobs safer, easier, and more productive.

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cold-working. Cold drawn shafting is well known to the designer, but there are neglected possibilities in carbon or very mildly alloyed cold-rolled steel, rolled to conditions analogous to the "half-hard" and "three-quarter hard" states so often utilized in nonferrous alloys, in which formability sufficient for limited forming operations is retained and high yield strength is achieved. An interesting discussion is available [131] of the properties of cold-rolled low carbon steel in thin sheets. While the work-hardenability of ordinary steel sets limits of usable strengthening, the limits are greatly extended in the case of austenitic steels whose capacity for work-hardening is much greater.

The most prominent member of this class is "18:8", the familiar austenitic stainless steel that usually contains very low carbon, about 18 percent chromium and about 8 percent nickel. This is valued chiefly for its well-known corrosion resistance and for the greater strength at high temperatures (up to around 1000 degrees Fahr.) it shows in comparison with ordinary steels, as well as for a high degree of cold formability.

The strength that can be imparted to 18:8 by cold-work makes it of interest as an engineering material, even when no use need be made of its corrosion resistance or heat resistance, and, in normal times it has been considered for, and has found some slight use in, some of the "streamlined" railway passenger cars, and for experimental aircraft construction.

The strategic position of nickel and chromium makes such uses for 18:8 highly questionable from the point of view of conservation; hence, alternates that do not exert such a drain on the supply of strategic metals are of timely importance. Such an alternate appears to be attainable by recourse to manganese, which is produced in so great a tonnage that its use in austenitic steels is not out of the question.

High Tensile in Soft Condition

In the soft condition, obtained by rapid cooling, such as quenching from 1800-2100 degrees Fahr., 18:8 ranges from 75,000 to 95,000 p.s.i. tensile according to the carbon content, which runs 0.05 to 0.20 percent. The elongation and reduction of area in the soft state are high, 65-75 percent.

The yield strength in the soft state is low, only 20,000 to 30,000 p.s.i., but is rapidly raised on cold-working.

By severe cold-work, i.e., in very light gages, the tensile can be raised to 300,000, the yield to 250,000, with still a little ductility, say 1 percent elongation and 3 percent reduction of area. Intermediate conditions, e.g., 185,000 tensile, 140,000 to 150,000 yield, 5 to 8 per cent elongation, can, of course, be had.

The cold-worked strength is lost in welding, and during the cooling from the welding heat a carbide precipitation may occur that is detrimental to corrosion resistance against some types of corrosion, and to high temperature behavior. Carbide stabilizers, such as titanium and columbium, are added to avoid this precipitation. Spot welding produces so small an area of softened material that the presence of the soft areas does not materially detract from the engineering performance of many spot-welded structures, but other types of welding are seldom applicable to strong, cold-worked austenitic alloys.

The performance of cold-worked 18:8 in fatigue is noteworthy. The material hardens so rapidly by cold-work that there is produced, at the base of a notch, a condition of so much enhanced strength that the notched-fatigue behavior is excellent. Indeed, in the fully soft condition, the endurance limit on a polished bar is less than that of a similar bar carrying a notch, and the "damage" resistance also appears high.

After having been cold-drawn to a tensile strength of 132,500 p.s.i., a polished endurance limit of 70,000 p.s.i. has been found for 18:8, and a notched endurance limit of 50,000 p.s.i. Comparison with Fig. 22 brings out the superiority of these values to those usually met at a corresponding strength in ordinary steel. However, since minor variations in composition affect the work-hardenability of 18:8 in a not-easily predictable manner, these figures should be taken as indicative rather than representative of every modification of 18:8, and attention should be given to the specific behavior of individual lots.

Comparative Behavior Noteworthy

Very similar behavior under cold-work to that of 18:8 is found in the manganese austenitic steels. Franks, Binder, and Brown[132] report, for steels of:

Carbon	Manganese	Copper	Chromium	Nickel
0.10	16.5	1.0	—	—
0.23	16.5	0.7	3.0	3.0
0.23	16.5	1.0	3.0	1.0

the following cold-worked properties:

Tensile	Yield
180-200,000 p.s.i.	125-150,000 p.s.i.

Elongation
About 10%

If corrosion resistance is required, a steel of 0.14 per cent carbon, 16 per cent manganese, 12 percent chromium, is suggested by these authors who give its cold-worked properties as 190-215,000 tensile, 125-150,000 yield, 15 percent elongation.

The spot welding behavior of all these is said to be satisfactory. No data on fatigue-properties are reported, but the same general behavior as for 18:8 would be expected.

None of the austenitic steels machine as well as do ordinary steels, but small additions of sulphur, selenium, lead, bismuth, or silver are sometimes made to improve machinability with little detrimental effect upon mechanical properties. "Free-machining" 18:8 is an article of commerce, and it might be expected that the low or high carbon manganese stainless steels, by dint of small alloying additions and of special elements such as those listed above, might be brought to a degree of machinability, or at least grindability, that would adapt them to quantity production for a much wider range of engineering uses than those obtaining at present.

Because of the propensity for carbide precipitation in the temperature range 900-1400 degrees Fahr., the handling of any austenitic steel must be carried out in regard to the metallurgical factors involved. The whole story is lengthy and complicated in respect to securing suitable mechanical properties plus the acceptable welding behavior and immunity to specific chemical corrodents called for in the manifold uses in the chemical industry. It is not so complicated when mechanical strength only is involved, but the austenitic steels are a quite different class from ordinary steels and they have to be handled intelligently to avoid mistreatment in processing.

Iron Parts Made by Powder Metallurgy

Articles may be made from iron powder by pressing, sintering, then finally finish machining or "coining" into final dimensions by pressure, if they do not come close enough to dimensions after sintering.

Use of the iron powder objects is being extended beyond bearings, other objects usually being made as dense and pore-free as the method will allow. Small gears are made that require no finishing, and, though the usual products are small, since it is difficult to properly compact the inside of large pieces, the size is being extended as experience is gained.[133]

The mechanical properties are not high. One tentative listing of properties expected gives three grades, one of 15,000 p.s.i. tensile, with very little elongation about 0.5 per cent; another of 25,000 p.s.i., 3 per cent; and a third of 35,000 and 7 per cent.

Thus, the properties range from approximately those of an extremely weak cast iron to approximately those of a weak malleable iron or of a weak zinc base die casting. The virtues are not in strength as engineering materials, but in the low production costs when the production is large enough to amortize the dies and when the pieces come out accurate enough in dimensions to require no machining.

A German substitution for the all copper driving band for projectiles progressed in two stages; first, the employment of a duplex—half soft iron half copper—band, with the portion in the seating groove, iron, that projecting beyond the groove, copper, bonded to the iron. The second uses a pressed-on powdered iron driving band, with the pores wax-impregnated to avoid rusting. Such bands are highly brittle against being pried off, but appear to resist sufficiently the forces applied in use.

In the first case, the traditional material is used, but only where its properties come into play. In the second the properties demanded by service are

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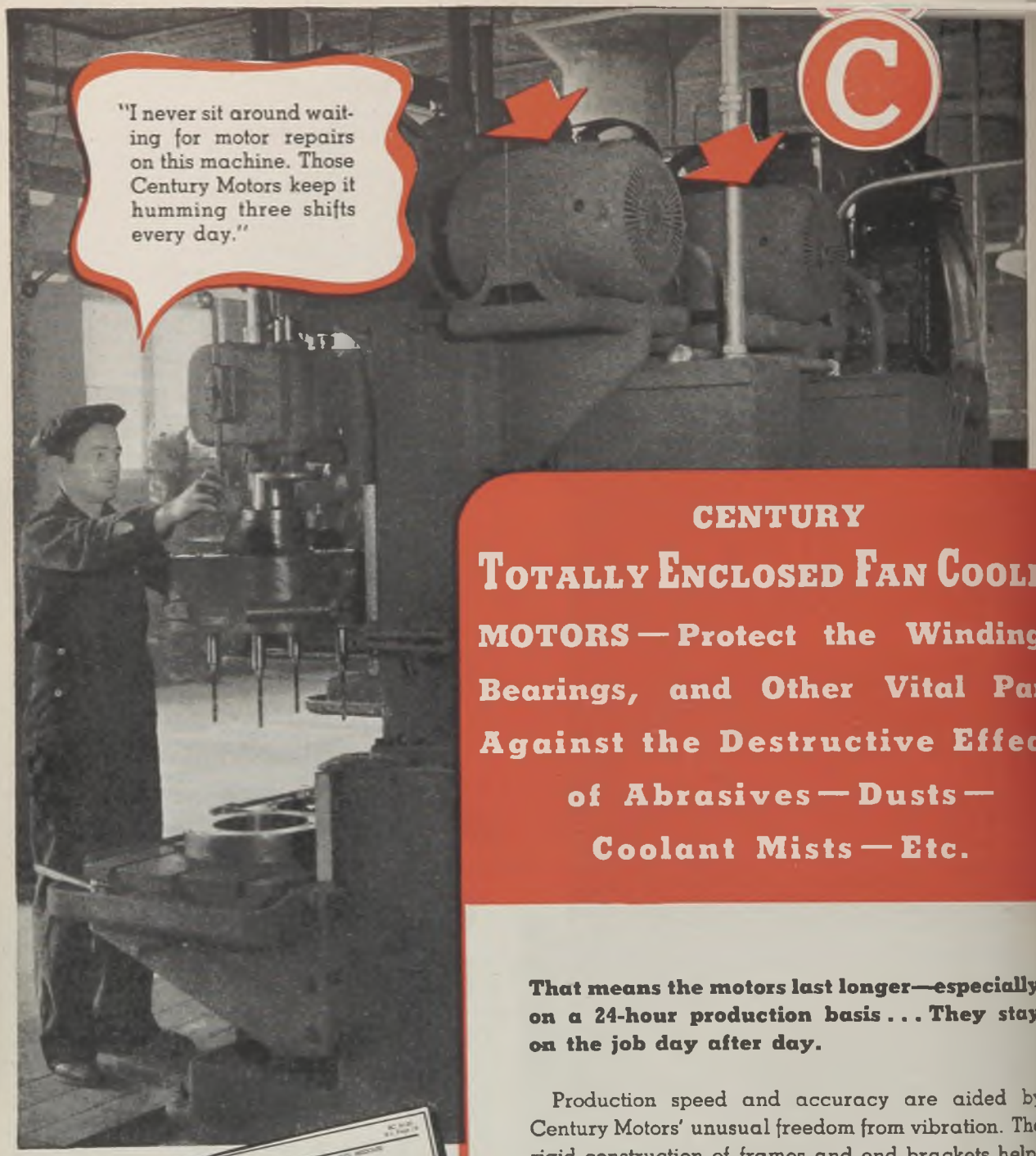

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supplied, and the fact that other properties, not called upon in service, are notably inferior, has not been allowed to prejudice the engineering selection.

New methods of fabrication are coming in, such as the "coining" of gears cast nearly to shape, by pressing into a die that gives them their exact final form of an approach to this. Casting may replace forging, as is the case with the crankshaft of the German Juno 211 B engine for the Heinkel and Junkers planes. The willingness of German designers to use a cast crankshaft in a very high-power engine indicates that they have taken the lesson of the Ford crankshaft to heart. Conversely, welding together of rolled or forged pieces often replaces castings. There is continuous change in fabrication practices as the art advances.

In view of the many radical changes in fabrication methods the production engineer may well be called into conference with the design engineer, the testing engineer, and the metallurgist, so that the amenability of the candidates for consideration as alternate materials to new, convenient, methods of fabrication may be discussed along with the other features entering into a choice.

It is also the task of the production engineer to guard the quality and uniformity of the product, by setting up suitable production control tests and records. A wrong process can spoil the best material. For example, perfectly good forging stock can be made into consistently bad forgings, so it is as necessary to control the forging process as it is to control the forging stock. The same holds for nearly all processes, since few processes are foolproof. It is axiomatic that there is need for process specifications, for indicating and recording instruments to catch variations that would otherwise go un-noted, and for tests made and inspection exerted at suitable steps in the process, so that trouble is caught before it is too late to do anything about it.

Design, choice of materials, and processing of the materials are all inseparably connected. Each has to be done with an eye to the others, and with engineering judgment directed toward the true conditions of service. There are aids to, but no substitute for, judgment in any of the three.

Handbooks and lists of alternates can tabulate certain properties of well-known materials on the basis of average expectancy of properties determined by standard tests. It doesn't take an engineer to run an eye down such columns, or to pull the slide on a slide-rule type of steel "selector".

It does take engineering background and judgment to appraise the true requirements of service and so instruct the testing engineer what attributes to attempt to measure in quantitative figures, and the metallurgist as to what brand of metallurgical stability is demanded.

When the standard or simulated service test results are in, and the metallurgical evidences needed have been adduced, there still remains the engineering responsibility of making a selection of, and writing sensible specifications for, the permissible materials.

Nothing can relieve the engineer of this responsibility, but the task may perhaps be eased and much guesswork eliminated when the engineer approaches the problem of materials from the point of view outlined in Mr. Heron's introduction, which this discussion seeks to emphasize.

One can easily sum up the principles of the selection, testing and specification of engineering metals. Good selection, good testing, and good specifications all try "to make the punishment fit the crime".

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APPENDIX

Reference Books

Extensive bibliographies could be supplied on nearly every topic discussed in the text. Use of such references requires access to back volumes of metallurgical journals, which may not be readily available to the designer. Footnotes have been given in the text to a few of the outstanding sources of detailed information.

The bulk of the evidence, on which the statements in the text are based, has been collected in a few important summaries, which have been repeatedly cited, as numbered references.

These books and pamphlets have been selected for their availability, as compared with back copies of journals, for their up-to-dateness, and with an eye to their readability by engineers rather than metallurgists.

These selected sources form a "two foot shelf" of pertinent information that should be within easy reach of any design engineer.

The primary authority on methods of mechanical testing, and of a variety of other facts that do not come under that heading, is the American Society for Testing Materials, 260 S. Broad street, Philadelphia. Its definition of terms, specifications and recommended practices represent the experience and considered opinions of the specialists in testing.

Specific restrictions upon the methods of testing are imposed by the ASTM in the cases of many important tests. In others, notably those relating to fatigue and creep, the exact equipment and method of operation are not specified, but, instead, emphasis is laid on the fundamental principles that must be observed to secure reliable results.

Since testing practice is constantly changing and improving, the ASTM classes many of its specifications and recommended practices as "tentative", for a few years before final revision and adoption as "standard". Even the long-established standards are periodically reviewed and, when necessary, revised. The apparent finality of an ASTM specification is more apparent than real.

Many of the most important tests for metals are described in sections of the *Metals Handbook* published by the American Society of Metals, Reference 1.

The *Metals Handbook* is also revised and enlarged to include new information and new methods, about every two years. Hence, care should be taken to refer to the latest ASTM and ASM publications.

This applies also to the *Welding Handbook* of the American Welding Society, Reference 4. The testing of welds is a rapidly growing art, current development of which is recorded in the Welding Research Committee's Supplement to the *Welding Journal* of the society. Recent articles include some dealing with welding of NE steels.

The numbered references follow:

1. *Metals Handbook*, 1939 Edition, 1803 pages, published by American Society for Metals, 2016 Euclid avenue, Cleveland. $10.00. Written primarily for metallurgists, contains excellent summaries of properties and methods of testing the old alloys. Does not deal with NE steels or other recent substitutes.
2. *Cast Metals Handbook*, 1940 Edition, 504 pages; $5.00, published by American Foundrymen's Association, 222 W. Adams street, Chicago. Written for the foundryman, but from the engineering viewpoint. Contains data on properties of ferrous and nonferrous castings, including some of those that are resorted to as substitutes, though that point of view is not emphasized.
3. *Steel Castings Handbook*, 1941, 503 pages, $2.00, published by Steel Founders Society of America, Cleveland. Like Reference 2, but confined to steel castings.
4. *Welding Handbook*, 1942, 1593 pages, $6.00, published by American Welding Society, 33 West 39th street, New York City. Current data on properties and on weldability tests appear in the monthly *Welding Journal*, especially in the Welding Research Supplement. Same address.
5. Prevention of the Failure of Metals Under Repeated Stress, a handbook prepared for the Bureau of Aeronautics, Navy Department, 1941, 277 pages, $2.75. Published by John Wiley & Sons, New York. Written from the engineering point of view. Fatigue of Metals, Some Facts for the Designing Engineer, Second Edition, 1942, 88 pages, published by The Nitralloy Corp., New York City, repeats some of the same information.

(*Please turn to Page* 156)

CLEANING METALLIC BELT LINKS

. . . . made easy by use of special handling equipment

AMONG the "expendables", few war materials can compare with the astronomic production required for metallic belt links that hold machine gun bullets to form a continuous belt to feed the guns. Millions upon millions of these are processed each day, each one individually tested and inspected.

Of special interest is the production setup used by National Stamping Co., Detroit, one of the largest link producers in the field. Here one finds the latest modern equipment; a smooth yet fast flow of work; clever yet simple devices to relieve or assist purely manual work. Guiding hand behind all this is Walter Glenn Scott, a man whose 30-year professional career has embraced the economic mechanization of innumerable processes.

Paralleling and supplementing an almost automatic functioning of the link manufacturing process, Mr. Scott has introduced various exacting production, time, quantity and expense controls. Balances of materials in various stages of the process are only sufficient for maintenance of uniformity of scheduled outputs.

Of all product operations in this plant, none is more interesting or unique than the shot blast cleaning department, because here is typified the modern thinking that has gone into the whole production setup. Like many other producers of metallic belt links, National Stamping Co. relies entirely upon the airless Wheelabrator abrasive blasting process manufactured by American Foundry Equipment Co. A battery of six 27 x 36-inch Wheelabrator Tumblasts, equipped with rubber conveyor belts, is used in this department. Auxiliary equipment includes time signal clocks to regulate the duration of the blast, and ammeters for determining the abrasive input to the blast units.

Minimum of Hard Labor

In the manufacture of metallic belt links at National Stamping Co. practice after stamping and forming is to harden, degrease, shot blast, draw, and Parkerize. Following the hardening operation, which occurs at ground level, the links are hoisted electrically to an overhead mezzanine in baskets having a capacity of 20 to 23.5 cubic feet, and holding approximately 800 to 940 pounds of links.

Upon reaching the upper level, the baskets are moved electrically to a point above any one of six storage hoppers, each of which has a capacity of 90 to 110 cubic feet. Here the basket is positioned in a cradle-like dumping mechanism as shown in Fig. 1. A back-geared ratchet device enables the operator, by means of a crank, to dump the basket into the hopper.

With four to five cubic-foot loads being cleaned in each machine per hour there is sufficient capacity for 3.6 to 4.5 hours of operation, with minimum hopper loading. The hoppers are located above and behind the skip bucket loaders used for charging the mills. A balanced spout, located at the bottom of the hopper, and facing the loader, as shown in Figs. 2 and 3 is so designed that approximately one skip hoist load of links is handled by one dumping action. Spouts can be so manipulated that skip hoist loads are always very nearly 5 cubic feet, because each skip bucket is marked at certain levels to indicate the capacity. A full 5-cubic-foot load comprises 20,000 links of .30-caliber, or 5000 links of .50-caliber. Filling the skip bucket is a matter of only 5 seconds.

In order to facilitate operating and maintenance functions, platforms and walkways are arranged above and around all six machines, as well as at the front over the skip hoists and hoppers, see Fig. 1.

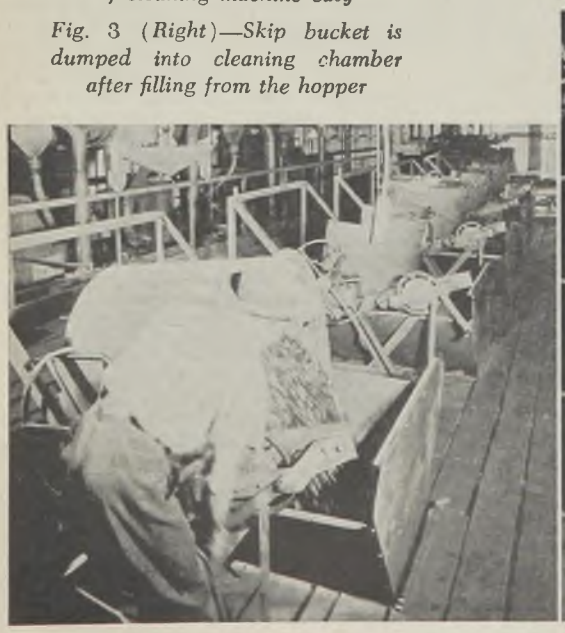
This two-level platform-walkway arrangement makes it possible for one crane operator on the upper level to handle the loading of links into the reverse hoppers, as well as the loading and unloading operations in connection with the two degreasers, eight draw furnaces and one draw furnace dumping mechanism. Approximately one-third of the crane operator's time is actually applied to loading the shot blast reserve hoppers.

Only one operator on the floor level is required to operate and load the six cleaning machines. In addition, this man is required to handle the 4-way bin storage system at the end of the conveyor, and to handle the auxiliary draw-furnace baskets to the Parkerizing drum dumping mechanism. He also closes the Parkerizing drums and pushes them into the Parkerizing department. Only one-

Fig. 1 (Below)—Platforms and walkways over loading sections or hoppers of abrasive cleaning machines facilitate operation and maintenance work

Fig. 2 (Center)—Balanced spout at bottom of hopper makes loading of cleaning machine easy

Fig. 3 (Right)—Skip bucket is dumped into cleaning chamber after filling from the hopper



THESE STORAGE BATTERIES ARE *VETERANS* OF TWO WARS

A Report on Conservation for Users of Industrial Trucks

ADVANTAGES OF THE EDISON ALKALINE BATTERY IN INDUSTRIAL TRUCKS AND TRACTORS

★ It is durable mechanically. High strength steel construction is used in the containers, grids, pole pieces, etc. The electrolyte is a preservative of steel.

★ It is foolproof electrically. It may be accidentally short-circuited, over-charged, over-discharged, or even charged in the reverse direction without injury.

★ It can be charged rapidly. It is not subject to finish-rate limitations. It requires no equalizing.

★ It withstands temperature extremes. It is not damaged by freezing. Free air spaces on all sides of all cells provide ventilation for rapid cooling under high temperature conditions.

★ It is simple to maintain. Merely charge adequately, add pure water, keep clean and dry.

★ Its tray assembly and cell connections are extremely simple.

★ Its life is so long that its annual depreciation cost is lower than that of any other type of storage battery.

During World War I, a New England plant installed a fleet of battery industrial trucks each provided with two Edison Alkaline Batteries, one to operate the truck while the other was on charge. The trucks worked around the clock on war production, but after the Armistice the plant went to an 8-hour day so that one battery per truck was enough and the spare batteries were not needed. They were put into storage and there most of them remained until the outbreak of the present war.

Now they are again in service. In spite of the fact that most of them stood idle for nearly a quarter of a century, they are doing a completely satisfactory job keeping the trucks supplied with power. In fact, shortly after the outbreak of the present war, the plant purchased a new truck without a battery because its reserve stock of spare batteries was still ample.

The current performance of these veterans of two wars is living testimony to the extra reserve dependability in the Edison Alkaline Battery. Some of the unique characteristics which account for this dependability are cited in the column at the left.

EDISON STORAGE BATTERY DIVISION, THOMAS A. EDISON, INCORPORATED, WEST ORANGE, NEW JERSEY

Edison

ALKALINE BATTERIES

Fig. 4 (Extreme left)—Work from cleaning chamber is discharged into dual conveyor shown here

Fig. 5 (Left)—Two-line or dual conveyor carries work to 4-way bin dumping mechanism shown here

fourth of his time is applied to the shot-blast conveyor and the 4-way bin system.

One-third of the crane operator's time is applied to the shot blast loading. One floor operator handles all six shot blasts, and half of his time is devoted to handling the conveyor and the four-way bins. The entire setup requires the manpower of only 1.8 operators. Approximately one-third of the foreman's time supervises these operations. Occasionally general help aids in bringing abrasive and loading it into the system.

The cycle of operation of the six Tumblasts is progressive, with the operator working from one end of the system to the other. Charging the mill with the skip bucket loader takes 30 seconds, the mill is timed to turn with the blast on 10 minutes, and with the blast off another minute to sift out good abrasive, followed by an unloading period of 30 seconds. These operations are done successively for all six mills.

A two-line conveyor, approximately 16 inches wide and operating at a rate of 120 feet per minute, is located along the front of the six Tumblasts, Figs. 3 and 4. The conveyor belt has apron pockets 12 inches long, 4 inches wide, 5 inches deep. The wire mesh bottom of the belt allows excess abrasive to drop through the belt to suitable pans directly under the upper belt section, from which the abrasive is collected periodically and returned to the mills.

A hopper with movable baffle plate is located immediately above the conveyor and directly under the discharge point of each mill. The hopper extends slightly beyond the width of the cleaning chamber. See Fig. 3. By turning the handle at the side of the hopper, the links can be diverted or spouted to either one or the other side of the conveyor belt, depending upon the ultimate delivery point desired.

The conveyor leads forward and upward to a 4-way bin dumping mechanism, as shown in Fig. 5. Notice the baffle arrangement to divert and segregate the discharging links into the proper compartments. The vertical baffle, separates the two halves of the conveyor, while the movable baffle, activated by a lever, shunts the links into the correct bin on either side of the hopper. Links stored here are spouted by gravity directly to draw furnace baskets or Parkerizing drums. Each bin handles 15 cubic feet of material.

The speed of Wheelabrator cleaning, plus the ingenious handling system and close observation and control of all operating and maintenance function, have resulted in a very low cleaning cost. According to Mr. Scott, a load of 5000 links of .50-caliber or 20,000 links of .30-caliber is cleaned at a grit cost of only 12.65 cents.

Indicative of the thoroughness with which operations are controlled is the intensive study being given to the economic usage of abrasive. In the words of Mr. Scott: "It is an important controlling factor in the cost of manufacture of .30 and .50-caliber links. If abrasive feed valves, loads, speed and duration of the blasting operation, together with the condition of the wheel impeller blades and other controlling elements, are not handled properly, excess unused abrasive goes over into the dust. When this happens the abrasive has not been sufficiently pulverized—that is, it hasn't been sufficiently used—and is a direct loss.

"If we shot blast for a period longer than required to give adequate burring or proper finish for Parkerizing, this also wastes abrasive.

"Shot blast periods were 10 minutes for both .30 and .50-caliber links. Abrasive usage should average approximately 3 1/3 pounds per 10-minute period, in which approximately 20,000 links of .30-caliber or 5000 links of .50-caliber are processed in each load. The less the load, the less the required period, so sizes of loads should be made definite for uniform shot blast action.

"To hold down the consumption of abrasive, shop men should periodically remove the residue in exhaust pipes leading to dust arrestors, watch for losses from holes in bags in which abrasive is shipped, also in cars and conveyances from which each delivery is received.

"In order to salvage every last vestige of abrasive that might be lost by spilling, we also clean the floor regularly with a vacuum system."

Increases Belt Mileage

Industrial So-Lo, a product for repairing breaks, burnt or worn spots, filling holes and for resurfacing industrial belts of all types is now being made with synthetic rubber by So-Lo Works Inc., Loveland, O. The manufacturer claims it will greatly lengthen the life of belts and permit continued use of some conveyor belts that might otherwise be discarded. It is easily applied, dries tough overnight, and is very economical. One quart covers approximately 14 square feet.

It is said to have greater resistance to oil and grease, less shrinkage, spreads easily, and dries smoothly. The product consists of a cement primer and a mastic. The belt surface is roughened and the primer applied. The mastic is then spread on.

This material also is used for resurfacing metal, wood, and composition pulleys, to which it readily adheres, preventing slipping and cutting down wear. It safeguards workers when used as an insulator to cover switch handles and other electrical devices; and it prevents slipping when applied to metal and concrete stair treads. This product is also used by industry and government in repairing rubber boots and gloves.

New Wire Rope Guide

Containing general list prices, tables, data and helpful information on wire rope, catalog No. G-15 printed at the year's end for MacWhyte Co., Kenosha, Wis., is now being mailed to customers and prospects of the firm. Replacing all previous editions, the 60-page buyers' guide has tabbed index for quick reference to sections on aircraft cables, noncorrosive and galvanized ropes, strands, slings, fittings, etc.

A copy of the catalog may be obtained by requesting it on a company letterhead to Jessel S. Whyte, president, MacWhyte Co.

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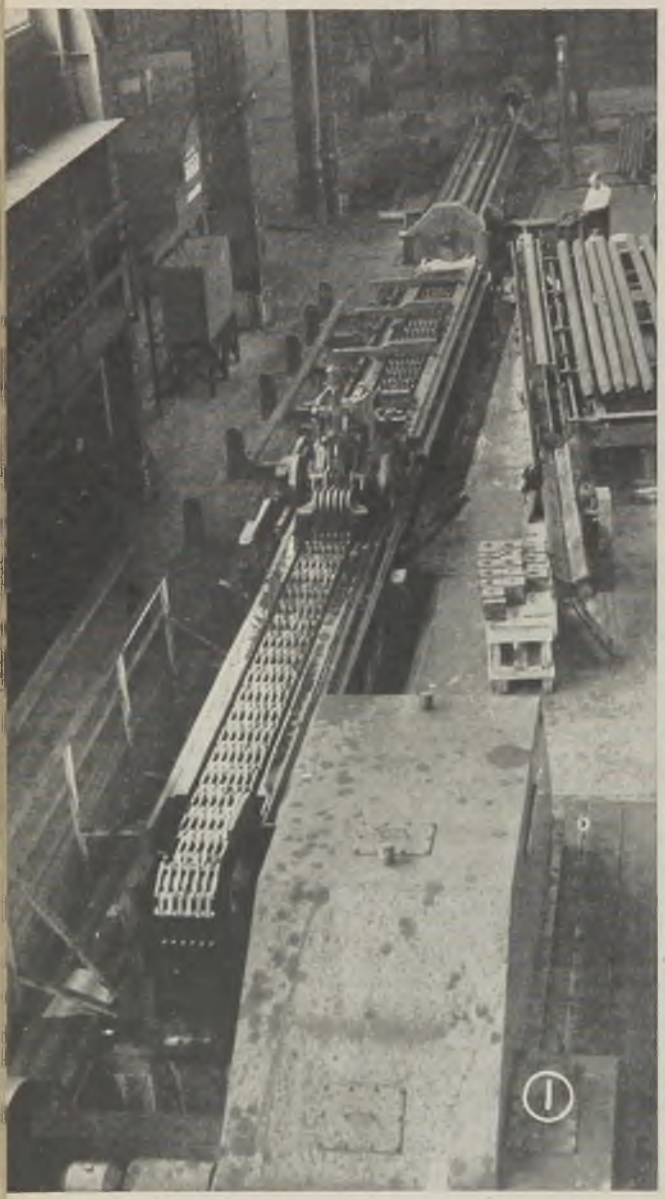
Drawbenches ---

Their Operation, Use



Increasing demand for tubular shapes has brought the drawbench to the forefront. In this, the first of a series of three articles on this cold finishing unit, the author discusses various developments in design which have increased production, and cites effective means for loading mandrel, feeding material on rod and handling finished product

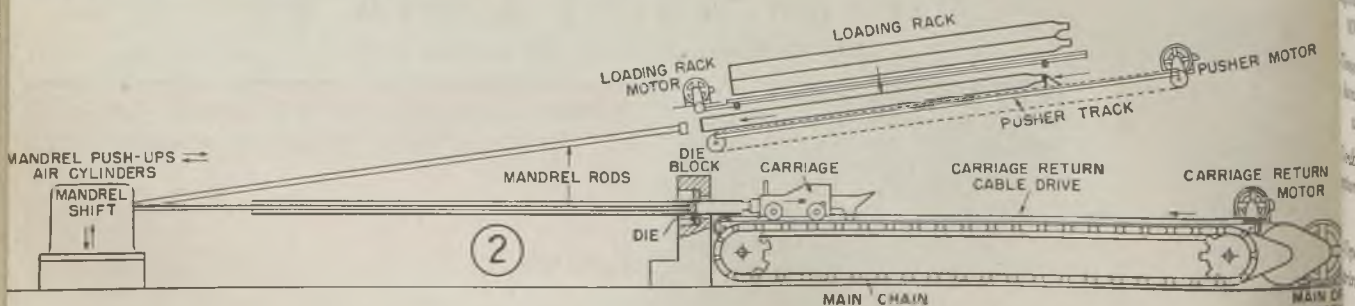
Part I

UNPRECEDENTED DEMANDS of World War II for tubular shapes have so greatly accelerated the need for draw benches that their use has more than doubled since the war started. Ferrous and nonferrous alloy tubing is being used in ever increasing quantities in our war machines, and most particularly in aircraft. New methods of fabrication give the aircraft structural designer opportunity to take advantage of the ideal structural properties of the tubular shape. From a defensive standpoint in actual combat the tubular shape appears to be the best available. When a tubular member is pierced by a bullet it often loses less of its original strength than any other section under the same conditions. Also, upon hitting a properly streamlined tubular shape a large percentage of bullets will slide off without appreciable effect.

Tubing is made in a number of ways; the most widespread methods are: extrusion, piercing, and welding tubing from skelp. The product of any of these processes is frequently not in the finished form or of the exact required dimensions. This is where the drawbench enters the picture.

The Machine: The drawbench is a cold-working machine for pulling tubes, bars, rods, or other shapes through a die to obtain a reduction in diameter, to impart to the material improved physical properties, or to make special shaped tubing from standard round tubes. A bench is usually rated at the pounds pull corresponding to the rated capacity of the main chain and the die stand. The range in pounds pull-rating of most benches is from 5000 to 200,000 pounds although many benches in operation are rated as low as 1000 pounds and a number of 300,000-pound benches are in use.

Smaller benches may work material as small as that approaching the size required for hypodermic needles, while at the other extreme they may work steel tubes up to 14



TWIN MAND

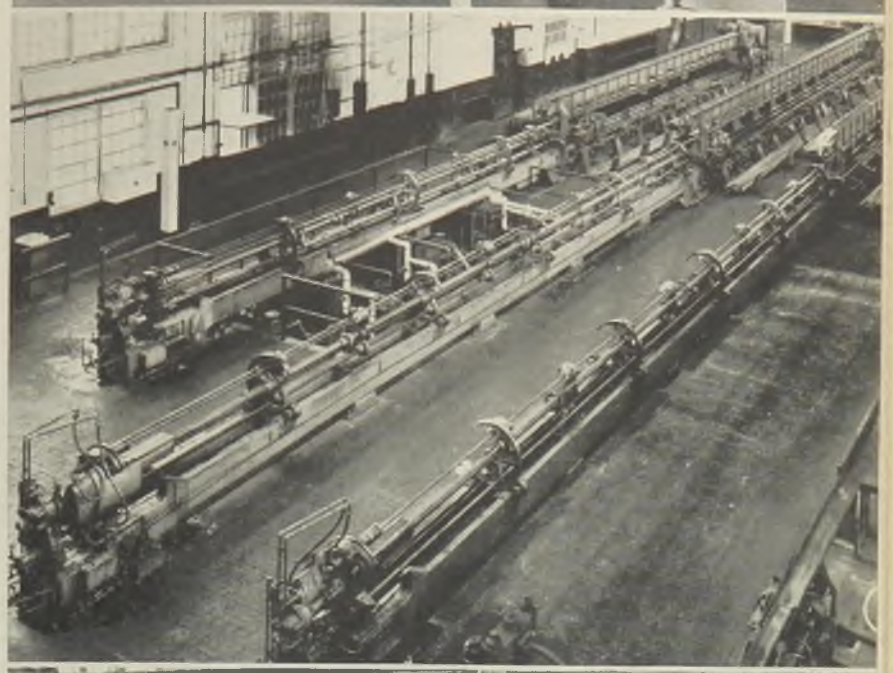
By A. L. THURMAN
Industrial Engineering Division
General Electric Co.
Schenectady, N. Y.

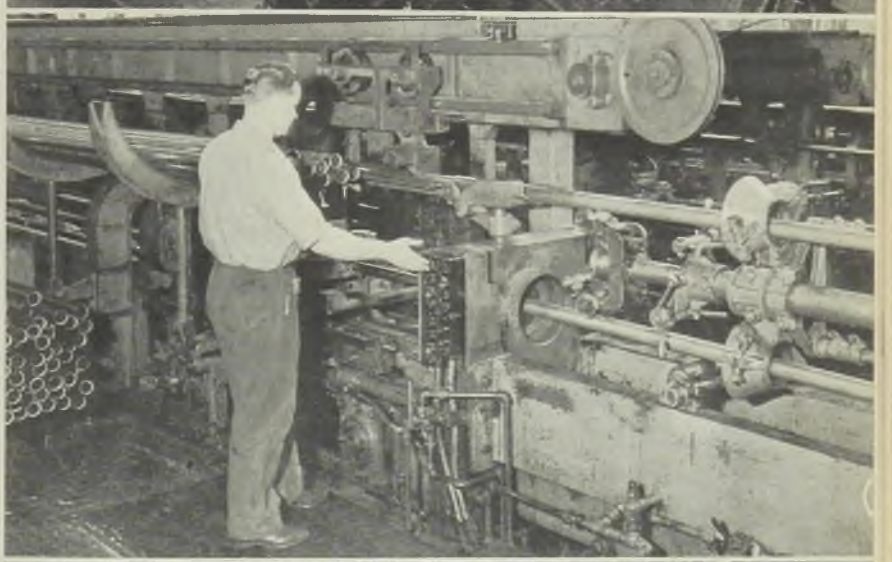
...nd Drives

inches diameter. The drawbench is capable of working material to close tolerances, and is generally required for the production of thin-walled tubing.

The essential parts of a fixed mandrel drawbench are shown in Fig. 2. As indicated, the carriage tongs grip the tube to pull it over the mandrel and through the die. The carriage is pulled by the main chain, which is driven continuously in one direction. The inside diameter of the tube is determined by the size of the plug on the end of the mandrel; the outside is determined by the inner diameter of the die. Tension in the main chain causes the hook to raise to about the centerline of pull where it is latched to the carriage in the raised position. This enables the hook to become disengaged when the tube is pulled through the die to relieve chain tension. The carriage tongs are so designed that this release of tension releases them from the tube; the carriage is then free to travel along its track in either direction. The tube is then moved to one side of the bench and as soon as another tube has been placed on the mandrel the operator is ready to return the carriage for the next draw.

These are essential parts of the bench, but many additional features have been added to the drawbench in the past few years to make all tube handling functions easier for the operator. Alert drawbench manufacturers, ever conscious of the demand from the metalworking industry for improved production methods, have made the modern





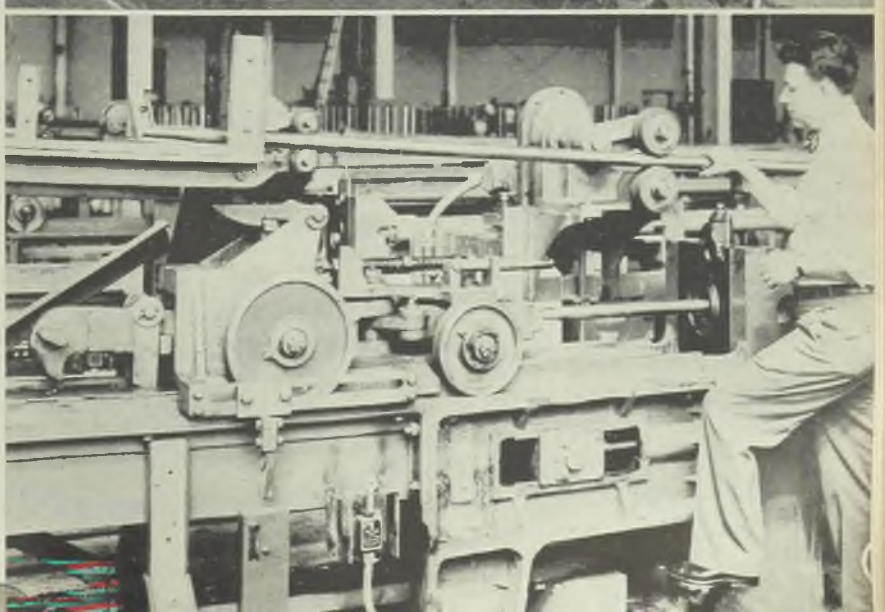


Fig. 1—Single mandrel accelerating drawbench with 300,000-pound capacity

Fig. 2—Twin mandrel drawbench designed with loading rack and tube pusher

Fig. 3—Drawbench with twin mandrel arrangement. Capacity, 100,000 pounds

Fig. 4—Three 50,000-pound drawbenches showing double mandrel assemblies

Fig. 5—Double mandrel drawbench in operation. Capacity 50,000 pounds

Fig. 6—Operator using pinch roll to string tube on mandrel

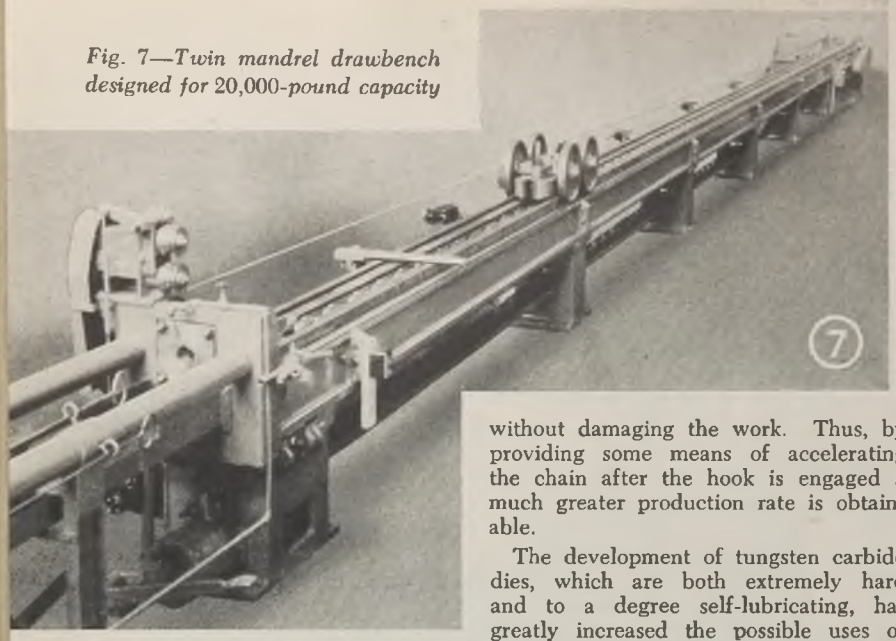


Fig. 7—Twin mandrel drawbench designed for 20,000-pound capacity

drawbench so automatic that even the largest machine can be operated by one drawbench operator.

For some time, the drawbench was considered a constant speed drive application, but in the past few years the accelerating bench has so improved its production capabilities that it has been possible to meet the demands of this war with a far fewer number of benches. With most classes of material there is usually a maximum safe speed at which the carriage hook will drop into the chain after the tongs have been engaged, without damaging the work. Thus, by providing some means of accelerating the chain after the hook is engaged a much greater production rate is obtainable.

The development of tungsten carbide dies, which are both extremely hard and to a degree self-lubricating, has greatly increased the possible uses of the drawbench. With this die it has become possible to obtain highly polished scratch-free tubes and close tolerances.

In the span of years covering this improvement in drawbench operation, production per bench has increased from about 1000 feet per hour with two or more operators, to a present normal output of around 3000 feet per hour with only one operator. Essential tube handling functions are now accomplished by the increased application of electric equipment.

Tube Benches: Tube drawing is accomplished in three ways: (1) over a mandrel, (2) by the drawing-on-the-mandrel method where a mandrel is inserted in the tube to travel through the die with the tube, and (3) by "sinking", or by drawing without a mandrel. The most widely used of these is the fixed-mandrel type which is built with either a single or double mandrel. The single-mandrel bench has the disadvantage that the operator must wait until a new mandrel is loaded before he can start the next draw; in other words, the operator is usually idle while the draw is in progress. Double-mandrel assemblies are usually furnished on benches rated between about 20,000 and 100,000 pounds. Below the minimum rating the tubing is usually too long, while above 100,000 pounds the tubing is too heavy and the time saved in handling is less important.

Bench Has Wide Speed Range

A large single-mandrel bench is shown by Fig. 1. This bench is rated at 300,000 pounds and is driven by a double-armature-horsepower, 175/700 revolutions per minute main-drive motor. The mandrel is shown in position for the start of the next draw. After this tube is drawn, the mandrel rod assembly will be shifted toward the operator to receive the next tube from the pusher track. The pusher head is shown ready to push the tube forward onto the mandrel. The mechanical drive has a 4:1 gear change which, combined with the motor speed range, makes possible an operating speed of from 6.5 to 104 feet per minute.

The double-mandrel bench (Fig. 2) requires additional drives in order to take full advantage of the increase in productive capacity made possible by the addition of the second-mandrel rod.

The loading rack normally furnished with the pusher drive for a double-mandrel bench consists of a series of stands within which are mounted sloping tube supports. The tube supports are guided in these stands and raised and lowered by means of roller lift chains. In operation, the crane operator places a bundle of tubes on the loading racks, from which the drawbench operator feeds the tubes onto the pusher track. The operator will raise the bundle of tubes until a tube passes over the roll-off plate onto the pusher table which extends the length of the loading rack, as shown in Fig. 2.

Fig. 3 shows a 100,000-pound twin-mandrel bench. Each mandrel is provided with solenoid operated air valves to position the mandrel in the die for controlling the inside diameter, and has a motor for adjusting the mandrel position to compensate for wear. The two mandrel rods with supporting troughs are shifted from the loading to the drawing level by means of a double-solenoid air valve.

Three 50,000-pound benches with a different type of double-mandrel at-

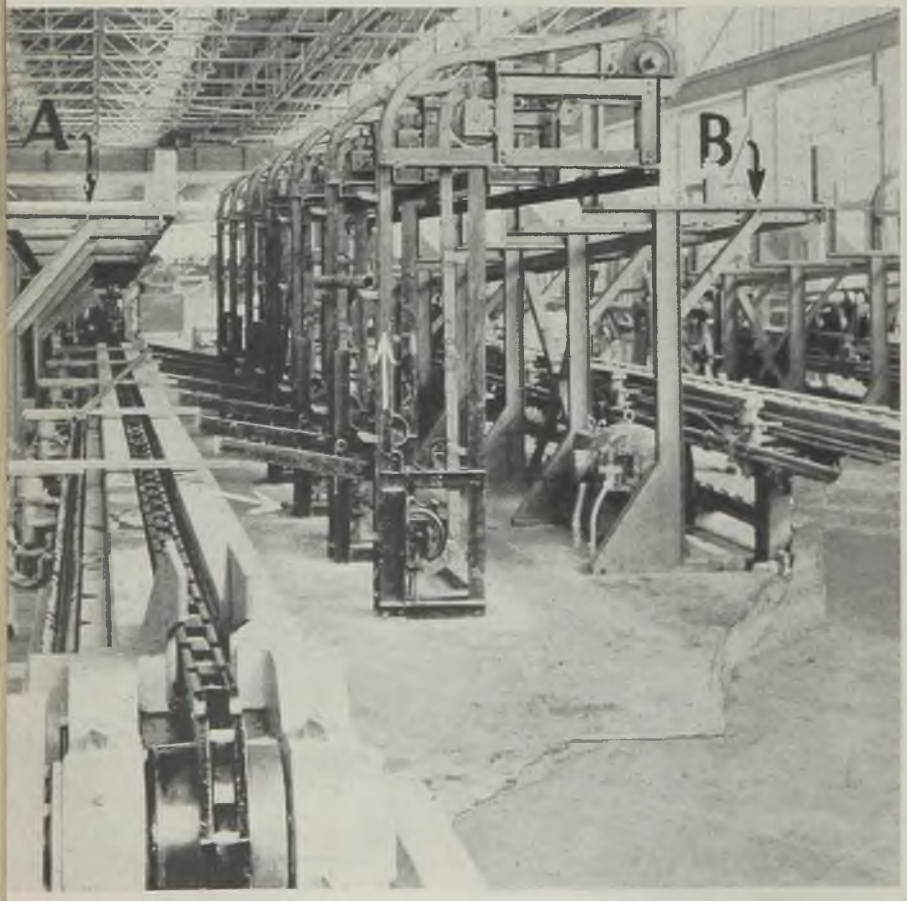


Fig. 8—Series of tube drawbenches arranged for semicontinuous flow of material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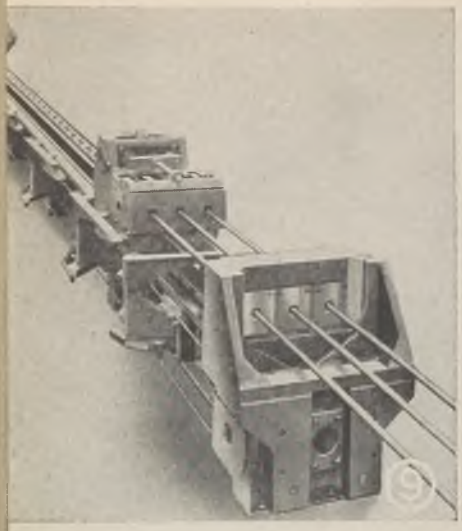


Fig. 9 — Drawbench of [illegible] pounds capacity for drawing three bars simultaneously

sembly are shown in Fig. 4. The tube loader drive mounted over the chain provides for pushing the tube on the top mandrel rod. The double-mandrel locating mechanism is shown at this end of each bench with the lower mandrel in position for drawing. Each bench is provided with unloading arms. The tubes are brought to the bench by a crane and placed in the rack alongside the tube loader drive. After the draw the tubes are removed from the cradle at the right-hand side of the bench.

Shows Bench in Operation

Fig. 5 shows a view of this type of bench during the drawing operation. The tube loader is near the end of its stroke, where the stop limit switch will cause the drive to return to its preselected position. The operator has just started the draw. The carriage is shown as it is moving away from the die, with the first skid arm in position for helping to support the tube.

On smaller tubing, an effective means for loading the mandrel is the pinch roll, or a pair of rolls driven by a single speed alternating-current motor. Fig. 6 shows the operator loading one mandrel from the loading rack by this method. The carriage is shown in the position it would assume just after the start of the draw, but in this illustration the draw is not in progress.

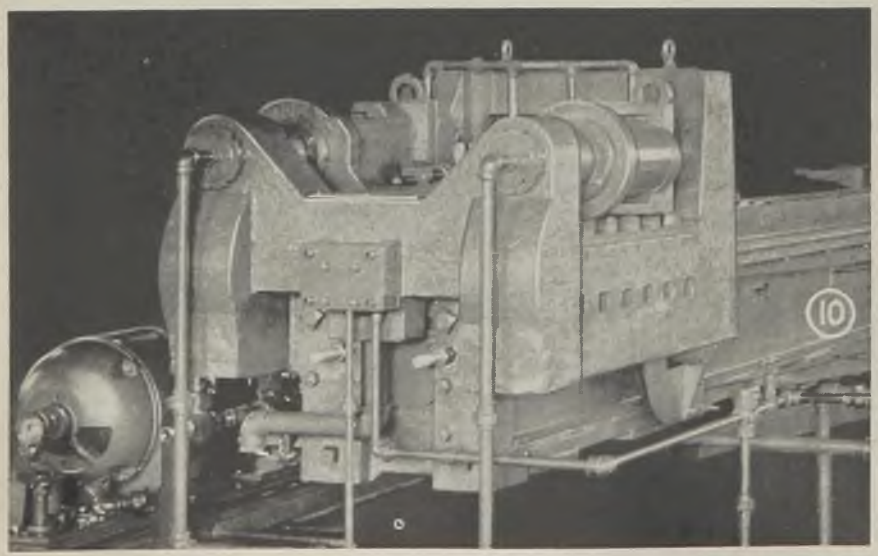
Fig. 7 shows a twin-mandrel 20,000-pound bench of another type which is also provided with pinch rolls for feeding the tube onto the rod. The rods are operated by a pneumatic cylinder to bring the tube forward into the drawing position, and are connected to a lubricant pump in such a way that when the rods are pushed forward, the lubricant is forced into the rod to lubricate the work as it is being drawn. The length of draw is 65 feet; as indicated, the bench is provided with skid arms for unloading the tube.

Affords Continuous Flow

Some of the tube handling facilities previously illustrated have been co-ordinated in one installation to approach a continuous flow of material. Fig. 8 shows an arrangement of this type. The crane places the tubing on the first rack, A, from which it is fed onto the mandrel rod and drawn by the bench. It is then discharged to an adjacent elevator platform; here, the elevator conveys each tube up to the next loading rack, B, where the operator can give the tube a second draw. This same process is repeated until the end bench in line is reached. This arrangement is especially advantageous with material which does not require annealing after each draw, although all loading racks are so arranged that the crane can take the tubing from the rack to an annealing furnace and replace the tubing with annealed tubes for continuing the process.

With a fixed mandrel the maximum reduction in ring area on any one draw is about 40 per cent, while by drawing-

Fig. 10—Closeup of hydraulic push-pointer mounted on bar bench



ible. The ultimate strength of the material and its sensitiveness to work hardening limit the amount of reduction per pass.

In cold drawing, also, there are certain ranges of reduction which cause excessive grain growth in annealing. These reductions, the so-called "critical passes", must be avoided.

Tubing may be drawn through the die without a mandrel ("sinking") where the inside diameter is not of great importance and where a high rate of reduction is required. Subsequent passes then may be taken with a mandrel to obtain an inner diameter of greater accuracy.

Multimandrel Drawbench: A six-mandrel drawbench has recently been developed; two benches of this design are now under construction. Three tubes are drawn simultaneously from three mandrels by providing a three-hole die and three-tong carriage. During the draw, a pinch roll drive loads the other three mandrels; the operator starts the tubes on the three mandrels by hand, then uses the pinch-roll drive to complete the loading. The operation is similar to that of a twin-mandrel bench, except that three tubes are drawn or loaded (as the case may be) instead of one; the mandrel assembly is rotated in the same manner to interchange the positions of the three top and the three bottom mandrel rods. A pinch is used on these particular drawbenches because of the size of the tubing to be drawn; a tube pusher would be used for larger tubing.

Bar Benches: This unit is another type of drawbench on which no mandrel rod is furnished. Most barbenches are arranged for drawing either one, two or three bars simultaneously. Fig. 9 shows a 50,000-pound bench drawing three bars.

Preparation a Factor

Where only one bench is available in a given plant, the larger stock will be drawn one bar at a time, while for smaller material it can be drawn two or three bars at a time. To meet this condition a means for quick change of the tong attachment for the carriage is provided so that it is necessary only to have the separate tong attachment and different die inserts available.

Two to three bars at any one draw is the usual number although some benches have been designed for drawing smaller bars or rods up to eight at one time. The time spent in getting ready for each draw with such a large number of bars, however, is usually so great that it pays to draw only two or three bars at a time; also the smaller bar stock can probably be drawn more economically on a large wire drawing machine.

With bar benches, the usual extent of material handling equipment furnished with the bench is the skid arms, although chain conveyors have been used for conveying the material from anneal-

(Please turn to Page 159)

What's Behind the Trade Mark?

QUALITY

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SERVICE

Additions and Improvements for Greater Service

IN the five worst years of the Depression -- 1931 to 1935 -- The Youngstown Sheet and Tube Company spent over twenty-nine million dollars for "additions and improvements." Specifically, this meant new electric weld tube mills, improvements to seamless tube mills, new 79" continuous hot and cold sheet and strip mills, new alloy steel facilities, new thin wall conduit mills, new tin plate mills, blooming mill furnaces, railroad spike and tieplate plants, river coal loading equipment, ore mine improvements and many other projects to improve quality and further to diversify products.

How could Youngstown afford to invest so many millions in new equipment when the economic world seemed desperate? Because of two vitally important things: First, because the company had been permitted -- under a system of free enterprise -- to earn and conserve profits which *could* be spent in bad times. Second, because under free enterprise the company could look forward with certainty to business recovery, when America would need vast quantities of steel again and would reward those producers who had the most efficient plants.

Typical of industries created and reared by Free Enterprise, Youngstown can continue to improve quality and further to diversify its products with additions and improvements, so long as enterprise remains free.

Historical Series . . . No. 12

TAPPING HEAT OF OPEN HEARTH STEEL

YOUNGSTOWN

THE YOUNGSTOWN SHEET AND TUBE COMPANY

YOUNGSTOWN, OHIO

Manufacturers of

CARBON - ALLOY AND YOLOY STEELS

Pipe and Tubular Products - Sheets - Plates - Conduit - Bars - Tin Plate
Rods - Wire - Nails - Tie Plates and Spikes - Alloy and Yoloy Steels

Grinding Wheel Dresser

To relieve the acute wartime shortage of industrial diamonds by putting to more effective use chips and broken pieces ordinarily crushed into diamond dust, Cleveland Industrial Tool Co., 4713 Euclid avenue, Cleveland, offers a new, patented type of grinding wheel dresser called the "war emergency shank". Basically, this is a steel nib or holder of standard shape for mounting on grinding machines. However, instead of carrying a single large diamond or group of smaller stones, as in the conventional design, this tool carries in a pocket at its working end a 3-carat load of diamond rejects (chips) held securely in a special metallic matrix.

In use this matrix gradually peels away without loading the face of the wheel, thus bringing into action fresh, sharp diamond chips as they are needed

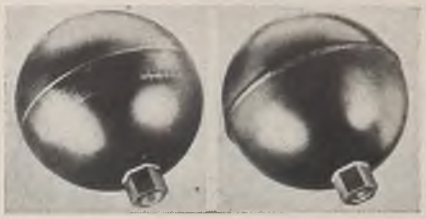
to replace those which have worn out in service. Hence the tool is an expendable item—being used to the very last bit of diamond and then thrown away. Its cost is only about 25 per cent that of a dresser carrying even a low grade solid diamond of comparable weight and effectiveness. This makes the tool economical in production grinding departments, it being especially suitable for use by new operators, who are quite likely to damage costly solid diamonds.

Hollow Metal Floats

For use in steam traps, liquid level controllers and similar float-actuated mechanisms, a new line of hollow metal floats has been developed by Chicago Float Works Inc., 2330 South Western avenue, Chicago 8. They meet the need for corrosion-resistant floats for service at working pressures up to 300 pounds per square inch and temperatures up to 750 degrees Fahr.

Two types of float construction are available, both utilizing Monel metal shells. In one the joint is brazed with high temperature silver solder and connection fittings are silver brazed. In the other the shells are welded with Monel metal and connection fittings either are silver brazed or welded. The silver brazed construction provides a smooth exterior surface. Floats of either type are available in a range of sizes from 2 to 8 inches diameter, ball shape only.

A variety of standard brass or Monel metal connections is available, or floats



can be made without connection. The illustration shows standard brass hexagonal spud connection with ⅛-inch internal thread.

Rod Washer

A machine which will wash and degrease rods and small machine parts is reported by Aufhauser Brothers Co., 295 Madison avenue, New York. The frame of the machine is rigidly built and has all-welded construction. The washing tank has built-in steam heating and special drain plug to facilitate cleaning. Each machine is equipped with two sets of baskets, four for 14-inch rods and two for 18-inch rods. One set is loaded during the time the other set is operating. It has a 5-horsepower gear motor driving an eccentric with adjustable stroke. A crank mechanism promotes the rocking motion of the baskets.

Unbaked rods are cleaned in four minutes while baked rods take 10 minutes. Load capacity is approximately 500 pounds. The machine occupies 5 x 12½ feet of floor space and weighs 3000 pounds.

Capacitors

For high-voltage direct-current applications where space is limited, new solder-sealed porcelain-clad type FPC Inerteen capacitors are announced by

Westinghouse Electric & Mfg. Co., Dept. 7-N-20, East Pittsburgh, Pa. From 7500 volts up to and including 200,000 volts, the capacitor elements are hermetically sealed in a tubular, wet-process porcelain body with solder-sealed end closures. The end closures act as the capacitor terminal by connecting the element leads at opposite ends, utilizing the porcelain tube as insulation.

By eliminating the large metal case and bushings, the porcelain-clad capacitors help maintain minimum overall dimensions. Larger types are furnished with or without cast mounting flanges. Where castings are used, the capacitors are solder-sealed, then castings are cemented on with mineral-lead compound.

Counting Scale

A new Detecto-Gram counting scale has been added to the line of industrial scales manufactured by Detecto Scales Inc., 1 Main street, Brooklyn 1, N. Y. This model No. 66-02 was designed specifically to count small, light pieces speedily and accurately. It has a sensitivity of 1/54-ounce and is equipped with a special over and under dial which immediately shows up a discrepancy of one piece more or less than the desired count.

The two counting pans are arranged on a 10 to 1 and 50 to 1 ratio. The capacity of the scale is 6 pounds. This type counting equipment is used in keeping records of day's production, preparing orders for shipment, checking incoming merchandize and taking inventory. It is available for immediate delivery.

Hydraulic Safety Strap

A hydraulic release mechanism which protects the machine frame and the crankshaft of a punch press in the event of overload is announced by Dayton Rogers Mfg. Co., 2835 Twelfth avenue South, Minneapolis 7. Under overload conditions, the safety relief valves crack at the maximum working pressure of the press, shortening the strap and allowing the crank to go through its cycle without damage to the machine.

This hydraulic safety device also is provided with a pump to adjust the height of the ram, which eliminates the usual mechanical screw thread adjusting means. If during the work cycle of the press, the safety overload valve is brought into play and performs as a safety means, allowing the connecting link to shorten, the safety valve may

(All claims are those of the manufacturer of the equipment being described.)

MAEHLER FURNACES

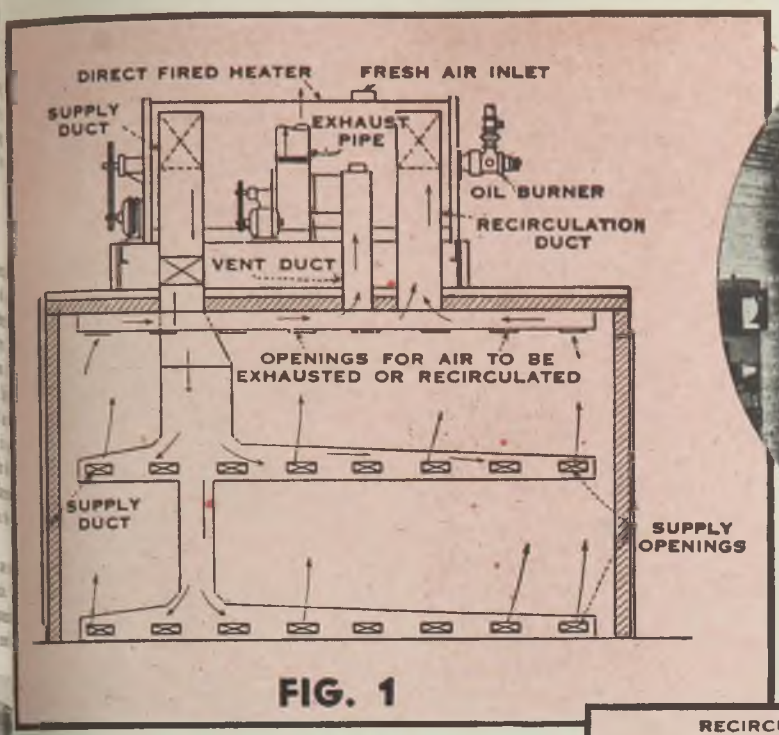
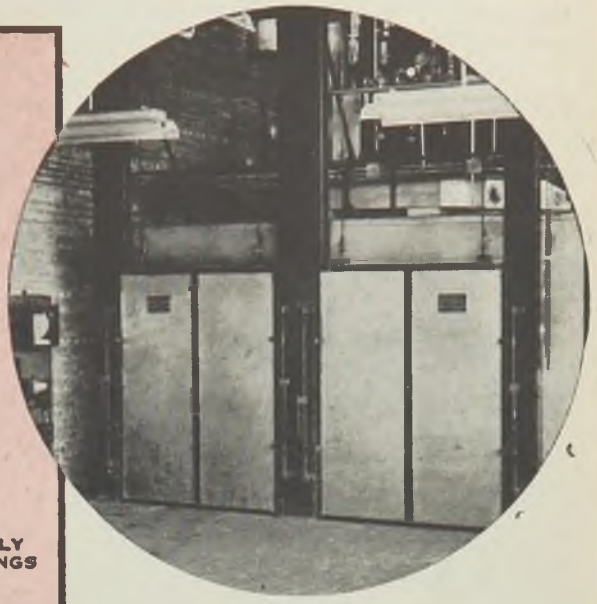


FIG. 1



Above—Typical Maehler 2 compartment magnesium aging furnace.

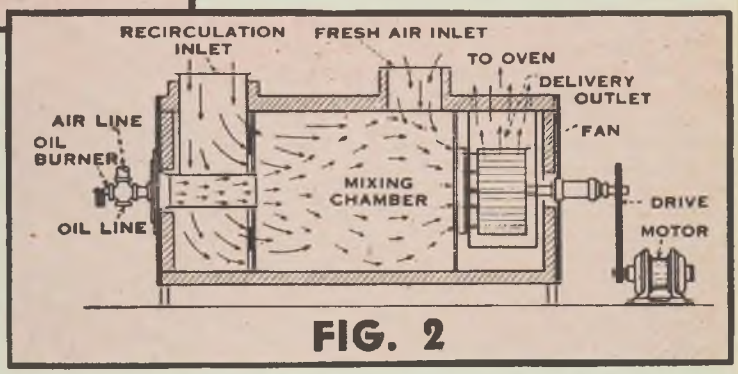


FIG. 2

. . . give you more uniform HEAT TREATMENT

MAEHLER builds a complete line of re-circulating air heat furnaces for normalizing, stress-relieving, annealing, bluing, aging, drawing, tempering, etc. This equipment is oil-fired, gas-fired or electrically heated.

Maehler originated and perfected the re-circulating air-heat system whereby air from a heater is circulated through the furnace and back to the heater. The principle of this system is clearly illustrated in Figure 2 at the right. Figure 1 above shows how the air is distributed uniformly throughout the furnace chamber in a typical Maehler unit, resulting in temperatures that are more uniform.

It will pay you to get the details on how a Maehler air-heat furnace can increase output, do a better job and decrease operating costs on all types of heat-treating jobs.

Experienced Maehler engineers are ready to work with you in solving your heat treating problem. Write today.

THE PAUL MAEHLER COMPANY
2200 W. Lake Street . Chicago 12, Ill.

A FEW TYPICAL USERS OF MAEHLER EQUIPMENT

Advance Aluminum Castings Corp.

Packard Motor Car Co.

Revere Copper & Brass Ebaloy Foundries

Phelps Dodge Corporation

General Motors Corp.

Bohn Aluminum & Brass Corp.

Sargent & Greenleaf

Magnesium Fabricators

Howard Foundries

Extruded Metals Corporation

MAEHLER

Industrial Ovens and Furnaces for all kinds of Heat Treating, Enamelling, etc.

be reset to its normal working pressure —and after the needle valves are opened, the hydraulic pumping means again used to adjust the ram to its working position.

Heating Coil

A graphitic carbon heating coil for heating tanks containing acid cleaners used to prepare aluminum aircraft parts for spot welding has been developed by the Heil Engineering Co., 12901 Elmwood avenue, Cleveland. This coil, made in standard sizes and in any shape, is impervious to chemical action. It is non-

metallic and has a heat conductivity between that of steel and copper. It can be used for heating, pickling, electroplating and metal etching baths, and is particularly effective for muriatic pickling and other chloride processes which now require heating for best results.

The coils are supplied for simple heating of solutions, and steam jets of the same material are supplied for direct introduction of steam to perform both heating and agitation. Other heating equipment of the same material includes bayonet-type heaters, nozzles, heater sheaths and electric immersion heaters. Steam coils usually operate with pressures up to 50 pounds per square inch.

Testing Instrument

Tests and measurements of flexibility are made on a new machine known as the Elongauge developed by Arco Co., Cleveland. The machine is mounted with its observation well in a vertical position so that water from a hypodermic

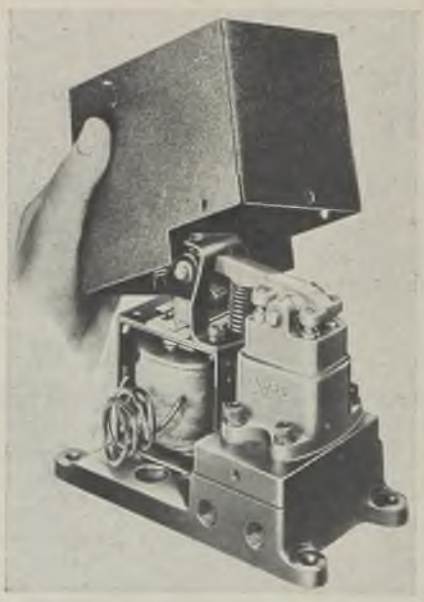
syringe is in contact with the paint film being tested. Two wires, one of which is attached to the test panel and the other to the hypodermic needle, are connected to a galvanometer.

The machine is operated by a constant-speed drive geared to thrust a 3/16-inch spindle against the back of the test panel which is clamped between two anvils. The paint film being tested acts as an insulator. When it fails, the water contacts the steel test panel and the bimetal condition completed by the presence of a copper needle causes a current to flow. This deflects the galvanometer which signals the end point of the test.

The thrust is measured in hundredths of a millimeter and is converted to per cent of elongation by a fixed table. In this way the points at which failures occur on identical panels after various degrees of exposure can be accurately measured, recorded and compared.

Air Control Valve

An unusually compact solenoid air-control valve which can be operated at sustained speeds up to as high as 400 reversals per minute is a development of Ross Operating Valve Co., 6474 Epworth boulevard, Detroit 10. This model No. 835 is a ¼-inch heavy duty, solenoid



operated, 4-way valve for the control of double-acting cylinders. It also may be used as a 3-way valve by plugging one outlet. It operates on the poppet type principle.

Other features are its low current consumption, noiseless operation and long life. Overall dimensions are: Length 7 inches, width 3½ inches, height 5¼ inches.

Push-Button Units

Industrial Control Division, General Electric Co., Schenectady, N. Y., has developed a new line of standard duty push-button units designed for flush or surface mounting on machine tools, welding controls and similar equipment. Available in both pendent and oilproof types, the units are made of smooth, hot-molded moisture-resisting phenolic compound. The buttons are large in diameter and slightly concave to fit finger-tip. The contacts are of fine silver and have a steel back projection protected by rust-

resisting plating, welded to contact supports. Several units may be mounted in a relatively limited space.

The oilproof units are provided with an especially treated leather ring packing. Moving back and forth with the button, this packing serves to wipe the oil from the surfaces.

Both pendent and oilproof types may be obtained with buttons of various colors and with interchangeable, labeled nameplates for identification. Accessories offered for use with these units include a long button for applications requiring a button ½-inch longer than standard; a removable snap-on mushroom head for quick selection, and a tamper-proof locking attachment to prevent operation by unauthorized persons.

Bar Stock Truck

A new model truck designed for handling bar stock is announced by Ross Mfg. Co., 12400 Strathmoor, Detroit. This is a balanced 4-wheel type that features maneuverability. Because of the nature of the load it carries, it must necessarily turn corners sharply. It can be turned around in its own length like a turntable. It is furnished with two heavy duty swivel casters front and rear, heavy duty steel wheels, Hyatt roller bearings. The frame of this model 601

bar stock truck is built up of structural steel members electric welded with a trailer coupling on the front.

Women

ARE TAKING THIS WAR SERIOUSLY

SOUTH BEND LATHES

9" swing, South Bend Engine Lathe

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

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

Since World War I, women operators have preferred South Bend Lathes.. Their nimble fingers find the convenient controls well suited to their sensitive touch. They like the fully enclosed design. And, most of all, they appreciate the ease of operation that prevents fatigue and makes the workday seem shorter.

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

BUY WAR BONDS

SOUTH BEND LATHE WORKS

Lathe Builders for 37 Years
SOUTH BEND 22, INDIANA

Thermit Welding

(*Concluded from Page* 103)

pattern is burned out and the mold thoroughly dried. The preheating gates may be closed with an iron plug or a sand core.

In the meantime, the cone-shaped crucible is placed in pouring position directly over the mold so that it may be tapped immediately upon completion of the preheating step. As previously noted, the thermit reaction requires less than a minute, so that it is necessary to "fire" the material only a short time before the preheating has been completed.

As soon as the slag is completely solidified after pouring, the steel plates forming the mold box are removed, the baked mold material itself being left in place until the newly welded section has cooled properly.

Stripping off the mold material and removal of the gates and risers complete the operation. The thermit collar may be completely machined off when this is dictated by the application for the finished piece.

Process Used by Shipyards

In production work, the thermit process now is being regularly used by shipyards building Victory, Liberty and other types of ships for the Maritime commission, this type of construction having been tested and approved by the American Bureau of Shipping, Lloyd's Register of Shipping and other inspection bureaus. Fig. 3 shows the positions of four welds in a stern frame for a C-2 cargo ship. Fig. 5 shows a completed stern frame in position.

Figs. 6 and 7 indicate the further possibilities for the process in regular production work. In the first of these two illustrations are shown large steel sections prepared for welding into a homogeneous crankshaft. Shown in Fig. 7 is the crankshaft after the welds have been completed.

As another example, four welds were made in each of seven H-beams (Fig. 4) forming the body of a special railroad car with an overall length of 90 feet. Each of the beams was made up from five separate members and butt-welded by the thermit process. Inasmuch as 28 welds, all alike, were required it proved advantageous to make up permanent patterns in place of the usual wax pattern.

In addition, the work could be set up readily on a production basis. The beams were fabricated in pairs with the aligning and applying of the molds to the second beam of each pair proceeding while the first beam was being preheated.

In another case (Fig. 8), a foundry faced the problem of turning out a plate roll 38 feet long and 31½ inches in diameter which would have been difficult even if adequate facilities had been available. The problem was solved by casting the roll in two pieces and joining the two halves by thermit welding.

SURE, that Saturday night pay envelope's bulging. But let me tell you something, brother, before you spend a dime . . . *That money's mine too!*

I can take it. The mess out here. And missing my wife and kid.

What I *can't* take is you making it tougher for me. Or my widow, if that's how it goes. And brother, it *will* make it tough—if you splurge one dime tonight. You're making money. More money than there's stuff to buy. Money that can sock the cost of living to kingdom come—if you blow it! So hang on, till the job's done. On to every last dime—till the squeal means a hole in the seat of your pants!

You're working . . . and *I'm fighting* . . . for the same thing. But *you* could lose it for both of us—without thinking. A guy like you could start bidding me right out of the picture tonight. And my wife and kid. There not being as much as everybody'd like to buy—and you having the green stuff. But remember this, brother—everything you buy helps to send prices kiting. Up. UP. AND UP. Till that fat pay envelope can't buy you a square meal.

Stop spending. For yourself. *Your* kids. And mine. That, brother, is sense. Not sacrifice.

Know what I'd do with that dough . . . if I'd the luck to have it?

I'd buy War Bonds—and, God, would *I* hang on to them! (Bonds buy guns—and give you four bucks for your three!) . . . I'd pay back that insurance loan from when Mollie had the baby . . . I'd pony up for taxes cheerfully (knowing they're the cheapest way to pay for this war) . . . I'd sock some in the savings bank, while I could . . . I'd lift a load off my mind with more life insurance.

And I wouldn't buy a shoelace till I'd looked myself square in the eye and knew I couldn't do without. (You get to knowin'—out here—what you can do without.)

I wouldn't try to profit from this war—and I wouldn't ask more for anything I had to sell—seeing we're all in this together.

I've got your future in my rifle hand, brother. But you've got both of ours, in the inside of that stuffed-up envelope. You and all the other guys that are lookin' at the Main Street shops tonight.

Squeeze that money, brother. It's got blood on it!

Use it up . . . wear it out, make it do...or do without

HELP US KEEP PRICES DOWN

A United States war message prepared by the War Advertising Council; approved by the Office of War Information; and contributed by the Magazine Publishers of America

War and Future Steels

(*Continued from Page* 108)

and artillery, where properties closely comparable with those of wrought steels were demanded.

Improvements have been made by more thorough application of known principles of steel melting and deoxidation, flow of molten metals, and cooling phenomena. All types of castings—static, centrifugal, and pressure—have participated in the development.

In development and control of quality, use of radiographic techniques has expanded greatly and played an important part.

In spite of attempts made to distribute information, the less progressive foundries are falling behind the procession of quality improvement. The fact still exists that each casting is a problem in itself so that, in addition to the general foundry problem of melting good and suitable steel, it is usually necessary for capable men to study each job painstakingly in order to maintain reputations as consistent producers of sound and dependable castings.

Effects of improvements in steel castings will be, of course, more and diversified applications, especially for high-production parts of which expense for detailed study is warranted, with resultant decreases in amounts of metal required and in fabricating costs. Greater use of X-ray and gamma-ray inspection techniques will undoubtedly be made after the war than before. It may also be found that small jobbing foundries will experience greater difficulty in competing in production of high-quality castings, because of lack of men, facilities and money to permit detailed studies required to "work out the bugs" in production of intricate castings.

Welding

Great strides have been made during this war in the progress of welding from an art to a science.

Two of the outstanding advances are spot-welding and arc-welding of armor and other highly stressed parts of carbon and alloy steels previously considered unweldable, at least for primary structures (Fig. 3). Intensive industry-wide cooperative studies of basic principles, designing and building new types of equipment, X-ray examination, ballistic tests, careful training of personnel, close supervision, and above all the ruling idea "it must be done" have been responsible for these developments.

New automatic arc-welding equipment, including submerged-arc type, has been devised to weld carbon and alloy steels with high degree of uniformity and at far faster rates than obtainable by manual welding.

In both automatic and manual arc welding of hardenable (medium and high carbon, and alloy) steels, use of austenitic welding rod [10 11] was first developed. Steel in those electrodes contained total of 30 per cent or more of alloying ele-

One of a Series of Articles on Aids in Metal Fabrication

COPPER AS A DRAWING MEDIUM

THE QUICK, PRACTICAL ECONOMICAL METHOD FOR COPPER-COATING STEEL TO FACILITATE DRAWING

Copper has been used as a drawing medium, by the Wire Industry, for a considerable number of years. Originally applied by the electrolytic process—it was later applied by immersion in acid copper sulphate solution, thus obviating the use of electric current. In recent years the American Chemical Paint Company Laboratories developed a more efficient process for applying a copper coating. This method, known as the Cuprodine process, has been widely used for the past five years in wire drawing. Cuprodine produces a better copper coating than was possible by the use of copper sulphate solutions and the wire so treated withstands many more drafts. Parts which have been Cuprodized can often be recoated with Cuprodine without the removal of the previous coating, provided the initial coating has not been oxidized by open annealing.

Drawing Steel Cartridge Cases—A logical development of this new copper coating process, which has proved so satisfactory in wire mills, was its application in drawing steel cartridge cases. Here Cuprodine proved its definite superiority over other lubricating methods. It made unnecessary extensive installations of electro plating equipment, and was found to be exceptionally well adapted to a large-scale, continuous production. Test data available at the present time indicate that it has increased die life from five to ten times that obtained without its use.

The Cuprodine copper coatings are thin (varying from .00002" to .00005" in thickness) but very adherent. They have frequently been found to be even more adherent than electro deposited coatings. Like all copper coatings, the rust resistance is limited although their stability is ample for drawing and forming operations (in a further discussion on Cuprotek we will show how Cuprodine coatings can be given considerable corrosion protection).

Requirements for Cuprodine Process. The requirements for good results with this new process are few. The metal must be clean prior to the application of the coating—grease, rust and scale must be absent.

A typical process applied to steel cartridge case cups prior to drawing includes the following steps:

1—Alkali clean.

2—Anneal for thirty minutes at 1300°F.

3—Pickle and rinse thoroughly in running water.

4—Immerse for three minutes in a solution containing 4 oz. of Cuprodine per gallon of 3% by volume 66° sulfuric acid at a temperature of 100°F.

5—Rinse in cold running water.

6—Rinse in hot water containing 10 lbs. per 100 gallons of neutral soap.

7—Dry by means of heat.

This typical procedure can be subjected to many variations. The temperature of the Cuprodine solution can vary from room temperature to 150°F., and the time would be determined in actual operation from the results obtained in drawing.

The Cuprodine bath should be maintained at optimum concentration by additions of acid and Cuprodine. Easily performed titrations determine the constituents of the Cuprodine solution and indicate the additions necessary. This can be done by the workmen on the job.

Tanks should be constructed of sheet lead, or of lead lined steel; however, wood can be used. All of the operations carried out in connection with the coating process are improved by proper agitation. Apparatus of the continuous type is very satisfactory.

The Cuprodine method of copper coating steel and iron has been generally adopted in wire mills and in small arms steel cartridge case plants. There is a large field outside these industries in various types of drawing and forming operations where the efficiency of and economy of this new method should and will be applied. The marked increase in die life, reduction in metal pick-up, improved quality of drawn parts, freedom from scratches and minimized breakage all suggest a careful investigation of the Cuprodine process by all fabricators of drawn parts.

ments nickel, chromium, manganese, molybdenum and others; such rod was for a time the only known type for welding plate up to 1 inch in thickness without preheating or postheating. More recent work at General Motors Corp. Truck & Coach division has resulted in development, for automatic welding, of a low-alloy steel electrode containing only one-tenth of the total alloy content formerly considered necessary for such welding. Welding hardenable alloy steel parts with this low-alloy electrode has been in regular production for the past 16 months. A similarly low alloy rod for manual welding has just recently been developed under a National Research Council project.

Several new electrodes have been developed for better welding of sheet steel (Fig. 4) in all positions, with a-c as well as d-c equipment. New materials for welding cast iron[12] and for hard-surfacing have widened the scopes of those operations. Improvements in arc-welding machines have also been noteworthy.

Gas torch applications with respect to welding have also broadened and improved. Flame cutting of steel has so increased in accuracy that many intricate parts are now being cut so nicely that no subsequent machining is required[13]. Flame descaling of steel plate[14] and flame gouging of weld roots[13] are important aids to high-speed production.

Advances in Equipment, Technique

Resistance-welding equipment and technique have advanced remarkably. By pulsating technique, spot-welding of heavy-gage sections has been made possible[15]. Stored energy equipment of several types has been developed, with this, rapid spot welding of aluminum and other metals as well as steel[16] is possible without large power demands involved with alternating-current machines. Use of synchronous timing equipment has made possible extremely accurate performance, with one stroke of the spot-welder, of a sequence of operations consisting of weld, grain refine, quench, and temper,[17 18]. Electrode tip refrigeration has speeded spot-welding, stabilized tip temperature, and increased tip life[16]. New automatic devices have improved control and uniformity. Other inventions and studies have resulted in great expansion of seam welding, in flash and spot welding of dissimilar metals (steels to nonferrous alloys), and in spot welding of hardenable alloy steels and even of case-hardened parts.

Progress has been made in evaluation of weldability of steels. Many different tests have been devised and are in use to control weldability for specific applications. The Committee on Standard Tests for Welds, American Welding Society, has published, for comment and criticism, proposed tentative tests for arc weldability with intended broad applicability[20]. Weldability has been correlated with hardenability (examples will be given later).

The expected effects of these and other welding developments on industry may be summed up in a few words: Vastly

We would really like to know the answer ourselves. The facts in the case are that Genesee today is one of the Nation's major producers of Dovetail tools just as it is among the leaders in the production of many other types of special tools.

It may have something to do with jealous maintenance of quality—though we know other companies make good tools too. It may have something to do with deliveries—though we haven't been too happy at times in the past when we looked at our banks of unfilled orders. Somehow "price" can't be the answer, for we have never sacrificed quality for the sake of price.

Perhaps it's just a combination of all of them. If you know, won't you tell us?

We welcome your comments and inquiries.

GENESEE TOOL COMPANY

FENTON, MICHIGAN

★ Registered Trade Mark

and resistance, to replace more expensive assembling methods. All-welded ships[21], tanks and many other types of war *materiel* will lead the way to more welded road and rail transportation equipment as well as machinery and structures of countless types.

In order to bring this about, greater attention will be paid to "design for welding". It will not be sufficient merely to make sure welding operations are correctly specified; welding engineers must be allowed to influence thought of designers from the first conception of an assembly, long before detailing is begun.

Evaluation of Alloying Elements

The effect on steel common to virtually all alloying elements—and the most important effect obtained from alloying steel—is now expressed as increased hardenability.

Absolute and relative effects of the several commonly used elements have been evaluated by several investigators; the method devised by Grossmann[22] is at present the most widely accepted. It is now realized that effect on hardenability of a single element is often exceeded by the cumulative effect of the same total percentage of several elements each present in small amounts.

In past years, steels often were selected for certain parts because of one or more of the following:

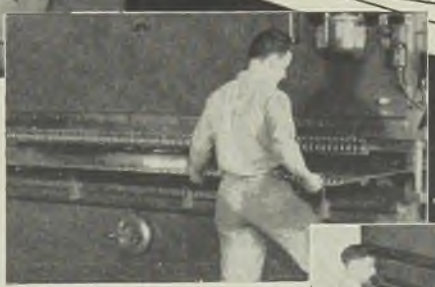
1—Sales efforts of alloy manufacturers.
2—Preferences and recommendations of steel suppliers.
3—Users' customs and prejudices (familiarity with certain steel types).
4—Lack of good heat treating equipment, and need for "foolproof" steels.
5—Willingness of steel mill to furnish "residual" alloying elements not specified or publicly acknowledged and not directly paid for.

Much debunking and self-education has already been accomplished. We realize that many low-alloy steels of equivalent carbon contents are interchangeable, and that carbon may sometimes be substituted for alloying elements, provided heat treating characteristics are understood. Efforts are being made to express such interchangeability in tables and charts. Recommended practices have been established[24] for selection and substitution of British En steels for deep-hardening parts, on basis of usable sections for heat treatment to various physical properties, although those recommendations may be classed by some as ultraconservative. A group of American metallurgists (headed by F. C. Young), working as a subcommittee of SAE War Engineering Board Iron and Steel Committee, is attempting to classify steels on basis of performance requirements; progress is slow, because one of the chief products of discussion so far is realization that certain data which are considered essential have never been compiled.

Future effects of more precise evalua-

Cleveland STEELWELD PRESSES

Bends light or heavy plates quickly.



Punches many holes at each stroke.

Corrugates large plates accurately.

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tion of alloying elements would appear to be:

1—*Use of Less Alloy.* Gradual reduction in total amount of alloying elements used, and possible increase in complexity of alloy steels, is an expected trend.

2—*More Intelligent Specification of Materials by Engineers.* The trend may be toward stipulation of mechanical requirements, with no mention of steel to be used, leaving steel selection to the metallurgist. As an example, for parts to be hardened and tempered, a suggested list of mechanical property ranges is shown in Table I. The ranges given cover all requirements from soft to hard steels; there are probably more ranges than would be required by any one group of designers, but each may be classed as "commercial" with present-day standard steels and heat treating equipment of average precision.

3—*More Intelligent and Economical Selection of Steels by Metallurgists.* Selection will be based more upon physical and mechanical requirements than directly upon chemical composition. However, for some applications, relative susceptibilities of hardenability and maximum hardness to prior treatment and structure[25] may be considered. A frank and intelligent discussion of steel selection has been made by Gillett and others in a War Metallurgy Committee report[26].

Hardenability as a Primary Requirement

Hardenability is one metallurgical term which should be understandable even to the most aloof engineer. It is not a foreign-language word, nor coined in honor of someone; it means simply the ability to harden (by heating and quenching).

Steels must of course be compounded by adding chemical ingredients. In structural steels to be heat treated, however, chemical compositions are but means to ends, the most important end usually being proper hardening. Unfortunately, composition as ordinarily determined is not the sole criterion of hardenability; grain size and other factors, some difficult to evaluate, are also influential. After years of working on several of the factors, metallurgists finally began to realize that it might be simpler and more satisfactory to measure what was wanted —hardenability—than for users to continue to try to control a set of factors growing gradually more complicated and reaching far back into the steel's history.

Hardenability has been measured in many ways, to control steels and heat treatments for specific parts. The procedure which is most generally accepted is the end-quench or so-called Jominy method, developed by Jominy and Boegehold[27]. The method consists essentially of quenching with a jet of water one end only of a uniformly heated test bar until the entire bar is cold, then measuring hardness along the side of the bar and plotting hardness readings; all details of the method have been carefully standardized[28]. Hardness adjacent to quenched end is indicative of maximum