Mechanical-finger tool eliminates injuries to punch press operators in Boeing plant. Page 76

STEEL

The Magazine of Metalworking and Metalproducing

APRIL 24, 1944

Volume 114—Number 17

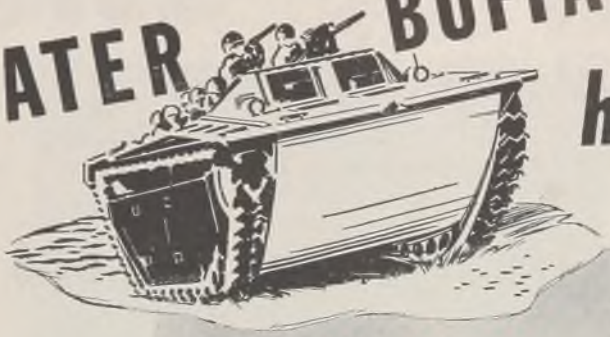
NEWS

TECHNICAL

FEATURES

MARKETS

WATER BUFFALOS hit the surf on time



Photo, courtesy of Food Machinery Corp., designers and builders of the Water Buffalo.

because "Electrical Innards" arrived on schedule via GraybaR

From the battle-scarred beaches of the South Pacific comes first-hand testimony of the vital role of these versatile amphibians. Plunging through high surf, then up and over coral reefs, they helped decisively in upsetting Jap plans for concentrating their defense at narrow reef openings.

For this task, and for other beach assaults yet to come, the Water Buffalos require "innards" to match the Marines who man them. The electrical systems, particularly, must be proof against water as well as the shock of battle.

Despite great expansion in the production program for this craft as its worth was demonstrated, a continuous flow of essential parts and materials has been furnished the builder *via Graybar*. It includes distribution boxes, junction boxes, switches, circuit breakers, terminals and other wiring supplies. One reason why the Water Buffalos were ready was the time-saving assistance of this all-inclusive electrical service of supply.

YOUR OWN Electrical Needs for parts and materials to be installed in combat equipment can be effectively met by Graybar's unique combination of *procurement* and *application* service. From the same source, too, come the electrical supplies to maintain your plant and make fast production changeovers as the war program moves ahead. A local Graybar representative is ready to make your needs his *personal* responsibility.

MOBILIZED MATERIALS No. 17 of a series of actual examples of GRAYBAR service, providing electrical materials to be installed in ships, planes and in war facilities.

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STEEL
April 24, 1944

Political Double Talk

Addressing members of the Commonwealth Club of San Francisco on April 14, Secretary of the Interior Ickes proposed that government-owned war plants be turned over to returning servicemen after the war for ownership and operation in competition with private enterprise as a bonus payment for their sacrifices.

When we first read the reports of this speech we were inclined to dismiss it as just another Ickesism. The secretary has been prone to issue provocative pronouncements for the simple pleasure of seeing conservatives squirm and to further bolster his reputation as the No. 1 curmudgeon in public life—a role in which he revels to the extent of writing articles about it. Judging from past experience, Mr. Ickes could be kidding.

However, upon reflection we think the secretary's remarks were more purposeful than whimsical. In the first place this is an election year and cabinet members are not overlooking any bets. Second, Mr. Ickes was talking in the Far West where the question of continuing or abandoning the Kaiser and Geneva steelworks, as well as other war-built industrial enterprises, is uppermost in the public mind. Third, any proposal which seems to benefit men and women in the armed services is a political ten-strike. Fourth, the proposition ties in nicely with the secretary's ill-concealed animosity against certain types of private industry.

In view of these considerations and in spite of the fact Mr. Ickes says he has not discussed the plan with President Roosevelt, we feel that the proposal has tacit administration support—at least to the extent of sending it up as a trial balloon. For these reasons, industry is warranted in viewing the matter seriously.

Ickes sees three alternatives for government-owned plants. Continuation of government ownership, he says, is a negative solution. If turning over these plants to the highest private bidder means that they will be "quietly throttled in the interest of an economy of scarcity—scarce production, scarce opportunities and few jobs", the result, he predicts, will be "postwar chaos." Much preferable, he believes, would be to turn over the plants to service personnel, under a giant holding company, to assure full and profitable operation.

Ickes' trouble is that while giving lip service to private enterprise he distrusts it because he thinks it is too monopolistic. His double talk should not deceive anybody. He wants to keep the government's hand in business as long as possible.

NO PROFITEERING HERE: Following a custom of many years standing, the editors this week present an analysis of steel company earnings. Returns from 26 companies representing 90.1 per cent of the nation's steelmaking capacity show an aggregate net income of $183,245,436 in 1943. This is the lowest net in four years. It compares with $198,606,587, $277,565,532 and $260,309,958 in 1942, 1941, and 1940, respectively.

This moderate return, in a year which undoubtedly will prove to be the peak year of the war effort, speaks volumes against the charges of those critics who talk carelessly about exorbitant profits. The cold fact is that the steel industry in a year of unprecedented output earned for its owners and for future needs of the business an amount which is modest in comparison with net incomes in numerous peacetime years.

Net income to net sales in 1943 was only 2.83 per cent, compared with 3.46 in 1942, 5.44 in 1941 and

(OVER)

7.48 in 1940. There is no element of wartime profiteering in this 1943 ratio. The explanation is that while the owners received less in dividends and the federal government received less in taxes, the employes—whose spokesmen raise the cry of excessive profits—received much more in wages.

—Insert following p. 70

* * *

45,000 NEW MACHINES: Before the war General Motors had about 75,000 machine tools engaged in the manufacture of its automotive products. It estimates that 50,000 of these machines were converted to war production and 3000 were disposed of to other producers. In the meantime, 60,000 government-owned machine tools have been installed in General Motors plants.

When the time comes to reconvert to civilian production, which in the case of General Motors may mean tooling for production 50 per cent greater than the previous peacetime level, the corporation first will have to weed out all of the specially designed government-owned tools, replace or recover machines transferred to other companies, reallocate most of the machines converted to war work and purchase and install approximately 45,000 new machine tools.

These figures not only emphasize the complexity of the reconversion problem but they also indicate the key position of machine tools in the shift.

—pp. 61-79

* * *

NONESSENTIAL STEELS: Standardization of materials and products has received considerable attention sporadically during the past half-century. Standardization as a factor in simplification was given a strong impetus in World War I, has been revived in World War II and has enjoyed numerous spurts of activity in time of peace. For instance, it made noteworthy gains in the mid-twenties when Herbert Hoover was secretary of commerce.

Now representatives of producing and consuming interests are advocating a program of simplification for steel as an economic "must" for the postwar period. Almost everybody agrees that there are too many types, forms, grades and sizes of steel. The excessive number of varieties increases the cost of production, warehousing, distribution and use.

Important factor in any crusade for simplification is the user. If he can specify two steels to replace five or more steels now specified, he probably will save money for himself and will help to increase the efficiency of industry generally. —p. 94

INTEGRITY IN WAGES: In presenting their testimony for the hearing on steelworkers' wage demands, numerous steel companies are concentrating upon the objectionable features of the dues check-off and the maintenance of membership clause and are seeking penalties for wildcat strikes.

Jones & Laughlin Steel Corp., in its brief, contends that there now is no necessity for the check-off or the maintenance of membership clause "because the union has had several years in which to sell itself to employes and should be willing to stand on its own record as a business organization." However, contends J. & L., if WLB decides that these concessions are necessary, "then the board should at least preserve the integrity that has heretofore surrounded the wages of employes by providing that, as in every other instance in the corporation, no deduction may be made from an employe's earnings without his written authorization."

It will be interesting to follow the fate of these alternatives through the course of the panel's deliberations and to learn the final decision. —p. 66

* * *

SUBCONTRACTORS' WOES: Sidelights on the problems of subcontractors were given members of two congressional committees last week by Frederick C. Crawford, president of Thompson Products, Inc. According to his testimony, some subcontractors need protection against possible loss because of the shaky financial position of the prime contractors for whom they are working. Mr. Crawford also cited instances in which subcontractors have incurred serious losses through the mistakes of prime contractors.

Obstacles to the purchase of government-owned plants by private industry also were brought out in the testimony. A certain war plant which cost the government $8,000,000 can be reproduced at today's prices, in Mr. Crawford's opinion, for $4,200,000. He recommended that such plants be offered to private purchasers at replacement costs, with certain allowances, rather than at actual cost less depreciation.

However, it may prove to be difficult to devise a single formula for pricing war plants. One plant ideally located might bring a good price, while its identical twin, poorly located, might have to be abandoned. —p. 70

E. L. Shaner

EDITOR-IN-CHIEF

Inland Freighters Plow Through Ice To Deliver Materials of Victory

The Inland fleet began plowing its way through ice in late March to deliver materials of Victory to the great Indiana Harbor mills.

The shipping season was opened several days earlier than usual this year—because the winter was generally mild at the head of Lake Michigan, and because it was necessary to begin delivering as early as possible the millions of tons of high grade ore, pure limestone, and coking coal needed by the mills for the production of steel for war.

The Inland freighters, like every other unit in the Inland organization, are doing their best to bring Victory as quickly as possible, so that we can begin filling the peacetime needs of America.

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Whenever you need flame-cutting service, call Ryerson. You'll get immediate action—prompt delivery. If there is any question, we will review your specifications or estimate any job you have at hand. Get in touch with the nearest Ryerson plant.

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RYERSON

Pattern for Readjustment Seen Evolving

Conference of automakers and war production officials seen as model for preparations for return to peacetime production. Manufacturers agree resumption of passenger car output must wait until war effort passes peak

PATTERN for the readjustment to civilian goods production began to evolve last week as representatives of passenger car manufacturers sat down with WPB and military officials to discuss problems involved in switching from war to peace output.

The meeting, described by WPB Chairman Donald M. Nelson as "probably the most important" to be held so far this year, will serve as a model for other industry conferences designed to prepare for the transition to peace.

The automakers and the war production officials agreed there should be no resumption of passenger car output as long as the industry is engaged in an all-out war effort. They also agreed that both industry and government should be ready for a sudden collapse of the Axis, or for a long transition period in which some resumption of peacetime production would accompany a continuance of substantial war production.

One of the problems explored at the conference was the question of the number of cars to be produced when some resumption of production is finally permitted. Several of the manufacturers asserted it should be fairly substantial—in the neighborhood of 2,000,000 cars annually. The smaller producers urged that any program finally evolved be kept flexible enough so that no company would be compelled to reenter peacetime production at too great a loss.

It was generally agreed that the manpower situation in the auto industry is likely to ease considerably during 1944 and

Members of the new automobile industry advisory committee which is exploring the possibilities of resumption of passenger car production. Left to right, top row: K. T. Keller, president, Chrysler Corp.; Paul G. Hoffman, president, Studebaker Corp.; George W. Mason, president, Nash-Kelvinator Co.

Second row: B. E. Hutchinson, vice president, Chrysler Corp.; Henry Ford II, vice president, Ford Motor Co.; Powel Crosley Jr., president, Crosley Corp.

Third row: C. E. Wilson, president, General Motors Corp.; S. G. Baits, vice president, Hudson Motor Car Co.; R. R. Rausch, vice president, Ford Motor Co.

Fourth row: Delmar G. Roos, vice president, Willys-Overland Co.; Courtney Johnson, vice president, Studebaker Corp.; A. Edward Barit, president, Hudson Motor Car Co.

Bottom row: Albert J. Bradley, vice president, General Motors Corp.; Ward M. Canaday, president, Willys-Overland Co.; R. C. Cosgrove, vice president, Crosley Corp. Photographs of J. H. Marks, vice president of Packard Motor Car Co., and A. N. Wibel, vice president of Nash-Kelvinator Co., who are also members of the committee, were not available. NEA photos

ERIC JOHNSTON

PHILIP MURRAY

WILLIAM J. KELLY

WILLIAM GREEN

that a serious unemployment problem would develop with the tapering off of war production unless the transition was properly planned.

Approximately 75 per cent of the industry's equipment, it was stated, has been converted to the war effort and the automakers urged that a policy governing tools and machinery should be a first consideration. This should cover both the release of government-owned facilities and the placing of new orders with machine tool builders.

One outgrowth of the conference will be renewed consultations between the industry and its machinery and equipment suppliers. While such studies have been going on quietly for the past year, some manufacturers even going so far as to specify actual requirements for machine tools, with deliveries and prices on an "if, as and when" basis, in the next 90 days all the loose ends should be wound up and each manufacturer will compile complete specifications as to needs for machinery and equipment. Naturally, these will vary widely from plant to plant.

In the past fortnight, a number of automotive suppliers report calls from manufacturers inquiring as to sources for parts and materials. This has led some of these vendors to guess that resumption of motor car production may be nearer than anyone had thought. However, the inquiries are believed to be merely part of a program to speed up preparatory work, so that more complete information will be available for transmittal to the WPB.

The meeting of the auto company executives and the war production officials followed closely the appointment by Mr. Nelson of a top advisory committee representing all phases of the economy. In naming this group, Mr. Nelson pledged: "We are going to operate this readjustment and reconversion program in a goldfish bowl so far as the public is concerned."

Among the problems which will be considered by the general committee are those of competition, quotas and distribution, the timing of the start of the change, and the allocation of materials. Decisions on these matters will be sought before major cutbacks are made in war contracts.

The committee will have nine members, some of whom have not yet been named. Those who have been named are: Eugene Meyer, editor and publisher of *The Washington Post*, representing public opinion; Gordon Rentscher, chairman of the board of the National City Bank, New York, representing finance; Eric Johnston, president of the United States Chamber of Commerce, industry; Philip Murray, CIO president, and William Green, AFL head, for labor; William J. Kelly, president, Kelly O'Leary Steel Works, Chicago, for heavy industry; Ruth O'Brien, Bureau of Human Nutrition and Home Economics, Department of Agriculture, representing the consumers.

Robert M. Gaylord, president of the National Association of Manufacturers, was invited to serve on the committee but declined. In a letter to Mr. Nelson he explained that "repeated experience in recent years has shown that committees of this nature are ineffective. They cannot adequately represent the different sections of the economy and the problems they have to consider are so complex that it is impossible for them to reach an agreement on anything but very general, or relatively unimportant, subjects. You have the responsibility of reconciling conflicting views of the various elements in the interest of the general welfare and no partisan committee can adequately advise you."

The committee, Mr. Nelson said, will meet every three weeks or so, and will have a permanent secretariat.

Mr. Nelson indicated he intends to make the decisions on reconversions, but wants to have the benefit of the advice of the committee so that his conclusions will represent a rounded appraisal of the problem.

Division of Small Business Formed Within Department of Commerce

CREATION of a Division of Small Business within the Bureau of Foreign and Domestic Commerce, Department of Commerce, forecast in STEEL of March 29, 1943, p. 42, anticipates a move for which Congress has been preparing legislation. Last year, in fact, the Senate approved S. 883, a bill to create an Assistant Secretary of Commerce for Small Business. Subsequently Sen. James E. Murray (Dem., Mont.), chairman of the Senate Special Small Business Committee, requested further consideration of the bill on the ground that its phrasing was too broad and general.

Senator Murray's committee staff now is formulating a bill which will attempt to specify in detail just what types of service should be rendered to small firms, and what agencies shall have responsibility for rendering these services. In particular, an effort will be made to prevent overlapping and duplication of effort between the Smaller War Plants Corp., the

QUINCY ADAMS

Department of Commerce and other government agencies having an interest in small business.

Current thinking in the Murray committee is that the SWPC should be continued in the postwar "interim" period and that its powers possibly should be broadened. The trend of present thinking, however, is that the type of financial aid rendered by SWPC should be limited so as to encourage lending by banks instead of directly by the SWPC wherever possible, so as to keep the government out of business to the maximum degree.

In general, the ideas about the types of service that should be made available by the government to small firms have not changed. Such services should include financial assistance, legal and managerial and technological advice, and particularly the rendering of information about new processes and new inventions, and technological improvements developed in college, university and government laboratories.

There are signs that the proposed bill may take some of the emphasis off of helping only "small" business; some of the legislators involved have come to feel that it would be a mistake to even suggest a policy of discriminating against big business in favor of small business.

In the first place, it is appreciated that big business is well aware that it cannot prosper unless the country as a whole, including small business, prospers. Secondly, members of congress have come to realize that big business buys parts and supplies from many small companies and is interested in their efficiency.

Chief of the new Division of Small Business is Quincy Adams, a scion of the historic New England family. A former editor of *Dun's Review* and manager of the sales research division of Dun & Bradstreet Inc., he joined the General Statistics Staff of the War Production Board in 1940 and subsequently became a commissioned officer in the Office of Procurement and Material, Navy Department, with responsibility for material requirements data. Recently he was shifted over to the Commerce Department.

Initially the Division of Small Business will consist of two units. That known as the Special Studies Unit will conduct a program of "continuous research in problems relating to the competitive marketing and merchandising position in trades and localities. This unit also will maintain close relationships with the collegiate schools of business." Chief is Wilford L. White, a marketing specialist.

The other unit is the Management Aid and Finance Unit, which is "concerned principally with the development of management aid for small business. It will also conduct studies in the vital fields of credit, taxation and finance." Its chief is William Sheperdson who has served as head of the Small Business Unit of the Bureau of Foreign and Domestic Commerce since 1941. Mr. Sheperdson is a New York state certified public accountant and was engaged in business for himself in New York city.

SWPC Opposes Production Quotas

Asks that small companies be given preference in materials, manpower and facilities when reconversion begins. Early resumption of peacetime output urged

ALTHOUGH formerly critical materials such as steel, aluminum and copper are now available over and above military and essential civilian needs, there has been no significant relaxation in the allotment of materials for civilian production, according to Maury Maverick, chairman, Smaller War Plants Corp. in a report to Donald M. Nelson, chairman, War Production Board.

"American labor and materials should not remain idle while American wants are unsatisfied," declares Mr. Maverick. "Unemployed labor contributes nothing to the war effort—except hardship, confusion and misunderstanding. SWPC urges that civilian production be resumed as rapidly as possible whenever it does not interfere with war production."

Mr. Maverick also recommends that small firms should be given preference in this readjustment whenever the manpower, materials and facilities required in this reconversion can be spared or are not available to war production.

"This means," he says, "that we are opposed to the allocation of a fixed quota of production based on each firm's prewar production, applied equally through-

(*Please turn to Page* 170)

Present, Past and Pending

■ STEEL INSTITUTE CANCELS BANQUET

NEW YORK—American Iron and Steel Institute has canceled plans for its banquet originally scheduled to be held in connection with its annual meeting May 25.

■ LEWIS ASKS "BACK PAY" FOR MINERS

WASHINGTON—John L. Lewis, president of the United Mine Workers, has made a formal demand on Harold L. Ickes, coal administrator, for aid in compelling mine operators to pay $18,000,000 allegedly due to the mine workers as retroactive portal-to-portal pay of $40 each approved by the War Labor Board last October. Mr. Ickes refused the demand, saying he had no power to act.

■ SHIPYARD WORKERS GRANTED WAGE INCREASE

WASHINGTON—Wage adjustments averaging 4 cents an hour for some 44,000 workers in the eight East Coast shipyards of Bethlehem Steel Co. have been ordered by the War Labor Shipbuilding Commission.

■ RAILROAD PROTESTS BASING POINT CHANGES

JERSEY CITY, N. J.—Central Railroad of New Jersey has protested to the Office of Price Administration against basing point changes which require the railroad to charge only $18.16 a gross ton for No. 1 railroad heavy melting steel at Bethlehem, Pa., although it had been receiving $19.75 a ton even since OPA price regulation started May 7, 1941.

■ CANCELS MONESSEN, PA., BLAST FURNACE

PITTSBURGH—Defense Plant Corp. and the War Production Board have ordered cancellation of the new blast furnace and open hearth facilities at the Pittsburgh Steel Co.'s plant at Monessen, Pa.

■ BRITAIN ADOPTS ANTISTRIKE LEGISLATION

LONDON—A drastic antistrike measure has been adopted by the British government which provides penalties up to five years' imprisonment for anyone convicted of provoking a strike.

■ MARCH MACHINE TOOL SHIPMENTS SLIGHTLY HIGHER

WASHINGTON—Machine tool shipments in March amounted to $50,799,000 an increase of 1½ per cent over the February total. March orders totaled $41,854,000.

■ DU PONT DEVELOPS WOOD HARDENING PROCESS

WILMINGTON, DEL.—E. I. du Pont de Nemours & Co. has developed a new chemical process that transmutes all types of soft wood into wood of any desired hardness.

■ GENERAL MOTORS TO HOLD TOOL FORUM

DETROIT—General Motors Corp. divisions will hold a Machine Tool Forum here at Hotel Statler April 27 and 28 at which 140 machine tool and electrical engineers from 50 selected tool builders and as many of the corporation's own representatives will discuss problems concerning use and maintenance of machine tools.

Deliveries by Great Lakes Shipyards Million Since Pearl Harbor

SHIPBUILDING companies on the Great Lakes have achieved a total production of $150 million since Pearl Harbor and have delivered 117 fighting and cargo ships and 200 knocked-down barges to the United States Maritime Commission. Work is continuing on uncompleted contracts for the commission amounting to $100 million more.

Employment in all Great Lakes yards —including those working for the Army and Navy as well as the 14 working for the Maritime Commission—now approximates 68,000, compared with a normal force of 4000.

The sea-going craft being produced for the Maritime Commission are headed by frigates which correspond to the British corvettes. These really are small destroyers and are used for submarine patrol work and as escort vessels.

Great Lakes yards also are building ocean-going tugs, cargo vessels, tankers, ore freighters, harbor tugs and three types of barges for the commission. Virtually all of these ships are of steel construction.

The 14 yards extend from Duluth and Superior to Ashtabula, O., and include the following: Scott-Graff Co., Duluth; Barnes-Duluth Shipbuilding Co., Duluth; Globe Shipbuilding Co., Superior, Wis.; Walter Butler Shipbuilders Inc., Superior, Wis., and Duluth; Waterways Engineering Corp., Green Bay, Wis.; Marinette Marine Corp., Marinette, Wis.; Leatham D. Smith Shipbuilding Co., Sturgeon Bay, Wis.; Froemming Bros. Inc., Milwaukee; Calumet Shipyard & Dry Dock Co., Chicago; Lyons Construction Corp., White Hall, Mich.; Great Lakes Engineering Works, River Rouge, Mich., and Ashtabula, O.; American Shipbuilding Co., Cleveland and Lorain, O. Walter Butler Shipbuilders Inc. took over the operation of the Barnes-Duluth yards Dec. 1, 1943.

The fighting frigates, 306 feet long and with a 37½-foot beam, were built by the Maritime Commission for the Navy in the Ohio yards of the American Shipbuilding Co., Froemming Bros., Leatham D. Smith Co., Walter Butler Shipbuilders Inc. and the Globe Shipbuilding Co.

Froemming Bros. and Globe Shipbuilding built the sea-going tugs. Calumet Shipbuilding constructed five 100-foot tugs. The cargo ship producers are Walter Butler, Leatham D. Smith and Barnes-Duluth. The ore freighters were built by American Shipbuilding and Great Lakes Engineering Works.

At the outset of the Maritime Commission's program on the Great Lakes some of the yards were barren property and complete new yards had to be built.

Another obstacle was blizzards, subzero weather and slips frozen with four feet of ice.

Still another problem surmounted by Great Lakes shipbuilders was the delivery of ships to salt water. The locks in the St. Lawrence river will not permit passage of vessels over 259 feet in length, whereas ships 600 feet long can be taken down the Illinois-Mississippi waterway to the Gulf of Mexico by attaching pontoons to the stern of the vessels which require too much draft for the water stage available below Lockport.

Ships built in Great Lakes yards cannot be taken through the St. Lawrence river from December to late May or early June; neither can ships built in Duluth-Superior, Cleveland, Lorain, or the Detroit-River Rouge areas be sent on their way to the Gulf by way of the Illinois-Mississippi route because ice conditions in the Soo make lake traffic impossible.

Some of the yards in the Great Lakes area presently are working on a new program of cargo vessels, 338½ feet long, with a beam of 50 feet. These are the largest ocean-going vessels ever to be built on the Great Lakes. They are single screw and diesel-powered, considerably smaller than the Victory ships, but said to be of comparable speed. It also is expected that these new cargo vessels will fit admirably into postwar shipping plans.

The 117 vessels that have been built by the commission in the Great Lakes have a combined tonnage of 501,345

One of the largest ships ever built on the Great Lakes, the LEON FRASER, built by the Great Lakes Engineering Works at Ecorse, Mich., for the Pittsburgh Steamship Co. is shown during construction, below. Circle, the U. S. S. LANCE, one of the Navy's new minesweepers, is launched at the Lorain, O., yards of the American Shipbuilding Co. Extreme right, the BELLE ISLE, 621-foot ore carrier built for the Maritime Commission at the Cleveland yard of American Shipbuilding. NEA photos

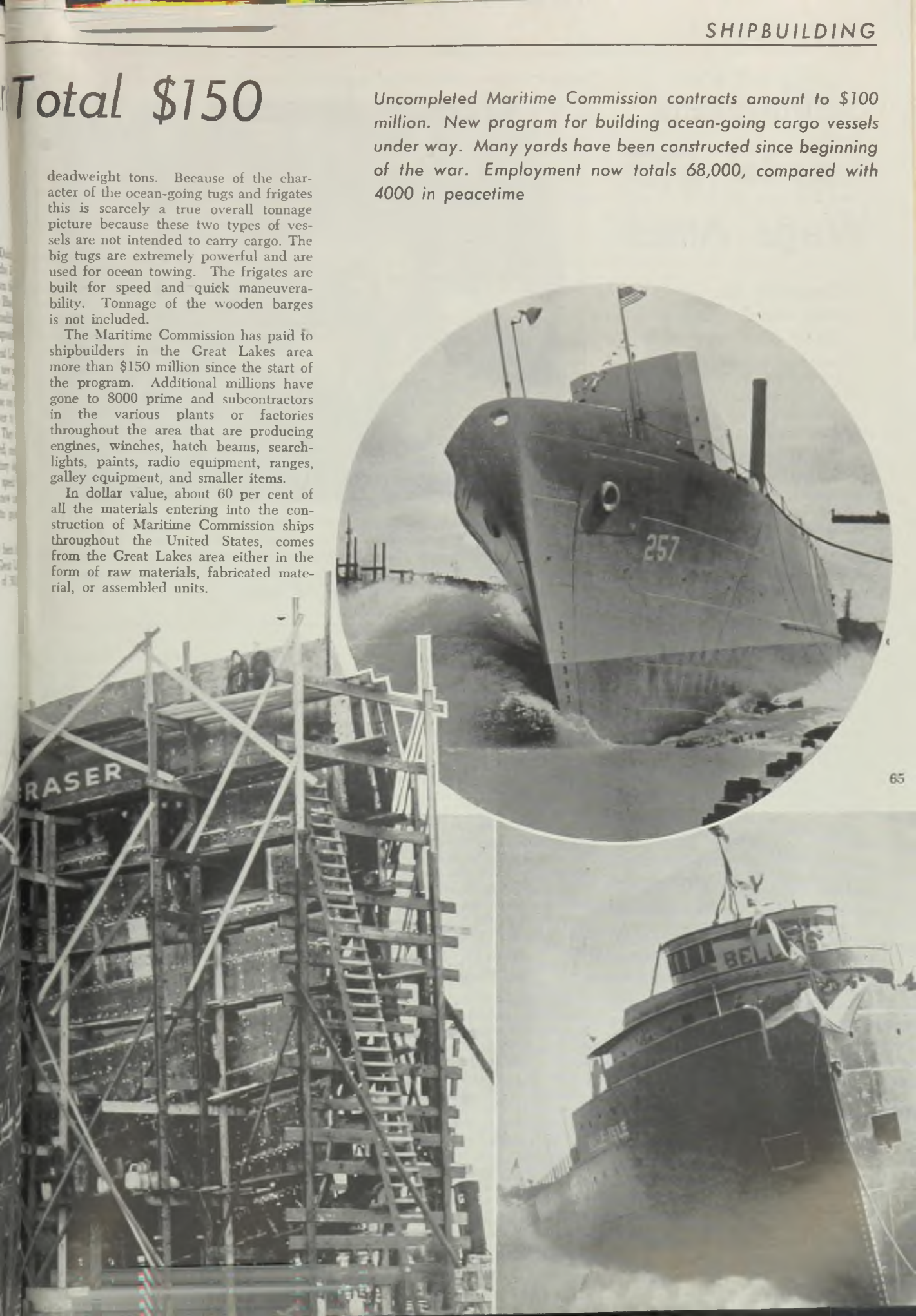
Total $150

Uncompleted Maritime Commission contracts amount to $100 million. New program for building ocean-going cargo vessels under way. Many yards have been constructed since beginning of the war. Employment now totals 68,000, compared with 4000 in peacetime

deadweight tons. Because of the character of the ocean-going tugs and frigates this is scarcely a true overall tonnage picture because these two types of vessels are not intended to carry cargo. The big tugs are extremely powerful and are used for ocean towing. The frigates are built for speed and quick maneuverability. Tonnage of the wooden barges is not included.

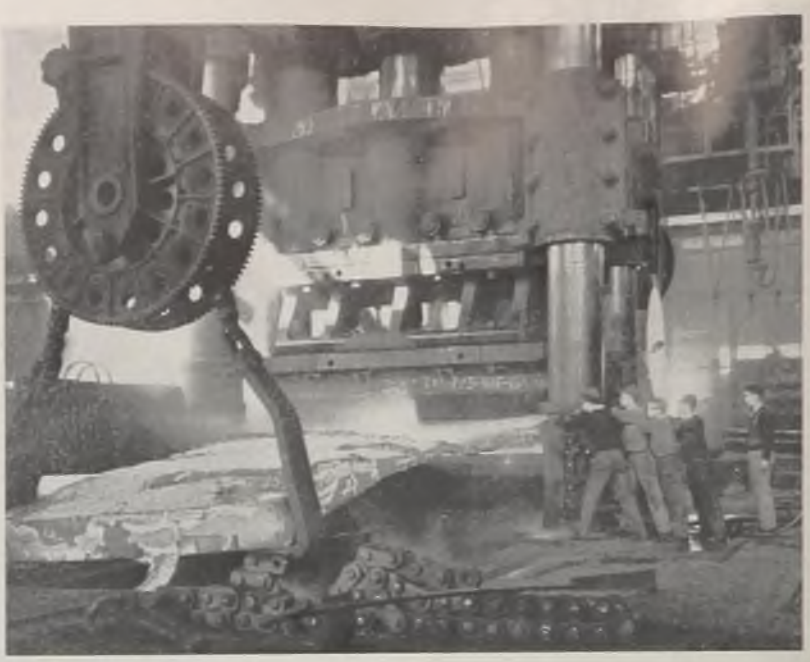
The Maritime Commission has paid to shipbuilders in the Great Lakes area more than $150 million since the start of the program. Additional millions have gone to 8000 prime and subcontractors in the various plants or factories throughout the area that are producing engines, winches, hatch beams, searchlights, paints, radio equipment, ranges, galley equipment, and smaller items.

In dollar value, about 60 per cent of all the materials entering into the construction of Maritime Commission ships throughout the United States, comes from the Great Lakes area either in the form of raw materials, fabricated material, or assembled units.



Steelmakers Counter CIO Wage Attack

Companies file briefs with Labor Board seeking elimination of dues check-off, maintenance - of - membership and penalties for wildcat strikes



MINIMIZES SCALE: Pulverized coal is sprayed off armor plate before forging in a hydraulic press at the South Charleston naval ordnance plant of the Carnegie-Illinois Steel Corp. Surface of the plate is covered with the pulverized coal to minimize formation of scale during intense heating in the furnace

PRESENTATION of testimony by the 94 basic steel producers in the hearing being conducted by the National War Labor Board into demands of the United Steelworkers of America (CIO) for wage increases and other advantages, which, if granted, would break the Little Steel formula and undermine the government's stabilization program, last week was put off until April 25 at request of attorneys representing the companies.

The union's presentation of evidence was made several weeks ago and the companies' side of the various issues was scheduled to be argued April 18. David L. Cole, chairman of the Labor Board's tripartite panel which is taking the testimony, said postponement of the companies' presentation was granted on the basis of assurances that the delay would speed up presentation of the companies' position.

Philip Murray, head of the steelworkers' union, objected to the granting of the delay.

More than 50 steel producers have filed briefs with the Labor Board answering demands of the union and making counter demands in the dispute. In general the counter demands of the companies are similar, including elimination of dues check-off, maintenance-of-membership, and the application of penalties for wildcat strikes.

As a general thing the companies' demands are subject to amendment or complete revision. Meanwhile the delay in presentation of arguments in support of the demands is thought to have been sought to enable attorneys for the companies to correlate all of the data and demands presented in the individual company briefs.

On April 14, the panel held a hearing in New York to decide on procedure for handling the cases of some 350 companies which are not considered basic steel producers. No decision was reached, however.

Company attorneys are expected to argue for elimination of the union's maintenance-of-membership guarantee and check-off of dues, and will ask for penalties against union members who engage in "wildcat" strikes, when the hearing is resumed. Numerous "flash" production tieups have been experienced in the industry in recent months, all of short duration but, nevertheless, resulting in considerable loss of output. For example, production of 21,000 tons of bars, structurals and strip steel was lost by the recent 3-day strike in the warehouse department of Carnegie-Illinois Steel Corp.'s merchant mills at Gary, Ind. Walkout of the cranemen and expediters seeking to hasten action on liberalization of an incentive plan, forced 3000 other workers into idleness. Threats of suspension from union leaders and pressure from the armed services ended the strike, full operations being resumed April 15.

Files Counter Proposal

Jones & Laughlin Steel Corp., Pittsburgh, summarized its opposition to the maintenance-of-membership and check-off in a counter proposal filed with the Board. This in part read:

"There now exists no necessity for maintenance of membership or dues check-off because the union has had seven long years to sell itself to employes and it should be willing to stand on its own record as a business organization. Government decree should not force people to pay for the right to work or force another business organization to become the agent of the union.

"If the War Labor Board believes that these concessions are necessary to the continued existence of the union and that their record entitles them to continue to be the recipients of concessions alien to good business practice, then the board should at least preserve the integrity that has heretofore surrounded the wages of employes by providing that, as in every other instance in the corporation, no deduction may be made from an employe's earnings without his written authorization."

Speaking for the Carnegie-Illinois Steel Corp. and six other subsidiaries of the United States Steel Corp., John A. Stephens, vice president, said the companies he represents believe "That choice of union and continuance of membership therein should be voluntary and that compulsion from either the union, the company or the government is inconsistent with the principles of a free society."

Lukens Steel Co., Coatesville, Pa., suggested that if the board reaffirms the union concessions it order that the new contract provide a 15-day "escape period" in which members may resign if they so desire.

With respect to proposals that workers participating in "wildcat" strikes be penalized, one company asked that the union agree to discipline local union officials and staff representatives who participate in such walkouts or fail to act promptly to halt slowdowns, etc. Also, it suggested, that the company be reimbursed by the union $5 an hour for each hour a union member participates in such a work stoppage.

Still another company proposed that strikers be penalized through cancella-

tion of such employe's vacation for the year in question or loss of his seniority. Another company asked for a general assumption of union responsibility for the acts of its members, while another asked for effective disciplining of the employes involved, or indemnification on the part of the union for labor-agreement violations.

United States Steel also asked that the union permit it to relieve certain male employes from work that can be performed by women and place such men on work which cannot be performed by women. It also asked that the new contract make it clear that women employed to perform work on production and maintenance jobs, heretofore performed by men, shall receive the same pay when fully performing the same quantity and type of work.

History of the steel wage case now pending before a panel of the War Labor Board is described in a booklet, *Steel Wages, A National Issue,* published by the Steel Case Research Committee representing the producing industry.

"Nominally," the committee says, "the steel wage case concerns only the steel companies and the CIO union, United Steelworkers of America. Actually, the principals in the case are the union and the United States government. The future economic life of this country is bound to be affected by the outcome of the steel wage case.

"Nominally, the issues are the union's demand for a wage increase of 17 cents per hour and other demands involving substantial hidden wage increases. Actually, both the companies and the union agree that the real issue is the future of the national wage stabilization policy established two years ago to prevent inflation.

"The union is attempting to override the stabilization policy of the government."

The committee points out that under war conditions the level of steel wages has risen far above previous peaks. Since the trend of steel wages influences the trend of industrial wages generally, the wage scale of American industry has followed the same upward movement.

Before the invasion of France, the committee states, the average hourly earnings of steelworkers were 84 cents. "Even in 1938, when the steel industry as a whole lost money and the average production for the year fell to less than 40 per cent of capacity, hourly wages of workers held steady.

"On April 1, 1941, there was a ten-cent-an-hour general increase in steel wages. Ten months after that, in January, 1942, the union presented to Bethlehem Steel Co., Inland Steel Co., Republic Steel Corp. and Youngstown Sheet & Tube Co.—the socalled Little Steel companies—a demand for a further increase of $1 a day (12½ cents an hour). At the same time the union for the first time demanded the closed shop and checkoff."

Kerber, Krug Leaving WPB Posts

WILLIAM KERBER, deputy assistant director of the War Production Board's Steel Division and chief of the Raw Materials and Plant Facilities Division, will leave WPB May 1 to rejoin the Hanna Furnace Corp., Buffalo.

Mr. Kerber joined WPB in August, 1941. Previously he had been eastern district sales manager for the Hanna company. His successor has not been named.

J. A. Krug, vice chairman of WPB, after declining to permit WPB officials to ask for a draft deferment in his behalf, has accepted a commission in the Navy. He is 36.

While his secondary post as head of the Office of War Utilities has been filled by his immediate assistant, Edward Falck, no successor has been named to his position as vice chairman.

Ruml Urges End of Corporate Taxes

ELIMINATION of corporate taxes, all excise levies except those on tobacco and liquor, and a one-third reduction in personal income taxes were advocated as an incentive to postwar prosperity by Beardsley Ruml, chairman of the Federal Reserve Bank of New York, at a meeting sponsored by the Economic and Business Foundation at Youngstown, O., recently.

Dr. Ruml, who is author of the original plan for pay-as-you-go income taxes, contended reductions in prices made possible by the elimination of these taxes would stimulate production so much the federal government would obtain a higher volume of revenue from other sources.

Elimination of mass unemployment will be the most important essential after the war, the noted economist declared. He estimated employment of 55,000,000 persons and a national income of $140,000,000,000 annually would be needed to attain prosperity goals.

Dr. Ruml spoke on a panel forum in which his associates were Dr. O. M. W. Sprague, Harvard University, and Dr. Garfield V. Cox, chairman of the board of the S. E. National Bank of Chicago and acting dean of the Chicago School of Business.

Construction of the Lake Erie-Ohio River waterway immediately after the war as a public works project was advocated by Louis A. Bahr, president of the United Labor Congress.

Lake Shipping Season Fully Under Way

GREAT LAKES shipping season for 1944 is well under way with 95 per cent of all vessels on the lakes moving on schedule, fully manned, according to the Office of Defense Transportation last week. Some ships are sailing under waivers, however, indicating difficulties in getting experienced seamen.

Under a new War Manpower Commission plan the United States Employment Service in the Great Lakes area will handle all orders for lake seamen and take responsibility for staffing vessels. All draft deferments will be requested by the Lake Vessel Committee. Lake vessel operators, through this committee, will continue a co-operative recruitment program for new employes.

The WMC has called a meeting for April 24 of its regional representatives on the lakes for full instructions on implementation of the new recruitment and manning program. The meeting will be held in Cleveland.

Predicts Rapid Postwar Recovery

RAPID recovery in normal business will take place after the war if industry is given a fair chance, O. E. Hunt, executive vice president, General Motors Corp., declared in Newark, N. J., last week. If government will clear the way by lifting all undue restrictions, industry will do the job of creating the high rate of employment which will be essential to a prosperous postwar era.

Mr. Hunt spoke at a dinner following a press inspection of the Trenton, N. J., and Linden, N. J., plants of the Eastern Aircraft division of General Motors Corp., at which the accomplishments of the company in building the Avenger bomber and Wildcat fighter planes for the Navy were demonstrated.

Mr. Hunt took the occasion to point out the accomplishment of General Motors in other lines of war production, and said in 1943 it produced more than $3,500,000,000 of munitions. During the first quarter of 1944 production was at an annual rate of about $4,000,000,000.

He said that prior to the war his company figured that it was doing about 10 per cent of metal cutting of the country and that they had come to look upon this as its proper load in the war effort. The corporation is now operating at not far from that goal, notwithstanding the fact, he said, that it has taken on some tough problems.

Integrated Steelmakers Enjoy $5 Advantage Over Cold Metal Plants

Open-Hearth Steel and Raw Materials committees told at Pittsburgh meeting of experiments by nonintegrated mills with scrap premelting furnaces. First advantage has been to increase production of open-hearth furnaces

METALLURGISTS, blast furnace operators, steelmakers — both acid and basic — and refractory manufacturers, came from almost every part of the country to attend the twenty-seventh conference of the National Open Hearth Steel Committee and Blast Furnace and Raw Materials Committee of the American Institute of Mining and Metallurgical Engineers, held at the William Penn hotel, Pittsburgh, April 20-21.

Maximum production problems were discussed by the basic open-hearth group Thursday morning; during the afternoon both the basic and acid groups met in a joint session for the discussion of metallurgy of the open-hearth process.

At separate sessions in the morning and afternoon, the Blast Furnace and Raw Materials group discussed coking coals and coke, and ores. Thursday evening J. L. Perry, president, Carnegie-Illinois Steel Corp., was the principal speaker at the annual fellowship dinner, over which Henry A. Roemer, president, Sharon Steel Corp., presided. Friday separate sessions were held by all three groups.

A subject of widespread interest at one session dealt with the use of cupola iron in open-hearth furnaces, W. C. Buell Jr., steel plant consultant, Arthur G. McKee & Co., Cleveland, in opening this session pointed out that the cost of making steel ingots in integrated iron and steel plants is probably $5 or more a ton lower than in any cold metal plant. He based his opinion on the economic advantages accruing from the use of a 50 per cent hot metal charge commonly debited to the open hearth without selling or administrative costs or profit. Moreover, he stated, integrated producers usually have a lower operating cost because of larger operations and diversified products. Seldom is the 15 per cent tonnage participation of the nonintegrated ingotmaker ever considered in the selling price structure.

Mr. Buell drew attention to the fact that the hot metal practice of integrated steelmakers offers four major economic advantages over the nonintegrated producer:

1. Substantially lower cost of metallics of the charge.

2. Ability to adjust the percentage of iron in the charge so as to exert a measure of control over the price and quality of such purchased scrap as may be used (out for the duration).

3. Inclusion in the charge of a considerable quantity of iron as low-cost ore to displace a similar quantity of high-priced metallics.

4. Substantial savings in conversion costs resulting from the use of the premelted iron components.

In an effort to bring production costs of ingots more into line with those of integrated producers, nonintegrated producers have looked longingly at the hot metal practice of larger companies and lately efforts have been made to develop such a practice through the media of scrap premelting furnaces.

The speaker drew attention to the two original premelting cupola installations at Sterling and Kansas City pointing out that they were authorized on the assumption that they would prove an economic media for the conversion of the then low-cost and usually undesirable agricultural scrap, originating in the West-Central states, to satisfactory melting furnace metal. However, it developed after the units swung into operation that the most important function of the process was a means to a greater unit steel furnace output.

Boosts Unit Furnace Output

Plants at Bridgeport and Alton and the government-sponsored plants at Detroit and Warren, were conceived primarily for the purpose of accomplishing increases in unit furnace production at the behest of WPB.

Three of the six premelting furnace installations were designed as conjunctions of electric furnace and three of open-hearth furnace operations. Four of the installations are conventional drop bottom types of cupola; two have modified blast furnace types of bottoms. Four have open-top cupolas and two semi-closed tops. In the case of four of the installations the hearth and the bosh of the cupola are relined every two or three days; at two plants water-cooled linings have stayed in service for several weeks' operation. Basic linings have been tried with operating improvement noted.

Mr. Buell stated that there is little at present to indicate the premelting furnace as now designed and operated offers anything in the way of reduced cost of metallics to the nonintegrated ingot producer. It should be remembered, he warned, that the cupola during a period when high production probably will be unnecessary must operate competitively against the blast furnace. It will have to convert $5 miscellaneous scrap to the equivalent of $12 blast furnace metal.

One operator gave a conversion cost of about $5 for cupola iron which is an optimistic figure. Under modern practice, the cost for conversion of a ton of pig iron in a blast furnace is about $1.50 after gas credit, the speaker stated.

W. C. BUELL JR.
Steel Plant Consultant
Arthur G. McKee & Co.

Mr. Buell did not question the virtue of cupola iron as a means of increasing unit furnace production. He recognized the claim of open-hearth operators that the time of heats are reduced as well as that of electric furnace operators who point out that the time of heats are cut in half and electric current input by a third.

Most installations, he stated, are being operated in line with general cupola practice. Operations are along empirical lines and little progress has been made toward bettering conditions through technological study. As a solution to the problem of cheap and good-quality hot metal for the nonintegrated producer—one that would be nearly competitive with blast furnace iron, Mr. Buell advocated a well arranged and financed research program. He believes the successful practice lies somewhere between the cupola and blast furnace practices as outlined above.

Other types of melting equipment might be much more suitable to develop the results desired—both metallurgically and from a cost standpoint. The speaker questioned the standing of the nonintegrated producer of primary rolled materials of common steel in the postwar era unless he can carve out a cost of charged metallics which will compare more nearly to those of the integrated producer.

Mr. Buell told members that hot metal made from low-cost quality scrap and produced at a reasonable conversion cost, can easily reduce ingot costs by $3 a ton or perhaps $5 a ton in the primary product.

The revival of the beehive coke industry under the impetus of war was described by Joseph A. Kelley, mining engineer of the Bureau of Mines. During 1943, he said, the beehive industry produced 7,000,000 tons, or 12 per cent of total output.

Zinc Supply Outlook Discussed

Government expert tells American Zinc Institute meeting nation no longer self-sufficient in the metal. Galvanizers plan for broader markets after the war. H. I. Young re-elected president

"THE UNITED STATES no longer enjoys self-sufficiency in zinc and the deficit in the postwar years may range upward of about 200,000 short tons a year," Thomas H. Miller, chief, Metal Economics Division, Bureau of Mines, told about 300 members and guests attending the twenty-sixth annual meeting of the American Zinc Institute at St. Louis, April 17-18.

He pointed out that this country has imported progressively larger quantities of zinc since 1935. Many factors have influenced this trend, including exhaustion of domestic ore reserves, gradually mounting costs of production, the downward trend in tariff, and the war-inflated demand for zinc.

Julian D. Conover, secretary, American Mining Congress, said that the future safety of the nation and the future of the mining and smelting industries depends upon government stockpiling of strategic metals.

The institute was then told by Myron L. Trilsch, assistant director, Zinc Division, WPB, that "it is generally conceded that manpower will prove to be

HOWARD I. YOUNG

our biggest problem during the balance of this year."

Mr. Trilsch estimated that zinc surplus during the second quarter would total about 40,000 tons and the total for the entire year about 146,000 tons, which added to the 156,000 tons remaining at the beginning of the year, would find stocks at approximately 302,000 tons in January, 1945.

With the fundamental and inherent merits of zinc as a coating metal as a background, with better quality, low price, and new developments which are coming from research, the galvanizing industry is definitely setting out to increase its markets after the war, Nelson E. Cook, general superintendent, galvanizing operations, Wheeling Steel Corp., declared, speaking at the meeting of the Galvanizers Committee.

". . . The galvanizing industry is challenged to maintain its position in the field of coated products . . . We have worked with zinc for many years. We are convinced of the value and utility of zinc coated products. We are confident that such products will continue to be accepted by the buying public. We accept the challenge," he said.

E. A. Matteson of the Aetna-Standard Engineering Co., Youngstown, O., discussed the progress towards continuous galvanizing that his company has made over the past 20 years.

Mr. Matteson then discussed the three approaches to continuous coil hot galvanizing which are specialty galvanizing, semicontinuous galvanizing, and fully continuous galvanizing.

S. E. Maxon, technical service, New Jersey Zinc Sales Co., told the group that "all signs point to a decidedly larger output of die castings in the years following the end of the war."

"The present outlook for the war period is that our zinc smelting production is more than ample to take care of any and all wartime requirements and the zinc smelting industry can well be proud of its enviable record during this great emergency," R. A. Young, American Zinc, Lead & Smelting Co., told the convention.

Howard I. Young, president, American Zinc, Lead & Smelting Co., was re-elected president of the American Zinc Institute for the tenth successive year at the annual directors' meeting. Ernest V. Gent was also re-elected secretary for the tenth year. Both John A. Robinson, vice president, Eagle-Picher Mining & Smelting Co., Miami, Okla., and C. Merrill Chapin, vice president, St. Joseph Lead Co., were returned to office as vice presidents. A newly elected vice president of the institute is R. B. Caples, manager, Great Falls reduction department of Anaconda Copper Mining Co. Raymond F. Orr, president, Athletic Mining & Smelting Co., Fort Smith, Ark., was elected treasurer.

POSTWAR PREVIEWS

CIVILIAN GOODS—Pattern of readjustment to peacetime production evolving. Preparations for changeover to be made in industry-WPB conferences. See page 61.

SMALL BUSINESS—New division of Bureau of Foreign and Domestic Commerce organized to give financial, managerial and technological aid to small companies. See pages 62, 63.

TAXES—Elimination of corporate taxes to provide incentive for postwar prosperity advocated by Beardsley Ruml, originator of "pay-as-you-go" income tax plan. See page 67.

ZINC—United States no longer is self-sufficient in zinc supply and faces a postwar deficit of 200,000 tons annually. Estimate zinc stockpile at end of 1944 will be 302,000 tons. See page 69.

PLANT DISPOSAL—Aircraft parts manufacturer suggests replacement cost less depreciation and allowances for inferior materials as formula for selling government-owned plants. See page 70.

PLANNING—Industrial capacity in the postwar period must be greater than in prewar if jobs are to be provided for demobilized servicemen and war workers, in the opinion of W. L. Batt, chairman of National Planning Association. See page 71.

AUTOMOBILES—Resumption of passenger car production involves tremendous amount of preparation, including restoration of facilities, acquisition of parts suppliers and purchase of machine tools. See page 79.

TRAINING PAYS—Lessons learned in training welders and supervisors for large-scale fabrication of ships should prove useful to industry in establishing or improving existing production procedures. See page 92.

SIMPLIFICATION—Simplification of extensive lists of common and special steels, until recently required by industrial buyers, is one postwar job which can be tackled immediately by every manufacturer with direct benefit to products and large dollar savings. See page 94.

Protection for Credit Risks of Suppliers Urged at Hearing

Aircraft parts manufacturer suggests government-owned plants be sold at replacement cost less depreciation and allowance for inferior construction. Says company can reconvert in ten days, with proper government aids

"The American Congress has devised a very effective birth control over business. Under present tax laws, if you win, you lose, and if you lose, you still lose." — Frederick C. Crawford, president, Thompson Products Inc., Cleveland, and chairman, National Association of Manufacturers

MORE and more subcontractors are becoming fearful over the failure of the government to provide safeguards to protect their financial position. Many are shipping to prime contractors whose solvency they have good reason to suspect. Unless Congress acts speedily to cure this situation many subcontractors may be forced to suspend shipments.

This warning was included in testimony last week by Frederick C. Crawford, president, Thompson Products Inc., Cleveland, and chairman, National Association of Manufacturers, before the House Special Committee on Postwar Economic Policy and Planning and the War Contracts Subcommittee of the Senate Military Affairs Committee.

In the early days manufacturers went ahead and patriotically accepted subcontracts without, as they normally do, investigating the credit and financial position of their prime contractors. In many instances they accepted subcontracts before they had any knowledge as to where they were to make deliveries.

"Thompson Products Inc.," he said, "was asked by the Army to make certain engine parts and they told us they would advise us later on as to the prime contractors to which we would make shipments. The Army provided the facilities and we went ahead without any credit investigation." The Army, said Mr. Crawford, went so far as to refuse to permit Thompson Products to ship to a certain peacetime customer, saying that another subcontractor would take care of that particular prime. He is making shipments today to a large prime contractor who in his opinion faces bankruptcy.

Under the present setup, said Mr. Crawford, subcontractors frequently lose when their prime contractors make mistakes even though the subcontractor in no way is to blame. In one instance, he said, Thompson Products lost $3,500,000 on a subcontract for airplane engine parts through no fault of its own. It made no difference to the company because the renegotiators would have taken it anyway; however, it shows how insecure a subcontractor's position is.

Mr. Crawford asked for a realistic policy of disposing of government-owned plants. The present policy is to ask cost minus depreciation.

"The government-owned plant which we operate," he said, "allowing only for the buildings and real estate represents an outlay of $8,000,000. Our own plant we value at $5,000,000. Both plants have the same floor space and each turns out about $100,000,000 worth of products annually. If we were to buy the government-owned plant we are asked to pay cost less depreciation. At the same time, we could duplicate that government plant for our particular purposes for around $4,200,000 at present building costs."

Recommends Plant Disposal Formula

Asked to recommend a formula for disposing of government-owned plants, Mr. Crawford recommended that the replacement cost, not the original cost, would be the fair starting figure, with adjustments for depreciation and allowance for the higher maintenance costs for many of these buildings due to use of substitute materials in construction.

Reconversion from war to peace will be amazingly fast provided Congress will pass laws which will enable terminated contractors to get back rapidly the cash tied up in inventories and to get their plants cleared. That, he said, is 90 per cent of the problem. Fully 75 per cent of the companies involved will not have to reconvert; they will continue to make the same products as during the war.

"The country will need to provide 25 per cent more jobs after the war than in the prewar period," he said. "That will mean 25 per cent more healthy employers and 25 per cent more working capital. The public seems to have the idea that there is plenty of capital. That is not true. If my company were to make an advance of one month's pay it would wipe us out. We will need a prompt cash settlement after the war to get back into peacetime production. We cannot wait months or years for a settlement by audit."

Another thing Congress should consider in shaping its legislation is that industrial management now can take no chances whatever in dealing with the government. Thompson Products on one occasion, he said, was told to go ahead and put up a $100,000 test room on which, it was assured, rapid amortization would be allowed. "Then, when we came to Washington," he said, "we were told an edict had been issued under which rapid amortization could not be allowed on any project on which work had been started."

Mr. Crawford also deplored the large amount of talk in Washington and elsewhere about the need for setting up training programs under government supervision. "We do not need any training programs; they would only upset the labor situation that much more." The problem, he said, is not to train more men to fill skilled jobs but to persuade men who have been upgraded during the war to go back to their old job; it is one of getting a precision grinder to resume his old job as a polisher at lower pay.

Questioned about disposition of government-owned goods at lower than their original cost, Mr. Crawford again recommended a realistic approach. He told a story about grandpa's beautiful set of false teeth. The material cost about $5 but it cost $200 to make them up. "When grandpa died," said Mr. Crawford, "they were worth $5, because they did not fit anybody else but grandpa."

Questioned whether the federal government should undertake to pay people made idle through contract termination for their idle time, Mr. Crawford thought this problem could be pretty well solved by passing laws to get cash into terminated contractors' hands and to get their plants cleared promptly. "Thompson Products Inc.," he said, "could get started on peacetime production within 10 days."

Steel Industry's 1943 Net Income Off with Costs Up

STEEL industry's 1943 net profits were the lowest in the past four years, despite an increase of 32.7 per cent in steel production and 111.1 per cent in net sales over the 1940 period.

Payroll costs continued to rise throughout last year, while steel prices remained frozen at the first quarter 1941 level. The industry has been able to absorb rising costs of both material and labor through capacity production. The profit breakeven operating rate for the industry at present cost levels is not definitely known. Most believe it is substantially higher than in prewar years, however, and point out that even a moderate decline in current operations would turn the industry's modest profit into a deficit. Wage or price levels would have to be adjusted to compensate for any loss in production.

Combined net income of 26 steel producers, representing 90.1 per cent of steelmaking capacity, totaled $183,245,436 during 1943, against $198,606,587 in the preceding year. During 1941 and 1940, net profits for this same group totaled $277,565,532 and $260,309,958.

Net sales reported by 25 companies rose 12.8 per cent to $6,475,803,303 last year. This compared with $3,068,152,721 in 1940 for practically the same group of companies, during which period profits were substantially higher. The net profit margin for these companies tended downward in recent years; amounting to 7.48, 5.44, 3.46 and 2.83 per cent for the years 1940, 1941, 1942 and 1943, respectively.

Amount set aside for income taxes in 1943 by all of the 26 steel producers totaled $432,387,446, compared with $554,990,490 in the preceding year and $524,136,611 in 1941. Lower tax provisions during the latest period reflect reduced net operating profits in most instances. Compared with 1940, taxes are up 107.3 per cent.

Aggregate payroll costs of 23 companies reporting amounted to $2,574,991,281 in 1943, or 22.7 per cent above the $2,097,904,362 paid out in wages and salaries for the same group in the preceding year. Average number of employes for 22 companies was up only slightly to 929,098, compared with 877,798 in 1942.

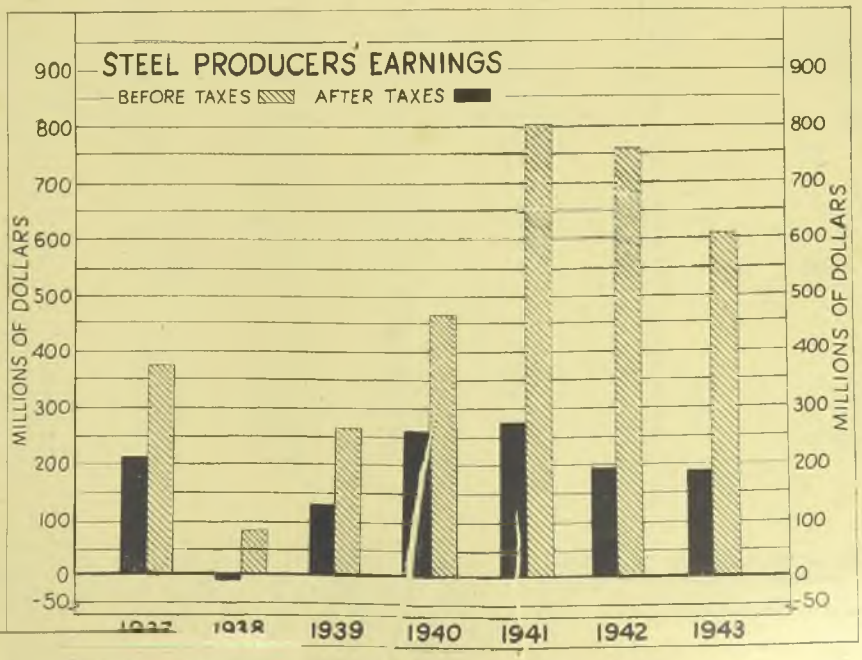
Ingot capacity represented by these 26 steel producers rose 2.8 per cent to 84,339,853 at the close of last year. Steel production amounted to 76,708,837 net tons for the 21 companies reporting, against 74,179,202 in 1942.

Net income per common share for the entire group was off substantially to $3.82, compared with $4.24 in 1942. For nearly the same group the net profit per common share in 1941 and 1940 was $7.44 and $6.11 respectively. Three companies omitted paying dividends on common stocks in both 1942 and 1943. Only three companies paid larger dividends last year, eight paid less and twelve held their dividend rate unchanged.

Reduction of funded debt to $640,976,697, compared with $695,879,093 in 1942, and amount set aside for postwar contingencies reserve of $54,942,638, against $45,870,000 in the preceding year, indicate a deepening interest in postwar adjustments. This also is reflected in the reduction of current liabilities for these companies to $993,028,858, while current assets rose to $2,422,202,049.

Total capitalization of the group was off slightly, amounting to $4,042,689,141 compared with $4,046,444,298 in 1942. Common stock valuation was up moderately to $1,588,791,021 during the latest period, while value of preferred shares was lower at $713,402,696.

Total income before dividends and interest on bonds was $210,280,743 last year, against $230,226,488 in 1942 and $304,846,259 in 1941. During the past year the 26 companies had a return of total income on capitalization of 5.20 per cent, compared with 5.69, 7.87, 7.57 per cent for 1942, 1941 and 1940 respectively.



Combined earned and capital surplus account for the entire group of companies at the close of last year stood at $1,133,685,883.

STEEL acknowledges with appreciation the co-operation of all the companies which supplied data for the accompanying tabulation. Additional copies may be obtained from Readers' Service Dept. STEEL.

Financial Analysis of the Steel Industry for 1943

Official Returns from Twenty-Six Producers, Representing 90.1 Per Cent of Steelmaking Capacity

No. Shares Common Stock Outstanding 1943	1942	Common Stock Valuation 1943	1942	Price [1] 1943	Funded Debt 1942	Surplus 1943	1942	Total Capitalization 1943	1942	Capitalization Per Ton Ingot Capacity 1943	1942	Total Income Before Dividends and Interest on Bonds 1943	1942	Per Cent Total Income on Capitalization 1943	1942	Net Sales 1943	1942	Net Profit Margin Per Cent 1943	1942	Net Income Before Dividends 1943	1942	Preferred Dividend Requirements 1943	1942	
8,703,252	8,703,252	$652,743,900	$652,743,900	$360,281,100	$360,281,100	$128,993,645	$139,694,841	$415,145,986	$411,730,125	$1,560,571,393	$1,568,683,516	$47.96	$50.36	$69,700,008	$77,401,961	4.47	4.93	$1,976,844,751	$1,862,951,692	3.21	3.82	$63,448,546	$71,248,569	$25,219,677	$25,219,677	United States Steel Corp.
2,984,994	2,984,994	283,574,430	283,574,430	93,388,700	93,388,700	156,502,865	162,171,365	121,344,499	107,842,081	654,810,494	646,977,476	50.76	50.94	37,810,280	34,727,360	5.77	5.37	1,902,819,720	1,495,672,299	1.69	1.70	32,124,592	25,387,760	6,522,509	6,537,209	Bethlehem Steel Corp.
5,669,922	5,669,922	130,309,141	130,309,141	32,921,000	33,325,800	72,331,593	78,806,350	103,720,445	99,364,852	339,180,179	341,806,143	40.48	39.33	15,938,204	21,354,976	4.70	6.25	549,060,859	517,892,134	2.19	3.31	12,011,037	17,154,578	1,985,420	2,017,580	Republic Steel Corp.
1,602,488	1,602,467	67,373,600	67,373,900	58,682,200	58,682,200	43,878,765	47,922,882	72,336,555	68,952,181	242,271,120	242,929,763	48.22	54.82	11,156,386	11,634,904	4.61	4.79	280,676,172	234,980,038	3.39	4.32	9,512,228	10,141,690	2,934,110	2,934,095	Jones & Laughlin Steel Corp.
1,675,008	1,675,008	151,394,284	146,881,859	15,000,000	15,000,000	60,175,811	68,636,082	46,308,231	41,793,805	230,371,937	234,085,250	55.89	58.49	10,363,839	12,717,200	4.50	5.43	224,879,404	217,856,260	3.57	4.73	8,037,442	10,305,706	825,000	825,000	Youngstown Sheet & Tube Co.
2,206,267	2,205,667	55,156,675	55,001,800	None	None	56,345,423	57,865,464	105,914,377	100,787,716	217,416,475	213,654,980	55.75	54.78	13,451,943	15,767,663	6.19	6.44	256,168,341	219,851,176	4.57	5.43	11,698,362	11,929,867	None	None	National Steel Corp.
1,633,105	1,633,105	62,500,000	60,979,309	None	None	34,340,000	37,360,000	54,283,025	51,165,685	156,448,025	155,504,994	44.78	44.30	12,070,868	12,827,238	7.99	8.18	203,680,146	189,612,000	5.30	5.65	10,801,584	10,721,372	None	None	Inland Steel Co.
2,868,724	2,868,700	71,730,009	71,730,009	44,993,000	44,993,000	17,750,000	24,827,954	22,425,278	31,220,650	150,907,287	152,780,813	48.10	51.19	6,999,097	8,787,739	4.46	5.40	199,266,466	180,978,867	3.06	4.30	6,098,074	7,780,988	2,024,733	2,024,731	American Rolling Mill Co.
569,559	569,559	28,477,950	28,477,950	36,316,800	36,316,800	32,400,000	33,600,000	25,091,402	23,422,324	122,285,952	121,816,874	62.39	62.15	5,521,173	5,644,891	4.51	4.63	121,359,532	118,988,790	3.35	3.73	4,339,246	4,441,964	1,815,830	1,815,830	Wheeling Steel Corp.
444,698	444,698	11,117,443	11,117,443	32,292,000	32,702,615	12,467,000	13,892,000	23,527,919	21,442,166	79,404,362	79,154,224	54.61	57.08	5,452,124	5,383,389	6.86	6.80	209,435,789	183,044,853	3.36	3.66	4,949,696	4,864,781	1,614,600	1,635,130	Crucible Steel Co. of America
563,620	563,620	5,636,200	5,636,200	None	None	11,035,200	11,035,200	19,707,740	18,870,574	36,379,140	35,541,974	32.16	31.42	2,034,043	3,356,045	5.60	9.44	50,273,424	52,130,223	2.69	4.95	1,351,529	2,580,135	None	None	††Colorado Fuel & Iron Corp.
508,917	508,917	4,862,190	4,862,190	16,282,500	16,327,200	7,082,864	8,220,864	20,234,036	19,630,383	48,461,590	48,940,458	45.91	45.65	2,177,125	2,883,283	4.49	5.89	66,624,191	70,480,700	2.60	3.39	1,734,223	2,390,224	863,216	862,939	Pittsburgh Steel Co.
494,752	459,316	4,947,524	4,593,164	None	None	394,638	900,166	13,501,915	13,341,142	18,449,439	17,834,306	109.81	106.16	1,516,613	1,599,004	8.20	9.00	24,649,867	25,886,069	6.15	6.18	1,516,613	1,599,004	None	None	Wickwire Spencer Steel Co.
317,976	317,976	3,179,760	3,179,760	None	None	1,372,000	2,200,000	8,172,858	7,237,149	12,724,618	12,616,909	22.84	22.65	1,387,214	1,358,819	10.90	10.77	52,338,397	43,990,463	2.51	2.66	1,317,281	1,172,522	None	None	**Lukens Steel Co.
382,488	382,488	8,483,821	8,483,821	None	None	2,500,000	2,670,640	4,721,164	4,367,703	15,704,985	15,522,164	38.95	38.49	633,555	738,279	4.03	4.76	17,324,988	17,737,576	3.23	3.47	554,271	616,275	None	None	Granite City Steel Co.
392,331	392,331	3,974,530	3,974,530	5,972,000	5,972,000	None	900,000	8,340,306	8,023,493	18,286,836	18,870,023	28.75	31.66	1,023,341	1,331,722	5.60	7.05	39,916,238	35,355,190	2.52	3.68	1,007,743	1,302,315	298,600	298,600	Sharon Steel Corp.
200,000	200,000	4,388,889	4,388,889	7,182,433	7,182,433	None	None	4,328,502	4,132,040	15,809,834	15,703,362	28.91	28.55	699,230	739,590	4.40	4.71	30,138,407	30,262,976	2.32	2.44	699,230	739,590	502,768	502,768	Alan Wood Steel Co.
600,000	600,000	10,574,621	10,574,621	None	None	6,745,014	5,897,066	17,319,635	16,471,887	35.77	40.24	2,046,658	2,582,941	11.82	15.68	NA	NA	NA	NA	NA	NA	2,046,658	2,582,941	None	None	Midvale Co.
1,260,130	1,257,809	7,875,812	7,861,306	2,834,000	2,834,000	22,354,826	21,276,628	33,064,638	31,971,934	72.98	70.57	3,865,315	4,129,126	11.69	12.91	114,528,928	102,679,075	3.37	4.02	3,865,315	4,129,126	198,380	198,380	Allegheny Ludlum Steel Corp.
200,561	200,561	5,276,243	5,276,243	987,800	1,765,632	1,000,000	1,200,000	6,305,659	6,091,222	13,569,701	14,333,096	37.28	39.38	800,860	983,102	5.90	6.86	22,264,078	22,865,882	3.43	4.11	762,610	938,852	69,237	125,213	Continental Steel Corp.
206,250	206,250	4,125,000	4,125,000	None	None	750,000	750,000	2,065,476*	1,637,578	6,940,476	6,512,578	21.29	18.65	61,023	167,039	0.87	2.56	13,139,003	13,183,648	0.35	1.15	46,023	152,039	None	None	Laclede Steel Co.
224,540	224,540	2,245,400	2,245,400	None	None	1,425,001	1,265,120	3,670,401	3,510,520	10.92	10.45	227,243	242,455	6.20	6.91	15,472,201	13,268,631	1.47	1.83	227,243	242,455	None	None	Central Iron & Steel Co.
514,864	514,864	2,574,320	2,574,320	1,895,850	2,068,350	6,183,968	5,642,282	10,867,138	10,551,952	33.82	38.50	1,154,577	1,382,164	10.62	13.10	33,622,430	29,434,495	3.13	4.31	1,052,297	1,268,564	189,585	206,835	Copperweld Steel Co.
757,682	757,682	3,156,800	3,156,800	None	None	8,235,419	7,704,680	11,892,219	10,861,480	37.67	35.92	1,361,931	1,771,927	11.95	16.31	18,056,091	15,872,463	7.54	11.08	1,361,931	1,758,942	None	None	Keystone Steel & Wire Co.
217,706	217,706	2,177,061	2,177,061	2,547,913	2,547,913	908,285	4,050,542	3,605,373	8,969,489	9,238,632	63.56	65.47	491,016	579,723	5.47	6.37	30,366,986	15,188,456	2.19	3.37	445,170	511,771	127,395	127,395	Follansbee Steel Corp.
926,541	926,547	926,518	926,547	1,825,600	1,825,600	1,850,000	2,050,000	7,217,740	5,767,443	11,319,858	10,969,590	99.30	107.86	2,337,077	2,733,948	20.65	25.87	32,996,894	32,116,888	6.78	8.23	2,236,492	2,644,557	91,280	91,280	†Rustless Iron & Steel Corp.
36,126,325	36,087,929	$1,588,791,021	$1,582,233,593	$718,402,698	$715,113,663	$640,976,697	$695,879,093	$1,133,685,883	$1,082,112,361	$4,042,689,141	$4,046,444,298	$47.93	$49.32	$210,280,743	$230,226,488	5.20	5.89	$6,475,803,303	$5,742,243,544	2.83	3.46	$183,245,496	$198,606,587	$45,282,340	$45,422,662	Total (or average)

Earnings Per Common Share 1943	1942	Dividends Paid Per Share on Preferred 1943	1942	Dividends Paid Per Share on Common 1943	1942	Average Number Employed 1943		Total Payrolls 1943	1942	Rated Ingot Capacity Net Tons 1943	1942	Ingot Production Net Tons 1943	1942	Steel Operating Rate Per Cent [1] 1943	1942	Net Income Per Ton Ingot Produced 1943	1942	Net Income Per Ton Ingot Capacity 1943	1942	Total Taxes 1943	1942	Total Assets 1943	1942	Current Assets 1943	1942	Current Liabilities 1943	1942	Ratio of Current Assets To Current Liabilities 1943	1942	Postwar Contingencies Reserve 1943	1942	
$4.39	$5.29	$7.00	$7.00	$4.00	$4.00	340,498	20.3	$869,298,853	$738,444,009	32,537,000	31,150,900	30,540,427	30,029,950	97.8	98.1	$2.08	$2.37	$1.95	$2.29	$88,000,000	$153,070,000	$2,106,062,459	$2,123,334,106	$867,289,632	$899,130,476	$347,947,532	$384,061,979	2.49—1	2.34—1	$25,000,000	$25,000,000	United States Steel Corp.
8.58	6.51	7.00	7.00	6.00	6.00	280,232	16.6	892,339,693	646,272,085	12,900,000	12,700,000	13,015,755	12,451,692	100.9	98.0	2.47	2.04	2.49	2.00	129,600,000	139,980,000	1,044,869,730	1,005,646,523	558,544,883	523,813,297	338,037,045	321,652,740	1.65—1	1.63—1	15,000,000	5,520,000	Bethlehem Steel Corp.
1.77	2.67	6.00	6.00	1.00	1.25	65,700	6.4	173,168,834	155,727,579	8,378,000	8,690,000	8,651,273	8,597,206	100.4	99.6	1.39	2.00	1.43	1.97	39,300,000	67,870,000	394,627,726	411,265,789	154,090,928	151,930,932	39,257,005	41,510,639	3.93—1	3.66—1	4,750,000	3,000,000	Republic Steel Corp.
4.10	4.50	5.00	5.00	2.00	2.50	39,101	3.8	105,471,580	84,521,482	5,024,000	4,431,250	5,124,846	4,548,844	102.0	102.7	1.86	2.23	1.89	2.29	19,650,000	24,000,000	300,101,719	299,495,730	132,439,006	125,172,533	46,372,177	47,105,310	2.86—1	2.66—1	2,000,000	1,000,000	Jones & Laughlin Steel Corp.
4.31	5.66	5.50	5.50	2.00	2.50	33,593	3.2	82,596,625	57,999,668	4,122,000	4,002,000	4,122,501	3,970,992	100.0	99.2	1.95	2.59	1.95	2.58	18,400,000	24,700,000	253,606,668	260,248,971	119,042,777	116,113,484	16,986,317	20,267,946	7.01—1	5.73—1	1,650,000	3,250,000	Youngstown Sheet & Tube Co.
5.30	5.41	None	None	3.00	3.00	21,203	2.0	61,977,015	52,743,232	3,900,000	3,900,000	NA	NA	NA	NA	3.00	3.06	3.00	3.06	26,350,000	30,300,000	258,132,279	255,069,259	83,756,119	77,141,151	28,864,756	31,945,927	2.9 —1	2.4 —1	750,000	2,000,000	National Steel Corp.
6.61	6.57	None	None	4.50	4.50	19,696	1.8	52,342,789	46,616,438	3,375,000	3,350,000	3,597,975	3,427,511	108.6	102.3	3.00	3.13	3.20	3.20	19,325,000	23,885,000	183,300,441	179,844,865	84,386,469	75,872,142	21,550,243	19,977,165	3.91—1	3.79—1	1,000,638	3,000,000	Inland Steel Co.
1.42	2.01	4.50	4.50	1.00	1.00	21,124	1.9	56,377,766	48,902,953	3,262,000	3,180,000	3,115,410	2,848,739	95.5	89.6	1.96	2.73	1.87	2.45	8,953,073	19,539,878	190,010,021	200,155,212	85,099,338	87,546,275	26,254,257	32,360,760	3.24—1	2.70—1	1,080,000	1,500,000	American Rolling Mill Co.
4.43	4.61	5.00	5.00	1.50	1.50	16,816	1.5	45,927,457	42,181,514	1,980,000	1,960,000	1,947,066	1,915,621	99.3	97.7	2.32	2.32	2.31	2.27	3,459,000	5,886,199	132,723,422	133,431,412	53,875,289	52,044,328	7,883,996	8,407,829	6.83—1	6.19—1	None	None	Wheeling Steel Corp.
7.48	7.26	5.00	5.00	3.00	2.00	27,271	2.4	74,500,000	65,600,000	1,453,970	1,386,770	NA	NA	NA	NA	3.40	3.51	27,433,842	21,733,669	121,674,713	117,607,226	68,720,922	69,250,357	26,058,154	31,542,387	2.64—1	2.20—1	None	None	Crucible Steel Co. of America
2.40	4.58	None	None	1.00	1.75	10,944	1.0	21,975,660	20,987,064	1,131,218	1,131,218	1,141,286	1,104,090	100.9	97.6	1.18	2.34	1.19	2.28	1,266,000	2,981,500	53,199,538	52,221,080	20,831,278	24,850,564	8,754,156	13,105,934	2.38—1	1.90—1	None	None	††Colorado Fuel & Iron Corp.
3.71	3.00	17.88	13.75	None	None	8,260	0.7	22,432,643	20,701,341	1,073,000	1,072,000	1,011,932	986,372	94.4	92.0	1.71	2.42	1.62	2.23	3,140,000	5,432,850	57,419,494	58,436,477	24,048,590	23,868,300	7,499,379	8,041,151	3.21—1	2.97—1	None	None	Pittsburgh Steel Co.
3.06	3.48	None	None	1.00	1.00	4,268	0.4	11,308,502	10,588,812	168,000	168,000	172,171	177,807	102.5	105.8	8.81	8.99	9.03	9.52	904,541	1,127,649	22,538,864	22,092,411	11,353,766	10,922,212	3,468,797	2,472,456	3.27—1	4.42—1	None	500,000	Wickwire Spencer Steel Co.
4.14	3.68	None	None	1.20	1.00	5,997	0.5	17,149,143	13,351,626	634,000	624,000	631,092	558,640	101.1	89.5	2.09	2.10	2.11	1.88	4,719,000	3,860,543	33,539,599	25,628,038	22,318,754	14,352,392	17,846,587	10,785,901	1.25—1	1.33—1	1,063,000	330,000	**Lukens Steel Co.
1.45	1.61	None	None	0.53	0.35	NA	NA	NA	403,200	403,200	404,243	405,777	100.3	100.6	1.37	1.52	1.37	1.53	400,000	425,370	17,800,031	17,411,070	8,133,410	7,270,706	2,110,782	1,622,988	3.85—1	4.48—1	None	None	Granite City Steel Co.
1.81	2.56	5.00	5.00	1.00	1.00	3,645	0.3	10,118,932	9,059,981	636,000	596,000	646,429	640,570	101.6	107.4	1.56	2.03	1.59	2.18	4,375,000	3,355,750	22,967,577	22,433,473	13,155,303	11,650,520	3,755,741	3,238,450	3.50—1	3.60—1	600,000	None	Sharon Steel Corp.
0.98	1.18	7.00	7.00	None	None	3,187	0.3	8,313,205	8,205,739	350,000	550,000	545,499	550,141	99.2	100.0	1.28	1.34	1.27	1.34	541,900	1,247,000	19,116,691	19,363,253	8,685,619	8,843,728	2,432,548	3,062,139	3.57—1	2.88—1	None	None	Alan Wood Steel Co.
3.41	4.30	None	None	2.00	2.10	7,905	0.7	25,140,691	20,299,682	484,120	409,250	365,723	293,396	75.54	71.69	5.60	8.80	4.23	6.31	14,175,800	7,243,693	35,714,386	36,958,390	27,756,660	28,900,249	14,628,903	17,599,017	1.50—1	1.64—1	800,000	270,000	Midvale Co.
2.91	3.13	7.00	7.00	2.00	2.00	12,944	1.1	36,319,923	30,901,934	453,040	453,040	425,083	435,680	94.0	95.6	9.08	9.48	8.53	9.11	10,880,000	11,484,460	45,863,300	47,612,869	26,497,645	28,187,214	11,366,524	14,701,836	2.33—1	1.92—1	600,000	100,000	Allegheny Ludlum Steel Corp.
3.46	4.06	7.00	7.00	2.00	2.00	2,639	0.2	7,010,628	6,471,879	364,000	364,000	361,094	347,616	99.2	95.5	2.11	2.70	2.10	2.58	707,238	993,680	16,140,740	16,685,034	7,474,292	7,840,496	1,510,091	1,316,551	4.95—1	5.94—1	None	None	Continental Steel Corp.
0.22	0.74	None	None	1.30	1.75	1,500	0.1	3,752,239	3,530,228	326,025	349,171	297,049	286,812	91.1	82.1	0.17	0.53	0.14	0.44	42,000	400,000	7,929,076	7,723,069	3,671,641	3,853,969	704,151	675,491	5.21—1	5.70—1	None	None	Laclede Steel Co.
1.01	1.08	None	None	0.30	0.40	1,757	0.2	4,336,380	3,528,223	336,000	336,000	299,363	319,229	89.1	92.9	0.76	0.78	0.68	0.72	336,299	429,600	4,517,657	4,262,083	2,411,041	2,201,937	796,294	706,190	3.03—1	3.12—1	None	None	Central Iron & Steel Co.
1.85	2.25	2.62	2.61	0.80	0.80	NA	NA	NA	NA	321,360	274,080	NA	NA	NA	NA	NA	NA	155,899	1,389,152	20,151,997	17,132,692	14,137,683	10,953,416	7,008,671	3,764,671	3.02—1	2.91—1	None	None	Copperweld Steel Co.
1.80	2.32	None	None	1.05	1.25	1,818	0.2	5,424,081	4,627,790	302,400	302,400	292,020	289,517	96.6	95.7	4.66	6.07	4.50	5.81	1,493,196	1,462,232	12,908,888	12,658,056	5,001,086	4,710,504	1,379,185	1,691,132	3.63—1	2.79—1	None	None	Keystone Steel & Wire Co.
1.46	1.76	None	None	1.25	None	NA	NA	NA	NA	141,120	141,120	NA	NA	NA	NA	3.15	3.63	1,423,658	433,300	12,062,364	11,851,552	5,815,054	4,921,888	2,875,534	2,392,586	2.02—1	2.06—1	None	None	Follansbee Steel Corp.
2.32	2.76	2.50	2.50	0.75	0.75	NA	NA	7,808,650	6,651,103	114,000	114,000	NA	NA	NA	NA	19.62	23.20	7,356,000	7,732,975	20,047,385	18,486,994	13,664,874	11,590,639	7,680,033	6,958,554	1.78—1	1.67—1	640,000	400,000	†Rustless Iron & Steel Corp.
$3.82	$4.24					929,098	77.0	$2,374,991,281	$2,097,904,362	$84,339,853	$82,038,399	76,708,837	74,179,202	97.8	97.3	$2.39	$2.68	$2.17	$2.42	$432,387,446	$554,990,490	$5,387,326,735	$5,376,041,534	$2,422,202,049	$2,382,733,709	$993,028,858	$1,030,937,729	2.44—1	2.31—1	$54,942,638	$45,870,000	Total (or average)

[1] All retired Jan. 1, 1944.
*Amount of $650,000 added to Surplus account in 1943, reflecting adjustment of excess provision for depreciation in prior years.
[1]Figures for 1942 still subject to renegotiation.
*Shared on year end capacity.
NA—Not available.
††Fiscal year ended June 30.
**Fiscal year ended Oct. 9.

"Net Income Before Dividends" columns and totals do not take into consideration requirements (not actual payments) for preferred dividends. In computing earnings per common share these totals, adjusted for preferred dividend requirements, are used. In arriving at earnings per common share for individual companies the same method is followed.
Boldface type is used under those columns in which figures from all 26 companies were not available.

PER CENT EARNED ON CAPITALIZATION

1926	6.85	1932	2.85*	1938	0.59
1927	5.32	1933	0.96*	1939	4.27
1928	6.53	1934	0.36	1940	7.57
1929	9.88	1935	2.09	1941	7.87
1930	4.54	1936	4.40	1942	5.69
1931	0.40	1937	6.07	1943	5.20

*Loss.

Greater Industrial Capacity Needed

More plants necessary to provide employment for demobilized service and war workers, says William L. Batt. Decries fears of mature economy. Urges Congress to enact postwar controls now

THAT the nation's industrial capacity will have to be increased considerably as compared with prewar if the postwar problem of providing 15,000,000 to 20,000,000 jobs for war workers and discharged soldiers is to be solved, was the view expressed last week by William L. Batt, vice chairman, War Production Board, testifying at a hearing of the House Committee on Postwar Economic Policy and Planning.

Mr. Batt, who left his post as president of the SKF Industries Inc., Philadelphia, in 1940 to aid the government in formulating the national defense program, described to the committee the economic planning program of the National Planning Association of which he is chairman. This body is composed of "Americans in agriculture, business, labor and government," and as Mr. Batt put it: "When you get an agreement on the part of these groups in my opinion you have got something."

Danger of National Confusion

While special-interest groups have important functions to perform, declared Mr. Batt, there is danger of national confusion if national policies are set up as a result of group conflict, with each group considering its own welfare as paramount. Because the National Planning Association committee members resolve their group quarrels before approving recommendations, he considered the NPA program as particularly worthy of study by Congress.

When we are faced with the postwar problem of providing 15,000,000 to 20,000,000 jobs for war workers and discharged soldiers, he said, we will need to increase our industrial capacity considerably as compared with prewar. We are accumulating purchasing power in the hands of individuals, businesses, state and municipal governments; we are reducing indebtedness and depleting inventories. At the same time, we are creating a backlog of demand in consumers' goods, in inventories, and in deferred maintenance of our industrial and agricultural plants.

"The war brings postwar opportunities," said Mr. Batt. "It has proved that the American economy has not become stagnant. We should abandon that fear. We are not challenged by a mature economy, but by the need for mature thinking.

WILLIAM L. BATT

Since the early days of the national defense program William L. Batt has been active in the government's production program. He came to the National Defense Advisory Commission in May, 1940, on leave from his post as president of the SKF Industries Inc., Philadelphia, serving as deputy chief of the Minerals and Metals Division under Edward R. Stettinius. When the Defense commission was succeeded by the Office of Production Management, Mr. Batt became deputy director of production. When OPM was reorganized he was made head of the Division of Materials and shortly thereafter went to Moscow with a mission headed by W. Averill Harriman. Upon establishment of the War Production Board in January, 1942, Mr. Batt was made chairman of the Requirement Committee and director of the Materials Division. The most recent reorganization of WPB resulted in his appointment as vice chairman of the board working on assignments from the chairman.

"One objective is full employment—the opportunity to find a job if one wants one. No society can be healthy with a large amount of unemployment, but employment is not an end in itself. It means useful and constructive work.

"We believe the country is not overbuilt; there is need for new capital; need for the continued economic development of many regions of the country, including the south and west; need for the employment of many people in service and trade activities. The past is not good enough for the 10,000,000 in uniform, and the millions in war industry. Our task is not to reconvert back, but to convert up."

Mr. Batt stressed the importance of timing in setting up national policy, both public and private. First there is the need for speed in converting industry to peace after war contract terminations. "A few months' delay can mean, if unemployment becomes severe, the loss of many months' production."

Then will come the "catching-up-with-demand" period and, in answer to questions, Mr. Batt made it clear that government controls would be required to prevent dangerous inflation. Mr. Batt was not certain as to just what the government controls should be in the postwar period but felt they should be as few as possible in number and as gentle as possible in their effects on our people.

Finally, said Mr. Batt, we will come into the longer-term period of maintaining peacetime economic growth. It is imperative for Congress to establish national policies which will have the effect of eliminating many present business uncertainties. The financial atmosphere that the government creates in the postwar period, he said, will have a large influence on business and employment. At the request of the committee, Mr. Batt promised that he would furnish, in about six weeks from now, the postwar taxation proposals of the National Planning Association.

Stresses Labor's Responsibilities

Mr. Batt stressed the heavy responsibilities which labor leaders will bear in shaping a healthy postwar economy. But he felt hopeful that they would act in the best interests of the country.

Mr. Batt favored planned public works programs, and he thought there should be two types of programs, one consisting of projects that are needed presently, and the other long-term projects which can be held over to fill in gaps in employment. He warned, however, that too much emphasis has been placed on public works in order to provide employment.

Mr. Batt mentioned the likelihood of a big part in foreign trade by this country. "We can absorb large imports to pay for the goods we export."

The government, Mr. Batt believes, should prepare to move migrated workers and their families to their old homes or somewhere else where they can find jobs. He felt quite certain, for example, that workers who have migrated to the West Coast to work in war plants will have to leave that area after the war; the government, he said should pay their expenses.

Congress should not delay enactment of laws to control the postwar economy in an effort to have them cover every angle perfectly, warned Mr. Batt.

Training Our Neighbors

UNDER the auspices of the Inter-American Training Administration, since it was established in June, 1943, some 1500 nationals of the Latin American countries have received training in more than 60 industrial, agricultural and scientific fields. More than 850 of them have been brought to the United States where they are trained along with American skilled workers. They usually are here for one to two years. They make their own way, their average pay being around $150 a month. The project, aimed at stimulating industrialization in the Latin Americas, is under Administrator Elliott S. Hanson, former United States Steel Corp. executive.

Special Request

Hans Klagsbrunn, executive vice president, Defense Plant Corp., has been asked by the Murray War Contracts subcommittee, Senate Military Affairs Committee, to compile a list of patents and processes developed through operation of government-owned plants during the war, and to draft a recommended policy for disposing of government-owned plants, machinery, and processes to small business.

Difficulties Encountered

The Senate Small Business Committee is running into difficulties in attempting to vest the Smaller War Plants Corp. with authority for the disposition of government-owned plants and machinery. Administration spokesmen so far have made a pretty good case for confining such disposition to the administrative agency most interested, under the overall supervision of the Surplus War Property Board. They would limit the SWPC to making recommendations to the agencies owning the particular property involved.

Appalling Discourtesy

Government investigators of small business report that the practice of tie-in sales is widely prevalent despite the OPA ban. Typical instance is purchase by a tailor of coat hangers and paper bags from the same supplier despite the fact the paper bags could be had elsewhere at a lower price; this supplier is the only one offering coat hangers and will not sell one item without the other.

Investigators find the reason it costs so much to get household durable goods repaired these days is because most distributors have to live largely on their repair business in the absence of sales commissions on new products. Frequently investigators are able to clear up misunderstandings which make it difficult for merchants to obtain repair parts. A radio and phonograph retailer complained that he had been unable to repair a phonograph for an old customer because he could not obtain a new part. The original part had been lost and the supplier refused to furnish a new part unless the original part was turned in. The investigator found that under WPB order L-265 the supplier is authorized to supply the new part if the dealer furnishes him with a certificate stating the original part to have been lost.

Air Library

The new assistant secretary of commerce, William A. M. Burden, is the owner of what probably is the largest privately-owned library of books devoted to air travel and the aviation industry. This was acquired not only during several years when he served as special aviation assistant to the Secretary of Commerce, but in previous years when he served as an aviation consultant to banks and other interests. In his new capacity, Mr. Burden has responsibility for supervising the Civil Aeronautics Board, the Coast and Geodetic Survey and the Weather Bureau.

LEGAL OBSTACLES

William L. Clayton, surplus war property administrator, is encountering many difficulties because of legal obstacles which hamper government agencies in reporting what property is surplus or obsolete. He now is working with these agencies and with the War Production Board to cut through this problem to the end that surpluses may be disposed of speedily and put to use. Mr. Clayton is believed to possess full authority to make decisions but is prepared to seek legislation from Congress if he feels it necessary. He also is having difficulty in attempting to formulate any policies with respect to disposing of government-owned plants. One difficulty is that only a few manufacturers have made overtures to acquire these plants. Either they do not see any profitable postwar employment for them for one reason or another, or they are unwilling to buy them at prices based on wartime costs. Many of them are not located at sites chosen because of competitive advantages.

Brazil's Diesels

Delivery of the first diesel engines ever made in Brazil was celebrated recently with a special ceremony and exhibition. They were built at shops of the Brazilian Central railroad for a submarine chaser which is being constructed wholly from Brazilian materials. Sixteen diesels in all are being fabricated. A feature of the ceremony was the placing of emphasis on the strides being made in Brazil in manufacturing many new products.

Chile Plans Improvements

The Chilean government, according to announcement by Abraham Alcaino, minister of public works and communications, Santiago, will spend about $15,000,000 during the next three years on railroad electrification, and almost two-thirds of this sum will be spent in the United States for electric locomotives, cables, cars, transformers and other machinery and equipment. The country will need some 250,000 tons of steel rails to complete the Chilean section of the international railroad between Antofagasta, Chile, and Salta, Argentina. Another proposal now approaching the placing of contracts is construction of a $6,000,000 subway in Santiago.

More Films Available

Four new films prepared for war workers now are being readied for distribution by the War Department's Bureau of Public Relations. They are titled: "Soldiers Without Guns," "Earth Movers," and film communiques 6 and 7 which are made up of action pictures from the various war areas.

Element of Danger

Under a proposal by Sen. Edwin C. Johnson (Dem., Colo.), the President, by executive action, could make members of his cabinet completely accountable to Congress and thereby "remove the element of danger in a fourth term." Without legislative action, the President, said Senator Johnson, could require any cabinet member to appear before the House whenever the House desired an accounting. Any member of the cabinet thus called, he proposes, should be required to "stand or fall" on a vote of confidence.

"If such a system were in effect today," he said, "doubtless three, and perhaps four, cabinet officers would fall, and all the other cabinet officers would sit up and take notice."

Eliminate Paper Labels

Beginning at once, the Army Quartermaster Corps will require that all paper labels be eliminated from cans of food packed for the government. This is because labels frequently come off cans' contents. Also, labels retain moisture and in humid climates stimulate rusting with possible damage to contents. Hereafter packers are to print or lithograph the cans with statements as to contents and, if facilities are available, to use a rust-inhibiting paint or lacquer to protect the outer surfaces. The Quartermaster Corps will attempt to have coating facilities provided in all canneries engaged in filling overseas canned food requirements. In the event the can coating program cannot be entirely completed, uncoated cans properly marked but without paper labels, will better meet climatic conditions in overseas theaters.

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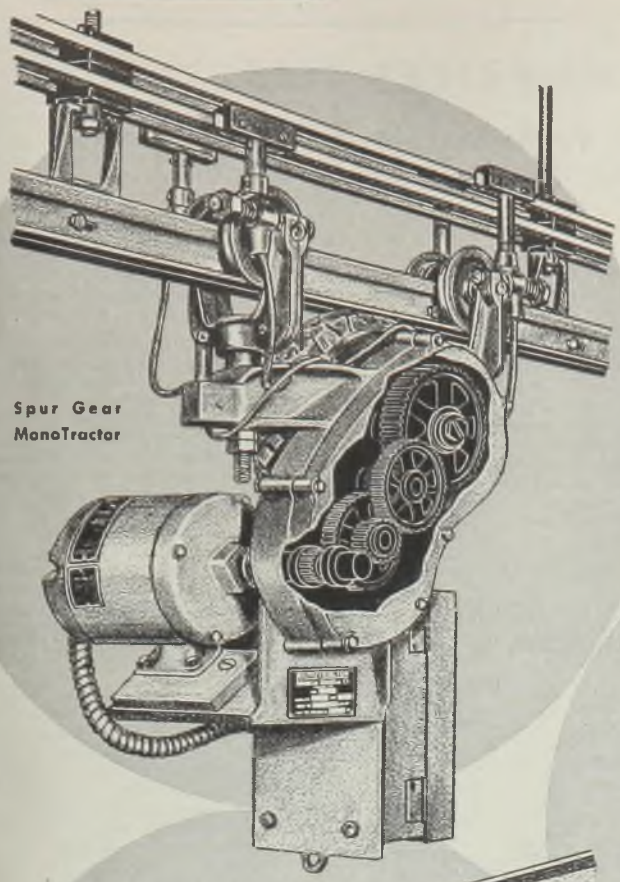
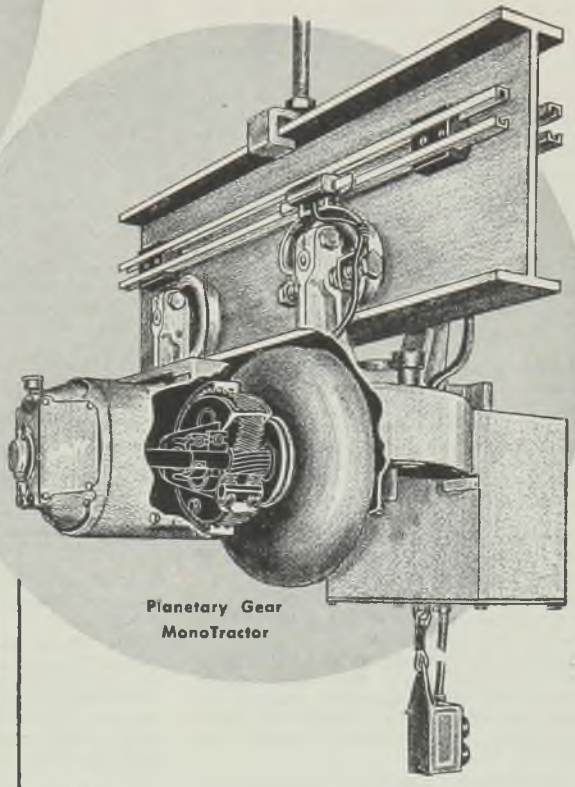
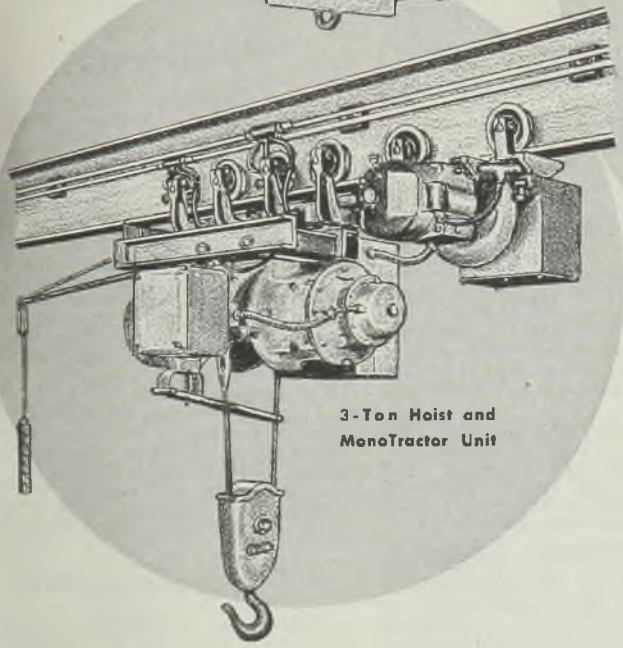


Spur Gear MonoTractor



Planetary Gear MonoTractor



3-Ton Hoist and MonoTractor Unit

AMERICAN MonoTractors with pneumatic tires inflated against the bottom of track provide transportation for carriers, hoists, and cranes. Increased tractive contact of the tire against the flat rail furnishes greater draw-bar pull required to handle heavy loads up or down grades and around curves, under perfect control. Compact electrification, together with many exclusive control features of the American MonoTractor, permits the application of automatic equipment to handling problems in nearly every industry. Costs are reduced in direct proportion to the number of man-hours saved.

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13102 ATHENS AVENUE CLEVELAND 7, OHIO

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

ELEVATOR PARTS: Provision of order L-89, permitting acquisition of $500 worth of elevator parts on an AA-5 or better priority rating, refers to materials for maintenance and repair. Labor cost for installation need not be included in this maximum dollar allowance. In the event any repairs costing more than $500 for materials and labor are designated as minor capital additions, the elevator owner must obtain approval of his order. If repairs are carried on the books of the owner as a maintenance charge, the maintenance repair order provisions will suffice as approval for his order.

MRO QUOTAS: An increased quota authorization, specifically granted for other than special circumstances, such as retooling, may be used by the person who has received it for all quarters subsequent to the one for which it was originally authorized. However, in the case of seasonal businesses, the increased quota may not be used for each succeeding quarter, but only for the quarter of the succeeding year corresponding to the quarter for which it was granted.

CMP REGULATIONS

CLASS A PRODUCTS: Small order procedure in regulation No. 1 of the Controlled Materials Plan may be used now in placing orders for class A products containing up to 10 tons of either carbon or alloy steel while the limit on aluminum which may be contained in class A products purchased under the procedure has been increased to 2000 pounds. A new limit of 1000 pounds has been established for copper wire mill and brass mill products, while the limit on copper and copper-base alloy foundry products remains at 300 pounds.

Purchases of class A products under the small order procedure are still subject to the other restrictions in the regulation.

Provisions of CMP regulation No. 1 with respect to sample orders have been revoked. Persons who desire controlled materials for testing and experimental purposes may obtain them under the provisions of order P-43. (CMP No. 1)

REPAIRMEN: Repairmen, including persons who recondition or rebuild damaged or used items for resale, may use materials and parts which they purchase under the procedure outlined in CMP regulation 9A to carry on such reconditioning or rebuilding. However, they may not use such materials or parts to replace material or parts which are still usable nor to replace material or parts solely to improve the original design of the article being reconditioned or rebuilt.

Repairmen are prohibited from using the AA-3 preference rating which it assigns to obtain the following items: Capacitors, microphones and loudspeakers, resistors, transformers, tubes and paint. These items are made available to repairmen and retailers on a pro-rata basis.

Distributors who sell copper tubing to automotive, heating and refrigeration repairmen, under provisions of direction No. 1 to the regulation, must reasonably believe that his customer is such a repairman. (CMP No. 9A)

L ORDERS

PLUMBING FIXTURES: Manufacture of cast iron interceptors is now allowed while restrictions limiting the amount of metal permitted in wash fountains have been removed. Use of copper or copper-base alloy trim in any wash fountain, however, still is limited to one pound as under previous restrictions. (L-42)

LIGHTING FIXTURES: Prohibitions have been removed on the use of metal to close the ends of fluorescent lighting reflectors, and in shields, louvers, and baffles. Manufacture of fixtures designed for the following purposes is prohibited, except upon specific WPB authorization: One tube of any wattage, unless the fixture is an industrial portable or an industrial attachable model; a continuous row of single tubes of any wattage; two tubes rated 30 watts per tube or less, unless the fixture is an industrial portable or an industrial attachable model; three or more tubes rated 30 watts per tube or less; five or more rows of tubes of any wattage in either an individual fixture or in a continuous row section.

New fixtures may be sold only to fill rated orders. After getting specific WPB authorization, inventories of completely assembled fixtures manufactured before June 2, 1942, may now be sold to fill unrated orders. Fixtures manufactured from material in inventory on April 20, 1942, may be sold only to fill rated orders.

Manufacturers who need additional allotments of metals as a result of the relaxation of metal restrictions may file interim CMP 4B applications in the nearest field office. Applications for authorizations required under the order are filed in Washington. (L-78)

PAPER MILL MACHINERY: Dollar value of repairs and maintenance parts for paper mill machinery has been increased from $1000 to $2000. However, under MRO ratings an amount of more than $2000 may be spent in the event of an actual breakdown or suspension of operations. Form WPB-1319 must be filed for all applications for equipment and machinery. Such applications for equipment costing less than $2500 may be filed with WPB field offices, but applications for equipment valued at more than $2500 must be mailed to the Paper Division, WPB, Washington. (L-83)

REFRIGERATION EQUIPMENT: Restrictions have been removed on both the use of seamless steel tubing and the wall thickness of the tubing permitted in the manufacture and maintenance of coil or tube assemblies for refrigeration condensers and coolers. It is estimated that this action will result in an increased use of about 300 tons of seamless steel tubing per quarter. (L-126)

AUTOMOTIVE PARTS: Producers of automotive parts have been authorized to set up a "band" for the production of truck and bus replacement parts on orders for civilian use and on other orders for automotive parts, as class B products, and in so doing to disregard priorities and CMP regulations. It may only be applied in any one-month period against automotive facilities which would otherwise be scheduled by the producer to be utilized 95 per cent or more in the production of a particular part on class A orders.

Protection is provided against interference with production of orders for the armed services by requiring any parts producer to notify WPB whenever it appears to him that the application of the 5 per cent reservation will interfere with military production. (L-158)

ALARM CLOCKS: Manufacturers of spring-driven and electrically-operated alarm clocks are being assigned individual quarterly quotas for production and delivery of this product. Production will be authorized so as to avoid increased labor requirements in labor shortage areas. Alarm clocks may not be made in plants where such production would interfere with other war production. Only alarm clocks with movements and cases approved by WPB may be made. Approval of models will be based largely on economy of production and minimum use of critical materials. Manufacturers may be required to sell specified quantities of clocks to nonproducing manufacturers who are in a position to facilitate distribution. No preference rating is required for the purchase of alarm clocks. (L-275)

CONTAINER MACHINERY: Leased container machinery requiring factory rebuilding or reconditioning now may be exchanged for new, reconditioned or rebuilt units of the same size and type without the necessity of first obtaining a preference rating order. Container machinery may be transferred within a plant or a single corporate enterprise or between majority-owned subsidiaries or branches. (L-332)

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M ORDERS

STEEL STRAPPING: Steel strapping now is permitted for domestic shipments of 90 pounds or less. (M-261)

GENERAL SCHEDULING: Table 14 to general scheduling order M-293 now includes a new column which indicates the number of calendar months for which a delivery schedule of class X products may be frozen under terms of the order. The following products are frozen for two months: Metal pipe fabricated beyond rolling mill shapes for resale to installers, excluding pipe only threaded, cut-to-length or bevelled by the manufacturer; boilers and boiler units, excluding steel, low-pressure types to carry less than 15 pounds per square inch; steel boilers for pressures over 15 pounds a square inch of water tube, but with under 500 pound square feet of heating surface, of water tube, Scotch marine, horizontal return tubular, refractory lined firebox and oil country types; and steel boilers of all sizes to carry over 15 pounds per square inch of pressure of the steel firebox, vertical and miniature types. (M-293)

PRICE REGULATIONS

SECONDARY ALUMINUM: Ceiling price of 15.00c a pound has been established for a new grade of aluminum alloy ingot, alloy No. 356. Specifications for the alloy are as follows: copper, 0.20 per cent; silicon 6.50-7.50; iron 0.40; magnesium 0.20-0.40; manganese 0.1; zinc 0.1; chromium 0.1; titanium 0.2; total others 0.1, each 0.05; aluminum, the remainder. (No. 2)

COIL BEDSPRINGS: Maximum prices for double deck coil bedsprings with metal frames have been established at $12.75 at the retail level. (No. 213)

Field Offices To Process More Construction Requests

Arrangements are being made to grant the War Production Board's field offices the right to process applications

for priority assistance on form WPB-541 (formerly PD-1A) involving $25,000 or less and applications for construction of facilities involving $100,000 or less. Field offices will continue to have authority to grant the right to use the Controlled Materials Plan MRO symbol on WPB-541 applications.

WPB field offices will be permitted to process applications for amending original authorizations to increase the cost of a project to more than $100,000. However, the effect of such an amendment, together with all previous amendments, may not be to increase the cost of the project by more than 50 per cent of the cost estimated in the original application for the project.

Eight classes of applications for construction of facilities have been added to the types which field offices are prohibited from processing.

Battery Manufacturers Seek Modification of Restrictions

Electric storage battery manufacturers, through their representatives on their industry advisory committee, have requested the War Production Board to lift restrictions on the production of batteries by plants located in critical labor areas. Under restrictions imposed by order L-180, all manufacturers of batteries in critical labor areas are prohibited from producing more than 100 per cent of their total output for either 1941 or 1943, whichever is higher.

Standard Form of Contractor's Report Prescribed by Government

Filing is mandatory to comply with statutory provisions of 1943 Renegotiation Act. . . Must be accompanied by financial statements. . . Estimate by contractor as to segregation of renegotiable and non-renegotiable business will be accepted

WAR CONTRACTS Price Adjustment Board has prescribed three separate "Standard Form of Contractor's Report" which must be filed to comply with the statutory filing provision of the 1943 Renegotiation Act. One form is for use by persons principally engaged in manufacturing and general business, other than the activities listed below; another form is for use by construction contractors, architects and engineers; and a third for agents, brokers and sales engineers.

Financial statements, consisting of balance sheet, income and profit and loss statement, and a surplus statement for the calendar year 1943, or for the latest complete fiscal year, must be attached to the contractor's report.

A careful estimate by the contractor as to the segregation of his renegotiable and non-renegotiable business will be accepted. Under the definition of "subcontract," profits on the production and sale of articles required for the performance of another contract or subcontract are subject to renegotiation, as well as profits on the production or sale of all materials, down to and including raw materials, except certain specified products. It was pointed out that the fact that articles are sold under price ceilings fixed by the Office of Price Administration or as the result of competitive bidding does not exclude the sale of such article from renegotiation.

Must Report Costs

If the contractor performed under one or more cost-plus-fixed-fee direct contracts or subcontracts subject to the Renegotiation Act, during his latest closed fiscal year, he should report in a separate statement the total of his billings, costs, and net fees thereunder. If he is unable to report costs, an explanation of the reasons therefore should be submitted.

Overall cost of manufacturing products sold under fixed price contracts or in the regular course of business (but not to cost-plus-fixed-fee contracts) must be reported in percentages as to materials used, wages and salaries, and other costs.

Each report must indicate which of the specified governmental agencies and its subdivision had the greatest interest in the contractor's business subject to provisions of the act.

Additional information must be given regarding the contractor's products sold or services rendered entering into renegotiable business; salaries and other compensation paid to the officers and employes (not exceeding five) who received $10,000 or more per year; estimated cost of facilities furnished or financed by the government; whether net profit before federal taxes on income, as shown in the accompanying financial statements, differs by more than 5 per cent from net income shown by the federal income tax returns filed or to be filed for the year; whether charges for postwar conversion, or reconversion, inventory reserves, contingencies or other items not deductible for tax purposes are included in costs and expenses in the accompanying financial statements; whether there were changes in the form of control of the contractor's organization; and whether the contractor has entered into a formal agreement or received an authorized clearance notice under the Renegotiation Act with respect to any of the past fiscal years.

Section B of the report provides for the optional reporting of information regarding the contractor's prewar business, his subsidiary and affiliated companies, etc.

CMP Delivery Regulations Clarified

SOME misunderstanding of provisions of CMP regulation No. 1 which govern deliveries of materials, have been clarified by Walter C. Skuce, director, CMP Division, WPB. Although interpretations Nos. 7 and 9 to the regulation recognize that some production processes are of such nature that practicable minimum production quantities must be produced so that the war effort will not suffer loss of manhours and production facilities' time, these interpretations do not place in a producer's hands the right to ship quantities of materials in advance of delivery dates requested by the customer or in quantities greater than are agreed upon by the producer and the customer in the original contract.

"These interpretations point out," Mr. Skuce said, "that a purchaser may order and receive quantities of materials or products which represent minimum practicable production runs from his supplier. In these instances, the producer is permitted to ship such quantities in accordance with shipping schedules agreed to and specified by his customer. However, the supplier may not ship quantities of materials or products in excess of the amounts or at earlier dates than are agreed upon.

"In order to co-ordinate these provisions with inventory restrictions, it is permissible to construe the inventories involved as 'practicable minimum working inventories reasonably necessary to meet deliveries.' Thus, in such cases there will be no violation of WPB inventory restrictions, if two rules are recognized:

"1. The customer is not required by any WPB order to accept more materials than are covered by his purchase order. However, he has the right to order the minimum production quantity which the producer is authorized to make and ship to meet the customer's requirements if it is not practicable for the customer to get this item from any supplier in the small quantities which he presently needs.

"2. A supplier may reject his customer's order if it is less than the minimum which he regularly sells---. The supplier does not have to accept orders which either total less than a minimum production run or which call for individual deliveries of less than a minimum production run.

"Furthermore, the customer's right to accept deliveries of materials or products at earlier dates than they are actually needed does not affect the contractual relationship between the customer and his supplier in any way. . . ."

Accident Prevention Programs A

Industry intensifies efforts to reduce accident toll to minimum with problem complicated by addition of thousands of inexperienced workers. Boeing Aircraft Co.'s policy provides typical example

AMONG major problems of the metal producing and metalworking industries as they press facilities to the utmost in the production for war is that concerned with the elimination of accidents through the promotion of safety programs.

The importance of the problem is seen in the fact that industrial accidents since Pearl Harbor (to Jan. 1, 1944) totaled 37,600 killed, 7500 more than the nation's military dead in the period; 210,000 permanently disabled and 4,500,000 temporarily disabled, 60 times more than the military wounded and missing.

Much has been said about lost production through strikes, but according to the Office of War Information, war plant injuries account for four times as many lost man-hours as work stoppages, with manufacturing industry reporting 50,000 workers absent every day because of accidents. It is estimated that deaths and injuries on the job occur at the rate of 270,000,000 lost man-days yearly, equivalent to the loss of 900,000 production workers. At the same time, it is estimated accidents cost employers an average of $35 per year for every worker employed.

Safety Programs Enlarged

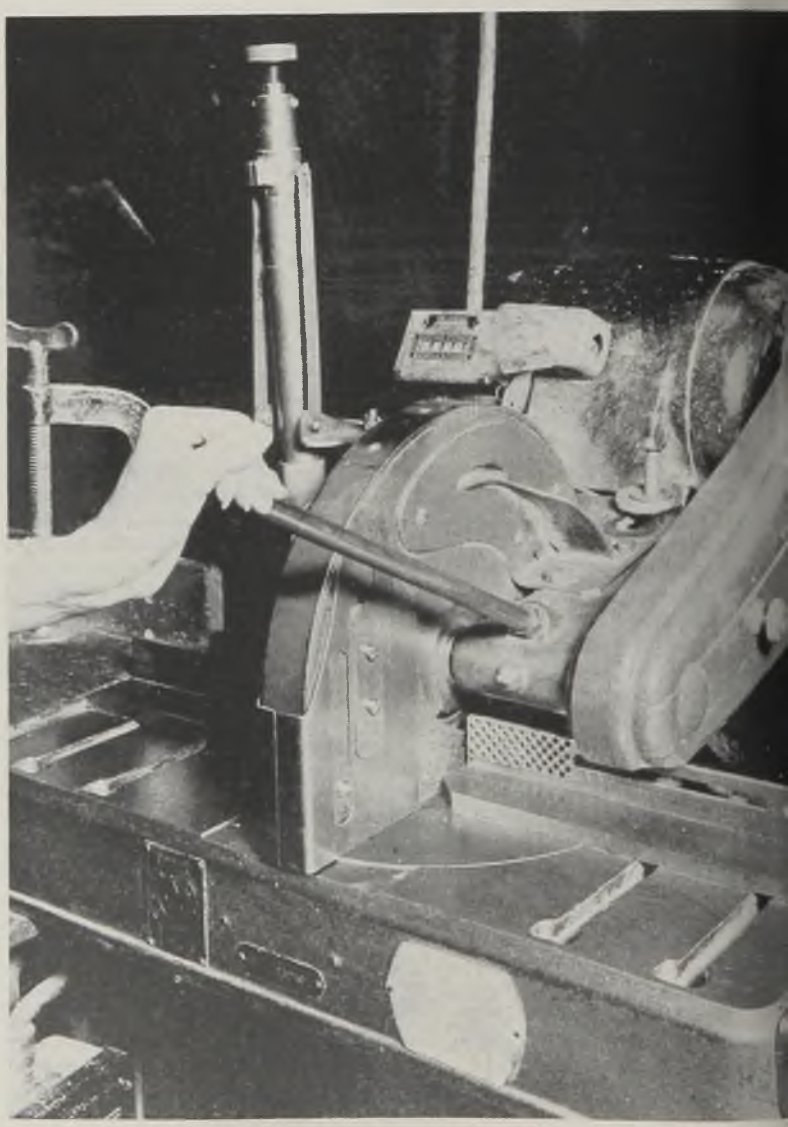
In recent years considerable progress has been made in cutting down industrial accidents. With the outbreak of the war and the upsurge of production bringing into industry many inexperienced workers, industry's safety programs have had to be enlarged and intensified. The effort has borne fruit as evidenced by the facts deaths due to accidents are only two-thirds as frequent per 100,000 workers in World War II as they were in World War I.

Co-operation among the various safety agencies, management, labor and government has worked wonders in holding down the accident toll. In the main, however, success of the safety program rests with industry, the burden of promoting safety and providing the devices which protect workers in the performance of their jobs being carried by the individual plants. Indicative of the way the modern metalworking plant is promoting safety is the program being aggressively pushed by the Boeing Aircraft Co., Seattle.

As part of an exhaustive campaign to reduce factory accidents to the minimum, Boeing engineers over the past few years have designed hundreds of machine guards and other safety devices for equipment used in the manufacture of Flying Fortresses and other planes.

Boeing inaugurated a policy of making its own safety equipment primarily because it was found that available stock models were not flexible enough to meet the variety of machine operations required in airplane building. It was necessary later to expand this program when the manpower crisis resulted in the hiring of thousands of unskilled men and women workers. Safety equipment which had been adequate when machines were operated by men with some or extensive, mechanical background were found woefully inadequate when these machines were in the hands of inexperienced operators, some of whom never had seen a power tool, let alone operate one.

"This program of Boeing-designed and custom-built safety equipment is a continuous one," explains Vincent Anderson, Boeing safety engineer. "We constantly are surveying our machines to see if any improvement can be made in their protection devices. In addition,



With this guard for a metal-cutting saw, designed and built by Boeing Aircraft Co., Seattle, it is impossible for the hand of the operator to come in touch with any moving part. Since the guards were installed there have been no injuries

ushed

design changes in the Flying Fortress often call for different tooling and then we find we may have to alter the protection equipment or build new units."

The safety equipment building program is conducted through close co-operation among the Boeing safety, tooling, plant engineering and maintenance departments. After a survey is made by safety engineers, the problem is turned over either to the tooling or plant engineering department for study and design. Then either the tooling or maintenance department builds the device, if that is decided upon.

In some cases a survey will show that a guard for a machine is impractical because an adequate guard would slow production too much. If possible, in such instances, the machine is redesigned to remove the hazard.

Mr. Anderson said Boeing's policy of building much of its own safety equipment has paid handsome dividends in reducing accidents. This, in turn, has conserved valuable man-hours.

Types of safety equipment which Boeing engineers have designed have been varied. Some of it has been complicated and some exceedingly simple. The objective always has been to make a machine as near 100 per cent accident-proof as possible. To this end, for example, a separate guard was made for each die on one punch press.

One group of swing saws used at Boeing to cut metal was equipped with standard, or stock model, safety devices but accidents to operators were found numerous. Tooling engineers designed a guard which made it impossible for the hand to come in touch with a moving part of the machine. This guard has been in use for more than a year and there has not been a single accident on saws equipped with it.

On a punch press, through which strips of aluminum are fed, it was found difficult to devise a guard which would not interfere with production. In this case, a pair of mechanical fingers was designed so the operator would not have to touch the metal to guide it through the press.

This device is shaped much like an old-fashined pistol. The handle is of pistol-grip shape and a trigger operates the two fingers at the barrel end of the tool. Pulling the trigger tightens the grip of the finger on the metal.

The shop in which these mechanical fingers are used has set a record of 18 months without an accident.

In another instance, a high accident rate was noted on a numbering press. The numbering die raised one inch from the material between each numbering operation and many fingers were hurt when they got under the die on the downward stroke. Here again difficulty was experienced in designing a guard which would not interfere with production. The solution was to change the crankshaft of the machine so the die raised only one-eighth of an inch between each operation. It was impossible then for a finger to slip under the numbering die.

One of the safety devices designed by the Boeing Aircraft Co., Seattle, is this mechanical-finger tool which operators use to guide aluminum strips through a punch press. No injuries have been reported on these machines since these "fingers" were installed

Protection for Unskilled Workers

Accidents on this machine not only were prevented, but the operators, confident they could not hurt themselves, were able to speed production materially.

"The war brought about a manpower crisis which, in turn, gave safety engineers a big problem," Mr. Anderson declares. "They had been dealing for years with men trained in mechanical skill who knew the dangers of power machinery and made allowances for them. Then came this influx of unskilled workers who had to be given protection.

"The safety engineers found themselves in the position of having to provide absolutely fool-proof safeguards. They had to go beyond state safety code requirements, for state codes were not written to cover this emergency."

As near as possible, each new employe is given individual instruction in ordinary safety practices.

Posters can be very effective or they can be of questionable value, depending on how they are used, Mr. Anderson believes.

"The posters chosen," he says, "should carry messages which apply to the plant in which they are displayed. This brings individual safety problems home to the worker. Too many posters, too, can spoil the effect of a poster campaign. At Boeing we have selected a few central points for our poster displays and we probably use fewer than most plants of our size."

Information supplied by an Industrial Publication

Properly used, the salt bath is a very effective means of preventing decarburization of high speed, carbon, and alloy steels during heat treatment. The following suggestions are offered as an aid to effective high speed tool steel heat treatment.

1. Clean work thoroughly. 2. Immerse in a preheat salt at 1500-1650° F. 3. Transfer to high heat bath at 2150-2250° F. 4. Immerse in quench bath at 1100-1200° F. After cooling to room temperature, wash in a hot alkaline cleaner, then reheat in salt to 1100° F.

To secure maximum pot life, (up to 3 years) use salts that are chemically neutral with refractory pots, and desludge bath periodically. Molten salt seals off all atmosphere, therefore decarburization, carburization, pitting, etching, or other surface defects can be avoided by using a suitable chloride salt and adding an acid rectifier. Several preparations are available containing rectifiers.

Adequate circulation in the bath is necessary to insure uniform temperature and prevent overshooting. Externally heated pots are not practical at high temperatures, so internally heated electrode baths, preferably with automatic, or electromotive, circulation are regarded as the most effective for mass production.

By A. H. ALLEN Detroit Editor, STEEL

MIRRORS of MOTORDOM

Resumption of passenger car production involves tremendous amount of preparation. Hundreds of outside suppliers necessary before assembly line can function. Machine tools are No. 1 reconversion problem

PARAPHRASING the old spiritual intoning how "everybody talkin' 'bout heaven ain't goin' there," it might be observed that a good many people talking about production of new automobiles "ain't goin' to be building none" and therefore have only the remotest concept of what is necessary preparatory to getting production under way once more. This calls for a little basic thinking on the realities of automotive production—materials, equipment, processes and plant.

To simplify the picture, an automobile can be broken down into a body, a chassis (frame, wheels, springing and steering gear), and an engine and a power train (transmission, driveshaft, differential and rear axle). To manufacture these basic components, the well-integrated manufacturer must operate certain types of facilities. Thus, the body will require a press shop, with a complete range of presses from the large steel top presses down to the small punch presses, body panel subassembly and assembly jigs, welders and the necessary painting and paint oven equipment.

As of the moment, most of the automotive body press shops are in a sad state of disarrangement, with a number of presses removed for other departments on war production, others set to one side, still others transferred outside buildings and more just gathering dust. However, it would not take long to reassemble these departments and for the most part the dies are ready to be put back into the presses. Most body assembly jigs are still available, although many would have to be rescued from "inventory" and rebuilt. But this type of equipment can be put together in a hurry. Welding machines and equipment likewise probably could be restored to service without too much delay. Paint spray booths and baking ovens have in many cases been disassembled and thrown to one side but they are not too complicated and could be re-installed in good order. Thus, as far as bodies are concerned, if the plant space is available, the body lines could be back in production in a matter of weeks.

But it takes more than just some painted steel to make a body. There is the matter of glass, window regulators, die cast hardware, rubber molding, glass channels, fiber board, upholstery cloth, seat cushions and springs, floor coverings, instruments and a hundred other items which have to be contracted for and delivered by outside suppliers who are now virtually 100 per cent swung over to some war activity. How soon they could be back at work on automotive contracts is problematical. True, there is a heavy volume of replacement parts production being handled by outside suppliers, but they are not in all cases the original suppliers of these parts, and might have difficulty in assuming any new production load.

Now consider the chassis. Frames usually have been supplied on the outside by companies like A. O. Smith, Midland Steel Products, Murray Corp. and others. Their frame-building machinery has been built up over the years to a marvel of speed and automaticity. Whether it is still intact is doubtful; if not, its re-installation would be slow. Wheels and springs should cause relatively little concern from either the time or material standpoints. More delay would be encountered in re-establishing steering gear sources, because of the extended amount of machining they involve.

Three Principal Engine Requisites

Turn next to engines. Mass output of passenger car engines has three principal requisites—foundries, forge shops and acres and acres of co-ordinated machine tools. Gray iron foundries supplying blocks, heads, flywheels and housings largely have been closed down, but the equipment and the patterns are readily available. Buick's gray iron foundry already is on the verge of resuming limited production, though not on automotive castings. It will furnish cylinder blocks and heads for an engine being used in invasion barges. The large Dodge gray iron foundry has been operating right along on truck engine castings and could be supplying passenger car engine parts within a few weeks, as could the Pontiac foundry. The Chevrolet foundry is idle, though the equipment has not been seriously disturbed except for that section of the foundry converted to magnesium casting.

Forge shops are probably in the best shape of any of the basic automotive departments as far as reconversion is concerned. About all that is necessary is to change the dies in hammers and trimming presses and they are ready to go. However, they are busy now on war orders, for truck and aircraft engine forgings, as well as some aircraft aluminum forgings.

When you come to machine shops, the problem really is tough. The vast automotive machining departments have been completely broken up, with every single one of hundreds upon hundreds of machine tools removed or relocated for war production. General Motors estimates, for example, that out of its 75,000 machine tools formerly used on all types of automotive work, 50,000 were converted to war production, 3000 were disposed of to other producers, and 60,000 more government-owned machine

OLDSTERS: To provide employment for men well past the usual retirement age, but whose loyalty makes them eager to aid the war production effort, the Studebaker Corp., South Bend, Ind., assigns oldsters to truck parts counting jobs. Members of above quartet all have passed the three score and ten mark

NEW COMBAT VEHICLE: Designated the M8, this armored car is the latest addition to United States Army mechanized equipment. It was designed to combine the speed and maneuverability of the automobile with the punch and armored protection of the light tank. A 6-wheel vehicle, the M8 mounts a 37-millimeter cannon and 0.30-caliber machine gun. Official Army Signal Corps photo

tools thoroughly mixed in with its own property and scattered all over GM's original peacetime plants and the 12,000,000 square feet of war-built plant.

To get back to a reasonably exact facsimile of former automotive production, and to lay the groundwork for a 50 per cent expansion from the previous peak level, the corporation estimates it will have to clear out all especially designed government tools from the plants which will accommodate automotive work, replace or recover essential machines transferred to other producers, and purchase something like 45,000 new machine tools. Meanwhile, something will have to be done with the inventories of raw materials and parts in the plants, which at the present time amount to about $500 million.

Chrysler Corp. reports its inventories of raw and semifinished materials held against war contracts amount to $150 million, and further that another $500 million purchase commitment has been made for supplies and raw materials, the latter doubtless reflecting the enormous appetite of the Dodge Chicago engine plant which is slowly coming into higher production.

So, by all odds, the problem of sorting out, relocating, reassigning and refitting machine tools is the No. 1 automotive reconversion problem. All else pales into insignificance beside it. Machine tools are, in a sense, the production lines behind the assembly lines, and without them the assembly lines are meaningless. Take a simple little thing like a transmission pinion shaft. It is a snap job to shear off a bar of steel and whack it to rough shape in a forging hammer, but after that 35 or 40 separate machining operations have to be organized, each with its own machine tool spotted in proper sequence to facilitate material handling. Then each lathe, slotter, gear cutter and grinder must have its special tooling, and there must be fixtures to hold the part—perhaps 200 individual tooling units in all, plus perhaps 150 gages to check the part in progress.

Machine Tools Very Important

Machine tools are not only highly important in production of engine components, but in the manufacture of clutch, transmission, differential and axle elements as well. Most departments in the plants of all manufacturers where these units formerly were produced have been completely uprooted, and their restoration is a matter not of weeks but rather of months.

Alternative to this delay would be to attempt contracting the work on the outside, a plan which has occurred to at least one manufacturer who contacted sources in the machine tool industry and found them unenthusiastic about taking on such work.

With these complicated problems confronting automotive plants which are backed by 40 years of know-how, the odds against any new car manufacturers appearing on the scene mount appreciably, at least over the next few years. For a time it was thought that the Michigan Kaiser Co., formed here, might be forerunner of an eventual move by Henry Kaiser into automobile manufacturing. These prospects have dimmed considerably following transfer of the company's activities to Bristol, Pa., home of the Fleetwings division of Kaiser Cargo Inc. And the West Coast aircraft companies now seem to be veering more in the direction of postwar prefabricated housing than toward automobiles.

Karl Probst, generally credited with being the father of the original jeep built in 1940 by the American Bantam Co. in Butler, Pa., and for many years an ardent advocate of removing weight from automobiles, has moved to Bristol with Michigan Kaiser Co. and presumably will continue his engineering work on the small-size jeeps developed six months ago for Army Ordnance.

Rumblings are heard of a proposal to organize and endow an independent Detroit research organization of the type of Battelle Memorial Institute and the Mellon Institute for Industrial Research. It is felt that industries here could profitably support the work of a well-staffed research group such as this, and ample capital should be available to provide a comfortable endowment. Research studies by local colleges and universities are on a puny scale and equipment is meager, in comparison with wealth and extent of industry in the area. Only the University of Michigan at Ann Arbor is capable of handling major research programs, but the fact that it is an institution of learning hampers the efficiency and speed of completion of such programs.

Detroit industry, both large and small, could well afford to back a large, independent organization devoted exclusively to carrying out assigned research projects with an automotive flavor. Its findings would serve to advance the automotive industry and to improve the position of Detroit as an automotive research center. There should be little trouble in obtaining the financial backing of philanthropic groups like the Rackham interests, the Ford foundation and numerous others.

United States Rubber Co. will begin at once the erection of a textile plant at Scottsville, Va., to supply 12,000,000 pounds of twisted rayon tire cord annually. Cost of the DPC-financed project will be $2,240,000, and about 300 will be employed at full operation by October. Twisting and weaving machinery, as well as extensive materials handling equipment will be installed.

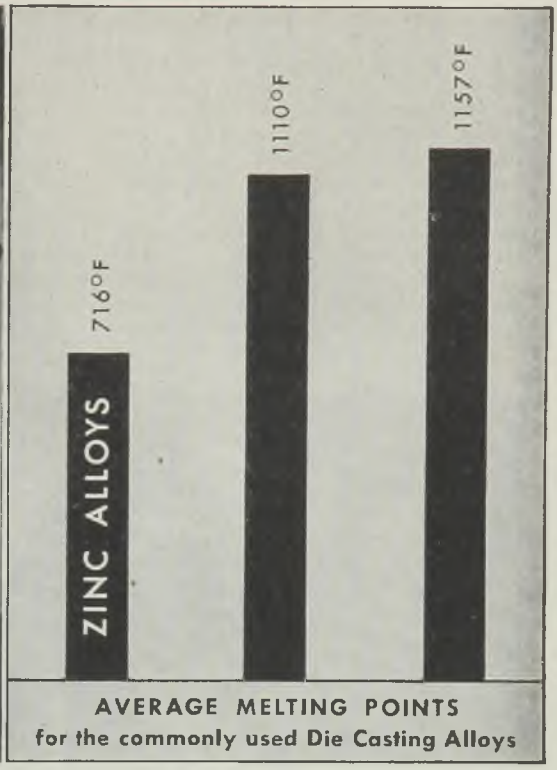
Machine Tool Distributors To Meet May 25-26

Maj. Gen. Levin H. Campbell Jr., chief, Army Ordnance, will speak at the war conference of the American Machine Tool Distributors' Association at French Lick Springs Hotel, French Lick, Ind., May 25-26.

John S. Chafee, director, Tools Division, WPB, will speak at the morning session on May 26. A. G. Bryant, chairman of the association's committee on government relations, will talk about Washington developments and J. Roy Porter, chairman of the planning committee, will discuss postwar disposal of surplus machine tools.

716°F.

—LOW MELTING POINT OF ZINC ALLOY HAS ENABLED THIS DIE TO PRODUCE OVER 2,000,000 DIE CASTINGS



AVERAGE MELTING POINTS
for the commonly used Die Casting Alloys

The two zinc alloy die castings in the photograph above are exact duplicates of the more than 1,000,000 pairs of castings already produced in this same die.* Long die life is just one of a number of economic advantages resulting from the lower melting point of the zinc die casting alloys.

Because low casting temperatures are used with zinc alloys, the die is not subject to the rapid erosion or heat checking common in the casting of higher melting point alloys. And low casting temperatures also mean lower fuel and cooling water costs. Furthermore, easily machined die steels can be used with zinc alloys and casting can be done in high speed machines. Alloys of higher melting point must be cast in hardened dies and in slower machines.

These economic factors, combined with exceptional physical properties, normally make zinc alloy die castings the most widely used. *Every die casting company is equipped to make zinc alloy die castings,* and will be glad to supply you with additional information—or write to The New Jersey Zinc Company, 160 Front Street, New York 7, New York.

**The two castings illustrated constitute a housing for a metal rule. Note the engraving on the exterior and the assembly elements on the interior.*

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WING TIPS

New California-built model B-25 Mitchell bomber carries 75-millimeter cannon and fourteen 0.50-caliber machine guns. Reputedly is most heavily armed plane in world. Second model produced in Kansas packs twelve 0.50-caliber guns

TWO new models of the North American B-25 Mitchell bomber are now in production at the company's Kansas and California manufacturing divisions, one reputed to be the most heavily armed airplane in the world.

Built at the company's Kansas plant is one version carrying twelve 0.50-caliber machine guns in addition to its normal bombardment equipment. The Pacific Coast plant is producing another model which is equipped with fourteen 0.50-caliber machine guns and a 75-millimeter cannon, supplementing bomb-carrying facilities.

Two distinctive features of both models are the relocation of the upper gun turret from the center of the fuselage to a point near the pilot's section, and the addition of the tail turret with two guns between the bomber's twin rudders.

Both versions also carry two fixed "package" guns on each side of the fuselage outside the pilot's section, an innovation for the B-25, and two flexible waist guns protruding from either side of the fuselage, which replace lower turret guns used on earlier models.

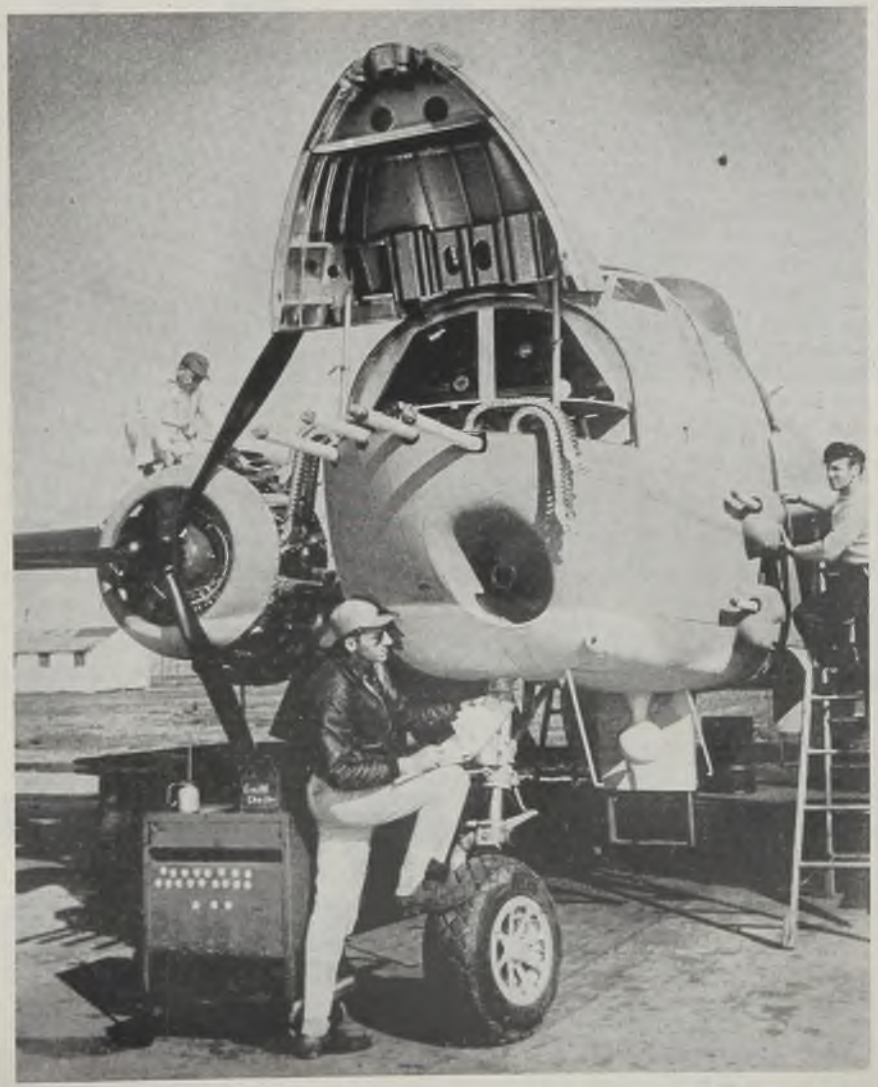
Principal difference between the two models is in the fuselage nose structure. The B-25's being built in Kansas are equipped with a conventional nose containing a bombardier's compartment and mounting one fixed and one flexible 0.50-caliber gun.

Retaining the all-metal nose first introduced in the B-25 last year, the California-built bombers have four forward machine guns in addition to the 75-millimeter cannon.

To effect the additional armament installations in the California plant required a total of 94,000 engineering man-hours since the cannon was installed in the previous model. The work required a total of 7666 engineering drawings. An estimated 250,000 engineering man-hours went into the latest Kansas model, requiring 8000 engineering drawings.

The tremendous forward firepower in both new types enable the B-25, during a bombing run on a ground or shipping target, effectively to neutralize antiaircraft positions. The bombers likewise are expected to prove even more devastating than previous models as low level strafers when hitting gun emplacements, trains, troops, air planes on the ground and other vital military targets. Some idea of this hitting strength may be gained from the fact that eight 0.50-caliber machine guns can fire more than 9000 half-inch slugs per minute.

The new position of the upper turret, carrying twin electrically-powered machine guns, enable the gunner to cover antiaircraft emplacements during a low bombing run, or train his guns on enemy airplanes approaching from directly overhead, behind, or from the sides.



The automotive influence on bomber design is noted here as the "hood" of a California--built B-25 Mitchell is lifted for servicing the ammunition compartments of the 0.50-caliber machine guns in the nose, below which is the 75-millimeter cannon. Also shown are the B-25's new side "package" guns

"Package" Guns Fired by Pilot

The "package" guns on both planes, the fixed gun installed in the one airplane's plastic nose enclosure, and the four 0.50s and the cannon in the nose of the other type, are fired in each case by the pilot. The bombardier operates the flexible machine gun in the transparent nose of the Kansas version. In both models, the flexible "waist" guns and the tail guns can be fired through a wide arc above or below, or to the side.

Both bombers carry considerably more armor plate than previous versions in order to afford maximum protection for the crews and to protect vital accessory equipment.

Speed and range of the bomber have not been affected by the installation of the extra machine guns in the bombers.

Crew for the B-25 manufactured in Kansas, includes pilot, co-pilot-navigator, bombardier, upper turret gunner, waist gunner, and tail gunner, while the California-built bombers carry a pilot, upper gunner, cannoneer-navigator, waist gunner, and tail gunner.

The twin-engine B-25 represents probably the most modified type of airplane in existence as North American has spent hundreds of thousands of engineering man-hours and made thousands of changes in drawings to fit the bomber for diversified tactical operations carried out on all fronts.

Power plant for the medium bomber comprises two Wright Cyclone R-2600 twin-row radial engines in semi-monocoque nacelles below extremities of the

In addition to the many standard SPEED NUTS, there are hundreds of other shapes and types designed to perform multiple functions and combine several fasteners into one. These SPEED NUTS, wherever used, reduce the number of parts in an assembly and eliminate the unnecessary handling of extra parts.

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center section. Propellers are three-bladed Hamilton-Standard hydromatic feathering and constant speed type. Wing span is about 67 feet, length 53 feet, height 16 feet. Weight empty is around 20,000 pounds, loaded over 30,000 pounds.

Designing the B-25 as an entry in a regular Army Air Corps competition in 1939, North American was awarded a contract in September of that year, one of the largest ever written up to that time. A completed structure was ready on July 4, 1940, for static tests at Wright Field, and the first B-25 was flown Aug. 19, 1940, nearly four years ago.

Consolidated Sponsors San Diego Improvement

Plans for construction at Lindbergh field, San Diego, Calif., of a new 8500-foot runway, which will make San Diego's municipal airport one of the largest and finest in the country, have been submitted by Consolidated Vultee Aircraft Corp, to contractors for bids following approval of the project by the Navy Department and the War Production Board.

The new runway will parallel the present east-west runway and will extend across the present west boundary of the field onto property now included in the Marine base.

6500 Thunderbolts Completed by Republic

Alfred Marchev, president, Republic Aviation Corp., told stockholders at their annual meeting that in less than 24 months since the first production model was completed, over 6500 P-47 Thunderbolts have been delivered to the Army Air Forces by the company's Farmingdale, N. Y., and Evansville, Ind., divisions.

Aircraft Scheduling Unit Presses Surplus Materials Disposal

WARTIME utilization of idle surplus material in aircraft contractors' plants is being accomplished on an expanded basis by the Army Air Forces Materiel Command through broadened operation of the Aircraft Scheduling Unit at Wright Field, O.

Objective of the ASU, acting under authorizations granted by the War Production Board, is to insure the use wherever possible of existing material while the need for it exists. Much of this material would probably have no place in a peacetime economy and either must be employed in war production or scrapped later.

In furthering its purpose, the ASU operates through the Materials Distribution Branch of the Production Division, Materiel Command.

Illustrative of the operation of the program is the situation on the West Coast. There the Army Air Forces Western Procurement District in conjunction with the Aircraft War Production Council, West Coast Inc., conducts weekly meetings in Los Angeles. At these meetings representatives of the aircraft companies in the area present lists of idle surplus material and their production requirements. The production requirements are screened against available surplus materials with the result that many thousands of dollars are saved.

In the East a somewhat similar procedure is in effect through the co-operative activity of the AAF Eastern Procurement District and the Aircraft Producing Council, East Coast Inc.

The WPB has made it possible for exemptions to be obtained for material involved so that it may be channeled into immediate production. The Materiel Command has also established contacts with the Air Service Command, Aviation Supply Office, Signal Corps and other technical services, and appropriate civilian and governmental agencies to determine their needs which may be filled with available surplus material.

Through liaison established with government agencies at Washington, the Materials Distribution Branch of the Materiel Command is kept advised of authorized civilian production.

How well inter-contractor transfers of surplus materials have worked is shown by the following tabulation of basic materials transferred through coordinating service of the Materials Distribution Unit:

Material	Weekly average for January	Weekly average for February	Total Sept. 1, '43 March 25,1944
Steel tubing, ft.	357,446	472,869	7,786,079
Other steel, tons	1,633	1,723	34,862
Aluminum tubing, ft.	672,543	495,472	12,094,374
Other aluminum, lbs	1,432,863	1,522,605	33,044,610
Copper Tubing, ft.	354,521	245,728	4,132,717
Ins. copper wire and cable, ft.	.....	348,231	18,805,028
Other copper, lbs.	116,971	221,710	3,174,775
Aircraft hardware:			
Rivets only, lbs.	81,755	142,125	3,382,562
Components, pcs.	1,044,192	1,658,659	17,089,465
Except rivets, pcs.	34,035,925	29,869,452	557,836,950

They Say:

"Unless labor and management devise the instruments for specific settlement of disputes, the public will insist—and rightly so—on settlement by legislative compulsion. Whether labor-management relations will be kept on a voluntary basis or be ruled by government depends on ourselves."—**Eric Johnston,** president, Chamber of Commerce of the United States.

o o o

"Labor has a vital stake in the problem of meeting competition, and it must take stock of itself and determine what is best for its own interest, and whether three-quarters of a million high-paying jobs are better than 1,000,000 good-paying jobs. Capital must have a fair reward, and capital, if it is to be employed in the railroad industry, will demand good credit."—**William White,** president, Delaware, Lackawanna & Western railroad.

o o o

"Unless reconversion is accomplished speedily, we will have the longest breadline in our history. . . Decisions as to clearance of government property from plants, and settlement of war contracts, must be made promptly and acted upon with finality. Settlement agreements that are tentative only and which cannot be acted upon until reviewed by another agency would slow down the termination procedure and seriously retard the postwar employment."—**Henry E. Bodman,** Automotive Council for War Production.

o o o

"If the public is deluded by dream planners' promises of jobs for every one, it will become so disappointed with the transition period that they will holler for government help. The enterprise system might never get its chance to function successfully. . . . We have all the ingredients present for unusual prosperity. We must put them together correctly."—**Robert Gaylord,** president, National Association of Manufacturers, and president, Ingersoll Milling Machine Co., Rockford, Ill.

Testing for HARDENABILITY

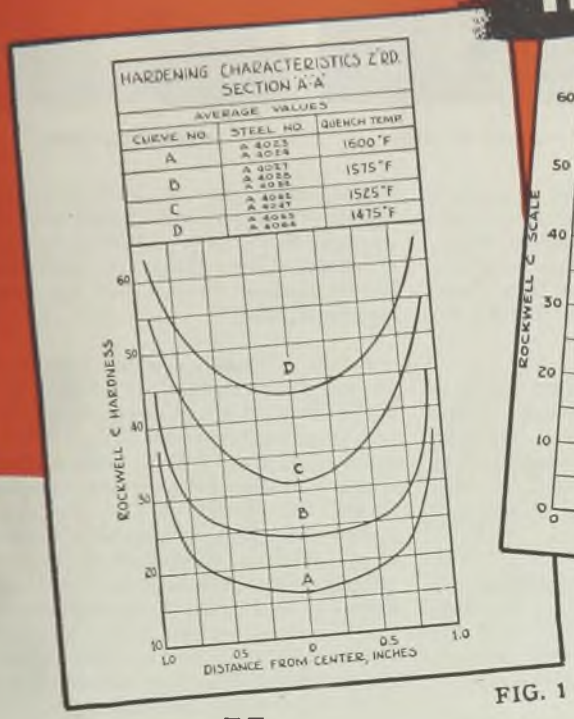

FIG. 1

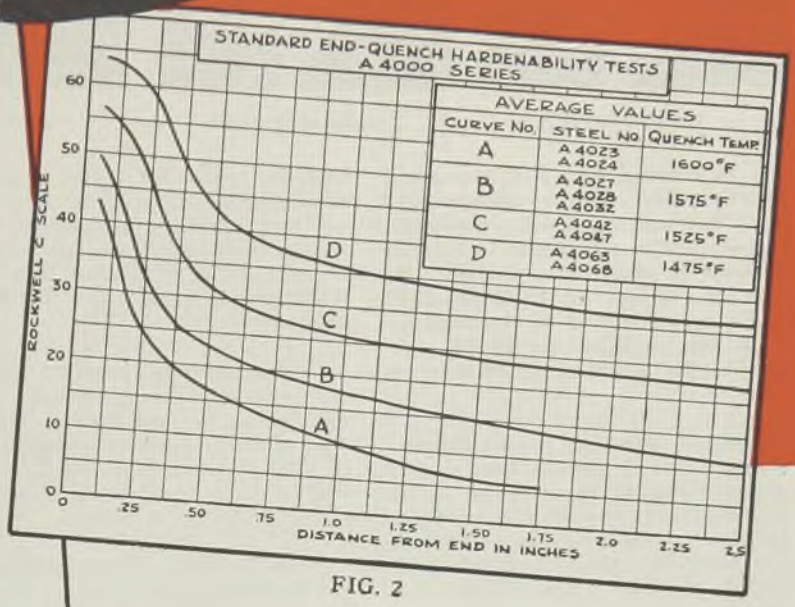

FIG. 2

Hardenability is defined as that property of steel which governs its hardening behavior in any size of section or type of cooling medium. Current interest in hardenability testing originates from the need for a reliable index of the response of steels to hardening.

One method of determining hardenability consists of quenching a cylindrical specimen from above the critical temperature range. Rockwell "C" hardness readings taken at intervals along the diameters of the cross-section will produce the familiar U curves shown in Fig. 1. Such curves, together with the quenching data, establish the hardenability of a steel.

Another method is the Jominy end-quench test. In this test a standard specimen is water quenched under prescribed conditions so that the cooling water impinges on one end until the entire specimen is cooled. After suitable surface preparation, Rockwell "C" hardness readings taken along the length of the specimen give the data from which curves can be drawn as in Fig. 2.

The interpretation of hardenability data and their application to both design and production problems has been the subject of considerable study and research by the Timken technical organization, who invite you to consult with them on your metallurgical problems. Steel and Tube Division, The Timken Roller Bearing Company, Canton 6, Ohio.

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MEN of INDUSTRY

E. B. WINNING

GORDON LEFEBVRE

FRANK M. BLUM

ROBERT S. ARCHER

E. B. Winning, since 1933 manager of Republic Steel Corp.'s northern coal mines, has been appointed to the newly-created position of assistant to the vice president in charge of operations. Mr. Winning will supervise all of Republic's mining operations. **J. L. Hamilton** succeeds Mr. Winning as district manager of the corporation's Pennsylvania mines.

—o—

J. A. H. Paterson, general manager, Mining Corp. of Canada, has been appointed Canadian representative on the copper committee of the Combined Production and Resources Board and the Combined Raw Materials Board of the United States, the United Kingdom and Canada.

—o—

R. F. Onsrud has been elected president and general manager of Onsrud Machine Works Inc., Chicago. **O. Onsrud** has been elected board chairman, **J. Knox,** secretary and **T. W. Foote** and **H. R. Krabol** have been re-elected vice president and treasurer, respectively.

—o—

Daniel D. Eyster has been named treasurer and manager of Acro Welder Mfg. Co., Milwaukee. Formerly Mr. Eyster was staff engineer on special assignments and welding methods for Nash-Kelvinator Corp., Detroit.

—o—

Cecil W. Armstrong, formerly senior research engineer of Lockheed Aircraft Corp., Burbank, Calif., and chief engineer of Marco Chemicals Inc., Sewaren, N. J., has been appointed chief development engineer, Plastics division, Continental Can Co. Inc., New York.

—o—

Dr. Willard Henry Dow, president and general manager of Dow Chemical Co., Midland, Mich., has been selected to receive the Gold Medal Award of the American Institute of Chemists for the year 1944.

—o—

S. T. Stugart has been appointed purchasing agent, Tube Reducing Co., Stamford, Conn., and Passaic, N. J., and **W. J. Binns** has been made assistant purchasing agent. Mr. Stugart was formerly associated with Lycoming Manufacturing division, Aviation Corp., and with Lawrence Aeronautical Corp., and Mr. Binns previously was in charge of purchases for Wallington Tube Corp., Wallington, N. J., subsidiary of Tube Reducing Corp.

—o—

Gordon Lefebvre, president and general manager, Cooper-Bessemer Corp., Mt. Vernon, O., and **Fred V. Gardner,** head of the management consulting firm of Fred V. Gardner & Associates, Milwaukee, have been elected directors of National Tool Co., Cleveland.

—o—

Frank M. Blum, assistant manager of the P&H Crane Sales division, Harnischfeger Corp., Milwaukee, since 1938, has been named manager of that division, succeeding **Ben Van Horn,** retired.

—o—

E. S. Weidle has been appointed vice president in charge of sales, Pittsburgh Steel Foundry Corp., Glassport, Pa., and **Walter White** has been named vice president in charge of production. Mr. Weidle was formerly general sales manager and Mr. White was plant manager.

—o—

Harry E. Smith, general manager of the Manhattan Rubber Mfg. division, Raybestos-Manhattan Inc., Passaic, N. J., and **Robert B. Davis,** general manager of the corporation's Raybestos division in Stratford, Conn., have been elected vice presidents.

—o—

Henry F. Binder, who for many years has been affiliated with the headquarters sales department of the Locomotive and Ordnance division, Baldwin Locomotive Works, Eddystone, Pa., has been transferred to the Chicago district office.

—o—

Harold Kingsmill, president of Cerro de Pasco Copper Corp., New York, has been elected to the board of Grace National Bank. Mr. Kingsmill is also a director of Homestake Mining Co. and American Metal Co. Ltd., New York.

—o—

Edgar K. Mull has been appointed chief metallurgist, Barium Stainless Steel Corp., Canton, O. Mr. Mull previously had served as chief metallurgist at Rustless Iron & Steel Corp., Baltimore; Bendix Radio Corp., Baltimore, and Darlington Rustless Steel & Iron Co. Ltd., Darlington, Eng.

—o—

Robert S. Archer, who has been chief metallurgist of the Chicago district, Republic Steel Corp., Cleveland, for the past 10 years, has joined Climax Molybdenum Co., New York, as metallurgical assistant to the vice president. During World War I Mr. Archer was connected with the metallurgical laboratory of the Bureau of Aircraft Production in Detroit. In 1919 he joined the Aluminum Co. of America, becoming head of the Cleveland section of the Research Bureau before he left in 1930 to take the position of director of metallurgy for A. O. Smith Corp., Milwaukee.

—o—

Laurence B. Hume, formerly service engineer at the Washington office of Cooper-Bessemer Corp., Mt. Vernon, O., has been assigned as supervisor in the installation, maintenance and repair of the company's diesel engines for the United States Navy. In his new post, Mr. Hume has been given the rank of technician, USN, and will represent the Bureau of Ships in foreign service.

—o—

Bernard F. Stolinsky has been elected board chairman of Pipe & Tube Products Inc., Reading, Pa., and Jersey City, N. J. Previously, Mr. Stolinsky had been vice president of the company.

—o—

Lou F. Kinderman, associated with the steel industry for many years in construction of steel mills and as a sales representative, has been appointed sales manager, Rail & Industrial Equipment Co., New York and San Francisco. Mr. Kinderman will be located in the New York office.

—o—

W. W. Scull has been appointed manager of the synthetic rubber plant being operated at Port Neches, Tex., for the government by B. F. Goodrich Co., Akron, O. Mr. Scull succeeds **W. J. Piggott,** who has resigned to go into

LAUSON STONE

JOHN FOLLANSBEE

THOMAS F. WILSON

JOHN M. SMITH

business for himself. **John D. Beebe** has been named manager of the company's new rubber suspension sales department, and **Charles W. Staacke** has resumed his duties as belting sales engineer after many months on special war assignments.

—o—

Lauson Stone, president of Follansbee Steel Corp., Pittsburgh, since November, 1942, has been elected chairman of the board as well as president of the corporation, to succeed **John Follansbee** as board chairman. Mr. Follansbee continues as a director and will be available for consultation by the corporation. He became a salesman for Follansbee Bros. Co. when it was organized in 1894, later was made general sales manager, then vice president in charge of sales, a director, and in 1927 was elected president. In 1940 when the company was reorganized as the Follansbee Steel Corp., he relinquished the presidency to become board chairman.

—o—

George Spatta, executive vice president and general manager of Clark Equipment Co., Buchanan, Mich., has been honored by the National Association of Foremen in recognition of "meritorious service" to the association.

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Dr. John Fairfield Thompson, executive vice president of International Nickel Co., New York, has been awarded the 1944 Egleston Medal of the Columbia University Engineering Schools Alumni Association, for distinguished engineering achievement.

—o—

Bernard J. Conway, formerly in charge of all metal finishing operations for Proctor Electric Co., Philadelphia, has become a member of the engineering and service staff of Udylite Corp.'s New York office. Mr. Conway will be in charge of territory in southeastern Pennsylvania and southern New Jersey and will make his headquarters in Philadelphia.

—o—

E. L. Foreman has been appointed manager of the newly-opened Los Angeles branch office of Whitman & Barnes, Detroit. Mr. Foreman was previously manager of the Whitman & Barnes' New York branch. **Lee W. Shetler** will be Mr. Foreman's assistant in the Los Angeles and southern California area, **B. J. Rohde** represents the company in San Francisco, northern California, Utah and Nevada, while **W. H. Dick** handles the Oregon, Washington, Montana and Idaho territory. The Los Angeles office is located at 2305 East Eighth street.

—o—

Thomas F. Wilson, who has served continuously with American Car & Foundry Co., New York, since 1916, with the exception of service with the United States Navy during World War I, has been appointed assistant to the president, Frederick A. Stevenson. Mr. Wilson had been Mr. Stevenson's assistant before the latter's recent election to the presidency of the company.

—o—

R. A. McCarty, vice president of Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., in charge of subcontracting activities, has been granted a leave of absence to assume the post of special assistant to **Maury Maverick,** chairman and general manager of the Smaller War Plants Corp., Washington. **Andrew H. Phelps,** vice president in charge of purchases and traffic for Westinghouse, will direct the subcontracting department at company headquarters during Mr. McCarty's absence.

—o—

Howard C. Wick, since 1916 secretary of American Car & Foundry Co., New York, has been appointed executive assistant to the executive committee, which office has been combined with that of secretary of the company. **H. H. Pancake** has been assigned to the company's Pittsburgh district sales office as sales engineer, and **J. F. Miller** has been transferred from Pittsburgh to the Berwick, Pa., plant for sales engineering work. **J. A. V. Scheckenbach,** recently elected vice president, has been placed in charge of manufacturing, and also will supervise improvements and maintenance in all company plants.

—o—

Dr. Willis R. Whitney, honorary vice president of General Electric Co., Schenectady, N. Y., and first director of its research laboratory, has been made an honorary member of the Electrochemical Society. A charter member of the society, Dr. Whitney was its president in 1912.

—o—

John M. Smith has resigned as general manager of manufacturing, RCA Victor division, Radio Corp. of America, New York, to become vice president in charge of manufacturing for P. R. Mallory & Co. Inc., Indianapolis, Ind. Prior to his 14-year association with Radio Corp. of America, Mr. Smith was affiliated with the Incandescent Lamp division, General Electric Co., Nela Park, Cleveland.

—o—

John Avery has been appointed manager of the blower and compressor department, Allis-Chalmers Mfg. Co., Milwaukee, to succeed **G. L. Kollberg,** who is retiring after 47 years of service with the company. Mr. Kollberg will continue as consultant to the company. Mr. Avery has been assistant manager of the blower and compressor department since 1935.

—o—

John W. White, since 1927 vice president and general manager, Westinghouse Electric International Co., has been elected president and general manager, and **William E. Knox,** formerly assistant general manager, has been elected vice president. For 18 years Mr. White lived abroad, managing affairs in the Carribean, Far East and South America for the company.

—o—

W. J. Schlapman, sales engineer, Young Radiator Co., Racine, Wis., has been elected president of the Racine Chapter, Junior Chamber of Commerce.

—o—

The Franklin Institute, Philadelphia, made the following awards at its annual Metal Day ceremonies April 19: The Francis J. Clamer Medal for meritorious achievement in the field of metallurgy to **Dr. Walther Mathesius,** president, Geneva Steel Co., Provo, Utah; the George R. Henderson Medal to **Joseph B. Ennis,** senior vice president, American Locomo-

tive Co., New York, "in consideration of his accomplishments in locomotive engineering and important contributions in the field of locomotive design"; the Louis E. Levy Medal to **Prof. Stephen P. Timoshenko** of Stanford University, Calif., for his paper "The Theory of Suspension Bridges", published in the Journal of the Franklin Institute, and the Longstreth Medal to **Frank B. Allen,** president, Allen-Sherman-Hoff Co., Philadelphia, in recognition of his inventions and developments in connection with power plants.

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Andrew M. Kennedy has been elected a director of Pittsburgh Steel Co., Pittsburgh.

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Delmar M. DeWolf has been appointed advertising manager of Skilsaw Inc., Chicago. For the past three years Mr. DeWolf has been assistant advertising manager and editor of the company's house organ, the *Skilsaw Blade.*

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W. G. Hassel has been appointed manager of sales, Pittsburgh Crucible division, Crucible Steel Co. of America, New York. **W. W. Noble** succeeds Mr. Hassel as manager of Crucible's Detroit branch, and **John S. Billingsley** has succeeded Mr. Noble as manager of the company's Pittsburgh branch. **Leo J. Rohrer** has been named acting manager of Crucible Steel Company's order and scheduling department.

EDWARD F. WHITTEMORE

Who has been appointed purchasing agent, American Welding & Mfg. Co., Warren, O., as reported in STEEL, April 10, p. 89.

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Arthur F. Skaife, for the past 12 years manager of the San Francisco district for Westinghouse Electric Elevator Co., Jersey City, N. J., has been named to the newly-created post of Pacific Coast district manager. The new position consolidates activities of the company in the Pacific Coast states, five Rocky Mountain and Southwestern states, Alaska and Hawaii. **Gano R. Baker** has been named Southern California manager for the company, succeeding **B. B. Burkett,** resigned.

—o—

A. Maxwell Jones, who resigned last January as vice president in charge of sales, Buffalo Bolt Co., North Tonawanda, N. Y., is now chief of the Redistribution Unit, Bolt, Nut, Screw and Screw Machine Products Section, WPB, Washington.

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C. J. Reese, president, Continental Motors Corp., Muskegon, Mich., has been appointed a member of the National Association of Manufacturers' War Contract Termination Committee.

—o—

James F. Reid, former deputy chief of the Alloy Steel Branch of WPB, has been appointed production manager, Timken Roller Bearing Co., Canton, O. Prior to obtaining leave of absence in May, 1942, to join WPB, Mr. Reid had been production manager of the Steel and Tube division of Timken.

OBITUARIES . . .

J. Byron Henry, well known throughout the steel castings industry, died April 13 in Wheeling, W. Va. Mr. Henry was associated with the Union Steel Casting Co., Pittsburgh, for many years, rising to the position of vice president and general superintendent. He left the company in 1930 to join Standard Steel Works, Burnham, Pa., and in 1933 joined Continental Roll & Steel Foundry Co., East Chicago, Ind., up to the time of his death being identified with the company's Wheeling plant.

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William J. Volkens, for 49 years treasurer, International Register Co., Chicago, died April 15 in that city.

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Paul F. Halverson, 67, president, Beloit Foundry Co., Beloit, Wis., died April 13 in that city. Mr. Halverson was one of the founders of the Beloit Foundry Co.

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Charles Clees Jr., 66, retired president of the former Clees Valve & Engineering Corp., New York, died April 11 in Orange, N. J.

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Michael Klosson, 51, chief engineer of Buffalo Pumps Inc., Buffalo, died April 11 while on a business trip to California. Mr. Klosson joined Buffalo Pumps Inc. in 1920 and was appointed chief engineer in 1929. He was a director of the company, and a member of the American Society of Mechanical Engineers, Society of Naval Architects and Marine Engineers, and the Technical Association of the Pulp and Paper Industry. Mr. Klosson was recognized as an authority on naval engineering and was largely responsible for changes that revolutionized pump design for naval vessels and paper mills.

—o—

Patrick J. Cusack, 76, an employe of the American Car & Foundry Co., New York, for half a century prior to his retirement in 1936, died recently.

—o—

John A. Nicklaus, 68, head of the Nicklaus Boiler Works, Columbus, O., died April 10 when he accidentally touched a 220-volt circuit at his plant in that city.

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Oscar J. Bedford, 48, superintendent of the Scott & Williams Foundry, West Concord, Mass., died recently. Mr. Bedford was an active member of the New England and American Foundrymen's Association.

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William F. Davis, 65, who retired eight years ago from Richards & Co., Boston metal dealers, died recently in Arlington, Mass. Mr. Davis had been associated with Richards & Co. in various capacities for 30 years.

—o—

Theodore G. Joslin, 54, director of public relations, E. I. du Pont de Nemours & Co., Wilmington, Del., and secretary to former President Hoover during his term in the White House, died in Wilmington April 12. A noted Washington correspondent for newspapers and national magazines, Mr. Joslin five years ago became head of the Du Pont public relations department.

—o—

G. H. Stolzenburg, purchasing agent for Precision Metal Workers, Chicago, for 18 years, died recently in Oak Park, Ill.

—o—

George H. Roe, 81, who began his business career at the age of 12 when he became junior partner in his father's steel tape manufacturing plant, died April 12 in Patchogue, L. I. At the time of his death Mr. Roe was a director of the firm, Justus Roe & Sons, which is now manufacturing materials for the War Department.

—o—

P. M. Sharples, 86, who is said to be the manufacturer of the first cream separator in the United States, and founder of the Sharples Separator Co., West Chester, Pa., which is no longer in existence, died April 13 in Pasadena, Calif.

—o—

Ernest L. Pinder, 51, factory manager, Ladel Conveyor Mfg. Co. Inc., New Philadelphia, O., died April 10 in that city.

—o—

Fred M. Emerson, 68, former contract officer in Milwaukee for American Bridge Co., Pittsburgh, and for the past 35 years a consulting structural steel engineer, died April 15 in Milwaukee.

—o—

Raymond W. Frey, 51, a purchasing agent for Eaton Mfg. Co., Cleveland, died recently in that city.

Plant Tour for Machine Tool Engineers Set

Reliance Electric & Engineering Co., Cleveland, arranges open house through its plants to aid postwar engineering

IN A DIRECT effort to assist the machine tool industry in postwar engineering planning, without adding to the already heavy load of wartime traveling, Reliance Electric & Engineering Co., Cleveland, has scheduled a "Seeing Is Believing" open house for machine tool men at its plants in Cleveland, April 29.

This weekend date falls directly between one machine tool conference which closes in Detroit on Friday evening, April 28, and another which opens in Pittsburgh, Monday morning, May 1. Hence, it will be convenient for a considerable number of machine tool men to make the weekend stopover in Cleveland.

Arrangements have been made for stateroom accommodations on the D. & C. boat from Detroit to Cleveland Friday night, April 28, and rooms have been reserved at the Tudor Arms hotel, Cleveland, for Saturday night. Individual demonstrations will be made on April 30 and May 3 for those who are unable to be present on April 29. Program follows:

9:30 a.m.—Welcome to guests by C. L. Collins, president of the company.

10:00 a.m.—Visit to working laboratory, plant No. 1. Demonstration of adjustable speed electrical drive systems as applied to lathes, drilling machines, tapping machines, grinders, and precision balancing equipment. Rapid starting, stopping and reversing performance with multispeed motors.

11:30 a.m.—Visit to experimental laboratory, plant No. 1. Demonstration of three sizes of electronic adjustable speed drive systems, including programming and speed matching performance.

1:00 p.m.—Lunch, company's cafeteria.

2:00 p.m.—Visit to working laboratory, plant No. 2. Use of adjustable speed electrical drive systems on precision boring machines and balancing machines, and on coil and armature winding.

3:00 p.m.—Visit to working laboratory, plant No. 3 (marine division). Demonstration of unusual precision electric motors.

3:30 p.m.—At plant No. 1, progress report and preview of postwar a.c. and d.c. motors.

7:00 p.m.—Visitors will be dinner guests of Reliance officials at Canterbury Golf Club.

Firestone War Products Display Held in Cleveland

An elaborate display of war products manufactured by its subsidiaries was presented at the Hotel Statler, Cleveland, April 13-15, by the Firestone Tire & Rubber Co., Akron, O.

Among the many items produced by the subsidiaries is the 40-millimeter Bofors antiaircraft gun. They recently completed production of the 25,000th gun. The subsidiaries also produce such war products as oxygen cylinders of four different sizes for aircraft, frame rings for electric steel motors, complete idler and bogie wheel assemblies used on such equipment as half-tracs, prime movers for airports, and light and medium tanks.

Various types of wheel rims, bead locks, and bead wedges are manufactured for military and combat vehicles. There were also on display bombs ranging from 500 pounds to the two-ton block buster.

COMBAT REPORT: Ninety per cent of Japanese troop and equipment barges in the New Guinea area were destroyed during the past year, according to Lieut. Comm. John D. Bulkeley, noted PT boat skipper. Commander Bulkeley is shown above inspecting a "cut-away" engine at the Packard Motor Car factory at Detroit as the guest of George T. Christopher, Packard president

Smith & Caffrey Celebrates Fiftieth Anniversary

Smith & Caffrey Co., Syracuse, N. Y., recently celebrated its fiftieth anniversary at the Hotel Syracuse by honoring its employes and their wives, civic leaders, and many business friends.

Tribute was paid to George G. Heidlauf, vice president of the company, for his 50 years of service. David C. Park, company president, with 47 years of service, was toastmaster at the banquet.

The company was organized from the ruins of the former Phoenix Foundry & Machine Co., which was organized in March, 1843. The original company was reorganized in 1888 under the leadership of A. J. Belden and A. C. Belden. It was on April 9, 1894, that William B. Smith and James S. Caffrey formed a partnership to manufacture gray iron castings. The company retained the name of Phoenix Foundry until 1942.

BRIEFS . . .

American Metal Products Co., Detroit, recently published a 44-page brochure describing its plant, equipment and production methods.

—o—

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., reports production of war equipment in March exceeded new orders. Its backlog has remained at approximately $900,000,000 since October, 1942.

—o—

General Motors Corp., Detroit, announces its stockholders totaled 423,780 for the first quarter of 1944, compared with 421,945 for 1943 fourth quarter.

—o—

W. H. Maze Co., Peru, Ill., recently purchased the Filshie Lead Head Nail Co., Chicago. Business and equipment of the Filshie factory has been moved to Peru and is now operating as an integral part of the Maze company.

—o—

Hudson Motor Car Co., Detroit, has published a profusely illustrated brochure reviewing its fourth year of war production.

—o—

Jam Handy Organization, New York, has completed slide film kit-sets on mathematics, air-age physics, and mechanical drawing and drafting.

—o—

Federal Security Agency, Washington, is aiming its nationwide program toward physical fitness as a means of curbing absenteeism.

THE BUSINESS TREND

Peak War Expenditures Force Production Gain

STEADY flow of new orders resulting from peak war expenditures furnished added impetus to production schedules in many war lines during the past week. Additional adjustments in projected war program scheduling continue to be made, but the overall tempo of industrial activity appears to be tending upward. In some important lines new bookings are in excess of shipments, with consequent lengthening of delivery promises.

Steel output remained at near capacity levels during the latest period, with most producers reporting volume of new orders exceeding shipments. There is little prospect current production schedules can be sustained through the summer months if the loss of men to the armed services continues to exceed ability of the industry to replace them.

Bituminous coal production rose to 11,920,000 net tons during the latest week, a gain of 2.1 per cent over the comparable 1943 period.

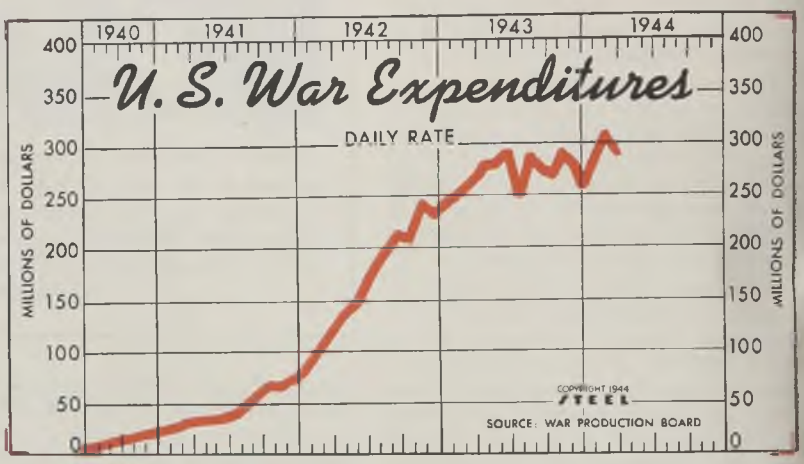
Freight carloadings in the second quarter are expected to be about 3 per cent above actual loadings in like 1943 period.

POSTWAR OUTLOOK—Popular demand for extensive government economic controls is likely to arise in the postwar period unless productive capacity is aggressively used to produce more adequate goods than the masses have hitherto enjoyed, a study made by Brookings Institution indicates. Asserting the American system of private enterprise will face a crucial test after the war, the study says permanent prosperity can be expected only if corporations execute and union officials follow price policies that make for high production. "Sound policy calls for the making of prices at the lowest level of costs attained through capacity operation," the institution states.

STEEL CASTINGS—Output recorded a moderate gain during February to 161,359 short tons, reflecting in part an upturn in new orders to 173,592 tons. Production is well ahead of the like month a year ago, but new orders are somewhat below that period. The industry operated at 74.7 per cent of capacity during February, compared with the peak last year of 85.1 recorded during March.

FOUNDRY EQUIPMENT—This industry reported a gain in new orders during March, but the current level of bookings is less than half that recorded in the peak period registered during March and April, 1942. The Foundry Equipment Manufacturers Association's index on new equipment orders including repairs stood at 498.4 during March, compared with 456.8 in the preceding month.

WAR EXPENDITURES—Reflecting the all-out effort to increase war production on the realigned schedules, war expenditures have moved steadily upward during the past three months and first half of April. Daily rate was off slightly last month, but currently is at an all-time high.



War Expenditures

(millions)

	1944 Monthly Expenditures	1944 Daily Rate	1943 Monthly Expenditures	1943 Daily Rate	1942 Monthly Expenditures	1942 Daily Rate
January	$7,416	$285.2	$6,254	$240.5	$2,193	$ 81.2
February	7,808	312.3	6,081	253.4	2,401	100.0
March	7,948	294.4	7,112	263.4	3,025	116.3
April			7,290	280.4	3,461	133.1
May			7,373	283.6	3,824	147.1
June			7,688	295.7	4,213	162.0
July			6,746	249.9	4,708	181.1
August			7,529	289.6	5,163	198.6
September			7,212	277.4	5,459	218.4
October			7,105	273.3	5,722	211.9
November			7,794	299.8	6,112	244.5
December			6,951	267.3	6,125	235.6
Total		Av.	Tt'l. 85,135	Av. 272.9	Tt'l. 52,406	Av. 169.1

FIGURES THIS WEEK

INDUSTRY	Latest Period*	Prior Week	Month Ago	Year Ago
Steel Ingot Output (per cent of capacity)	98.5	99.5	98.5	99
Electric Power Distributed (million kilowatt hours)	4,307	4,361	4,426	3,917
Bituminous Coal Production (daily av.—1000 tons)	1,987	1,917	2,008	2,028
Petroleum Production (daily av.—1000 bbls.)	4,432	4,416	4,381	3,907
Construction Volume (ENR—unit $1,000,000)	$33.0	$34.0	$44.6	$93.6
Automobile and Truck Output (Ward's—number units)	17,330	18,175	17,605	18,855

*Dates on request.

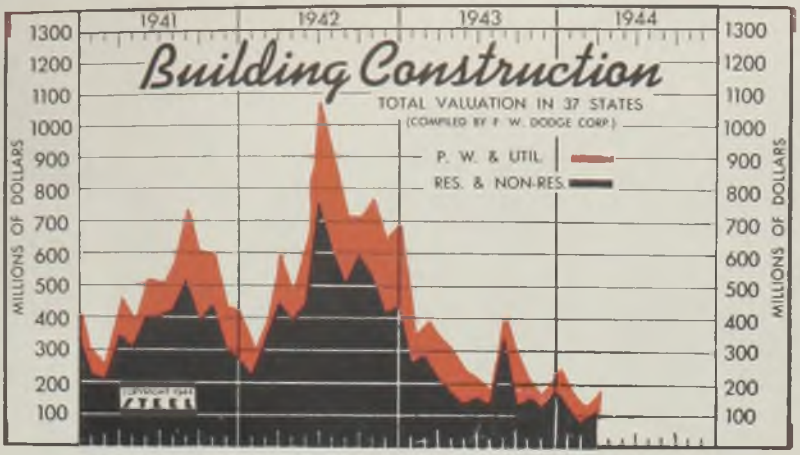
TRADE				
Freight Carloadings (unit—1000 cars)	785†	789	782	789
Business Failures (Dun & Bradstreet, number)	33	37	17	89
Money in Circulation (in millions of dollars)‡	$21,295	$21,191	$20,963	$16,424
Department Store Sales (change from like week a year ago)‡	+31%	+17%	+2%	−7%

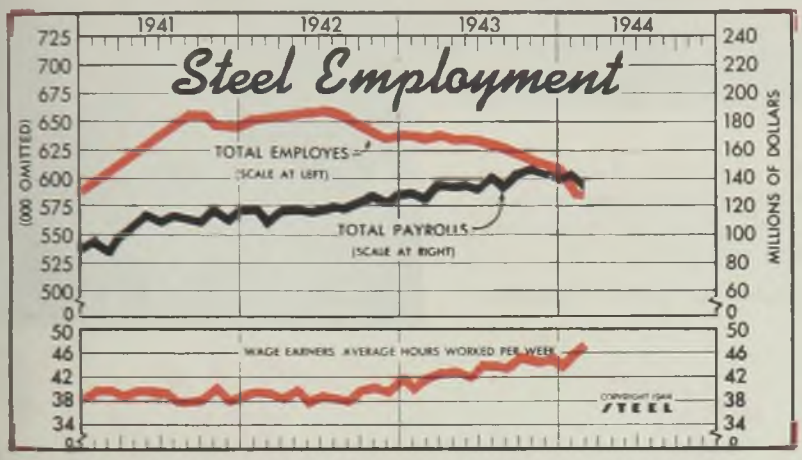
†Preliminary. ‡Federal Reserve Board.

Construction Valuation In 37 States

(Unit—$1,000,000)

	Total	Public Works-Utilities 1944	Public Works-Utilities 1943	Residential-Non.-Res. 1944	Residential-Non.-Res. 1943
Jan.	159.2	50.3	85.8	108.9	264.3
Feb.	137.2	55.1	112.9	82.1	280.5
Mar.	176.4	61.3	123.0	115.1	216.7
April	.....	.....	127.7	.....	175.6
May	.....	.....	95.8	.....	138.6
June	.....	.....	73.3	.....	156.3
July	.....	.....	50.0	.....	133.7
Aug.	.....	.....	73.4	.....	340.3
Sept.	.....	.....	175.1	.....	125.0
Oct.	.....	.....	63.5	.....	150.0
Nov.	.....	.....	59.0	.....	125.4
Dec.	.....	.....	67.4	.....	184.9
Total	.....	.....	1,106.9	.....	2,106.4





Steel Employment

	—Employes— (000 omitted) 1944†	1943	1942	—Total Payrolls— (Unit—$1,000,000) 1944	1943	1942
Jan.	583	637	651	$141.8	$129.7	$118.8
Feb.	583	635	651	137.6	122.8	108.5
March	...	637	653	.....	136.8	117.0
April	...	634	654	.....	133.3	118.5
May	...	632	656	.....	137.4	117.4
June	...	631	659	.....	136.2	118.0
July	...	627	655	.....	142.8	120.7
Aug.	...	625	647	.....	139.9	118.7
Sept.	...	620	641	.....	143.8	124.8
Oct.	...	615	635	.....	144.9	126.6
Nov.	...	611	632	.....	141.5	122.8
Dec.	...	605	633	.....	140.2	129.3

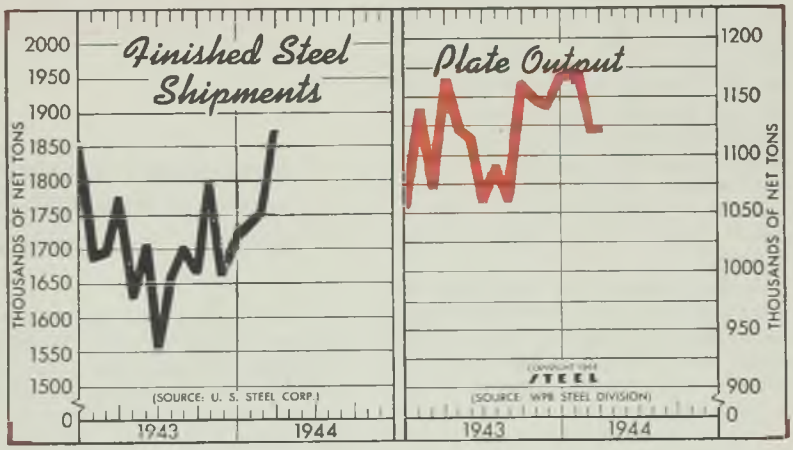
†Monthly average; previous reports showed total number regardless of whether they worked one day or full month.

Steel Shipments†—Plate Production‡

(Net tons; 000 omitted)

	—Shipments— 1944	1943	Plate Output 1944	1943
Jan.	1,731	1,686	1,173	1,135
Feb.	1,756	1,692	1,122	1,072
Mar.	1,875	1,772	1,223	1,168
Apr.	.....	1,631	.....	1,122
May	.....	1,707	.....	1,115
June	.....	1,553	.....	1,056
July	.....	1,661	.....	1,090
Aug.	.....	1,705	.....	1,061
Sept.	.....	1,665	.....	1,106
Oct.	.....	1,795	.....	1,147
Nov.	.....	1,661	.....	1,142
Dec.	.....	1,720	.....	1,169
Total	.....	20,245	.....	13,382

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



FINANCE

	Latest Period*	Prior Week	Month Ago	Year Ago
Bank Clearings (Dun & Bradstreet—millions)	$8,125	$9,218	$9,084	$9,090
Federal Gross Debt (billions)	$187.0	$184.5	$187.4	$120.4
Bond Volume, NYSE (millions)	$52.7	$38.4	$54.0	$75.4
Stocks Sales, NYSE (thousands)	3,395	3,160	6,413	6,513
Loans and Investments (millions)†	$51,633	$52,012	$53,290	$41,646
United States Government Obligations Held (millions)†	$37,961	$38,087	$38,898	$28,998

†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)†	249.7	250.5	250.3	247.1
Industrial Raw Materials (Bureau of Labor index)‡	113.6	114.0	113.2	112.7
Manufactured Products (Bureau of Labor index)‡	100.9	100.7	100.6	100.8

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

Teaching workers and supervision pays out: Before a knowledge of erection and welding sequence was taught, ship bottoms were so uneven large blocks of concrete were used to force buckles out of shell. Now the smooth level bottom shown above is produced every time

Class in human relations (center) employs round-table plan of discussion

Training Welders

Many lessons learned in training men for fabrication of ships on a large scale likely to prove useful to industry in establishing or improving existing production procedures

ENTRY OF the United States into war forced industry immediately to meet unprecedented demands for the implements of war. The call came when industry was geared for civilian production and the first needs were to: (1) Enlarge and extend present facilities; (2) construct additional plants; (3) hire and maintain personnel in greater numbers than ever before; (4) train workmen and supervisors for their respective jobs, without which training it would have been impossible to have accomplished the scheduled production and deliveries.

Welding, which had progressed far in the lean years since 1930, was to play one of the most important parts in this all-out war production. The training of welders and welding supervisors fell, for the most part, into the laps of the individual plants to work out as best they could. The government helped to some degree but was handicapped because with the limitation of time it was impossible to train welders quickly to a degree that would fit them for general welding. There was also the problem of each plant having its own ideas on welding technique.

In the shipbuilding field, personnel for welding training included men and women who had had little or no experience or training in mechanics. Supervisors came, for the most part, from those men who were welders before the war. These supervisors had to be taught steel ship construction, which includes a knowledge of Erection and Welding Sequence which in turn includes Welding Technique, Welding Procedure and Method and Order of Erection, and its co-ordination with Method and Order of Welding.

Training of Supervision: The speedy and economical completion of any welding job depends largely on the men who make up the crew. If these men are inexperienced, something must be done about training them, and quickly. Above all, the supervisors should receive training first.

Most of the old established companies, and some of the newer ones, have instituted nationally recognized foreman training programs. These programs broadly teach the theory of human relations. Now that the old-time Simon Legree type of foreman is gone, it is highly important that supervisors should know more about human relations. Reports indicate such training has produced excellent results and is now considered a necessity.

Some of the newer shipbuilders either have felt their existence in business would not be guaranteed long enough to warrant such a training program, or have not seen the necessity of starting one early enough to gain ample benefits before the expiration of their present contracts.

Under the present emergency, foreman training programs should be a requisite of any prime government contract and the cost borne by the government because the government will be the principal beneficiary. The things learned in each lesson can be immediately put into practice and the adaptability of the supervisor to the training is a good gage of his fitness as a supervisor. The training should go beyond the regular elementary course and should be continuous in the form of periodic open forum discussions.

As for preparing the supervisor to train others, the job instructor training offered by the government is used most widely. Job instruction training is based on the theory that through telling only, the student gains about 5 per cent of

On-the-job instruction, as shown above, is a most important part of the courses

and Supervisors

By M. Q. CELLERS
Seattle

the information it is intended to convey; by showing and telling he gets possibly 50 per cent, and by showing, telling and doing, he may get 85 per cent; then by practicing he gets a possible 100 per cent.

Aside from applying knowledge learned to the job, it is necessary for the supervisor to know how much is being accomplished by the workman per hour or per subassembly or per ship. There are miles of linear feet of welding even in small all-welded vessels and the object is to fabricate, erect and make these welds. Few men are apt to put forth their best efforts if they believe no one knows how much they are accomplishing each day. If it is not possible to get an individual footage check on welders, then a near approach to it by checking the manhours and welding footage or welding rod poundage expended in the fabrication of any piece or subassembly will have to suffice.

Training of Welders: The technical training of welders has never been generalized because in the past too many good welders considered their welding technique their own trade secret. Welding training started out in this emergency handicapped by the fruits of that past sowing.

Most in-plant welding training programs, while they may represent a good course inherently, may differ in many ways from courses taught in government schools. In many instances student welders after getting on the job are required to forget things they learned in pre-employment schools because of the lack of standardization of welding training. For this same reason the government schools are handicapped because of the lack of standardization of training of employers. Each employer has his own instruction methods. In many instances the on-the-job instructors merely teach "welding", which means each instructor has his own method of instruction. This might be all right if the student were to remain under the guidance of the same instructor until he became sufficiently skilled to proceed on his own. If he were obliged to move from one instructor to another, which is a general rule, only confusion and retarding of learning would result.

Welding technique and procedure can be standardized and it is high time this were being done.

The present demand for welders does not allow enough time to teach the use of a variety of electrode types and sizes and several makes of machines, or to acquaint the student with the many conditions encountered on the job. Time can be saved by teaching the use of no more than two sizes of electrodes in all positions. These should be practiced under comfortable conditions until the rudiments become "second nature". Then to the job where specific peculiarities of that job may be learned. In other words the learner should be trained for one particular phase of the job as far as is practicable. Among conditions which may differ from one job to another are: Type and size of machine, type and size of electrode, weight of material, black or galvanized iron, mild or alloy steel, type of construction and condition of fit-ups.

The object of any welding training program should be to turn out welders who are capable of doing the work covered by their schooling. To pass a welding test should not be the goal. The test should come as a matter of course only when the student is considered capable of passing it. Schools have been known to train students only to pass a required test and almost entirely neglect to teach them other common requirements of welding jobs. Such students may be able to make a perfect test plate and still not be capable of turning out a passable job of welding in the field. On the other hand, occasionally the best of welders fail tests, possibly because of overtension as a result of an intense desire to pass due to the extra money involved. The question of keeping a student welder on the job should be decided by the quality of work being done rather than by tests that have been passed.

Welding instruction should be continued for some time after the students

(*Please turn to Page* 146)

What they say about Simplification

EARLE C. SMITH, *Chief Metallurgist,* Republic Steel Corp. . . . .

"One steel producer offers for sale 70,000 different materials and products. Over 1000 common steels are produced according to chemical contents. With certain physical attributes (size, shape, etc.) as important as chemistry, the working group must approach 5000 . . . .

"Simplification of this amazing array is long overdue."

TELL BERNA, *General Manager,* National Machine Tool Builders' Ass'n. . . . .

"The war is giving us a fine chance to make a fresh start in steel simplification, and it wouldn't be a bad idea for us to take advantage of it. We are going to be in a period of intense competition one of these days and will need to conserve every penny that we possibly can save by wise management and careful planning."

A. L. HARTLEY, *Metallurgist,* R. K. LeBlond Machine Tool Co. . . . .

"There are few if any machines that cannot be fabricated satisfactorily from five steel compositions. Supplement these five grades of general-purpose steels with five grades of special-purpose steels and you will usually get a better product built at a lower cost, providing your selection has been done carefully."

STEEL

By G. W. BIRDSALL

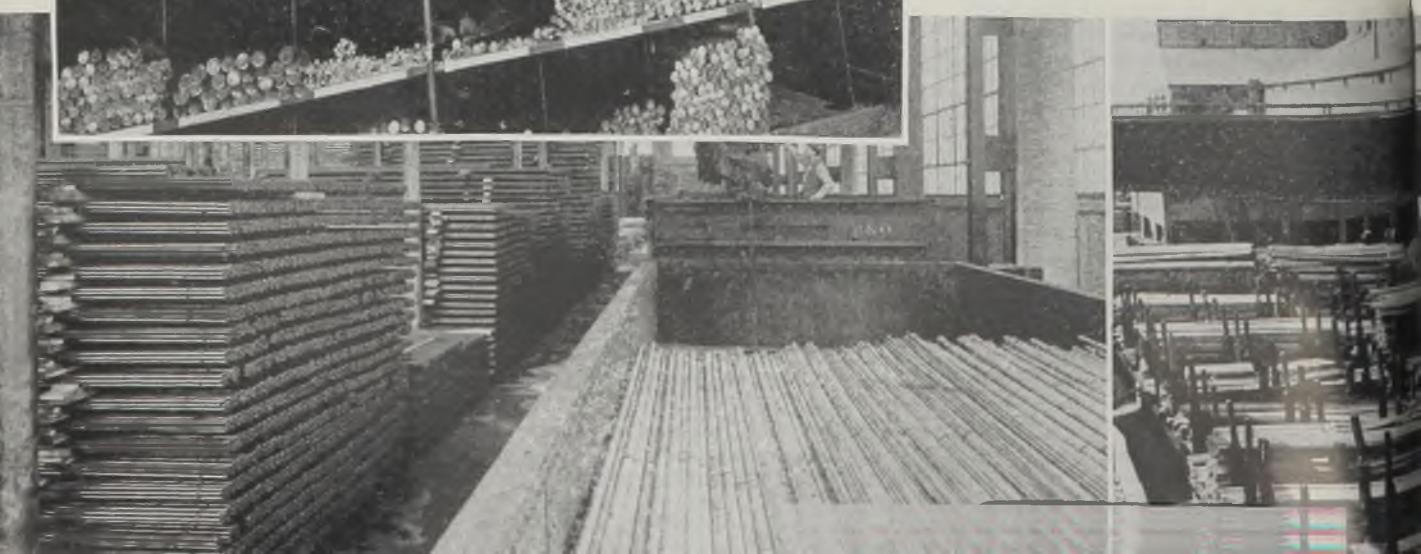
Associate Editor, STEEL

ANTICIPATING a mad scramble for postwar markets, many manufacturers are seeking to better their competitive position by careful scrutiny of every possible means of reducing production costs. So when individual companies report savings up to $100,000 yearly and at the same time obtain important improvements in processing and in the final product, the methods employed would appear to be well worth careful examination at this time.

Any simplification program must necessarily be closely associated with setting up certain standards. For standardization, by eliminating nonessentials, leads to simplification. While standardization to many people implies a certain amount of "freezing", simplification carries with it no such undesirable association, for almost every producer and user of steel will agree that there are too many different steels. (And we are talking only about engineering or constructional type steels; not tool or die steels which would add many more thousands to the steels under discussion.)

A most important step forward in simplification was the setting up of the SAE numbering system, for its use has eliminated much confusion that existed when steels were known primarily by trade names. Most manufacturers have certain limitations within which their designers must operate. When alloy steels were classified under the SAE numbering system (according to chemical content), many large organizations found that they were using overlapping types of steels and so could cut down on the number of different steels used.

Steel Producers' View: Before we see what steel users have done and can do



ES IMPLIFICATION

—a postwar job that every manufacturer can do in his own plant NOW

In addition to government, industry and association projects for simplifying steel lists, the individual manufacturer can improve his product and at the same time lower his costs by developing maximum possibilities of simplification in his own operations.

Direct savings up to $68.80 per ton are reported. One company saves $20,000 to $100,000 yearly. Also many other important advantages accrue

about steel simplification, let's take a look at it from the steel producers' point of view which has been well explained by Earle C. Smith, chief metallurgist, Republic Steel Corp., Cleveland.

"One steel producer offers for sale 70,000 different materials and products. Over 1000 common steels are produced according to chemical contents. With certain physical attributes (size, shape, etc.), as important as chemistry, the working group must approach 5000. . . .

"Simplification of this amazing array is long overdue. . . .

"In making 50,000,000 tons of steel per year, less than two dozen steels are produced in excess of 500,000 tons each per year. . . . These are obviously the significant compositions.

"Less than 200 steels are made in volumes ¼ of 1 per cent or more of the total. This number (200) is ample because the bulk of our business is done with 20 compositions. . . .

"It is difficult to reconcile the limited general knowledge of any given steel with any need for 500 steels. . . .

"Simplification is a big job but it will be done sooner or later," is the conclusion reached by Mr. Smith, see STEEL, June 3, 1940, p. 44-45.

Warehouse Problems: The steel warehouse has its problems, too. It is not unusual for a warehouse with 10,000 tons of steel in stock to list more than 2000 different items. Thus, *the average amount of any one item stocked cannot be over 5 tons.* Result is difficulty may be experienced in filling an order for a few tons if the item is one that has run low.

But perhaps simplification can mean the most to the steel user, for in addition to reducing number of different types, sizes, shapes, etc. of raw material he buys, he also can reduce the number of different sizes and models of his product.

Product Simplification: We have come a long way up the path of simplification of products since the time some 25 years ago when the International Harvester Co. with four huge warehouses crammed full of farm wagons found it could not fill an order for two carloads of one model. In those days every locality had its own particular whims in the way of color combinations, wheel diameters, wheel widths, roadway widths, etc., in addition to the logical variations involved in filling the requirements of the various specific services for which the wagons were to be used. Resulting studies reduced number of bar sizes for wagon tires more than 50 per cent, a figure that was typical of simplification carried throughout.

Simplification in number of varieties of manufactured products has been studied by industry and government committees for some time. Back in 1924, the Division of Simplified Practice of the Department of Commerce, the American Engineering Standards Committee, and Department of Manufacture of the United States Chamber of Commerce reported reduction in varieties of metal lath from 125 to 24, wire fencing from 552 to 69, range boilers from 130 to 13, pneumatic tanks from 100 to 12, brass straps from 1114 to 72. (IRON TRADE REVIEW, *Oct.* 16, 1924, *p.* 1015.)

Since then, many other product simplification programs have been worked out by industry and government committees. An example is the approval by bolt, nut and rivet manufacturers of the government simplified practice recommendation which eliminated 35 per cent or approximately 400 sizes of fasteners. (STEEL, Nov. 29, 1937, p. 17.) Other simplification projects reported at that time included expansion tanks, open web steel joists, cans for fruits and vegetables.

Materials Simplification: Co-operative simplification has not been limited to end products for much work has also been done to simplify materials used in fabricating them. An example is the simplification of steel specifications by airplane engine manufacturers as a move to eliminate bottlenecks in engine production (STEEL, June 17, 1940, p. 40).

A steel simplification program was set

Upper view, opposite page: In this small section of a typical stockroom will be found more than 100 different steel compositions, sizes, shapes, finishes—indicative of simplification possibilities

Extreme left: Frequently huge stocks of certain material must be duplicated three, four or maybe ten or twelve times to fulfill demands for slightly different chemical compositions, or small variations in sizes, shape, finish

Left: Portion of steel stocked alongside forge shop of large automotive parts manufacturer reveals how it is possible for simplification studies to make savings up to $100,000 yearly, as reported by one user. Even the smallest metalworking plant can "simplify" to advantage, it is reported by some authorities

up in Great Britain somewhat before the United States, establishing a list of some 100 significant steels in 1940 or earlier. These were reduced still further late in 1941 when a simplified list of 58 standard steels was published (STEEL, Sept. 29, 1941, p. 31).

War Speeds Simplification: Our war production agencies early realized the importance of simplification. In the fall of 1941, OPM started work on a project to increase steel production by reducing the number of steel specifications with the co-operation of the American Society for Testing Materials, the Society of Automotive Engineers and the American Iron & Steel Institute. A simplification committee was appointed. Purpose was not to write new specifications but to select a minimum number of steels from existing specifications to do the job.

First lists of standard steels resulting from these studies were published by AISI in May, 1941, covering 60 carbon steels and 76 alloy steels which accounted for 94 per cent of total tonnage of semifinished products, bars, rods and alloy strip made in 1940. These steels were selected from about 4000 compositions. Thus some 3800 steels comprised only 6 per cent of total tonnage. (STEEL, Aug. 3, 1942, p. 70.)

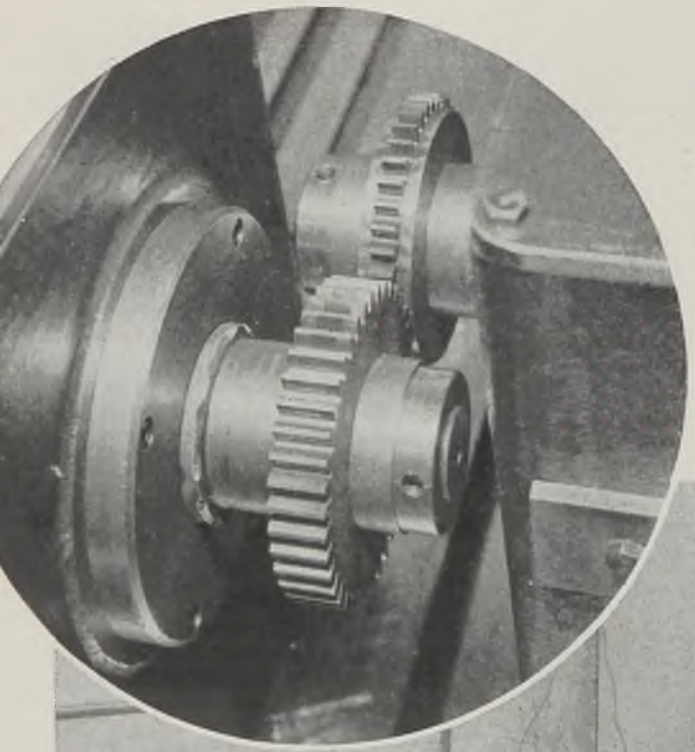
In January 1942, joint meetings of AISI and SAE resulted in compilation of a single list of 67 carbon steels and 104 alloy steels that replaced the individual lists of these two organizations (STEEL, Feb. 16, 1942, p. 64).

Priorities Director Nelson estimated *a widespread simplified practice program would increase production capacity of the country by 25 to 33 1/3 per cent.* OPM Bureau of Industrial Conservation pointed out that most manufacturers do 80 per cent of their business on 20 per cent of products handled. Other four-fifths of total varieties provide only one-fifth the business, run up costs of production and distribution, raise inventories, slow turnover, tie up funds, take up space. See STEEL, Nov. 10, 1941, p. 40.

So our war agencies proceeded to speed up the simplification trend by limitation orders reducing sizes, styles, etc. Typical is the order reported in STEEL, Nov. 3, 1941, p. 44, reducing number of certain structural shapes 50 per cent (angle shapes). Beams, channels and other shapes were reduced almost as much.

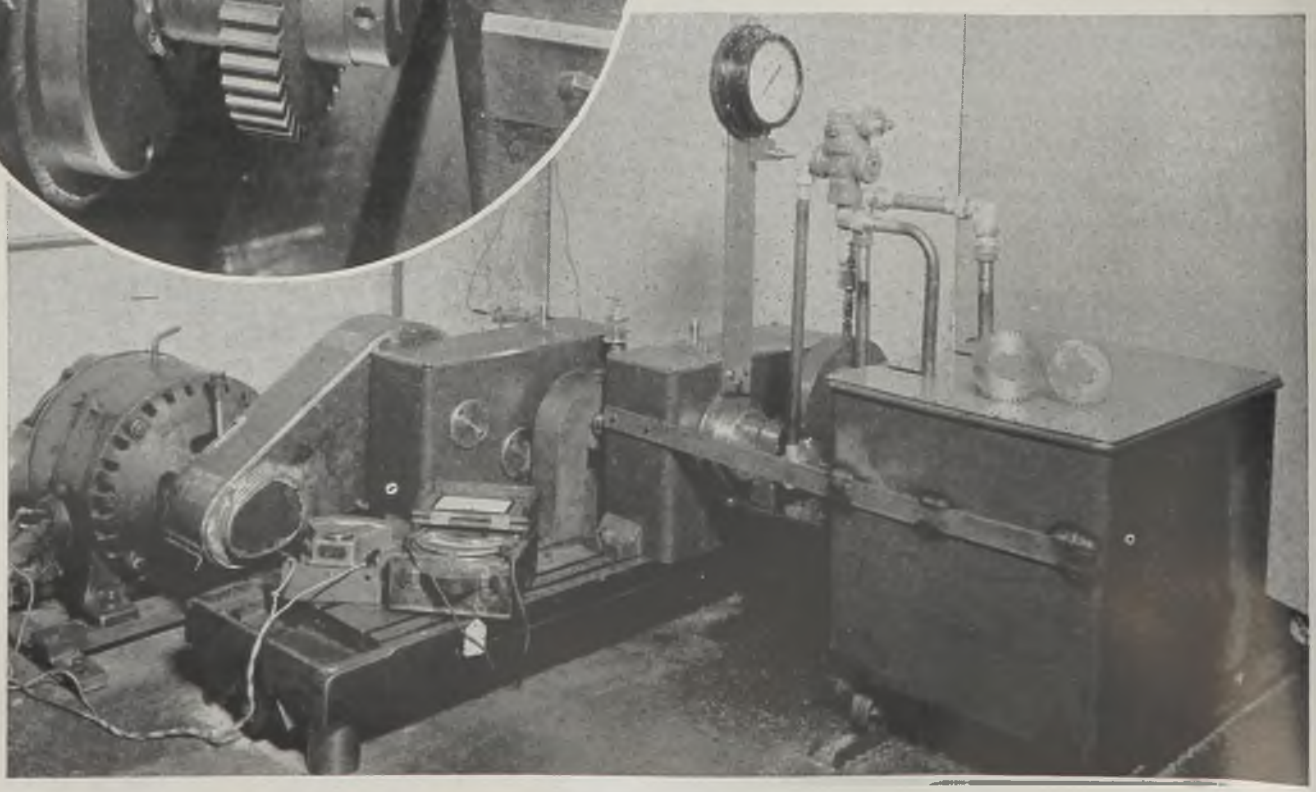
WPB, succeeding OPM, also thoroughly understood the value of simplification. Typical of its many limitation orders was the cut in number of steel mill products (STEEL, Nov. 2, 1942, p. 59) reducing number of varieties and shapes. Sizes of railroad and transit wheels and tires were reduced from 500 to 50—a 10:1 reduction. Others were equally forceful.

Alloy Scarcity: War made such demands on our supplies of alloying elements that to make the most of what were available, WPB issued a simplified list of 16 NE (National Emergency) steels (STEEL, Feb. 9, 1942, p. 70). These few NEW steels were designed to replace standard alloy steels which quickly became unavailable except for ordnance work. NE steel lists were revised



Left: Closeup of gear under test. As originally designed gears were cut with ¼-inch face, but this proved to require excessively high braking points so face width was reduced to ⅛-inch after this picture was taken.
R. K. LeBlond photos

Below: Special test setup employed by A. L. Hartley in his investigation of steels by testing performance in form of gears. Test setup applies wide range of loads, duplicates heavy impact loadings experienced in taking an interrupted cut on a machine tool



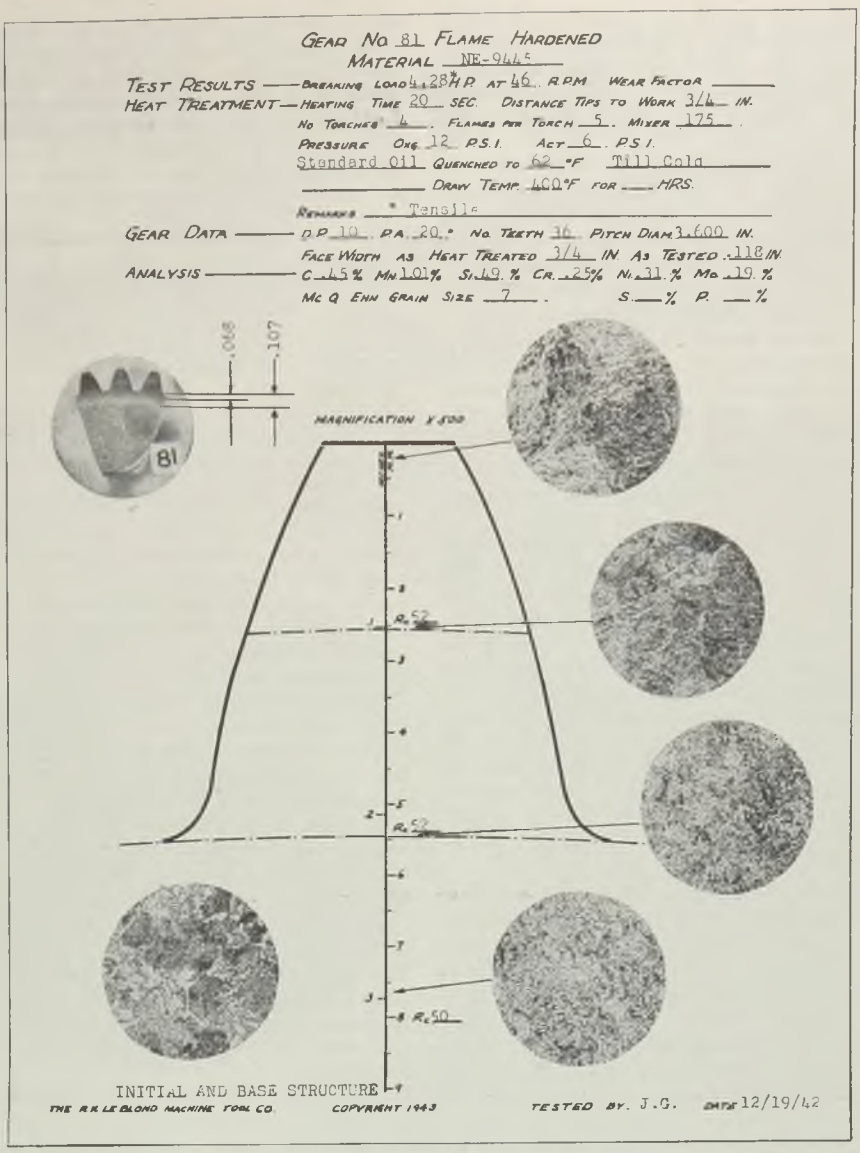
several times to meet changing supplies and war's demands. Currently some 35 compositions are listed (STEEL, Oct. 18, 1943, p. 97).

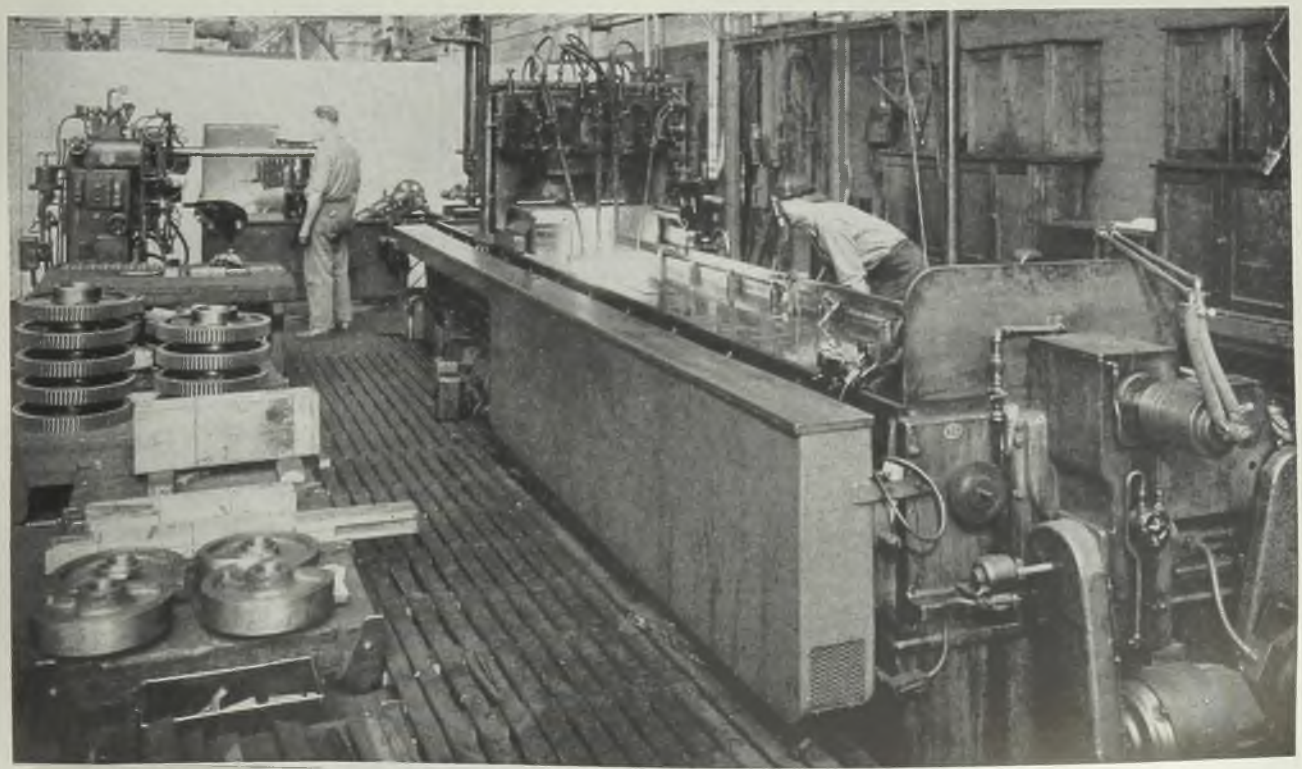
Substitution—an Opportunity for Simplification: Some manufacturers saw in the necessity for adoption of the NE steels an opportunity to simplify their alloy steel situation. It appeared an ideal time to inaugurate a steel simplification program by picking out a few NE steels to replace the many different standard alloy steels being used.

The Cincinnati Plan: At least Cincinnati steel users felt that way about it, for under the direction of S. T. Olinger, 1942 chairman of the Cincinnati ASM War Products Advisory Committee, a subcommittee on steel simplification was formed in June 1942. Howard Montgomery, Lunkenheimer Co., was made chairman. Other members were Jesse Daugherty, Cincinnati Planer Co.; Thomas Waltz, Cincinnati Steel Treating Co.; S. T. Olinger, Cincinnati Gas & Electric Co.; F. H. Pfefferle, Cincinnati Shaper Co.; Alfred Kuhlman, American

Report at right of test on NE-9445 gear, heat treated by flame hardening, shows microstructure analyses. When deep penetration of hardness was desired, flame hardening gave results practically identical with those from furnace hardening

Below: Portion of heat-treating department at R. K. LeBlond. Some crankshaft lathe tool bars are being flame hardened on special machines developed by company engineers





Tool Works; W. O. Anshutz, Cincinnati Gear Co.; N. M. Salkover, Queen City Steel Treating Co.; Stanley Binns, Cincinnati Milling Machine Co.; A. L. Hartley of the R. K. LeBlond Machine Tool Co.

At first meeting, NE-8615 for carburizing and NE-8744 for oil hardening were selected. Fine grain steel, controlled cycle normalized to a lamellar pearlitic structure, was recommended. All Cincinnati district machine tool builders were notified of this tentative selection and asked for comment, since predominating steel users in that area are machine tool builders and they would be most vitally affected. As result, NE-8620 and NE-8744 were formally approved shortly thereafter.

When it was found that these steels were not to be readily available, it became evident that an industrywide committee working direct with Washington would be the answer. Accordingly W. W. Tangeman, vice president, Cincinnati Milling Machine Co., and a director of the National Machine Tool Builders' Association, appointed a committee on strategic materials for the association. Its members were: A. H. d'Arcambal, Pratt & Whitney Machine Tool Co., chairman; Tell Berna, association general manager; L. D. Slade, Gleason Works; A. L. Hartley, R. K. LeBlond Machine Tool Co.

First meeting of this committee, Nov. 23, 1942, resulted in recommendation to use NE-9420 for carburizing and NE-9445 for oil hardening. Since then, NE-9415 and NE-9430 have also been recommended.

Arrangements were made to have A. L. Hartley, metallurgist, R. K. LeBlond Machine Tool Co., undertake a series of tests to determine what NE steels were most suitable for the various critical parts of machine tools. The committee felt that the best way to test the new steels was in the form of gears, for it was believed that comparison of results of such tests would help in selecting alloy steels for other important machine tool parts. Accordingly a testing machine was built upon which gears could be run under a wide range of loads and subjected to heavy impact loadings similar to shocks resulting from taking an interrupted cut on a machine tool. This machine is shown in an accompanying illustration on page 96.

Some of the gears tested were made from forged blanks, others from blanks cut from bar stock. No decided advantage was demonstrated for either form of stock, according to the committee report made to members of the National Machine Tool Builders' Association Feb. 5, 1943, describing results of Mr. Hartley's tests.

Certain gears were flame hardened, while others were furnace hardened. The tests revealed that when there was deep penetration of hardness, flame hardening gave results practically identical with those obtained from furnace hardening.

More than 100 gears were tested. Some were cut from old SAE X-1340 (now SAE C-1141) and SAE-4140 to furnish a basis against which the performance of the newer alloys could be judged. New alloys tested included SAE-1050, NE-9442 and NE-9445. Each alloy used was chemically analyzed to be sure its composition fell within limits.

TABLE I—HORSEPOWER TRANSMITTED BY A 10 DIAMETRAL PITCH, 14½° PRESSURE ANGLE, ⅛-INCH FACE WIDTH GEAR RUNNING AT 50 RPM.

Materials	Horsepower Range	Hardness Rockwell C
SAE-1050	3.8 to 4.5	53-55
SAE-C1141 (old X1340)	3.2 to 4.4	49-52
SAE-4140	3.75 to 5.5	51-52
NE-9442	3.9 to 5.2	49-52
NE-9445	4 to 4.9	50-54

The presence of inclusions in the steel made a greater difference in performance than the type of heat treatment, or use of forged versus cut blanks. The conclusion is that close metallurgical control of steel as received rates high in importance.

Hardness checks were made on the side of the tooth. Micrographs were taken of grain structure at tooth tip, pitch line, base and below base in hub. A typical report of this nature is shown here on page 97 to illustrate thoroughness of these tests.

Horsepower values given in Table I show power transmitting capacities per ⅛-inch width of tooth face.

Recommendations: Conclusion reached from these tests was that alloys available (NE steels) were satisfactory for critical parts. Steels and applications specifically recommended were:

NE-9415: for carburizing, in thin sections and small parts. If a higher core hardness is desired, NE-9420 may be used. However, if there is a choice, NE-9415 is usually preferable.

NE-9430: for straight heat-treat, for studs, bolts or other small parts for high stresses.

NE-9445: for oil hardening small or medium size parts, or water hardening large pieces or heavy sections.

In all of these, a 6 to 8 (McQuaid-Ehn) grain size is recommended and some question has been raised as to the advisability of using a water quench with the NE-9445.

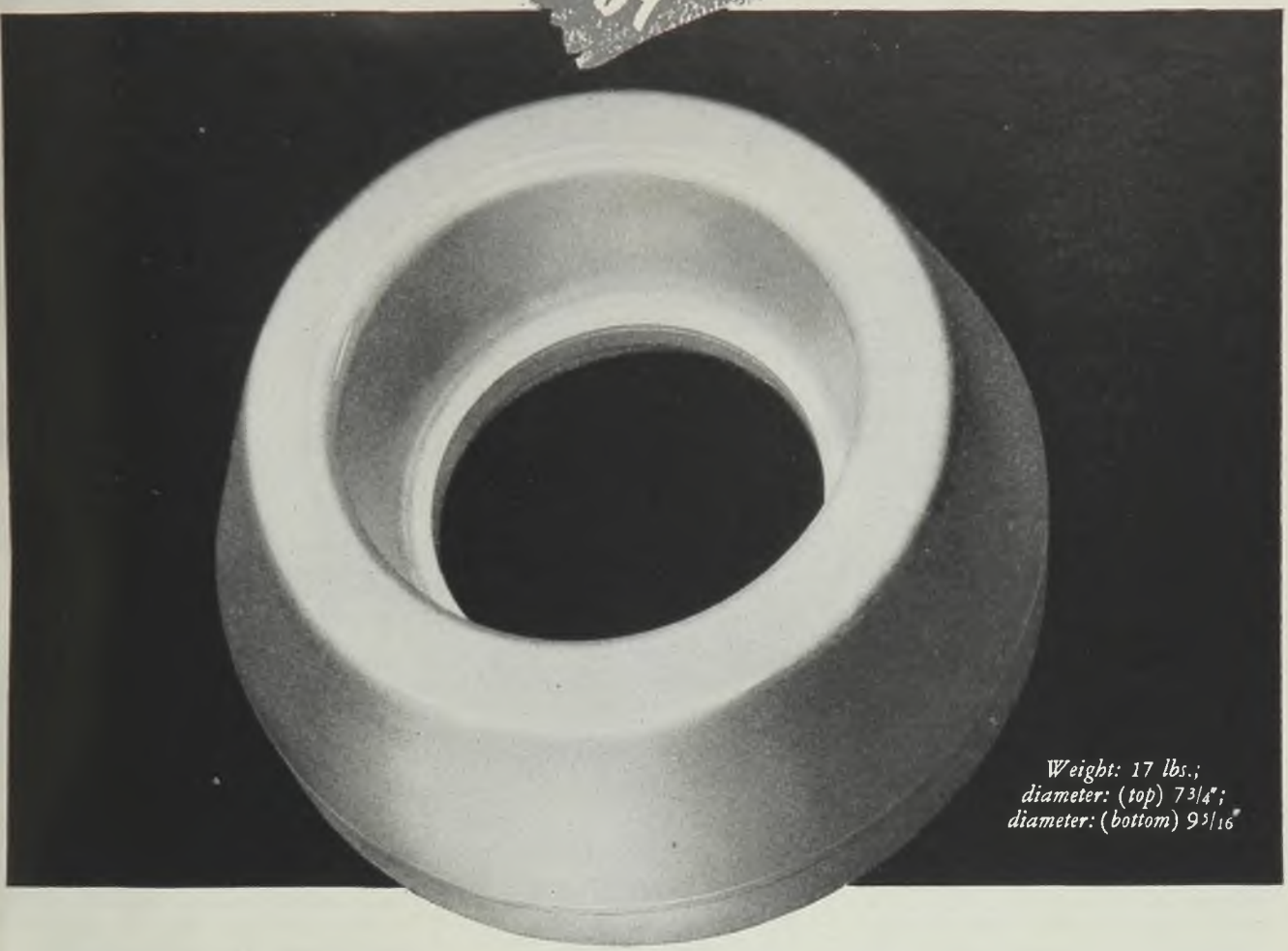
There did not seem to be sufficient difference between NE-9442 and NE-9445 to warrant adding NE-9442. It was recommended that a lamellar pearlitic structure be specified in purchasing NE-9445, even though a small extra charge must be paid, for it was felt that the time saved in machining would more than offset the charge.

Recommendations Widely Adopted: Practically every machine tool builder in the Cincinnati district is reported to have followed the recommendations of the Simplification Committee. Talking with various engineers and metallurgists of these companies, one gains the impression that the program has worked out rather better than at first expected.

(*Please turn to page* 118)

GRINDING UPS OUTPUT: Instead of milling the blood groove in bayonets, American Fork & Hoe Co., Ashtabula, O., uses formed grinding wheels which rapidly produce the desired groove. Resulting increase in speed greatly increases plant output

ALUMINUM DIE-PRESSED FORGING by REVERE



Weight: 17 lbs.; diameter: (top) 7 3/4"; diameter: (bottom) 9 5/16"

The cylinder barrel muff which we illustrate is typical of the strong close-grained, die-pressed aluminum forgings in which Revere has pioneered so successfully—especially in the aviation industry.

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Fundamentals of INDUSTRIAL ELECTRONICS

In the fourth article of his series, Mr. Chute shows how electronic tubes serve as alternating current switches to close or open circuits, including large power circuits. Previous articles discussed electronic tubes used as rectifiers and amplifiers

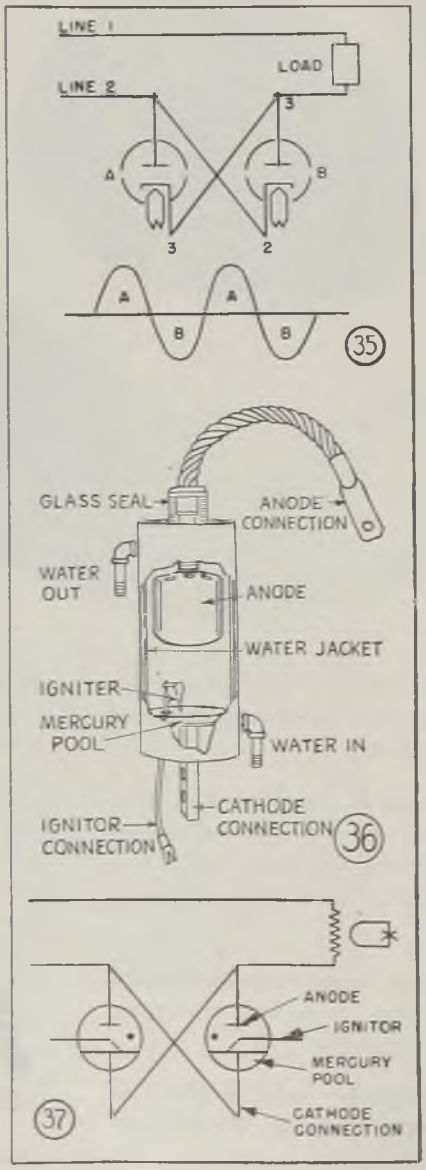
By G. M. CHUTE
Application Engineer
General Electric Co.
Detroit

PREVIOUS articles in this series have discussed electron tubes used as rectifiers and amplifiers. Aside from the phototube recently described, all the tubes we have studied are of the thermionic type, that is, they must be heated before they will work. These tubes have been shown operating in the circuits of the time-delay relay and the photoelectric relay. In this article we will show tubes serving as an alternating current switch, to close or open a circuit. To be able to switch a large power circuit in this way, we here introduce the ignitron tube which in the larger sizes may pass thousands of amperes, and will study it as part of the ignitron contactor.

Electron Tubes as an A-C Switch

Although nearly every type of electron tube acts as a rectifier, a pair of diode tubes can be connected, as in Fig. 35, to pass alternating current and to act as a single-pole alternating current switch. This connection, wherein the anode of each tube is connected to the cathode of its companion tube, is known as the "back-to-back" or inverse-parallel connection. As shown in Fig. 35, tube A passes current during the half cycles marked A; line 2 is positive during this half cycle, so current passes down through tube A to point 3 and through the load to line 1. During those half cycles marked B, line 1 is positive, so current passes from line 1, through the load to point 3, down through tube B to line 2. In each case, current flows in just one tube, anode to cathode.

Unless these tubes have control grids, such a circuit serves no purpose, for the alternating current flows continuously, as if a copper strap were connecting points 2 and 3. If the tubes have grids, there is no current flow as long as the grids are kept sufficiently negative. When the grid potential of both tubes is raised simultaneously, both tubes pass current, so alternating current flows through the load. In this way, two tubes act together like a single-pole alternating current contactor, but have the advantages that they are noiseless and have no moving parts.



If these tubes happen to be high-vacuum tubes (pliotrons), their grids can control the amount of current flowing at any instant. However, since pliotrons necessarily have low current ratings, they are little used for alternating current switching.

Thyratrons are commonly used to handle as much as 25 amperes per circuit. Since thyratrons are gaseous tubes, their grids can prevent current flow, but they cannot control the amount of current flowing at any instant. Whenever the grid permits the thyratron to "fire" or pass current, the amount of that current is limited only by the external load circuit. This current continues to flow during the rest of the half cycle until the anode voltage reverses. For practical purposes, in an alternating current we may consider that gaseous tubes can be grid-controlled to either close or open the circuit.

The Ignitron

To control large alternating current loads, ignitron tubes are commonly used, connected in pairs like the thyratrons just discussed. The various sizes of ignitrons that are available will handle currents from 40 to 10,000 amperes, per pair of tubes. Fig. 37 shows two ignitrons connected to switch one side of an alternating current circuit feeding the load of a transformer such as found in a spot welder. Although ignitrons are sometimes used to handle steady or maintained loads of hundreds of amperes, their ability to carry extremely high currents for a short time makes

Fig. 35—Two diodes passing alternating current

Fig. 36 — Cut-away view of a water-cooled ignitron

Fig. 37—Two ignitrons connected inverse-parallel, to switch an alternating current circuit

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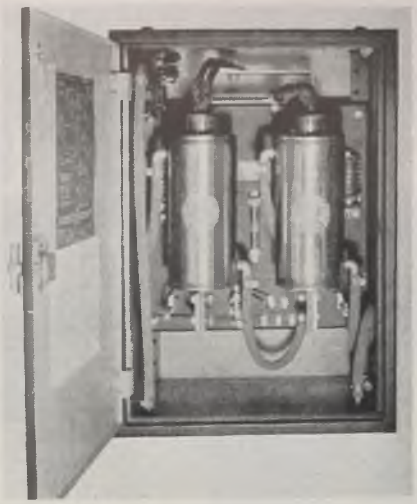
them especially suited to frequent switching of larger currents. It is common practice to use a pair of ignitrons to pass several thousand amperes for only one or two cycles, repeated on and off a hundred times per minute.

The ignitron is a gaseous tube, but is not a heated or thermionic tube. As shown by its symbol in Fig. 37, it has no filament, but uses a pool of liquid mercury as its cathode, like most mercury-arc rectifiers. If an arc can be started by some means within the ignitron, huge quantities of electrons are driven up out of the surface of the mercury pool and are attracted to the single large carbon anode whenever that anode is considerably more positive than the mercury pool. Notice that the ignitron, like most electron tubes, is a rectifier—it produces electrons from only one element, the mercury pool, so its current can flow in only one direction, from anode to cathode. The rate of current flow of such a tube is so great that a large amount of heat is produced during normal operation. This heat must be removed from the tube; enough water must circulate in the tube water-jacket to keep the tube within its safe operating temperature limit. In most circuits the contacts of a thermal flow-switch will prevent the flow of current through the ignitrons if the water temperature becomes too high. The metal water-jacket and tube wall are electrically connected to the mercury-pool cathode, as shown in the cut-away view in Fig. 36.

The Ignitor

Unless we furnish some means for starting an arc inside the ignitron, current cannot flow, for no electrons are freed from the cathode. In contrast, a thyratron passes current whenever there is no restraining grid potential present, and the anode is more positive than the cathode. With nothing connected to its grid, the more usual form of thyratron may pass anode current; without an ignitor or means of starting an arc, an ignitron cannot fire.



An ignitron contactor with size-C tubes

Fig. 38—The ignitor depresses the mercury surface, but is not wet by it

Fig. 39—Simplest form of ignitron control

Fig. 40—Ignitron control by a single switch

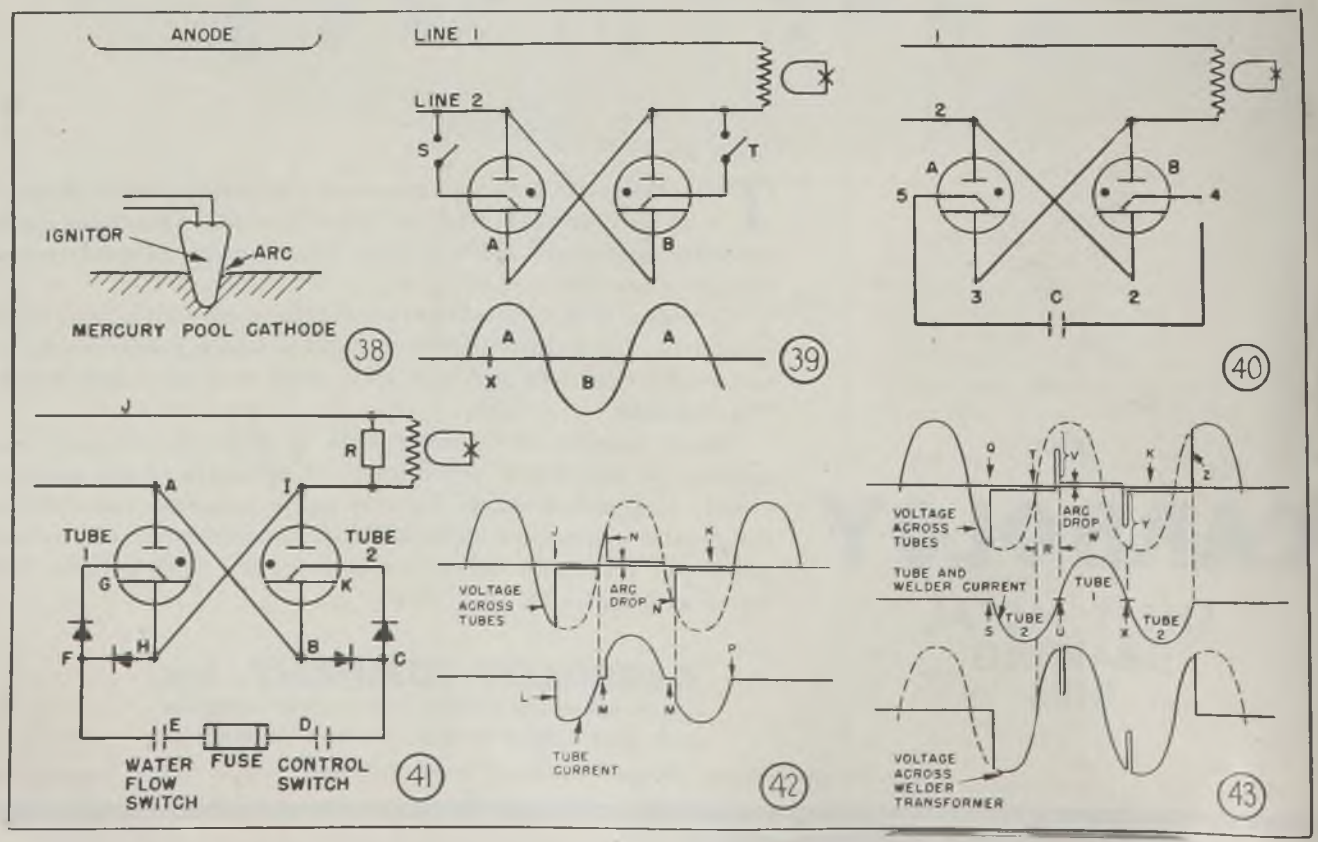
Fig. 41—The circuit of the ignitron contactor

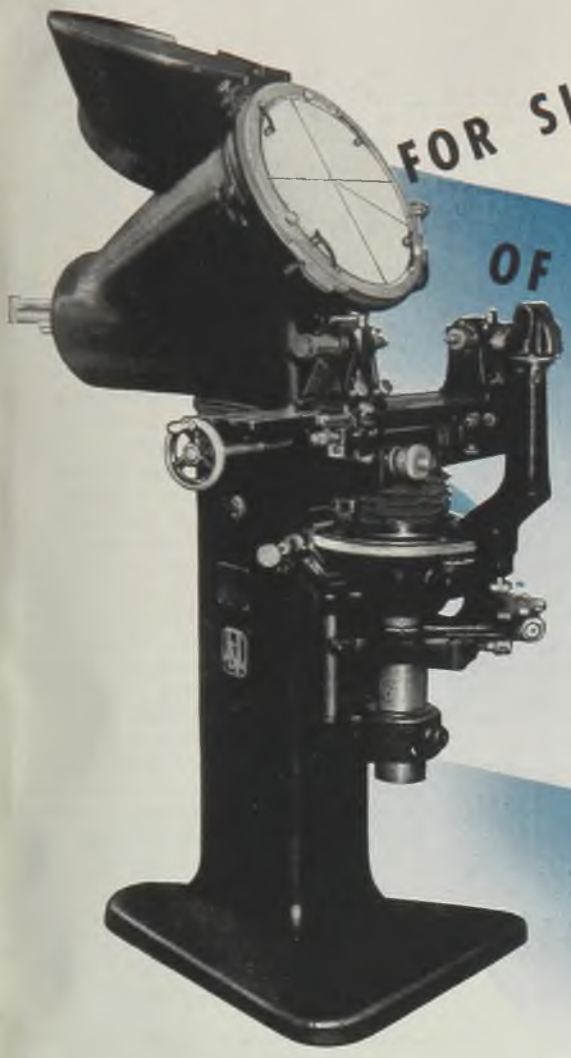
Fig. 42 — Ignitrons switching a unity power-factor load

Fig. 43—Ignitrons switching a lagging power-factor load, such as a spot welder

A Piece of Boron Carbide

The ignitor, or starter, is a tapered piece of boron carbide which extends down into the mercury pool but is not wet by it. As shown in Fig. 38, the mercury surface is slightly depressed by the ignitor tip. The material of the ignitor is selected because there is considerable resistance (10 to 500 ohms) measured between the ignitor and the mercury pool while they are in direct contact. This being true, it is possible to cause a tiny arc between the tip and the pool, if sufficient current (40 amperes) is made to flow from the ignitor into the mercury. This 40 amperes needs to flow only for a few millionths of a second as the tiny arc spreads between the cathode pool and anode, and ionizes the atoms of mercury vapor in the space between. Sufficient energy is obtained from the arc itself to free other electrons from the pool to carry any required current, which continues to flow until the anode voltage is reversed at the end of that half cycle. Of course, this whole process must be repeated for each half cycle during which the ignitron is to pass current. When anode current has started, the ignitor arc is no longer needed; we will soon see that the ignitor





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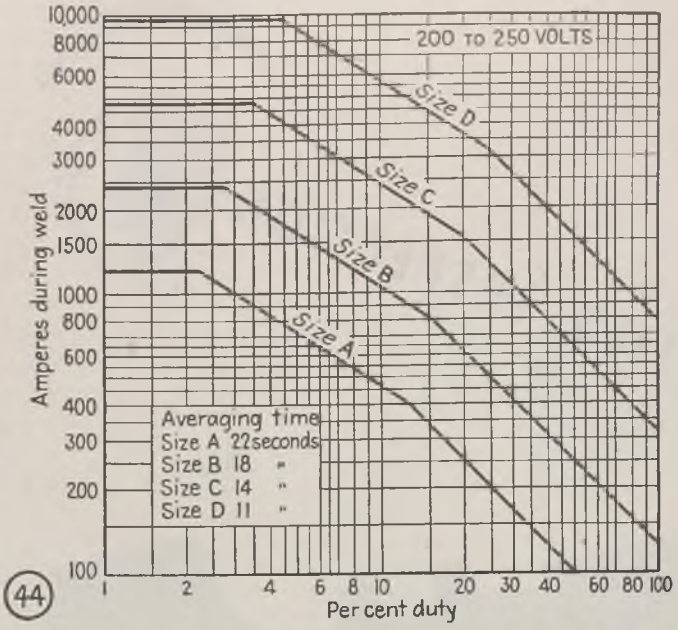


Fig. 44—Rating curves of ignitron tubes (pair) at 230 volts

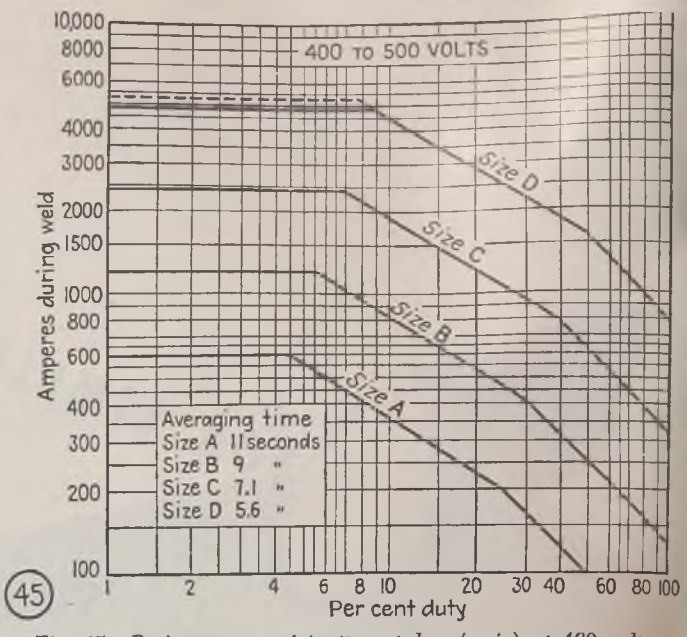


Fig. 45—Rating curves of ignitron tubes (pair) at 460 volts

current stops as anode current starts.

The simplest possible arrangement for controlling ignitrons is shown in Fig. 39. If you close switches S and T at the point marked X (in half-cycle A during which line 2 is positive) ignitron A instantly passes current which flows during the rest of half-cycle A. However, ignitron B cannot pass current until half-cycle B (when line 1 is positive) and after the current of tube A stops.

Notice that the circuit through S and the ignitor is in parallel with the main anode-to-cathode circuit of Tube A. When S closes, current first flows through S and the ignitor, causing the arc which ionizes the mercury vapor in tube A. This instantly permits load current to flow directly from anode to cathode in tube A. The resistance of this main current path from anode to cathode is so much lower than that of the circuit through S and the ignitor resistance, that the current flowing in the ignitor becomes negligible. As soon as the current stops flowing in tube A and the voltage at the anode of ignitron B has become more positive than its cathode, tube B is then "fired" in the same manner, by current flowing first through switch T and the ignitor, which instantly makes the mercury vapor in tube B able to carry the load current directly from anode to cathode. We see that, although the load current is carried mainly by the anode-cathode circuit, this flow must be started or "ignited" every half cycle separately. In a later article we will see how switches S and T are replaced by thyratron tubes, to pass current into the ignitors and provide accurate control of ignitron tubes.

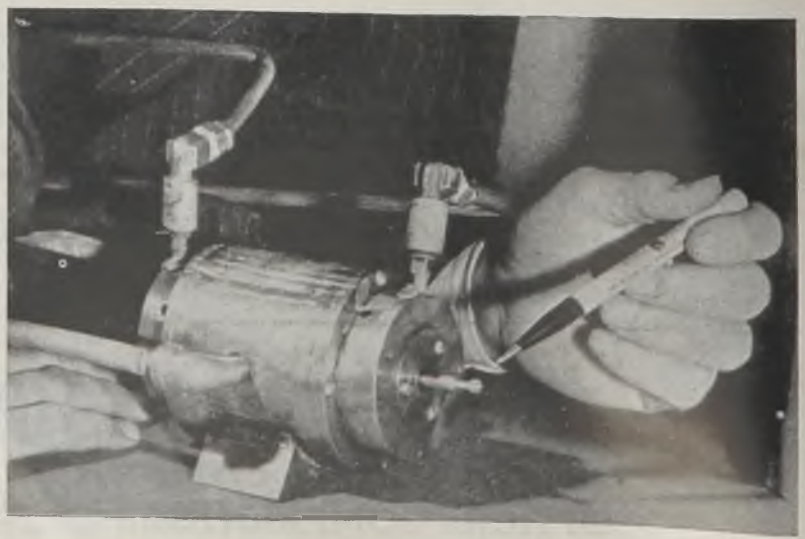
The Ignitor Circuit

Instead of two ignitor circuits controlled by separate switches, as in Fig. 39, the ignitors can be connected together through a single control contact (C), as shown in Fig. 40. With C closed and line 2 positive, current flows from 2, up through tube B from the mercury pool into the ignitor to 4 through C and into ignitor 5, to the mercury pool of tube A, to point 3, through the load to line 1. This "fires" tube A, which immediately passes current from anode 2 to cathode 3. Although this ignitor current fires tube A in normal fashion, this same current flows in reverse direction in tube B, or from pool to ignitor. Such reverse current definitely damages the ignitor and decreases tube life. To prevent this reverse current, copper oxide (metallic) rectifiers are added as shown in Fig. 41. Each rectifier is a stack of specially coated copper disks arranged to have low resistance to current flow in the direction indicated, but very high resistance to opposite current flow.

Fig. 41 shows the circuit used in a typical ignitron contactor. The ignitrons, connected back-to-back, close or open only one side of the alternating current line. Both ignitrons pass current when

(*Please turn to Page* 124)

SEVEN POUNDS OF SPEED: Operating at 120,000 revolutions per minute for finish grinding small holes ¼-inch in diameter and less, this diminutive electric motor recently perfected by General Electric engineers for application to internal grinding machines weighs only 7 pounds but it rated 3 horsepower. It also is intended for use in driving small drill chucks for drilling 1/32-inch and smaller holes in soft metals. The midget reaches full speed in less than 1 second and uses ½-gallon of water per minute for cooling. Size and weight contrast sharply with the standard 3-horsepower electric motor which weighs 105 pounds and turns at 1800 revolutions per minute



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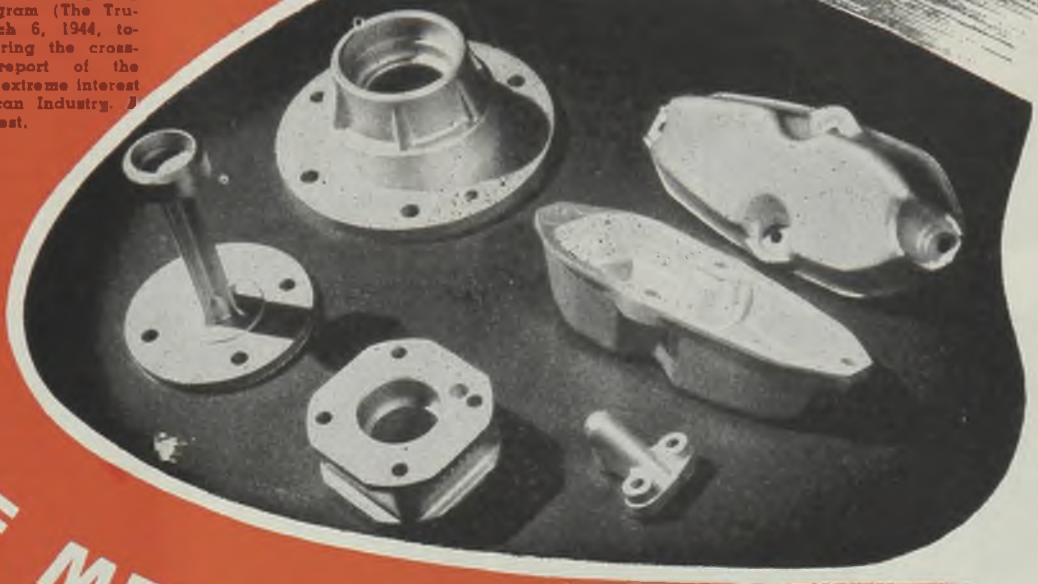

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UNIQUE DIE SETS

. . . . feature multiplicity of slides, cams, punches and the like to produce at one operation many complicated parts for electrical switchboards; permit vertical press to handle wide range of metalworking operations

By G. ELDRIDGE STEDMAN

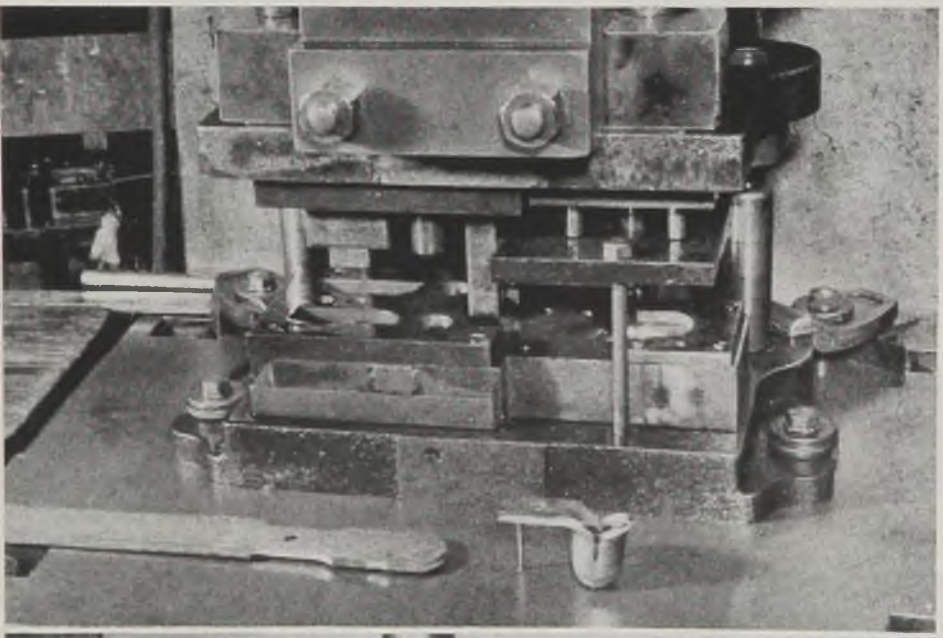
SEEKING new methods to speed construction and installation of electrical control boards to meet increasingly greater shipbuilding activity, the Frank Adam Electric Co., St. Louis, Mo., working with the Henry J. Kaiser organization, investigated to find that the hatches to the ship's engine room were sufficiently large so that a complete switchboard could be dropped through the opening.

Therefore, changing the manner of former sectional subassembly, it proceeded to build totally fabricated sheet steel switchboards, welding the various panels to braces in an integral structure that could be derricked through the hatch to be installed as a completely finished switchboard including all the wiring; see Fig. 1. This is regarded by many as an important innovation in construction that has equally important possibilities in many other fields.

As early as 1900, the company engineered the technique of enclosing electrical switches and panel boards in sheet steel protective housings. It early developed designs of closures for all kinds of control apparatus.

For lighting and appliance 15 to 20-ampere branch circuit panel boards, the majority of present enclosures are of one-piece sheet steel. To fabricate, the punching operations include two simple steps: First, the punching at each end of the corner cut-outs; second, punching of the mounting holes as well as the ½ and ¾-inch conduit knockouts. Work then goes to a planisher where knockouts are pushed back to eliminate hazard of accidental ejection. In the old technique of production, these one-piece enclosures were flanged over at their corners and riveted. In the new design, corners are cut square and welded.

A complete laboratory is maintained



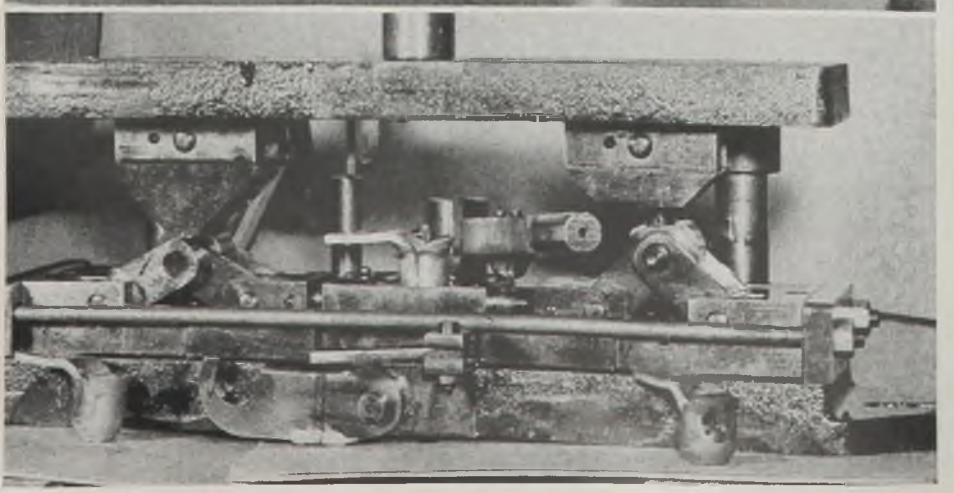


Fig. 1—Typical marine type switchboard of all-welded construction, ready for shipment and installation aboard ship as a complete switchboard in a single unit

Fig. 2—Two-stage progressive die blanks and makes first draw in a solderless pressure connector. Each stroke of press produces specimens shown in foreground

Fig. 3—Put in a vertical press, this die set punches two horizontal holes in opposite sides of connector by means of toggles and slides shown, both holes being made in sequence at single stroke of the press. Specimens in foreground show connector before and after horizontal holes have been punched in side walls. This is same connector started by die shown in Fig. 2

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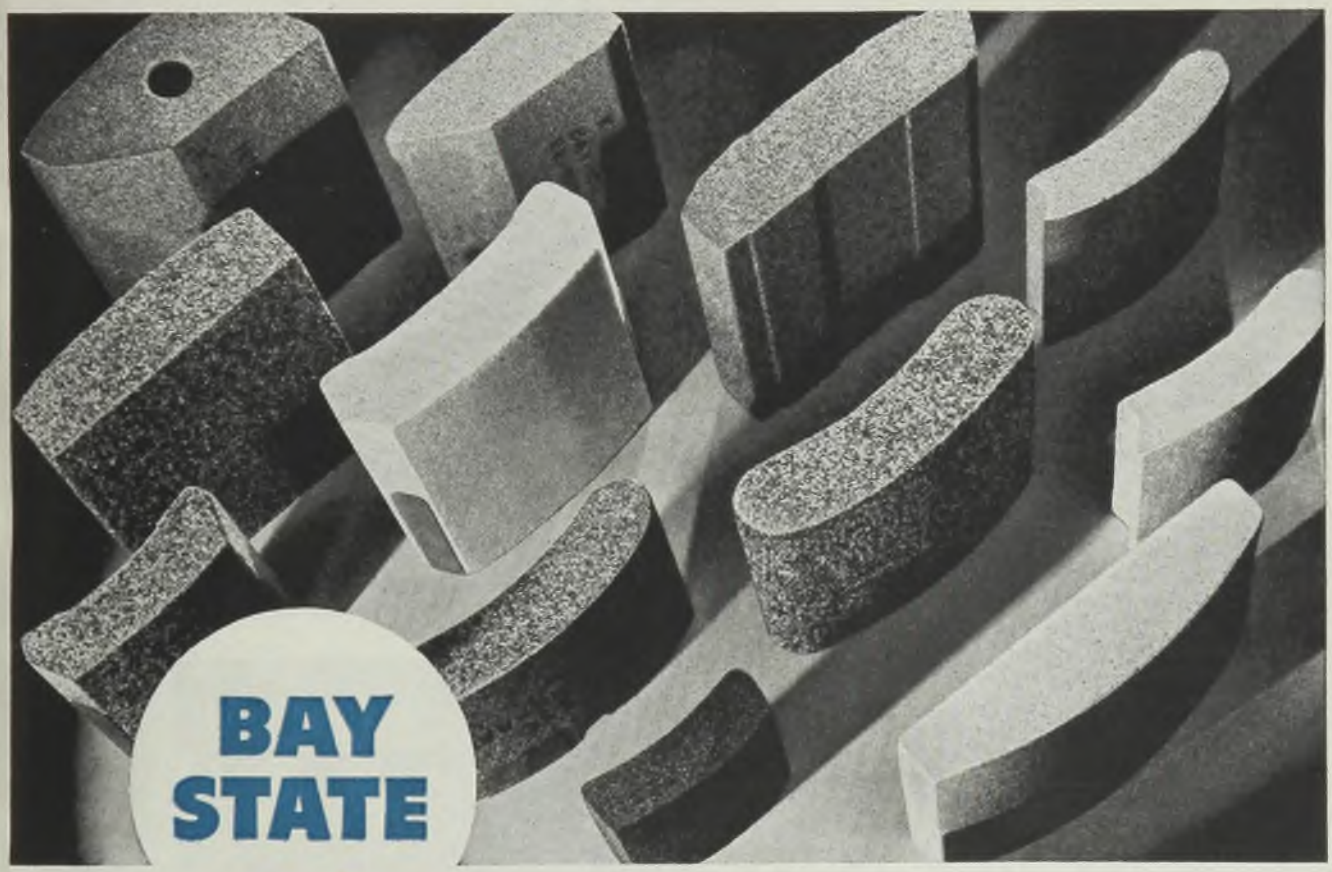

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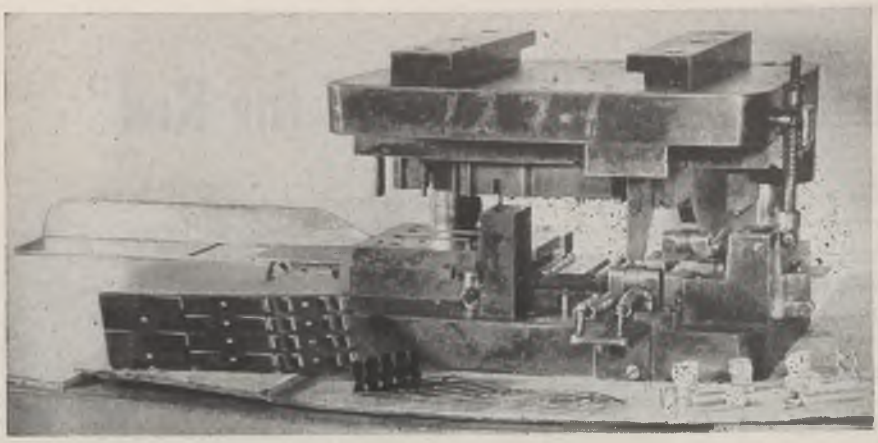

Fig. 4—Typical of complicated progressive die sets that handle multiplicity of blanking and forming operations simultaneously by means of slides and cams. Five stations are used here to produce four 60-ampere fuse clips at each stroke of press as follows: Perforate hole for first and third clip, also blank 99 per cent of second and fourth clip; perforate second and fourth clips, blank 99 per cent of first and third clips; form to final shape; shear remaining 1 per cent, separating parts. Sequence illustrated by parts in foreground

where all equipment is tested to be sure it meets or exceeds specifications established by Underwriters' Laboratories. Perhaps it was this continued effort to surpass requirements that prompted the company to investigate silver plating the contact surfaces of current carrying parts. One of the earliest manufacturers to conclude that silver plating was really a necessity, its research revealed silver plating did not increase the capacity of the current carrying parts, but that it does effectively prevent corrosion on the surfaces of such parts. As a result, no longer is continued use of such equipment accompanied by increasing resistance losses.

Protects Surface Only

Best technique involves producing a thickness sufficient (and only so) to protect the surface of the contact from oxidation. This is true even where friction is involved, as in parts of a knife switch. A minimum of plating thus results in working the silver into the copper pores eventually, with great improvement in current carrying conditions over unplated copper.

One of the causes for present Adam success is that there has been a long and agreeable association of such key men as Fred B. Adam, president; Henry Stieglitz, master mechanic; Leonard Schreier, foreman of the punch press room.

Some of the most pertinent achievements in the punch press department have to do with the tool dies conceived by Henry Stieglitz. A few of the most interesting are pictured.

A rather unusual setup is employed in forming, swaging and punching a solderless 600-ampere connector for use with 1,000,000-circular-mil stranded cable. Figs. 2 and 3 show dies used.

Briefly reviewed, the progression is a blanking operation with a punch, followed by swaging and forming, at the same time punching the hole for screw studs through the formed bottoms—all done in dies shown in Fig. 2. Thereafter, the die setup in Fig. 3 punches the side holes for receiving the stranded cable conductor. Finally there is the tapping of the hole for the bolt. In this latter operation, length of thread obtained in the drawn hole is nearly 2.5 times thickness of the original blank. This is important as the longer the screw thread, the more substantially can the cable be held by the screw plug.

Fig. 2 shows dies used to perforate, shear, draw 400-ampere detachable pressure-type lugs. Material is copper of dead soft grade and deep drawing point, suitable for electrical contacts with ample current carrying capacity. The material is lubricated with lard oil and then run through die, which in a progressive step-up at proper stops makes a lug in two stages in the die.

In the first stage it shears, perforates and cuts end round. In second stage it draws down copper to form a contact area 1¾ x 1⅜ inches, with the cup depth of 1⅞ inches. It also perforates a hole subsequently tapped for the set-screw for holding the wire, which is 500,000 circular mils. There is a 5¼-inch step-up between the two stages. Press has a 3½ inch stroke and about 60-ton capacity.

Fig. 3 shows the unique die setup employed to perforate the wire holes in 400-ampere detachable lugs, done on a 60-ton press with a 3½ inch stroke. Two holes are punched in the circular side walls of the lug in one operation. At left in front of die, Fig. 3, is an unpunched lug, with a punched lug on the right. The lug is inserted in the die with upper part of die pressure pad holding the lug in die as the side cam of die on right side perforates the hole for ⅞-inch diameter wire. Cam pushes down link which then allows punch to recede, allowing punch to enter on left side perforating ⅞-inch diameter hole. Then segment under left perforating link pulls punch out. Thus two holes are punched in the side walls of the lug to hold 500,000 circular-mil cable for feeders. This same procedure is followed in making other size lugs of this type, including 70, 100, 200, 300 and 400-ampere lugs.

Referring to design of such dies, Stieglitz says, "We make a forming plug to develop the correct size of blank and barrel for the size of wire that is for that particular lug. Then we go through the same procedure as to making the drawings, laying out operations and step-ups so that the die will work properly."

Wherever possible, progressive dies are employed. Perhaps a typical one is that shown in Fig. 4. It is used to perforate, shear and form 30-ampere fuse clips for tubular fuses. The material worked is 0.028-inch thick copper or spring bronze, 2⅞ inches wide, sufficient

(*Please turn to Page* 132)

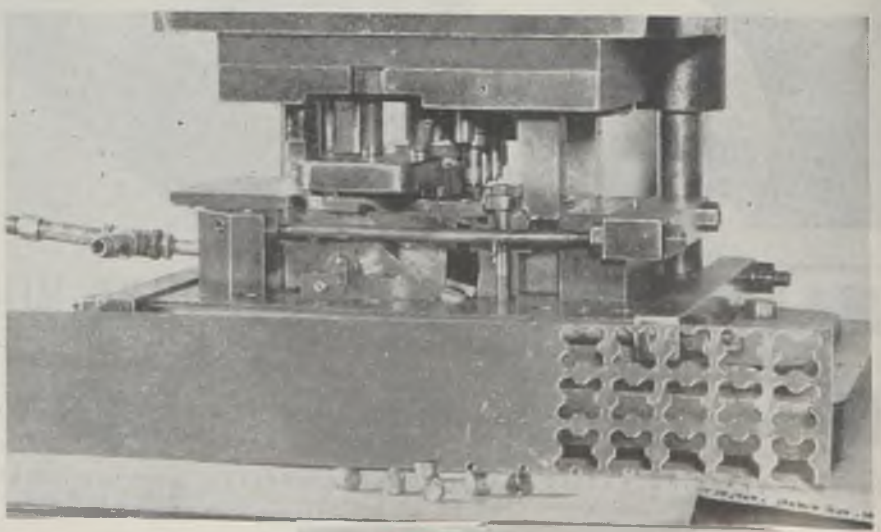

Fig. 5—Two-stage die for blanking and drawing "buttons". Blanked to four-leaf clover design, work then is drawn to tubular shape. Special cams are built in die to produce complicated forming and ejection actions

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BLAST

Fig. 1—Using an oxygen lance in tapping a salamander during a blowout of a Valley stack

Fig. 2—Beginning of the cast of salamander metal through a passageway made in the masonry foundation of a Valley stack

DURING the campaign of a blast furnace the iron and cinder tend to cut away one or more courses of the hearth blocks. A deep well thus is formed several feet below the taphole. Molten metal remaining in this well after the final cast, chills and forms a solid mass which in blast furnace parlance is known as a salamander. The removal of this mass of conglomerate after the furnace is blown out is a tedious, dangerous and expensive operation.

The usual procedure after the boshwall is torn down and all the soft material is removed from the hearth leaving the top of the salamander exposed, is to drill numerous holes in the material using star bits and a sledge hammer or compressed air, plant sticks of dynamite therein and blast the mass into chunks. The pieces then are removed by mechanical means, the operation sometimes requiring two or three weeks. The interior of the hearth jacket as well as the cast-iron furnace columns usually are padded with timber or mats to prevent the damage as a result of the blasting.

In 1918, following the blowout of No. 1 stack of the McKinney Steel Co., Cleveland, sinking the holes in the conglomerate for the explosive was done by the use of oxygen and was perhaps the first application of this gas for this particular purpose. One cylinder of gas was sufficient to sink a hole 4 feet deep.

Two Notches Are Provided

A method inaugurated in 1912 by the Sloss Sheffield Steel & Iron Co., Birmingham, Ala., never failed to drain its furnaces of iron on the blowout. The method consisted in maintaining normal operating conditions. The taphole was maintained long and deep so as to tap at the bottom of the hearth. In the event the taphole was short, a new hole was drilled beneath the regular iron notch. Drilling of this new opening was done at intervals for two or three days before the blowout and this hole then was closed with regular stopping clay so that it could be opened easily at the proper time. This hole, however, never was necessary when the regular taphole was long. For several days before the end of the furnace campaign the regular hole was strengthened and improved by the use of excess clay.

Uniform blast pressure was maintained throughout the final cast. This was accomplished by eliminating the coke charge, continuing the rounds of ore in sufficient quantity to maintain normal pressure at the tuyeres and by holding down the top temperature.

The final charge of coke was doubled

By JOHN D. KNOX
Steel Plant Editor, STEEL

FURNACE BLOWOUTS

Procedure for blowing out a blast furnace and removing salamander has undergone drastic change in past three decades. After last cast debris is removed quickly by hydraulic means. Salamanders are drained through passageway drilled in foundation masonry. Flushing eliminates dust nuisance, facilitates refractory removal, saves considerable labor and affords quicker start on tearout

and served as a "marker," so that the operator would know when to tap and how long it would be until the coke would be entirely consumed. On some blowouts it was necessary to reduce the pressure of the blast to prevent blowing through the stock.

A large quantity of iron ore was charged to absorb the heat and thereby protect the top structure of the stack especially if the top temperatures were high. The furnace was cooled by water applied through top sprays or through the tuyeres. The ore usually ran out when the tuyere coolers were removed and was returned to the stockhouse.

In some cases when a secondary taphole had to be drilled beneath the bath of iron it was necessary to use several sticks of dynamite to break through the crust and start the metal flowing. This was executed by the use of a small wooden pole with the dynamite secured in such a way that it could be placed at the extreme bottom of the hole and discharge with fuse and cap. Three or four sticks of dynamite usually were sufficient to bring the iron.

In 1921 a novel method employed at Central Furnaces, American Steel & Wire Co., Cleveland, during a blowout was to cast as much iron as possible at the final tap and to drain the metal remaining in the bottom of the hearth through a passage made in the concrete base.

About two days before the blowout a section of the subjacket beneath the floor of the cast house and between Nos. 3 and 4 tuyeres was removed by the use of oxygen. An opening about 13 feet long was made in the concrete foundation with a brick drill and dynamite before red hot brick was encountered.

An iron runner was installed on a brick foundation to convey the metal into a series of sand beds which were made up on the cinder ladle tracks. The bottom of the trough was lined with a layer of plastic fire clay and the hole in the foundation clayed and rounded in much the same way as a cinder notch is prepared. The clay in the runner and the hole was dried with an oil burner to avoid any possibility of an explosion during the drainage.

While the last cast was being made through the regular taphole, an oxygen burner was used in the foundation taphole which was inclined upward at about a 25-degree angle. Oxygen was supplied from standard cylinders, the gas being fed through a flexible, woven armored hose into a short piece of ¾-inch extra strong pipe fitted with an elbow. Standard lengths of ¼, ⅜ and ½-inch pipe as desired were screwed into the elbow and when the pipe became too short under the high temperature of the flame while burning the brick, it was replaced. About 500 lengths of pipe were used in gaining access to the bottom of the hearth.

Flow Gradually Increased

Eventually thick, mushy iron began to drip through the roof of the opening the first 20 tons or so leaving the hearth slowly. The remaining quantity flowed at about the same speed as a regular cast through the iron notch. While the hearth was being drained in this manner, the pressure of the blast on the furnace was maintained at about 3 pounds per square inch for the purpose of picking up metal trapped in the depressions of the hearth not directly connected with the lower opening.

Approximately 118 tons of good quality iron and between 10 and 12 tons of slag were obtained from the bottom cast. When the chunks of iron in the sand beds were cool they were hoisted by cable and yard crane into flat bottom steel cars, transferred to the scrap drop and broken into charging box sizes for the open-hearth furnaces. About 36 hours intervened from the time the last cast was begun until the salamander was drained and the sand cleared from the cinder tracks.

This method of draining the salamander also was used in 1942 at a Valley stack during its blowout. The stack was last relined in 1927 and at that time the hearth was set 20 inches below the level of the taphole. Since there is no way of determining the lower extremity of the salamander while the furnace is in blast, it is a case of trial and error in the lancing operation. The first probe, therefore, was started 12 feet below the initial level of the hearth, a 3-inch diameter passage having been drilled pneumatically and horizontally through the brickwork. Upon reaching red-hot brick an oxygen lance was used to hasten the work and effect a break-through. After the passage was 17 feet in length, it was abandoned because of its being too low to bring the iron. Another hole 10 feet below the initial taphole level was made in the same manner but after a length of 15 feet had been reached, this too was abandoned. A third passage inclined upward about 5 degrees was made 8 feet below the taphole level; the first 12 feet of drilling uncovered red-hot brickwork and an oxygen lance was substituted for the drill. About 3 lengths of ⅜-inch pipe feeding oxygen at 100 pounds pressure were consumed in effecting the break-through, though in the opinion of the lancer, it is believed the iron could be brought in less time by using ½-inch pipe and oxygen at lower pressure. The time involved in making the probes and final tap totaled about six hours. Lancing operations consumed about 40 cylinders of oxygen.

A decade ago, the plan followed by

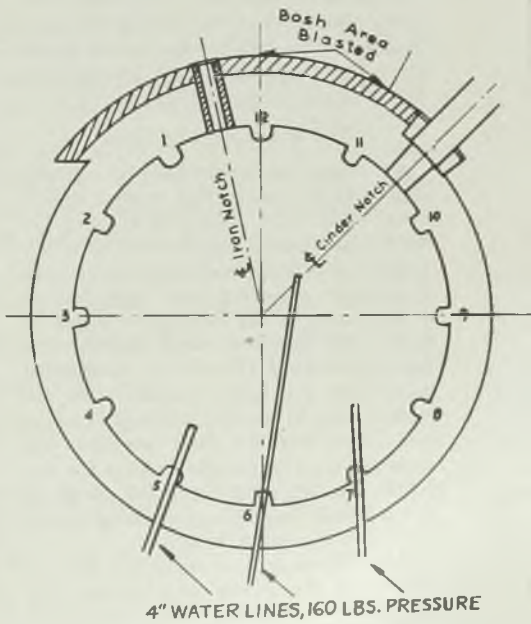


Fig. 3—Plan view of hearth and tuyere section showing location of water lines and blasted bosh section

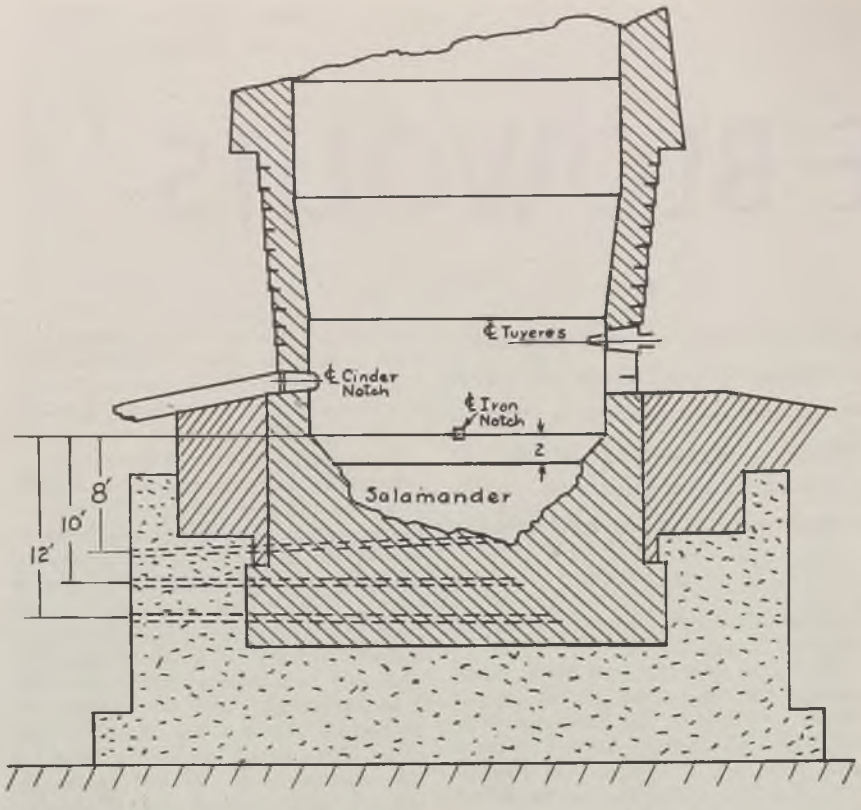


Fig. 4—Elevation of a Valley stack showing depth of salamander and of the three probes made with pneumatic drill

Jones & Laughlin Steel Corp., Pittsburgh, was to melt as much of the burden as possible at the time of the blowout and after draining the salamander, to blow out a section of the bosh with a charge of dynamite. Satisfactory results were not always obtained, but if dynamiting knocked out a sufficient area of the bosh a large part of the cast house soon was covered with hot debris from the interior of the furnace including coke, limestone, ore, brick, bosh plants, etc.—all of which had to be removed by wheelbarrows.

Since 1935, however, the company on the last two blowouts at its Pittsburgh group of furnaces has employed hydraulic means for removing the hot debris from the interior of the stacks, thus avoiding the mess in the cast house and saving time in the cleanup. Last September the same procedure was employed in blowing out No. 1 Otis stack, Cleveland. Some of the details of this blowout follow.

Water Supplied to Skips

A few hours before the blowout a 4-inch high-pressure water line was installed over each skip. When the stock in the furnace was down 33 feet below the regular stockline the furnace was cast. Meanwhile, a passage had been burned to the center of the foundation about 12 feet below the iron notch and through this was drained 177 tons of salamander metal into pig beds normally used for molten slag. While the salamander metal was being cast the blast pressure was maintained at 23 pounds to keep the top of the furnace cool. Later this metal in the pig beds was broken to charging box sizes for the open hearths.

After the wind was taken off the furnace and the blowpipes dropped, the tuyeres were removed. Water was turned into the top of the stack through a 1¼-inch spray line installed over the big bell and through 1¼-inch spray lines inserted through the four gage-rod holes. Shortly thereafter the skips started dumping full loads of water into the top as well.

While the stock was being cooled various holes for charges of dynamite were drilled in the bosh area from the center of No. 11 tuyere to the center of No. 12 tuyere and about 10 feet above the level of the hearth jacket. The bosh bands then were severed with an oxyacetylene torch. Opposite the drilled bosh section, or at No. 6 tuyere, a 3-inch pipe provided with a loose tapered head was dollied through the stock to a point about 3 feet beyond the center of the furnace. Then the nozzle of a 4-inch fire hose was inserted through No. 5 tuyere opening and another through No. 6 tuyere opening into the stock for about 3 feet. Two barricades of railroad ties piled about 10 feet high were made to flare out from the bosh to assist in directing the flow of material from the furnace to the slag bed in the cast house.

When the setup was completed the drilled section of bosh between Nos. 11 and 12 tuyere was blasted. The pipe inserted through No. 6 tuyere was withdrawn far enough to release the tapered cap and as soon as sufficient debris was raked out of the way for a wide chute to be inserted into the opening, water at 160 pounds pressure from every source provided beforehand was turned into the furnace. With both skips dumping water in the furnace, with all the top sprays open, with two 4-inch hoses playing on the blasted section and three 4-inch lines working on the stock opposite the blasted bosh area, the furnace soon started to empty itself.

Complete removal of the stock was accomplished in two hours and 55 minutes including the debris of the furnace burden and the encrustations on the inwall and bosh down to the level of the monkey at the cinder notch. At one point in the flushout fully three carloads of material left the furnace in about 20 seconds which under the conventional method of removal would have required from 60 to 65 hours. Not only does the flushing clean the walls and eliminate the usual dust nuisance during the blowout, but it facilitates the removal of the old inwall lining later.

Last December the salamander drain and hydraulic flushout also was employed at the nut coke blowout of No. 4 blast furnace, Republic Steel Corp., Cleveland. Starting at 6 a.m., Dec. 22, 1943, all miscellaneous materials including open-hearth slag, roll scale and scrap were deleted from the burden. At 10 a.m. an extra 10,000 pounds of Tilden silicious ore was charged and another extra 10,000 pounds at noon; at 2 p.m. 300 pounds of limestone was taken off the burden.

Sprays were installed in the gage-rod holes at 9:30 p.m., one spray being connected with steam as well as with water. Then all of the regular burden was taken off the furnace and straight nut coke charged, each charge including four skips at 6000 pounds per skip.

Volume of Wind Reduced

Two hours after charging the nut coke the wind was cut from 68,000 (normal volume) to 58,000 cubic feet per minute, and a further cutback of 2000 cubic feet per minute was made at 2-hour intervals until 48,000 cubic feet per minute was reached. The furnace was checked every hour to make sure the stock was moving.

The furnace was kept full to the regular stockline and top temperatures were held in line by charging 150 gallons of water per skip of coke and by the intermittent use of top sprays. Top temperature ranged from 300 to 750 degrees Fahr. and was up and down with each dump of the big bell. The furnace was not isolated from others of the group; its gas was used at the boilers and stoves throughout, the bleeders on top the stack being opened to care for excess gas.

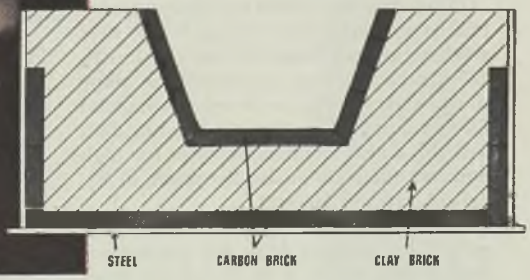
Casting schedule was maintained. The 12:30 p.m. cast yielded a ladle of 50 tons of iron; two hours later the last cast was entirely slag. At the final cast the blast pressure was 16 pounds per square inch with wind delivery of 60,000 cubic feet per minute and with this pressure a hard clean blow was obtained.

Following the last cast both bells were opened, the blowpipes dropped and all tuyeres plugged. Means then were taken to drain the salamander along the lines as previously described; when the salamander metal started to run the top

(*Please turn to Page* 144)

6 months' service!

. . . for Carbon run-out troughs



CARBON LINED run-out troughs for blast furnaces are now giving six months of continuous service . . . instead of only a day or so for those of conventional construction.

Built up with carbon brick as shown in the cross-section sketch, the necessity for routine—and hazardous—rebuilding of the lining is eliminated. A stream of cold water on the hot iron fractures the metal for immediate removal and cleaning of the trough . . . with no harm to the carbon brick from thermal shock.

The reasons for the excellent service of run-out troughs built with "National" carbon brick are important. It is to your advantage to know them. For carbon and graphite are the ideal materials for many metallurgical applications such as furnace linings, mold plugs, stools, molds, and others. These reasons are:

- **Carbon retains its mechanical strength well past the highest temperatures attained in handling molten metals.**
- **Carbon is subject to no deformation under the pressures normally encountered at these temperatures.**
- **Carbon is unaffected by rapid and violent changes in temperature, for example: from 3300° F. to 0° F.**

"National" carbon and graphite have other important properties . . . and there are other applications . . . that greatly improve steel making and foundry practice and economy. Our offices are conveniently near and we cordially invite your inquiries. Also, write for our Catalog Section M-8000 "Industrial Applications," National Carbon Company, Inc., Cleveland 1, Ohio, Dept. 34 D.

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CARBON PRODUCTS DIVISION, Cleveland 1, Ohio UCC New York, Pittsburgh, Chicago, San Francisco

METALLIC ARC WELDING ELECTRODES

—Class E7020

Section VIII in STEEL's series on metallic arc welding electrodes and their characteristics is devoted to E7020 type. Previous sections have covered the AWS-ASTM electrode classification system, March 6; class E6010 rods, March 13 and in succeeding issues classes E6011, E6012, E6013, E6020-E6030 and E7010

By HAROLD LAWRENCE
Metallurgist and Welding Engineer

THIS DISCUSSION will deal with class E7020 electrodes, ignoring the few E7030 types that are available. For as was pointed out when the E6020-E6030 electrodes were discussed (See STEEL, April 10, 1944), there is little to distinguish between the two grades in present day practice. The E7020 electrodes will do everything the E7030 electrodes are capable of doing and will make satisfactory horizontal fillet welds besides.

Of course, the E7020 electrodes are intended primarily for welding heavy steel sections, at least ⅜-inch in thickness, with the structure being positioned to allow downhand welding or at most horizontal fillet welding. The deposit is quite fluid and the slag is voluminous while the high currents used automatically result in excellent rates of deposit.

While the E7010 electrodes were suggested for welding both the proprietary high-tensile low-alloy steels and the structural alloy steels, it will be found that E7020 electrodes are used almost exclusively with the latter materials. There is good and sufficient reason for this as the bulk of the proprietary alloys are fabricated in light sections with but a comparatively small percentage of these steels being fabricated in the heavier gages. Therefore, thickness considerations lead to the selection of E7020 electrodes.

Three Steels Consume Most

E7020 electrodes are selected for work with the following steels: Carbon manganese, carbon molybdenum, Cromansil, structural silicon steels, structural nickel steels and vanadium steel. Three of these steels — namely carbon molybdenum, structural silicon and nickel steels—account for most of the electrode consumption with the relative importance of the three coming almost in the order named. For this reason a good approach to the application of this group of electrodes will be found in a discussion of the three steels for which they are so well adapted.

Considering carbon-molybdenum steel first, a typical analysis will show carbon 0.20 per cent, manganese 0.66, silicon 0.20 and molybdenum 0.46 with a small amount of phosphorus and sulphur as impurities. The molybdenum serves a dual purpose being effective in raising the tensile properties of the steel about 10,000 pounds per square inch over the values to be expected without the alloy and being helpful in imparting outstanding creep strength to the metal. Both of these factors have led to the adoption of carbon molybdenum steel in the fields of pressure vessels, pressure piping and transportation equipment.

TABLE I—MANUFACTURERS AND TRADE NAMES OF AWS-ASTM E7020 ELECTRODES

(Primary color—blue; Secondary color—green)

Air Reduction Sales Co. 60 E. 42nd Street New York 17	Airco 93
Allied Weld-Craft Inc. 401 W. South Street Indianapolis	Arc-Craft 70
American Agile Corp. 5806 Hough Avenue Cleveland 3	Blue-Grey
Anthony Carlin Co. 2717 E. 75th Street Cleveland	Moly-C-Alloy No. 2
Champion Rivet Co. East 108th and Harvard Cleveland 5	Red Devil 75
General Electric Co. Schenectady, N. Y.	W-54
Hollup Corp. 4700 W. 19th Street Chicago	Sureweld MLY-A
Lincoln Electric Co. 12818 Coit Road Cleveland 1	Fleetweld 9-HT
Metal & Thermit Corp. 120 Broadway New York 5	Type M Carbon Moly 50 Type N
Reid-Avery Co. Dundalk, Md.	Raco 64
A. O. Smith Corp. Milwaukee	SW-73 SW-76
United States Steel Supply Co. 1319 Wabansia Avenue Chicago 90	Hi-Ten B
Wilson Welder & Metals Co. 60 E. 42nd Street New York 17	Alloyrod B

Carbon-molybdenum steel pressure vessels are useful for high-temperature high-pressure applications in power boilers and refinery vessels. Power boilers of the locomotive and stationary types are often built with this steel because thinner walls may be used with safety due to the greater strength of this alloy and because creep strength will maintain the wall thickness under prolonged stress at elevated temperatures. Of course, the molybdenum does not impart any extra corrosion resistance which explains the use of alloy liners where corrosive oils are encountered.

Almost the same reasons prevail for the choice of carbon-molybdenum steels in the pressure piping field. If anything, service conditions in piping may be more severe than those in pressure vessels which explains a growing demand for molybdenum bearing steels. Since bolted connections are often troublesome as well as cumbersome in high-pressure steam distribution systems, jointless piping offers many advantages. Prefabricated piping with as many joints as possible made in the shop predominates and E7020 electrodes make the welds as the pipe is rotated by positioners to permit flat-position welding.

Saves Weight in Diesels

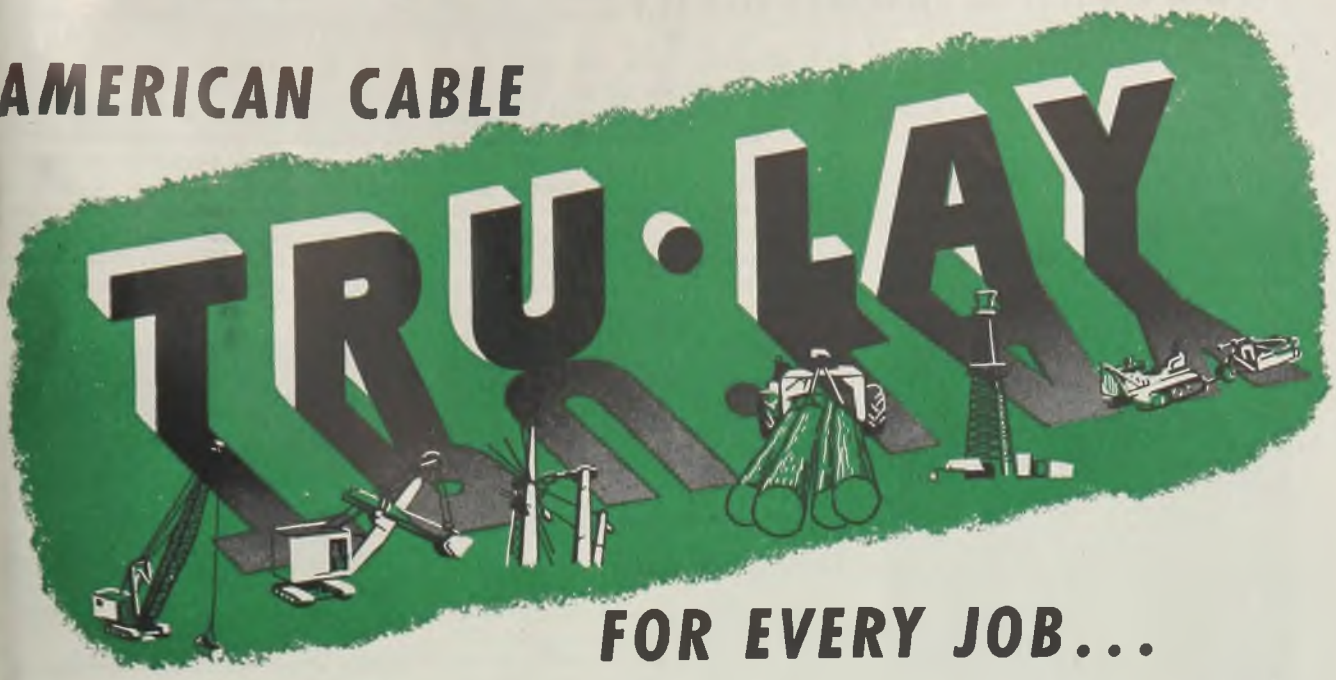
In the transportation field the use of carbon-molybdenum steels for locomotive boilers has already been mentioned. But diesel as well as steam locomotives depend upon carbon-molybdenum steels in their power units. Perhaps the greatest single contribution to the elimination of dead weight in diesel engines has been the arc welding process. High strength steel joined with E7020 electrodes in a strong, compact assembly under the guidance of able designing engineers has brought the weight per horsepower of diesel engines to a remarkably low point. Naturally these same diesel power units are found in sea going vessels of many

(*Please turn to Page* 134)

TABLE II—DEPOSIT ANALYSES PRODUCED BY E7020 ELECTRODES

	Carbon	Manganese	Phosphorus	Sulphur	Silicon	Moly.	Nickel
Min. %	0.07	0.26	.	.	0.02	0.20	.
Max. %	0.12	0.60	0.04	0.04	0.20	0.60	2.30

AMERICAN CABLE



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TRU-LAY Preformed saves time. Yes, this rope saves time—the most vital commodity in industry, the most important factor in winning the war.

TRU-LAY saves time by reducing the number of shut-downs for replacement. That's because it lasts longer.

It also saves replacement time because it's more flexible and easier to handle. You don't have to seize the ends of **TRU-LAY** Preformed.

It saves time because it's safer. Broken crown wires in **TRU-LAY** lie flat. They don't wicker out to jab hands and cause infection.

All these and many other advantages of **TRU-LAY** come from its being perfectly preformed.

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ESSENTIAL PRODUCTS...TRU-LAY Aircraft, Automotive, and Industrial Controls, TRU-LOC Aircraft Terminals, AMERICAN CABLE Wire Rope, TRU-STOP Brakes, AMERICAN Chain, WEED Tire Chains, ACCO Malleable Castings, CAMPBELL Cutting Machines, FORD Hoists, Trolleys, HAZARD Wire Rope, MANLEY Auto Service Equipment, MARYLAND Bolts and Nuts, OWEN Springs, PAGE Fence, Shaped Wire, Welding Wire, READING-PRATT & CADY Valves, READING Steel Castings, WRIGHT Hoists, Cranes . . . *In Business for Your Safety*

Washing Machine

Industrial Washing Machine Corp., New Brunswick, N. J., is now manufacturing a segmented cabinet washing machine with production ranges from 2 to 10 square feet of work per minute. Advantages of this new machine are: Only one unskilled operator needed; small floor space (11 x 7 feet); superior spray coverage; any cleaning detergents now on the market can be used. It consists of a large mesh turntable, or special fixtures, depending upon the nature

of the work to be cleaned, which rotate slowly. Surrounding the turntable is the housing which is proportioned off into various combinations of washing, rinsing and drying. Parts to be cleaned are placed either directly upon the mesh or on the fixtures. As the turntable rotates, it carries the work through the above mentioned cleaning operations and returns it to the operator who does the loading. Machine was designed for cleaning cylinders, gears, piston rings, connecting rods, master rods, pistons, machined castings, die castings, rocker arms and flexible metal conduit.

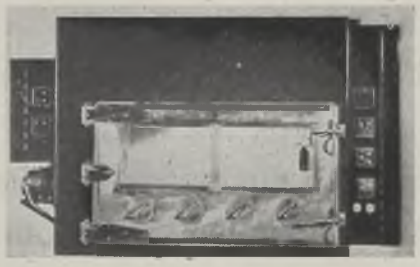
Electrode Holder

A new helium-shielded arc welding electrode holder for manual operation is introduced by the Electric Welding Division of General Electric Co., Schenectady, N. Y. It features a tapered friction joint between the electrode clamp assembly and handle which facilitates rapid change of electrode size without using tools or making threaded connections. Holder consists of a Textolite handle, a steel gas nozzle

and copper electrode clamp fitted with a tool steel spring-collet. Gas nozzle is designed with a fixed angle of 76 degrees between it and the handle to avoid obstructing the operator's view of the arc. Clamp will hold tungsten or carbon electrode until all but a ¾-inch stub is consumed. The holder may be laid down without arcing, since the handle, gas nozzle and electrode clamp are fully insulated. A button for controlling the gas supply valve is conveniently located on the handle of the holder and will remain in either the ON or OFF position without being held. It also operates the valve in intermediate positions to provide smooth, stepless control of the gas flow. The holder may be used with either helium or argon gas and was especially designed for use in welding of light metals where precise heat control and protection from the oxidizing effect of the air are required. It can also be used in the welding of other hard-to-weld metals such as aluminum and stainless steel.

Low-High Temperature Testing Chamber

American Coils Inc., Newark, N. J., announces an improved type of model RTC-1 test chamber for high and low temperatures. The improved unit embodies all the features of the standard Amcoil cabinets and may now be obtained with four individually operated plugs in the lower panel of the door which permit



ready access to the interior of the testing chamber. A turn of the handle opens the plug. The hand may be inserted through an insulated passage and the position of the part being tested can be adjusted. In the case of a regulating instrument being tested, its reading may be changed, so that the test can be continued without removing it from the cabinet or disturbing the other pieces being tested. This eliminates the necessity for opening the whole door and thus endangering the accuracy of the test on other parts in the chamber. The machine is completely automatic, and by precision mechanism assures scientific control of all temperatures. It can produce whatever temperature is desired between minus 70 degrees to 158.8 degrees Cent. It can maintain the temperature at any level so that actual service conditions may be created.

Spot Welding Control

A new thyratron welding control for providing precise control of low capacity spot welders is now available from Industrial Control Division of General Electric Co., Schenectady, N. Y. Coupled with a suitable welding transformer, this unit can be used with either welding tongs or a small bench welder and is particularly suitable for the spot welding of vacuum tube parts. Other applications for which the control, in combination with the proper welding transformer, is desirable include the welding of solid or stranded wires to terminals of copper, brass, bronze, steel, or ferrous alloys; joining two tinned-copper, steel, or alloy wires; and spot welding thin pieces of

various alloys. Suitable for operation on either 230 or 460-volt, 60-cycle power supply, it is an adjustable, synchronous-precision, electronic type in which only three thyratron tubes perform all the functions. Mounted in a compact, dead-front metal enclosure, it is designed to permit the control to be attached either to the top of the assembly bench or underneath, by a simple reassembly of parts. A single calibrated time adjustment on the front of the panel provides either one-half cycle or any number of complete cycles from one to ten. The removable cover of the enclosure allows quick inspection and full accessibility of component parts.

Countersink Cutters

Farnham Mfg. Co., Seneca and Elk streets, Buffalo, N. Y., announces the introduction of a new line of precision countersinking cutters for use on all types of countersinking machines and devices. The cutters are made in a wide range of sizes and rivet angles to fit all production

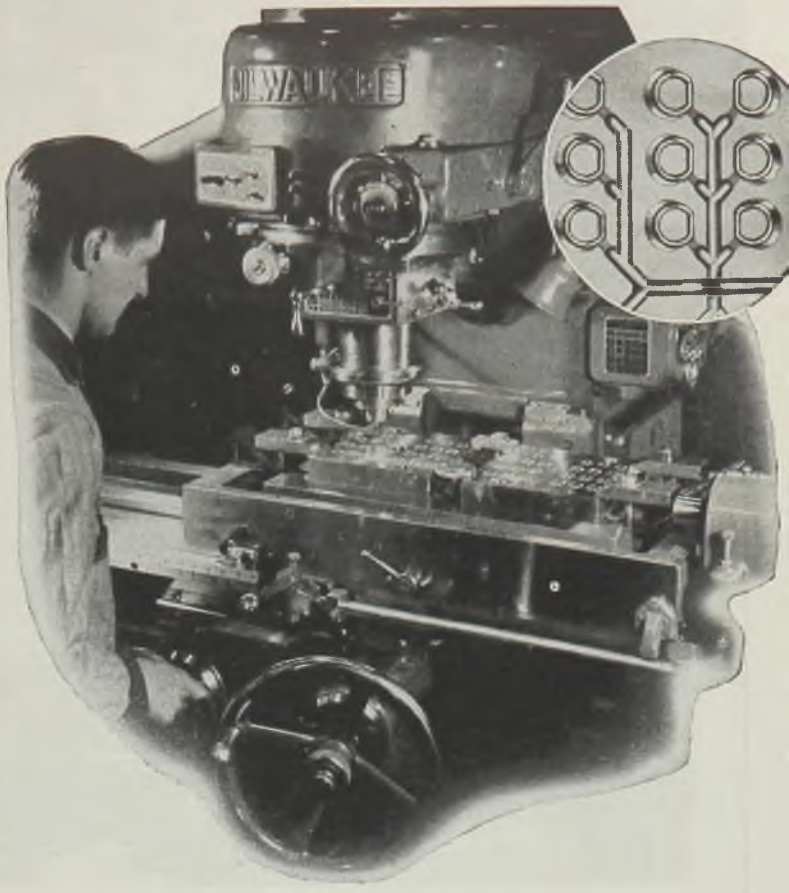
requirements: ⅜, ½, ⅝ and 13/16-inch body diameter. Rivet angles are made for all standard rivets and screws. In addition to the standard style, the cutters also are made in the built-in pilot style. Interchangeable pilots in these cutters permit their use for several sizes of holes. Special cutters to meet unusual production requirements also are available.

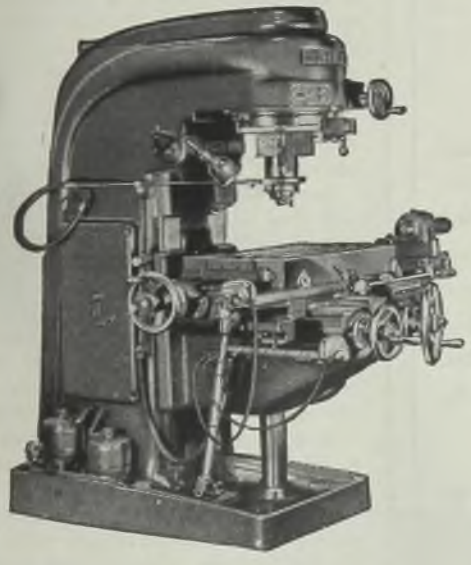
(All claims are those of the manufacturer)

24 CAVITY MOLD FINISHED IN *18* HOURS!

Estimated time required by other methods was more than 100 hours!

THE two halves of the 24 cavity mold were aligned and properly spaced on the Milwaukee Rotary-Head Milling Machine table. The first milling operation was performed on the first cavity in the back row. Then, by moving the table the proper distance — the same operation was performed on the next cavity. Since the cavities in the two mold halves were identical, this and succeeding operations were simply carried over to the opposite half of the mold. Each operation was readily performed in proper sequence and the entire 48 impressions of the 24 cavity mold were machined completely at a single set-up in 18 hours.





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ROTARY HEAD MILLER

The Most Versatile Machine Ever Designed for Mold and Die Work

DIRECT . . . mills mold cavities in a single set-up without the aid of templets or models.

ACCURATE . . . chances for error are eliminated because there is no change in set-up. Exact control of all combinations of cutting movements—possible only with this machine—transmits mathematical precision to the work.

FAST . . . initial job preparation and set-up time is reduced to the minimum. Accurate performance of the machine saves operator's time and rapid production of intricate molds and dies is the result.

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Write for Bulletin No. 1002C for complete information on the Milwaukee Rotary-Head Miller and the accurate and rapid production of all types of molds and dies for plastics.

Rotary Head Milling Machine
•
Autometric

Kearney & Trecker *Products*
CORPORATION
Milwaukee, Wisconsin
Subsidiary of Kearney & Trecker Corporation

Milwaukee Face Mill Grinder
•
Milwaukee Midgetmill
•
Milwaukee Speedmill

Steel Simplification

(*Continued from Page* 98)

In fact, some express great pleasure over the help it gave them in solving the knotty problem of substitutions.

H. S. Binns, chief metallurgist, Cincinnati Milling Machine Co., reports his company is following the recommendations and is widely using the lean (NE) alloy steels but that they will be glad when higher alloy steels will again be available for certain parts.

Alfred Kullman, vice president and works manager, American Tool Works Co., Cincinnati, tells of a plan adopted by his company in 1936 for simplifying alloy steel specifications. A single oil-hardening alloy steel replaced five; resulted in appreciable reduction in bar stock inventory and decided improvement in uniformity of heat treating. Several other machine tool builders using the same sources of supply followed suit.

All in all, Mr. Kullman reports, results were so gratifying that when standard SAE steels were no longer available, his company took an active part in the Cincinnati program detailed above.

Wm. Fritz, chief engineer, Acme Machine Tool Co., says they find NE steels work exceptionally well. Contrary to reports from some users, Mr. Fritz states his experience is that the NE steels are more uniform. He expects them to continue to be widely employed in the postwar era.

Tell Berna, general manager of the National Machine Tool Builders' Association, reports that practically all members have followed the recommendations and have generally found them to work out very satisfactorily.

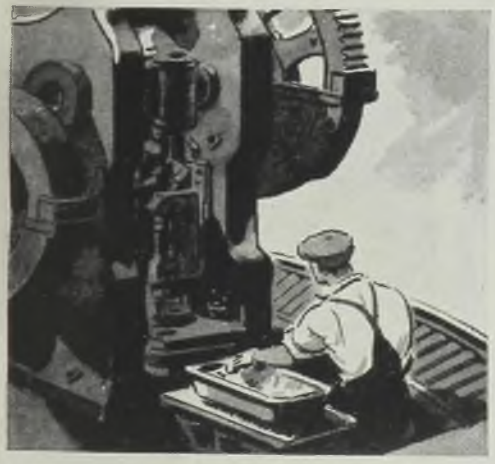
Successful Prior Experience: Mr. Hartley of R. K. LeBlond was particularly well fitted to handle the investigational work connected with the Cincinnati Simplification Plan, for his company had been working on its own steel simplification program for a number of years prior to that time. As far back as 1939, Mr. Hartley reported outstanding accomplishments resulting from this effort.

Saves $68.80 Per Ton: Mr. Hartley described net reduction in costs running as high as $68.80 per ton from this *company* simplification program. While this is not a typical figure, he states that in most cases a net reduction of $15 to $20 per ton can be averaged consistently. These are only direct savings in material costs. In addition, many other advantages accrue, as explained below.

A Company Simplification Program: In addition to the benefits that can be derived from government, industry and association simplification programs, the individual manufacturer can work out *his own program*. By following through and developing the maximum possibilities that lie in simplification in his own case he can obtain benefits far in excess of those that would otherwise accrue, as demonstrated by the experience of the R. K. LeBlond company.

As explained by Mr. Hartley, here is

TIME TO TAKE SPECIAL PRECAUTIONS AGAINST RUST



with

NOX-RUST No. 310

Spring atmospheric conditions create special rust problems that demand special precautions. Rust may show up on work left just overnight or for a week-end. Not, however, if it is protected with NOX-RUST No. 310. There are four specific rust prevention features you will find in NOX-RUST No. 310.

- **Protects work against rust between machine operations.**
- **Guards against rust when metals "sweat" due to temperature changes.**
- **Displaces water from metal surfaces.**
- **Removes fingerprints and their rust-creating effects.**

Write Today for Technical Bulletin and Free Sample of **NOX-RUST No. 310**

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2431 S. HALSTED ST. **CHICAGO 8, ILL.**

DETROIT 2 · NEW CENTER BLDG. **LOS ANGELES 21 · 1817-55 INDUSTRIAL ST.**

what can be done and how to do it.

An individual company simplification program can fulfill a two-fold purpose. First, it can improve the product. Second, it can at the same time reduce the net cost.

How?

Direct Cost is reduced by quantity discounts. Quantity extra on a typical steel is $2.50 per 100 pounds when purchased in lots of 300 pounds or less. This drops to 20 cents per 100 pounds when purchased in lots of 2 to 3 tons, and to base price in 5 to 10-ton lots. Records show cost of a given steel dropped from $8.77 per 100 pounds to $5.33 when purchased in larger quantities after simplification had reduced number of different steel compositions and allowed buying in larger quantities. This is a net reduction of $68.80 per ton. These are direct savings.

Indirect Savings: There are important indirect savings in addition. By having fewer types of steel to stock, economies can be had in shipping, storing and handling of incoming material. Inventories can be reduced. Because of better availability of mill products, mill deliveries can be faster and more dependable. To those who purchase from warehouses, steel would be more readily available also for the warehouseman would know exactly what to stock.

Higher Quality: Possibly of most importance in contributing to a better product is the fact that steel mills can afford to devote more effort to give a preferred series of steel analyses closer control, thus resulting in better steel. Mills are willing to accept very rigid specifications for steels furnished in sufficient quantity to make this rigid control possible.

A more uniform material in turn improves machinability, reducing machining costs, machining spoilage and heat-treating losses.

Equally important, adopting a limited number of steels reduces number of heat treatments required in a plant. This, in turn, leads to better heat treating by affording the operators a greater opportunity to study the characteristics and peculiarities of the smaller number of steels handled.

Simplification Possibilities — Compositions: Since he already has had considerable experience with simplification, Mr. Hartley's comments on the number of steel compositions required are particularly pertinent. He says,

"There are few if any machines that cannot be fabricated satisfactorily from five steel compositions. Supplement these five grades of general-purpose steels with five grades of special-purpose steels and you will usually get a better product built at lower cost, providing your selection has been done carefully."

"I feel that our particular industry can produce approximately 95 per cent of our parts from four or five grades of steel, such as:

1—A low alloy carburizing grade
2—An alloy oil-hardening steel
3—A straight-carbon carburizing steel, which in many instances can be used for

Water . . . enormous quantities of it . . . are used in industrial cooling operations. Water comes into the plant *cool*—goes down the drain *hot*.

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unhardened parts or like applications.

4—A medium-carbon steel, such as SAE-1045 or X-1340, for parts that require medium strength and no heat treatment or only localized heat treatment

"In addition to these, some shops may like to add a steel such as the old SAE-1120 grade for free-machining work."

"With the steel situation as it is today, it is almost impossible to specify the type of alloy carburizing grade and the type of alloy oil-hardening steel that should be recommended. I feel that a slightly richer NE steel than the 9400 series would be an ideal item for general use."

Simplification of Sizes, Finishes: Equally important cost reductions can be obtained by simplification studies aimed at reducing the number of sizes, shapes, finishes, etc. of steels ordered. The direct savings can be as great as those from simplifying compositions because the effect is the same—to reduce the number of different steel mill items ordered, thus allowing purchases in larger quantities of the smaller number selected.

Indirect savings in shipping, storing and in reduced inventories are likewise important. Too, this also increases the availability of selected items, no matter if purchased from mill or warehouse.

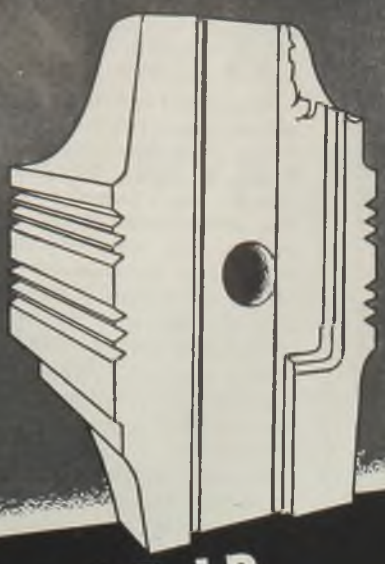
"Preferred" Sizes: The tremendous possibilities of simplification of grades, sizes, shapes, finishes and other variables has been brought out very forcefully by studies made at General Electric Co. As described by H. W. Robb, G-E Standards Department, Schenectady, N. Y., (STEEL, Nov. 30, 1942, p. 76), one investigation disclosed that 54 *per cent of the grades of copper, brass and bronze being used accounted for less than* 1 *per cent of the total tonnage purchased.*

As result of their studies, the number of gages of wire, sheet, tubing and other materials were reduced. A great number of grades, varieties, shapes, finishes, etc. were eliminated. By using a system of "preferred numbers", it was relatively easy to determine which sizes should be retained.

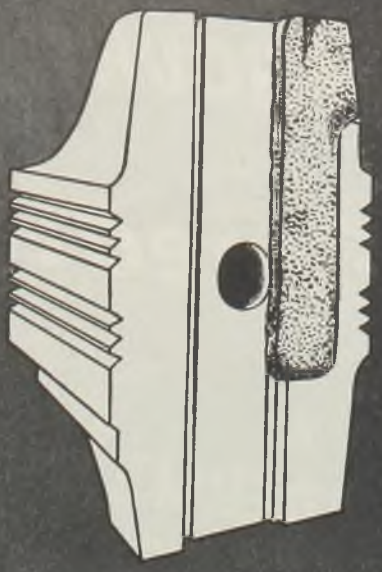
Advantages of simplification by use of preferred numbers system as explained by Mr. Robb extended to simplification of materials purchasing, stocking and design. Most important, costs were cut greatly.

Simplification—A Postwar Job That Can Be Done Now: Right now when many manufacturers are wondering what they can do that will help their postwar position, it is possible for them to investigate the advantages that could be obtained by an adequately developed simplification program suited to their own particular set of manufacturing problems and products.

Too, such a project is not something that changing markets or other unforeseen events are likely to outdate, for simplification is something that is extremely flexible—an adequately thought out simplification program can produce benefits right now and continue to be of value



Damaged hammer ram prepared for welding



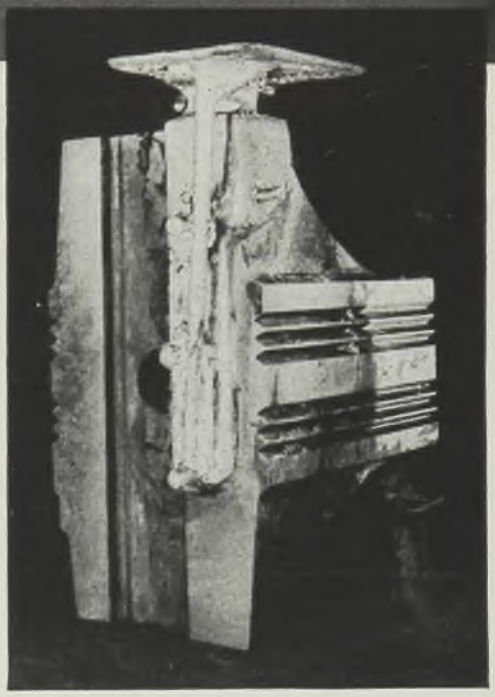
Thermit weld after pouring gate and risers have been cut away

35,000 LB. DROP HAMMER RAM REPAIRED BY *Thermit Welding*

When news of the damaged 35,000-lb. drop hammer ram first reached the front office, it caused considerable concern. Here was a part that might take months to replace, and ordinary welding was not considered adequate to withstand the shock of the hammer blows. Fortunately, the plant executives knew about Thermit welding and had the part back in operation within five days.

The chief advantages of the Thermit process for the repair of heavy parts are the great strength and durability of the weld...stronger than the casting...and the fact that stress relieving is not required and machining is seldom necessary. The result is a saving of many valuable man hours.

Because it meets heavy-duty requirements, the Thermit process is also used in the fabrication of large units such as stern frames, steel mill rolls, crankshafts—in which smaller castings or forgings are welded together. The difficulty of obtaining sound metal where large castings must be poured is eliminated, and shipping and handling of smaller units is easier.



Repaired ram; pouring gate and risers in place.

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describing the Thermit process in detail.

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no matter what conditions exist in the postwar era. Already many manufacturers are investigating the possibilities of an effective simplification program in their own plant.

Preparing For V-Day: Typical of what manufacturers can do in preparation for V-Day is the case history described in *Forbes Magazine,* February, 1944: Before the war, a manufacturer made more than 3000 different items. After cutting to 1100 they were still dissatisfied, so sent out a questionnaire to find out, "What size or sizes of fittings do you anticipate using after the war? And in what approximate quantity?"

As a result this company now has a reasonably accurate picture of its postwar market. *Only about* 700 *items will be made.*

An extra dividend was the frequent comment, "Yours is the first company that ever called on us asking us what we really need. Others have always tried to sell us what they had for sale. We appreciate your taking our side in this matter and you will get our business when you enter the market again."

Need any more be said?

Industrial Electronics

(*Continued from Page* 104)

the control switch is closed. To fire ignitron tube 1, current first flows ABCDEFGHIJ. This current flowing into ignitor G causes tube 1 to pass current, which flows AHIJ. During the following half cycle, ignitor current flows first through path JIHFEDCKBA, which fires tube 2 so that the load current then flows JIBA.

The control circuit CDEF carries each ignitor's current in turn. Although this current must reach 25 to 40 amperes momentarily to fire the ignitron, it flows such a small portion of each cycle that a 3- or 6-ampere fuse serves during normal operation. If an ignitron fails to fire or becomes "hard starting," the ignitor current flows a larger portion of each cycle, and blows the fuse. In the same circuit, the flow-switch contact opens when there is insufficient water flowing to cool the ignitrons.

Welding Transformer Protection

In Fig. 41, notice resistor R connected across the welding transformer. This resistor is furnished with the ignitron contactor and is usually a Thyrite unit, to by-pass surge voltages. In a circuit using ignitrons or thyratrons, it is desirable to use such Thyrite resistors across any inductive load such as a transformer or motor field; to be effective, the Thyrite must be connected close to the inductive load.

Use of Oscilloscope

Although the ignitron contactor just described is widely used, this same arrangement of ignitron tubes is also a basic part of more complex controls for resistance welders. In service, the performance of such ignitron tubes and

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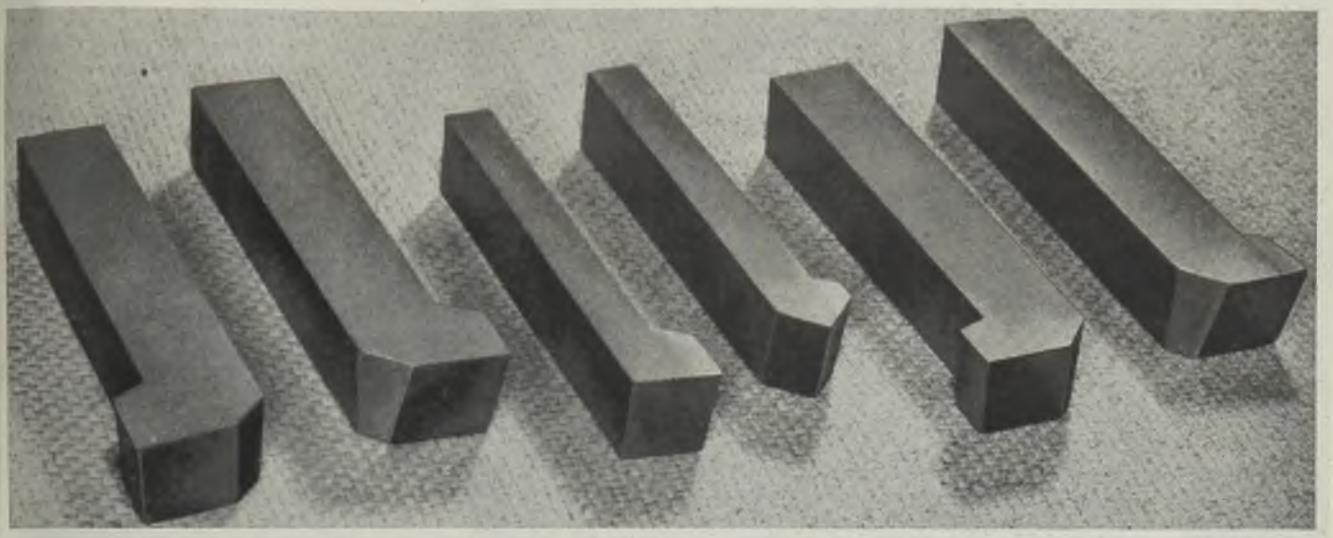

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thyratrons is best observed by means of an oscilloscope. The odd wave shapes seen with the "scope" connected in a typical welder circuit, are shown in Fig. 43. To understand these better, we must first learn about the arc drop of a thyratron or ignitron, and then see how the power factor of the load affects the tube operation.

From experience we know that when a switch controls a load, the entire circuit voltage appears across the open contacts of the switch. When the switch closes, no voltage remains across the contacts but the circuit voltage appears across the load. Similarly, thyratrons or ignitrons have circuit voltage between anode and cathode as long as no current flows. When these tubes "fire" the circuit voltage disappears from across the tubes and appears across the load—that is, all except about 15 volts. A drop of 15 to 20 volts remains across the tube when it passes current, and this is called the arc-drop of the tube. The amount of this arc-drop depends on the kind of gas or vapor used inside the tube (approx. 15 volts for mercury vapor, 90 volts for neon gas, etc.). Moreover, the amount of tube current causes little change in the arc-drop of any certain tube.

Oscillograph Traces

If oscilloscope leads are connected to anode and cathode of such a tube, the trace of alternating current line voltage is seen until the tube fires. When tube current flows, the trace drops instantly to within 15 volts of the zero center line. Fig. 42 shows such a voltage trace measured across the tubes in an ignitron contactor. The control switch closes at J and opens at K. Here the load is assumed to be non-inductive, so the current is shown in phase with the voltage. Notice the current at L, rising suddenly to its normal value on the sine wave. Notice also that no current flows at M, because an ignitron cannot pass current until the voltage wave rises high enough, at N, to force enough ignitor current to cause the arc at the ignitor tip. At least 150 volts is required before the ignitron fires. Notice also that although the control switch opens at K, the tube does not stop its current flow until P, where its anode voltage reverses.

For comparison with Fig. 42, the curves in Fig. 43 show the behavior of the ignitron contactor when it passes current to a welder transformer, which is a lagging-power-factor load and highly inductive. When current flows, it lags behind the voltage by the amount R. When the control switch closes at Q, the current does not increase suddenly at S, for the welder inductance (acting like a flywheel) prevents any sudden current change. Instead, the current increases gradually, following a sine wave. As soon as this current starts, the voltage across the tubes immediately decreases to the 15-volt arc drop. Notice that, although the circuit voltage reverses at T, tube 2 does not stop nor does tube 1 start at this point. Instead, tube 2 con-

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Our engineering staff knows and understands the amazing inherent characteristics of Kennametal and how best to apply them to any specific cutting job. There is an experienced field engineer in your district ready to help you select the right grade of Kennametal, and to determine the proper tool design and the most efficient machine set-up. When these factors are nicely balanced—Kennametal breaks production records!

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tinues to pass current later than 1, for the energy stored in the inductance of the welder transformer forces this current to flow until U.

Current Transfer Between Tubes

Meanwhile, as long as tube 2 continues to pass current, the anode-to-cathode voltage of both tubes is only 15 volts, which is not enough to fire tube 1. When the tube-2 current stops at U (since no energy remains in the welder transformer to cause further current flow), suddenly the entire voltage V becomes available across tube 1. This voltage V quickly forces current through tube-1 ignitor and fires tube 1. This all occurs within a few microseconds—so fast that the voltage trace on the oscilloscope does not have time to reach the line voltage curve at V, but returns to the arc-drop voltage at W. Tube 1 now carries all the current until at point X, the current dies out and voltage Y is then able to restart tube 2. At K, the control switch is opened, but tube 2 continues to pass current until the end of its half cycle. As this current stops, voltage Z appears across the tube 1, but it cannot restart tube 1, for the ignitor circuit is now open.

During every instant that the tube current flows, voltage is applied to the welder transformer. If the oscilloscope leads are connected across the welder transformer primary, a trace appears similar to the lower curve in Fig. 43.

Since an ignitron contactor consists mainly of a pair of big tubes, we naturally must be concerned with the methods of rating and selecting these tubes. Although the final answer depends on the use of curves in Figs. 44 and 45, several vital points should be emphasized here.

Ignitron Ratings

The four standard sizes of ignitrons (also known as size A, size B, size C, and size D) can carry continuous loads of 50, 120, 300 and 800 amperes per pair of tubes, at voltages between 200 and 500. However, at 50-per cent duty, these ratings become twice as great. In contrast, the rating of a motor or transformer operating at 50-per cent duty increases only 41 per cent, because the heating increases as the square of the load current. To understand why the ignitron rating doubles, recall the preceding statement that the arc drop of a gaseous tube carrying little current is the same number of volts as when carrying full or overload current. Since arc-drop E is constant, and $E = IR$, then the internal resistance of the tube must be decreasing as the current increases. In this way, a gaseous tube does not behave like ordinary current conductors, but the heating of the tube increases only in direct proportion to the load current. As a result, all gaseous tubes are rated in average amperes instead of amperes rms. At less than 50 per cent duty, heating is not the only limiting factor, as shown by the ignitron rating curves.

For example, the ignitron contactor with two Size-A tubes at 100 per cent

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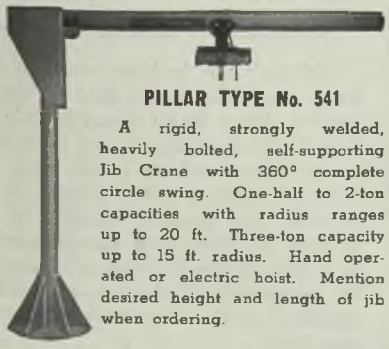
Through the simple expedient of installing a Jib Crane at this heat-treating point of operation, one man is able to lower the container into a pot type furnace. Then, with extreme ease, the container may be lifted and swung around to the oil drench at the left. There are many points of operation in steel working plants, where Jib Cranes will speed handling, save on help and reduce costs.



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There are numerous installations of Chicago Tramrail Jib Cranes used in conjunction with overhead cranes, thereby releasing overhead cranes for usually more productive heavy duty handling.

These Jib Cranes are able to take over loads ranging from ½ to 3 tons. Once installed you will observe more efficient crew operations, less worker fatigue, more production in the face of labor shortages.

Operating with a full 360° circle swing, these "little giants" of power may be operated by one man. We urge you—survey strategic handling points in and around your plant. You will be quick to recognize how Jib Cranes can result in a speedy lift in production with a sharp let-down in handling costs. New circular describing Pillar, Swinging Bracket and Mast Type Jib Cranes shows illustrations and specifications. Write for it today.

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duty will carry 50 amperes rms. This rating is true for 250 volts or 500 volts. If the tubes are not operated continuously, but on some shorter duty cycle, the maximum current the tube may carry is increased. For example, if Size A tubes are operated at 2 per cent duty at 250 volts, the maximum permissible tube current is 1200 amperes. The same tubes operating at 500 volts on a 2-per-cent duty cycle can permit only 600 amperes to flow through the circuit and still be within the safe operating limit of the tube.

It is seen that ignitrons may have constant-current rating when operating near 100-per-cent duty; at low duty cycles, ignitrons tend to have a constant-kilovolt-ampere rating to the allowable currents are higher for 220-volt operation than for 440-volt operation.

Excess Heat Stored Up During "Averaging Time"

Speaking of a motor operating at 50-per-cent duty, we think in terms of overloading the motor for perhaps 30 minutes during each hour. Experience warns us not to overload the motor for one day continuously, followed by one day of rest, even though this is still 50-per-cent duty. We know this 50 per cent applies to a reasonable time such as 1 or 2 hours, which is the "averaging time" during which the motor can safely store up excess heat with the hope of radiating it during subsequent periods of light load. All electron tubes likewise have a value of "averaging time," and it is very short—a matter of merely seconds, not minutes or hours. Electron tubes have no mass of metal comparable to a motor of equal current rating, so a tube reaches damaging temperatures in less than a minute of overload operation. Ignitrons selected for 50-per-cent duty may carry their larger current for 1 out of 2 sec, but not for 1 out of 2 min, for this exceeds the published "averaging time" of the tube. Electron tubes may "do wonders," but they still have load ratings or limits like other electric equipment.

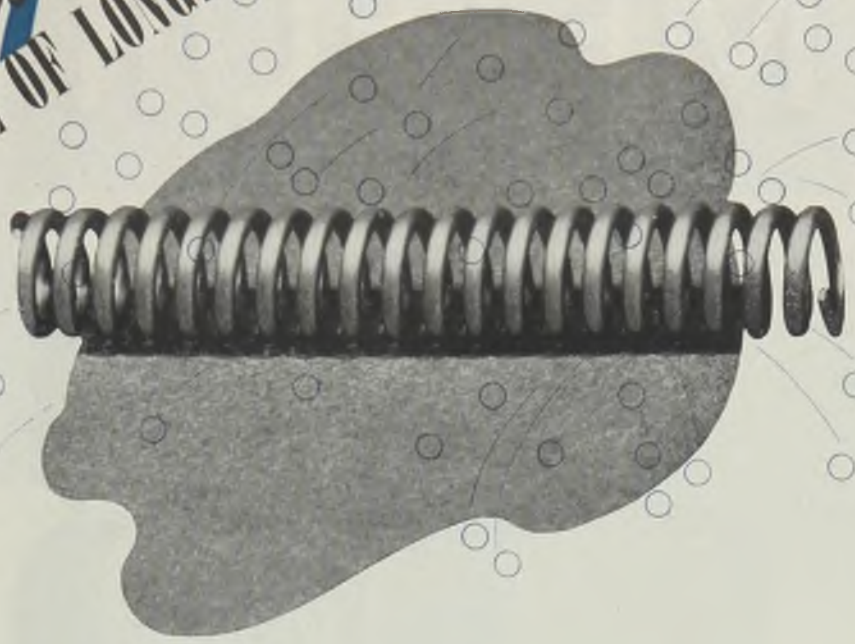
Advantages of Ignitron Contactors

Although the ignitron contactor finds its greatest use in the field of welding control, this is by no means its only use. The ignitron contactor can be used in many circuits where quick break and make of currents are required. It also permits the gradual control of the amount of alternating current supplied to a load, if the ignitrons are controlled by "phase-shifted" thyratrons, as will be explained in the next article of the current series.

New Postwar Products

Bendix Aviation Corp., South Bend, Ind., has developed a one-unit vacuum-hydraulic braking system which will be available for postwar vehicles. It now is being used on some 500,000 military vehicles.

LIFE Shot to death FOR A SENTENCE OF LONGEVITY



WHILE we do exercise untold care in bringing you spring products of exceptionally rugged quality, we do not really go to the trouble of subjecting our little "spirals" to early morning court-martialing to *toughen* their hides.

Instead we rain them with tiny pellets to "work harden" their surface and thereby increase their fatigue life—but it is accomplished more simply with a specially built Wheelabrator. Shot blasting, as it is technically called, also irons out any microscopic surface "bumps" on the wire—tending to *prevent* premature failure from stress concentrations at these points.

Every increase in the fatigue life of a spring automatically increases the period of trouble-free performance of the unit in which it is incorporated. This precaution we believe is a "must" whenever critical springs are highly stressed. It is included in our *SCIENTECH* service—Lee's way to longer spring life.

LEE Spring Company, INC.

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BROOKLYN 1, N. Y.

LEE-BUILT TRADE MARK SPRINGS

Unique Die Sets

(*Continued from Page* 108)

width to make four clips. This die set-up is used in a 2-inch stroke press of approximately 40-ton capacity. Material comes in coils, and is roll fed into the die to make four finished clips on each stroke of the press.

Die arrangement, Fig. 4, is such as to perforate and blank in first of five step-ups on die. First step-up is to perforate hole for first and third clip, also blank 99 per cent of second and fourth clips.

Third step-up is to form all four clips to fit tubular fuses with ears for preventing endwise movement of fuses in the clips.

Fourth step-up: Die in down-stroke has front and rear cam for form anvil action which is in two halves, front half and rear half of 2⅞ inch width, thereby allowing clip to form down over anvil in cam action. On up-stroke of press, anvil is pulled out of line of moving spider or scrap, allowing clip to pass over shear edge of die.

Fifth step-up is to shear off 1 per cent of remaining material, holding clip in position for four previous formations and thus separating the individual completely formed clips.

As to the system for engineering progressive dies, such as those for the 30-ampere fuse clips, Mr. Adam says, "Before proceeding with the die, we make temporary forming dies to get the right formation for the fuse barrel, and then proceed to make blanks to get the proper length of the fuse clip when in finished form. We then proceed to make drawings for the dies after we have found the proper formation and length of blank. Then we make the die drawings and lay out all operations and put in all dimensions necessary to get the proper step-ups for the operation in the die.

Work Within 0.001-Inch

"In making the die, all the operations are laid out with the height gage and all step-ups must work within 0.001-inch in order to get the proper lineup of all the operations of the die when it is in operation. The die must be properly lined up in the subpress to perform the operations correctly."

Fig. 5 shows two-step progressive die for blanking and drawing "buttons" used to close holes in panelboard sections. This particular button covers an opening approximately ½-inch in diameter. Material is 0.015-inch thick, 3½ inches wide, forming three at a time. It can be either soft copper or deep-drawing steel.

The blank is similar to a four-leaf clover design; pressure in the blanking die being employed to force blank in spider or scrap to carry over to second step-up position for forming of blank.

Blank is drawn down to tubular shape to a certain length. Upper part of die has an ejector plunger which allows the center of the forming punch to auto-

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Every Sterling wheel is planned to do a particular grinding job well. In your own plant, we can possibly recommend a wheel that will solve one or more of your troublesome grinding problems. May we make a grinding survey at no obligation? Our engineers will gladly cooperate upon request.

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matically recede as a lower cam [illegible] up the forming punch for heading the button. A side cam holds the forming die closed to clamp the button for the heading operation.

The head is put on the button to prevent it from dropping down through a ½-inch hole. Head of button is 9/16-inch diameter, 1/16-inch thick and length of button wall is approximately ⅜-inch. Four individual quarter round forms can be set to spring outward if more wall pressure is required to prevent the button from falling out of the opening. This also makes it easy to remove it, since the head permits handling with a screw driver or pair of pliers.

Welding Electrodes

(*Continued from Page* 114)

descriptions although the full story of these applications must await the winning of the war.

Transportation uses in addition to the foregoing include main strength members of railroad cars and trucks where the elimination of dead weight through the use of carbon-molybdenum steel is a common practice.

Structural silicon steels have carbon as high as 0.35 per cent with manganese running up to 0.90 per cent and silicon from 0.15 to 0.30 per cent. The rather extreme values of carbon and manganese are necessary because the structural silicon steels must exceed 70,000 pounds per square inch minimum tensile strength as rolled. Carbon, manganese and silicon are increased as the section thickness becomes greater in order to maintain the required strength.

All sorts of pressure vessels are built of structural silicon steels primarily because of the strength characteristics of this material. Oftentimes high-tensile silicon steels are suggested by fabricators who otherwise would be unable to build the larger units because of crane and handling limitations. From the standpoint of lower fabrication and transportation costs, the high strength materials are selected notwithstanding their higher initial cost. Naturally it is cheaper to weld 2-inch thicknesses of high strength steel rather than 2½-inch thicknesses of low carbon steel when all essential features of the process for welding heavy plate are the same.

Nickel steels contain from 2.0 to 3.5 per cent nickel with carbon in the neighborhood of 0.20 per cent and manganese less than 0.80 per cent. Once more high strength characteristics are important although the most unique property of these steels is their ability to absorb shock at low temperatures, that is, they possess good impact strength which makes them useful where shock at 50 degrees Fahr. below zero would be most hazardous.

One of the earliest uses for welded nickel steel vessels was the low-temperature dewaxing of oil. The manufacture of Dry Ice (solid carbon dioxide) is yet another application for nickel alloy steels. Liquified gas storage has opened up an-