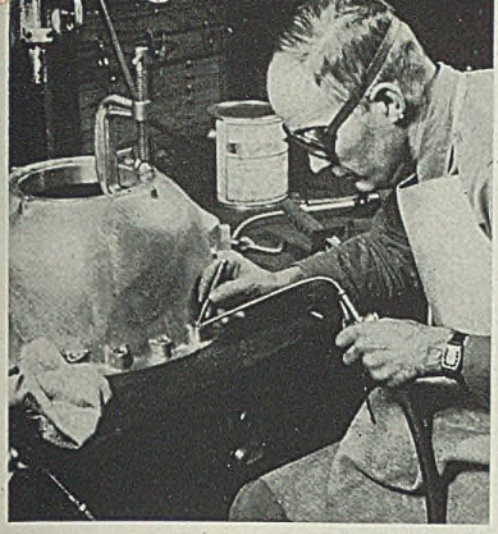

Recovery of broken drills by butt-weld extraction saves time and parts. P. 76

CONTENTS

Volume 112—No. 8 STEEL February 22, 1943

NEWS

FEATURES

TECHNICAL

PRODUCTION

MARKETS

FOR SHORT OR LONG RUNS

Boring, Turning, Facing, Grooving, Chamfering . . . with Precision!

Tomorrow, just as today, the watchword of industry in this country will be "Production." With the lid lifted high on accumulated peace time needs, the advantage will then definitely be with those who today are installing equipment for war production with thought for the future. The Ex-Cell-O Precision Boring Machine—for boring, turning, facing, grooving, chamfering to "tenth" accuracy—is the preferred type and make of equipment among many manufacturers producing parts for war purposes in large quantities today; its extreme flexibility in application makes it an equally sound investment for the inevitable tomorrow, in shops either small or large.

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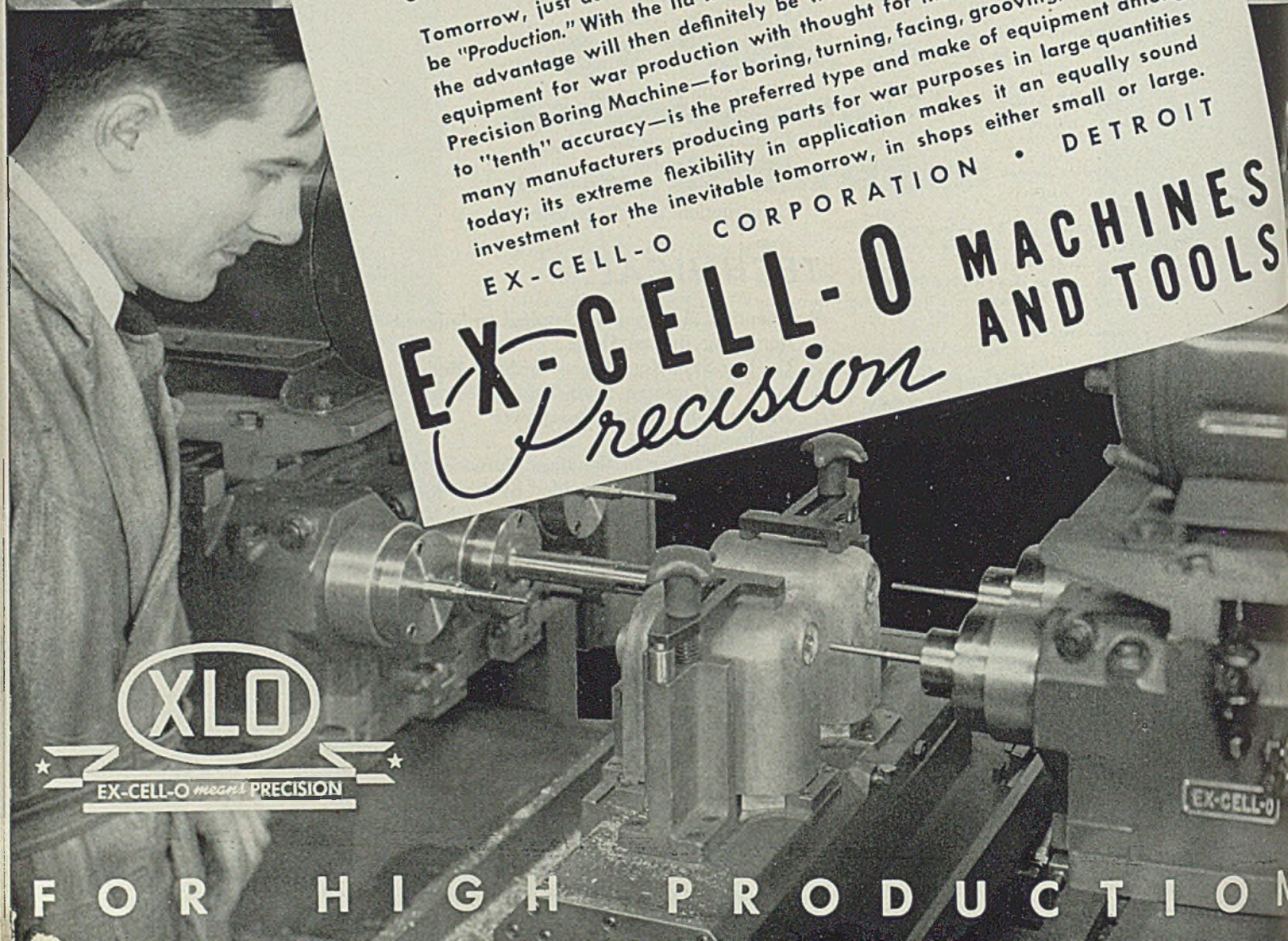


FOR HIGH PRODUCTION

HIGHLIGHTING

this issue of STEEL

MATERIALS Immediate planning to insure reserves of critical materials in the postwar period was endorsed by the American Institute of Mining and Metallurgical Engineers meeting (p. 40) in New York last week. . . .

Extensive deposits of vanadium ore discovered in Idaho and Wyoming (p. 43) promise to make the United States largely self-sufficient in this critical alloying material. . . . Largest shipping fleet in Great Lakes history will be in action this season (p. 69)—a total of 321 vessels to haul 100,000,000 tons of iron ore.

MANPOWER President Roosevelt's directive extending the workweek to 48 hours has not had much success in the Detroit area (p. 59). Considered as a move to stem labor's demands for an increase in wages above the Little Steel formula, the extension does not appear to satisfy union leaders there. The manpower shortage is rapidly approaching the critical stage with non-essential jobs providing few workers for defense industries. . . . Industrial relations are more important now than ever before, despite government controls over wages and other employment matters, the American Management Association was warned (p. 66). . . . Because women are mentally and physiologically different from men, their working conditions must be different and tailored to their capacities (p. 65). . . . Aircraft torpedoes are well ahead of production schedules at the International Harvester Co. plant in Chicago (p. 64). Intricately close work is involved in the manufacture of these torpedoes with as many as 15,000 to 20,000 separate operations. Majority of the workers are women because company officials found they are better adapted to perform fine machining operations where accuracy demanded is to 25 one-millionth of an inch.

WASHINGTON Charles E. Wilson, executive vice chairman of WPB, has been assigned control over both allocations of materials and production in a war board reorganization (p. 53) which started with the forced resignation of Ferdinand Eberstadt, formerly a vice chairman. . . . Virtually all operating procedures which will govern industry under the Controlled Materials Plan have been established by WPB (p. 54). . . . WPB Copper Division has been reorganized (p. 55) to simplify operations under the Controlled Materials Plan. . . . In the fifth of the Windows of Washington series on postwar planning, Dr. Alvin H. Hansen, economic expert, declares that the idleness of the 1930's caused the loss of 200 billions in income. With a great productive machine and trained men and women, the nation should be capable of producing a much higher standard of living.

IN THE NEWS Steel companies have invested $1,205,000,000 of their own funds to increase capacity since Hitler first moved into Czechoslovakia and Austria (p. 44). When the expansion program is completed later this year, blast furnace capacity will have been raised 20 per cent, open hearth by 18 per cent, while electric furnace capacity will be three and a half times what it was in 1938. . . . Heavy handling equipment is aiding American shipyards in establishing new records in the building of merchant vessels (p. 63). . . . Despite the reduction in the tank program, George F. Hocker, chief of the forgings and castings section of the Steel Division, WPB, stated at a Steel Founders' convention in Chicago that 1943 requirements for tank castings will utilize all the production facilities (p. 57).

TECHNICAL Reginald Trautschold tells how Link Belt Ordnance Co. employs principles of scientific management in subcontracting work, to increase output of munitions from that plant (p. 74). Several hundred subcontractors collaborate through a control system.

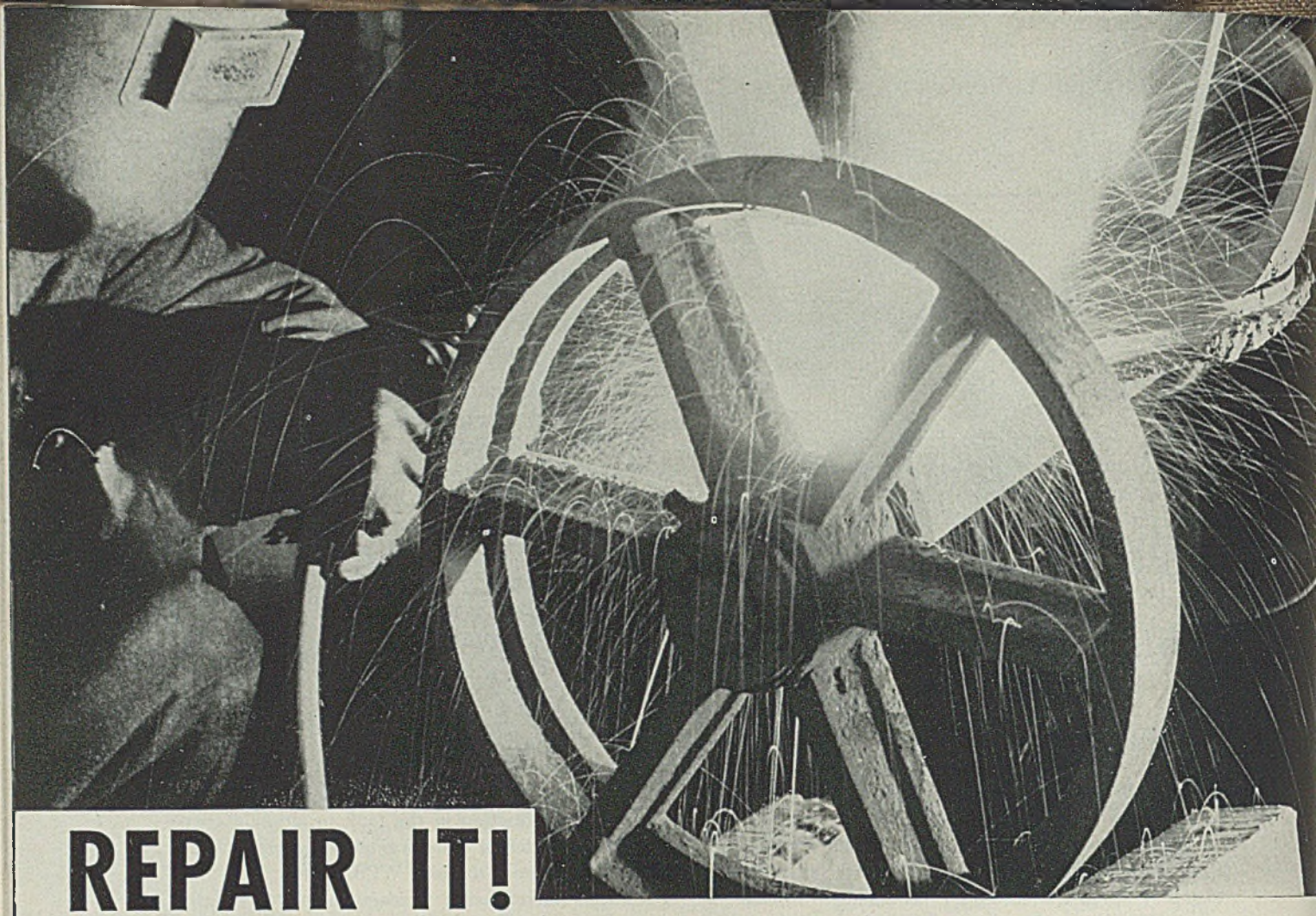
Henry J. Burnett and Charles E. Hansling present details of an effective method for removing broken drills, reamers and plug gages from drilled holes (p. 76), a method that has been employed with considerable success at the Pratt & Whitney aircraft engine plant.

Conservation of welding electrodes can be accomplished by a number of different means, according to G. G. Landis, who discusses and evaluates the various factors involved (p. 80). There are many more important ways to save electrode material than avoiding stub-ends.

Paul Miller shows (p. 82) what is being done by one producer to conserve critical materials through standardization of cutting tools. . . . Joseph A. Setter explains how determining the exact horsepower needed for a particular job may reveal important savings (p. 84). . . . A tin-free bronze is reported that appears to be superior to conventional gear bronze (p. 86).

Charles E. Agnew concludes his discussion of smelting sinter in the blast furnace (p. 88).

George E. Stringfellow tells how work period of industrial trucks has been doubled with only a 50 per cent increase in battery capacity (p. 98).



REPAIR IT!

The Steel Necessary to Replace It Must Be Sent to a Battle Front

The government has allotted a limited amount of steel for essential maintenance, but any part of that steel saved by *repairing instead of replacing*—is that much more steel for ships, tanks, guns, etc.

Much critical war steel now used for repairs and replacement of broken and worn parts can be saved if periodic inspections are made to discover failures in their early stages. Welding can be employed to rejoin broken parts, and to reinforce parts that show the effects of strain. Often times steel parts, and equipment, bent and twisted by accident, can be heated and straightened and put back into service, saving the new steel necessary for replacement. Steel damaged by localized corrosion can be cut away with a torch and replaced, sometimes with scrap pieces of metal, saving replacement of the entire member.

There are practical methods for building up worn shafts, and other parts worn by friction. Very often a few vital parts of old machines can be reinforced with the minimum use of new steel, and the machines put back into service for heavy duty work.

All the new steel that America can produce has a vital place in the scheme for defeating our enemies. Do your part in the fight for freedom by using the minimum of new steel for maintenance.

Repair it! Don't replace it!

ARMY E NAVY

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STEEL
February 22, 1943

Parity for Whom?

In extending the work week to 48 hours and retaining time-and-a-half pay for hours over 40 the government is provoking new demands for higher prices by the farm bloc.

The renewed pressure will be based upon the familiar claim for parity. Farm parity is a device introduced by the new deal in 1933 to raise farm income to a level more equitable with non-farm income. It is intended to peg the prices a farmer receives for his products in an equitable relationship with the prices he pays for the things he buys.

This relationship happened to be favorable, from the farmer's standpoint, during the period preceding World War I. Therefore the average price relationships of 1910-1914, inclusive, usually are the bases for the parity formula. In short, those who seek farm parity really are asking for a return to the "good old days" of a long past era.

The renewal of their demands raises a question as to whether the parity formula is practical under existing conditions. As things now stand, parity cannot be achieved without risking acute inflation.

This is because the portion of national income going to non-farm wage earners has increased so much during the past quarter-century, and has soared so sharply during the past two years, that parity for the farmer would lift farm prices to a level that would wreck the government's anti-inflation program.

The plight of the farmer is similar to that of investors. Individuals who own the private enterprises of the nation are as far removed from the parity of the "good old days" as are the farmers. The non-farm wage earner is about the only individual who is not asking for parity of the 1910-1914 variety. His best days are the present days.

All in all, the situation reminds one of the story of the proud mother who said that all of the soldiers were out of step except her son. Possibly the wage rates of non-farm workers are out of step.

E. L. Shaner

Editor-in-Chief

Engineers Want Permanent Stockpiles of Critical Materials

Overall outlook for strategic metals and minerals fairly comfortable. Continued conservation, development of new supplies and substitutions necessary to maintain position

NEW YORK

WHILE many problems remain, the overall situation in critical and strategic metals and minerals is fairly comforting. Provided the war is not too prolonged, and the country continues to develop supplies, observes rules of sound conservation and employs ingenuity in substitution of materials, all should prove well.

Such was the consensus of speakers at the 158th meeting of the American Institute of Mining and Metallurgical Engineers here, Feb. 14-18. However, so pressing has been the emergency and so critical the situation in some respects that it is believed the country should never again lay itself open to such a hazard, and should, as a matter of sound insurance, start planning now to maintain substantial reserves of critical materials after the war is over.

So urgent is this question in the opinion of R. C. Allen, Oglebay, Norton Co., Cleveland, that he introduced a resolution to the effect that the institute start working as early as possible with other interested groups in the formulation of a policy for submission to Congress that it, in turn, might enact a law making adequate provisions for such reserves. The resolution was presented at a joint session of the Industrial Minerals Division and the Society of Economic Geologists on stockpiling and materials supply, and was referred to the institute board for action.

"Industrialists Were Farsighted"

Mr. Allen spoke of the concern of many individuals, companies and engineering organizations for years before the war over the unpreparedness of the government with respect to critical supplies. "Had it not been for the industrialists, who laid in extra supplies before Pearl Harbor, the plight of this country would have been far worse. That the country came off as well as it did at the start of the emergency in this respect was "not because of the wisdom of the government, but because of the farsightedness of the industrialists themselves," he declared.

He said the only way to get action was through Congress, and it was a matter that should not be left until the war was over, when there would undoubtedly be many other questions of postwar adjustment to engage the attention of the federal legislative body, and which it might regard as more immediately pressing.

Other speakers, and particularly W. O. Hotchkiss, Rensselaer Polytechnic Institute, Troy, N. Y., emphasized the importance of providing for strong materials reserves, accumulating them during lean periods when prices were low and transportation was not hard pressed.

Two hundred scientific papers were presented at the 50 technical sessions held during the convention. Discussions of special interest to the steel industry included structure of carbon and alloy steels, boron in steel, blast furnace slags and various other phases of steelmaking. A round table discussion was held on boron, including such phases as methods of determination of boron in steel, effect of boron on austenitic grain size, its effect on deoxidation and on structure, its fading effect, types of steel affected by boron and the theory of boron effect.

One feature of the discussion on blast furnace slag was a paper by Gerhart Derge, assistant professor of metallurgy, Carnegie Institute of Technology, Pittsburgh, in which was described a method of testing for oxygen in molten steel. This method requires 10 minutes and was declared to be more accurate than any developed heretofore.

The twentieth Howe Memorial lecture was presented by Leo F. Reinartz, manager, Middletown Division, American Rolling Mill Co., on the "Development of Research and Quality Control in a Modern Steel Mill" Thursday afternoon. Vladimir K. Zworykin, associate director, Radio Corp. of America, delivered the twenty-second Institute of Metals Division annual lecture on "Applications of the Electron Microscope in Metallurgy" on Wednesday afternoon.

Three sessions of the Institute of Metals Division were devoted to a symposium on secondary metals. One of several important papers was by Floyd E. Blivin, supervisor of salvage, General Electric Co., Erie, Pa., on "Problems of the Producer in Segregation and Reclamation."

At a joint session of the Eastern Magnetite Mining and Milling Committee and the Iron and Steel Division, New York and New Jersey iron ores came in for special attention. I. D. Hager, general manager, Titanium division, National Lead Co., New York, discussed the Mac Intyre ilmenite and magnetite development of his company at Tahawas, N. Y. Meredith E. Johnson, New Jersey state geologist, Trenton, N. J., outlined results of some recent prospecting for iron ore in his state, and Ira D. Odgers, Alan Wood Steel Co., Conshohocken, Pa., spoke of recent developments at the Washington and McKinley mines of his company.

A feature of one session was a paper by R. B. Sossman, United States Steel Corp., New York, on metallurgical refractories.

Elect New Officers

The new president, C. H. Mathewson, chairman, Department of Metallurgy, Yale University, New Haven, Conn., was formally introduced at the annual banquet of the Institute at the Waldorf Astoria, Tuesday evening. He succeeded Eugene E. McAuliffe. Erle V. Daveler, vice president, Utah Copper Co., New York, and Harvey S. Mudd, consulting engineer, Los Angeles, are new vice presidents.

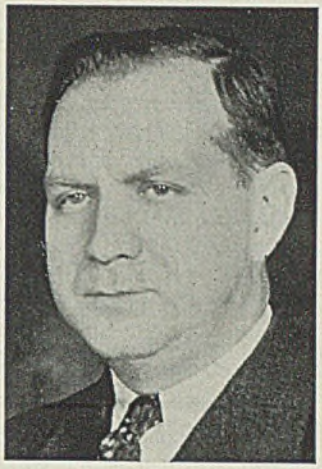
New directors are: Mr. Mathewson; Charles H. Herty Jr., assistant to vice president, Bethlehem Steel Co., Bethlehem, Pa.; O. H. Johnson, vice president, Mines & Smelters Supply Co., Denver; and Russell B. Paul, mining engineer, New Jersey Zinc Co., New York. F. A. Wardlaw Jr., assistant manager, International Smelting & Refining Co., Salt Lake City, Utah; Felix Edgar Wormser, secretary and treasurer, Lead Industries Association, New York; and Mr. Daveler and Mr. Mudd were reelected to the directorate.

H. W. Graham, director, research and development, Jones & Laughlin Steel Corp., Pittsburgh, was elected chairman of the Iron and Steel Division of the institute, and Cyril Stanley Smith, research metallurgist, American Brass

DR. C. H. MATHEWSON
New president, American Institute of Mining and Metallurgical Engineers

H. W. GRAHAM
Jones & Laughlin Steel Corp., and new chairman, Iron and Steel Division

CYRIL STANLEY SMITH
Research metallurgist, American Brass Co., and 1943 chairman, Institute of Metals Division



JAMES M. STAPLETON
Carnegie-Illinois Steel Corp., winner of the 1943 J. E. Johnson Jr. award

Co., Waterbury, Conn., chairman of the Institute of Metals Division.

Former President Herbert Hoover, also a past president of the institute, was a surprise speaker at the annual dinner. Said the ex-President:

"The quantitative mind of the engineer contrasts with the quantitative mind of members of other professions, who, unless they come down to earth may blow away with their bubbles when they break. The problems which surround us are finding expression in the taking over of our universities by the Army and Navy to train engineers in 15 months. As to this I have only one reservation, namely, that those who take the 15-months course, will, when the war is over, come back to the universities and get the real engineering education they will need. I know we will win this war and solve our problems because the Army, the Navy and industry are doing the job."

Ex-President Applauded

Mr. Hoover, who was given an ovation by the 1000 mining and metallurgical engineers, was followed by William M. Jeffers, national rubber director, who declared he was certain the former President's remarks "had not been submitted to OWI".

Robert A. Bryce, president, Canadian Institute of Mining and Metallurgy, was also an unscheduled speaker, conveying greetings from Canadian engineers.

A new era of transportation after the war was predicted by Mr. Jeffers in the principal address. Competition between various forms of transportation again will develop, but one of the lessons learned from the war will have been the dependence of these various forms on one another. Experience gained in the present conflict will be fully utilized in the construction of thousands of new freight and passenger cars, trucks, buses, automobiles, airliners and ships, said Mr. Jeffers.

"The world will have to be rebuilt and America will have to contribute its part in the job of superintending that reconstruction," he said. "It is no reflection on any country to say that America and the American way of life, in a very large measure, are the goals of all peoples everywhere. In all the civilized nations of the world, before the war, there could be found examples of American genius and inventiveness."

At the dinner, John Robert Suman was awarded the Anthony F. Lucas medal "for distinguished achievement in improving the technique and practice of producing petroleum." Paul D. Merica, vice president of the institute for the past 11 years and vice president of the International Nickel Co., New York, and Essington Lewis, chief general manager, Broken Hill Proprietary Co., Ltd., Melbourne, Australia, were awarded certificates of honorary membership. Sir Owen Dixon, Minister Plenipotentiary of the Commonwealth of Australia, was present to receive the certificate in behalf of Mr. Lewis.

Marcus A. Grossman, director of research, Chicago division, Carnegie-Illinois Steel Corp., Pittsburgh, was presented with the Robert W. Hunt award for 1943 for his paper entitled "Hardenability Calculated from Chemical Composition"; and James M. Stapleton, South works, (Chicago), Carnegie-Illinois Steel Corp., the J. E. Johnson Jr. award, for his work on blast furnace filling as described in his paper on "Results Obtained from Surveys of Gas and Furnace Tops".

The Institute of Metals division dinner Wednesday evening, was featured by an address by John W. Barker, dean, faculty of engineering, Columbia University, New York, and assistant to Secretary of Navy, on "Engineers and Engineering Education in Postwar Reconstruction," and the presentation of the Institute of Metals Division award to J. D. Hanawalt, director, metallurgical department, C. E. Nelson, assistant director, metallurgical department, and J. A. Peloubet, in charge of corrosion tests, all with the Dow Chemical Co., New York, for their paper entitled "Corrosion Studies of Magnesium and Its Alloys."

Speaks on Qualitative Control

In his lecture on the development of research and qualitative control in steelmaking, Mr. Reinartz emphasized standardization of processes, observation on deviations from such practices and methods of correction from the ore mines to the customer's plant. And from first to last, he stressed the need for an intelligent and efficient organization. Accurate records by the hundreds, he declared, must be kept. Proper follow ups must be maintained. Operators must know their jobs.

"Maintenance and service men must maintain equipment so delays do not interfere seriously with quality controls," he continued. "Metallurgists must observe the operations in the steel plant from the blast furnace through the open hearth department, the rolling mills, and the processing departments.

"In addition, the inspection department must double check on the physical and surface characteristics of the product as it goes through the mill, and on the inspection tables. Also accurate records must be kept so there will be no

mixups, lost lifts, nor improper schedules and treatments."

Quality production depends upon the interested co-operation of a loyal efficient working organization. It is a responsibility of management, he declared, to make sure that the men understand the relationship between quality production and quality control. Quality is the only foundation upon which an enduring business can be built, he added.

Mr. Reinartz traced briefly the development of research in the steel industry. He indicated that the most intensive research was first undertaken by small companies, who found they had to specialize to hold their own. During the early years of this century a great many large steel corporations were organized, the speaker asserted. The drive for large tonnage output in the bessemer and new open hearth furnaces was on. Profits were high and there was little attention paid to the development of real quality controls. However, the smaller concerns were in a less fortunate position. They evidenced an early interest in research to develop products which would provide them with a profitable operation. The managements of these companies making specialty steels early learned a great secret, he said; Namely that quality control was the starting point for an economical and profitable business.

Research Expenditures Heavy

Today there is no steel company of any importance that does not pay allegiance and homage to the need for research. Some companies, he said, spend large sums for pure research; others carry on such research by subsidizing independent research laboratories to work on definite problems; while still others combine the theoretical and the practical and carry on research investigations in special laboratories away from the operating plants. These companies then follow up the practical tests on a large scale in the operating departments. Thus, he said, with research and operating metallurgists and practical men working together to develop new steels out of abstract metallurgical theories, the large modern plant equipment becomes the laboratory for major experiments in metallurgy.

The speaker discussed quality control as applied to various operations. He spoke of accurate methods for mixing and analyzing ores, and referred to the coke plant as playing an important part in the maintenance of quality of pig iron or hot metal.

He touched on various phases of open hearth practice and remarked that at his company's Middletown plant, where high percentages of "hot metal" must be charged in the open hearth furnaces, it was found that low-silicon hot metal would improve operations because less ore would have to be charged and the resulting decreased slag volume would help in quality control and increased tonnage.

Aluminum Supply Fair

While aluminum is in fairly comfortable supply for essential needs, this is by no means true of finished steels, Dr. Harvey N. Davis, president, Stevens Institute of Technology, Hoboken, N. J., and director, scientific research and development, War Production Board, declared at the "All-Institute" luncheon. Pig iron is in fairly good supply, but blooming mill capacity constitutes a bottleneck in finished steel, he indicated.

He advocated the use of brick and rotary cement kilns for prouction of sponge iron. Many operators of these kilns, he declared, are confronted with financial difficulties as a result of present conditions and he believed that the application of their facilities to this work would serve the two-fold purpose of tiding the operators over the emergency and of adding somewhat to the total supply of iron, although clearly his emphasis was on the former.

Discussing aluminum, Mr. Davis said there is a fairly satisfactory reserve of good bauxite ore, but that it would be advisable in his opinion to further develop beneficiating processes and to build modest-sized pilot plants for the production of aluminum from low-grade bauxite. However, he thought such construction at present would prove costly from the standpoint of manpower and critical materials required.

At the session on the structure of carbon and alloy steels, G. A. Roberts, research metallurgist, Vanadium-Alloys Steel Co., Latrobe, Pa., and R. F. Mehl, director, metal research laboratory, Carnegie Institute of Technology, Pittsburgh, presented a paper on the effect of inhomogeneity in austenite on the rate of the austenite-pearlite reaction in plain carbon steels. They pointed out that the undissolved carbide when present in considerable quantity increases the rate of the austenite-pearlite reaction. The effect is greater, the higher the temperature of the reaction, and is much greater than the effect of alumina inclusions in the particular steels studied.

It also asserted that undissolved carbide when present in considerable quantity materially reduces the hardenability. Carbon concentration gradients have little effect on hardenability. The authors also declared that by calculating the true effect of austenitic grain size upon the rate of reaction at high subcritical temperatures and thus excluding it from consideration, a sensitive test for austenitic homogeneity is devised.

An x-ray diffraction method for the quantitive measurement of retained austenite in heat treated steels was discussed in a paper prepared by Frank S. Gardner, metallurgical department, American Brake Shoe & Foundry Co., Mahwah, N. J., Morris Cohen, and D. P. Antia, department of metallurgy, Massachusetts Institute of Technology, Cambridge, Mass. By means of an aluminum foil, which is exposed simultaneously with the steel specimen, a reference line is superimposed on the x-ray film along with the diffraction lines emanating from the steel.

Typical examples of the application of the x-ray method to 5 per cent nickel steels were given to show: (1) the effect of carbon content and cooling rate on the amount of retained austenite; (2) the course of austenite decomposition during temperature; and (3) the austenite gradient in quenched steel due to decarburization.

Carbides Discussed

Carbides in low chromium-molybdenum steels were discussed by Walter Crafts and C. M. Offenhauer, research metallurgists, Union Carbon & Carbide Research Laboratories, Niagara Falls, N. Y. In their research, steels containing up to 1.5 per cent molybdenum without chromium and steels with up to 1 per cent molybdenum and 5 per cent chromium were examined to determine the nature of the carbide phases after quenching and tempering. Cementite was found in steels tempered below 500 to 550 degrees Cent. and alloy carbides were found after tempering at higher temperatures.

Types of alloy carbides, which depended upon the composition of the steel and the temperature of formation were: Cr7C3 in intermediate chromium steels; Cr4C in higher chromium steels; and Mo2C in molybdenum steels. This molybdenum carbide (Mo2C), which previously had been observed only in high-molybdenum alloys, was found by chemical analysis to contain about 20 per cent iron. All these carbides, they declared, were found in chromium-molybdenum steels, and the approximate ranges of the carbides with respect to tempering temperature and composition were correlated in phase diagrams.

Discoveries in Idaho, Wyoming To Make U. S. Largely Self-Sufficient

DISCOVERY of extensive deposits of vanadium ore which is expected to go far in making the United States self-sufficient in this alloying material has been reported by the Geological Survey.

Up to this time the United States has been dependent to a large extent on imports. Submarine warfare has made the importation of the metal difficult and it is expected that utilization of the domestic deposits will free valuable shipping space for other much needed uses.

The deposits are located in Idaho and Wyoming in what formerly were ocean beds, and the story of their discovery is a saga of patient and careful work by the Survey. The discovery resulted from a study of phosphate beds in the western states.

"Back in 1911," the Geological Survey reported, "Survey geologists were studying the phosphate beds of Idaho and western Wyoming in preparation for the day when our eastern phosphate beds would be depleted and full knowledge of our western reserves would be suddenly demanded. As is usual, samples of the phosphate rock were carefully analyzed in the Survey's chemical laboratories. Those analyses revealed among other things the presence of small amounts of vanadium with the phosphate.

"The phosphate rocks exist as beds a few feet thick, interlayered with several hundred feet of other rocks that collectively are known to geologists as the Phosphoria formation. This formation is made up of layers of phosphate rock scattered through the beds of shale, mudstone and impure limestone, but little different from the surface rocks of much of the surrounding cattle and sheep country. They were deposited on the sea floor many millions of years ago.

Find Richer Ores

"Studies of the phosphate deposits were continued year after year as a part of the Survey's classification of public lands. Analyses were made by chemists of the Survey, the Department of Agriculture and others, including private companies. In 1925, a commercial mining company, aware by that time of the traces of vanadium in the phosphate rock, began a series of experiments in the endeavor to save the vanadium as a by-product in their phosphate mining. By 1941 they were able to develop methods by which this saving was accomplished, but they had no inkling that other obscure beds not far away contained a much higher percentage of the important steel alloy.

"In 1937, W. W. Rubey, a Survey geologist with many years of outstanding work behind him, took over the phosphate studies. Like his predecessors, he was searching for phosphate fertilizer for farmers, but the trail led to a deposit that holds high promise of solving a difficult problem now that war has come to the United States.

"Throughout the next three years, Rubey collected many more samples of the Phosphoria formation, carefully recorded the place of each sample in the rock sequence and had them analyzed. One day the chemist reported on his analysis of some of the rocks that are associated with the phosphate layers. It was found that some inconspicuous and unimportant-appearing dark shales and mud-stones contained much more vanadium than did the phosphate rock itself. This was new and prospectively important.

"In the winter of 1939 and 1940, the geological search was shifted from fertilizer to the steel alloy metal. All the trenches that had been laboriously dug in the mountain slopes in earlier years were carefully plotted, foot by foot, and the available analyses were plotted against them. An old fertilizer prospector's diggings along a gulch at the foot of Sublette Ridge, abandoned a quarter of a century ago, gave a rare opportunity to the searchers for cross section sampling. This lone chance for such sampling in the radius of a day's horseback ride fortunately yielded a high assay which led the searchers on. Some of the analyses, unlike those of the phosphate beds themselves, indicated a vanadium content rich enough to mine. Moreover, the better analyses seemed to come from one particular bed in the sequence.

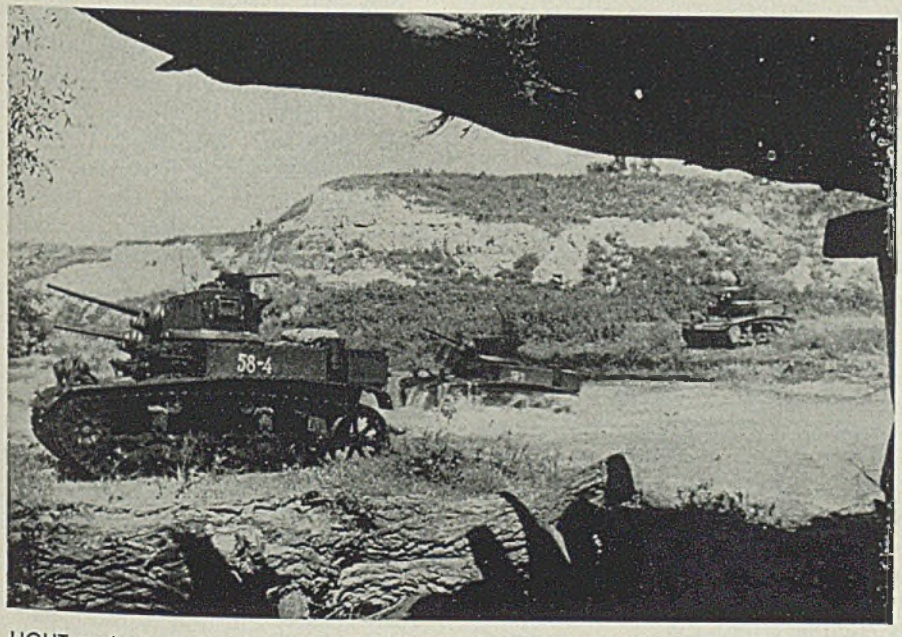
War Spurs Research

"After Pearl Harbor, the work was pushed specifically toward the goal of vanadium instead of fertilizer. The aid of laboratories other than the Survey's own was enlisted. Hundreds of the samples that had been collected by the Survey, the National Museum, the Bureau of Plant Industry, universities, state geologists, and by other agencies were exhumed from the archives and re-examined. Many were sent to Harvard University where a modern spectroscope had been installed. This instrument can be used to determine very rapidly and with a close accuracy the quantity of vanadium in any sample.

"In the spring of 1942, Rubey again

(*Please turn to Page* 138)

U. S. LIGHT TANKS HELP DRIVE GERMANS FROM CAUCASUS



LIGHT tanks built by the American Car & Foundry Co., New York, helped push the Germans out of Stalingrad. Above is first photo released by the Soviet Union of the light units, and shows them moving into action in the Caucasus. While the Americans know the tank as the "General Stuart," the Russians call it the "Suvorov" after a Soviet military hero

Industry Spends $1,205,000,000 in Six Years To Increase Capacity

WHEN the current steel industry expansion program is completed this year, blast furnace capacity will be 20 per cent greater than at the start of 1938, open hearth capacity will have been increased about 18 per cent, and electric furnace capacity will be three and a half times what it was in 1938.

In revealing these figures, the American Iron and Steel Institute reported that steel companies have invested $1,205,000,000 of their own funds to enlarge and improve equipment since Hitler moved into Czechoslovakia and Austria.

Approximately $432,000,000, or about one-third of the total was spent during the years 1938 through 1940 when hostilities were beginning and spreading through Europe.

From 1941 through 1943, the industry spent or is preparing to spend $773,000,000, nearly twice the amount spent during the preceding three years. The industry's own expenditures for this purpose were augmented, beginning in 1941, with appropriations from government funds to install certain new equipment wanted for special war work.

Combined total of government and private expenditures contemplated for 1943 to expand and improve iron and steel plant facilities is nearly $650,000,000.

About 30 per cent of that total will be devoted to installing additional blast furnace and steelmaking capacity.

Another 15 per cent will be used to provide additional rolling mill facilities, and the remaining 55 per cent will be spent to install other needed equipment, mostly in finishing departments.

The large-scale expenditures for new equipment are reflected in greatly increased capacity for producing iron and steel products. Much of the new capacity thus installed was built before the nation entered the war, and so was quickly available when the emergency arose.

Offer Plan To Increase Pig Iron Output Through Improved Coke

Program designed to increase pig iron production by an estimated average of 50 tons per blast furnace daily through improvement of the quality and uniformity of coke was suggested last week by Bureau of Mines officials.

Complete success of the program, which is being operated by the Office of Solid Fuels, the Bureau of Mines and a government-industry committee, would increase the production of pig iron to an amount equal to the production of three new blast furnaces of 1000 tons daily capacity, principally by better cleaning, grading and handling of coals and cokes and removing certain sulphurs.

Steps already are being taken to remedy coke problems limiting pig iron production and material progress is being made, it was said.

Technical changes in industry operations necessary to carry out the program were outlined last week in New York at the annual meeting of the American Institute of Mining and Metallurgical Engineers, in a paper prepared by L. D. Schmidt, Pittsburgh, Bureau of Mines chemist; W. C. Schroeder, assistant chief of the bureau's Fuels and Explosives Service, and A. C. Fieldner, chief of Fuels and Explosives Service, Bureau of Mines.

A Coke Production Committee, which was a highly important factor in developing the program and is now helping to put its proposals into effect, includes the following: Mr. Fieldner, chairman; W. T. Brown, Jones & Laughlin Steel Corp.; A. R. Powell, Koppers Co.; C. D. King, United States Steel Corp.; W. A. Haven, Arthur G. McKee & Co.; H. M. Crossett, Bethlehem Steel Co.; Hjalmar Johnson, Inland Steel Co.; Samuel Weiss, War Production Board; Harlen M. Chapman, assistant deputy, Solid Fuels Coordinator for War, and H. P. Zeller, Jamison Coal & Coke Co.

EARNINGS

Continental Steel Corp.

Earnings of Continental Steel Corp., Kokomo, Ind., for the year 1942 amounted to $938,852, after all known charges, including depreciation and federal income taxes of $1,151,089, equivalent after preferred dividends to $4.06 on the common stock. This compares with net of $1,225,674 and common dividend of $5.46 in 1941.

Crucible Steel Co.

In 1942 Crucible Steel Co. of America, New York, earned net profit of $4,864,781, equal, after preferred dividend requirements, to $7.26 per common share, compared with $7,439,480, or $12.95 per share, in preceding year. Provision for federal income and excess profits taxes was $23,923,513, against $14,797,787 in 1941. Allowance for depreciation and depletion totaled $4,790,620.

Lukens Steel Co.

Net income of Lukens Steel Co., Coatesville, Pa., for fiscal year ended Oct. 10, 1942, amounted to $1,172,522, after allowance of $6,730,000, including $3,900,000 for federal and state income and excess profits taxes, $2,500,000 for refund under the war contracts renegotiation law and $330,000 reserve for contingencies. Net income for 1941, when allowance for taxes was $1,695,000, amounted to $2,195,604.

Consolidated net sales of Lukens and its subsidiaries, By-Products Steel Corp., and Lukenweld Inc., rose to a new all-time peak of $46,490,463 before provision of the renegotiation refund.

Colorado Fuel & Iron Corp.

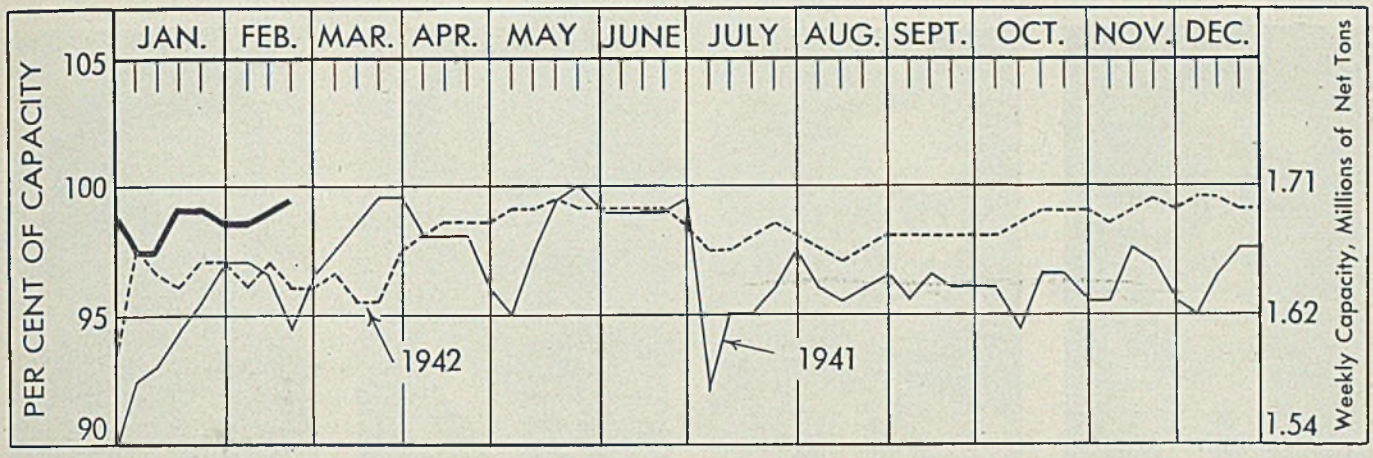
Colorado Fuel & Iron Corp., Denver, reports for fourth quarter, 1942, net income of $386,904, compared with $806,450 in the 1941 period. In the six months ending Dec. 31 net totaled $787,155, against $1,485,614 in prior year.

Hardening Malleable Iron By New Process

New heat treating process by which malleable iron castings or select portions of them can be converted to metal having the characteristics of hardened steel, has been acquired by General Finance Corp., 1884 West Lake street, Chicago, through purchase of all outstanding stock of Bi-Metallic Products Corp.. 1760 Diversey boulevard, Chicago, according to Owen L. Coon, chairman of the board of the former company.

Frank G. Buffum, inventor of the process, has been elected vice president of the subsidary company. L. H. Erickson, president, Borg-Erickson Corp., Chicago, is president.

The company's entire output is being utilized currently in the manufacture of small hand tools, such as hammers, sledges, axes and the like, in which the high degree of hardness of steel is required in portions subjected to impact, and the ductility of malleable castings is required in other portions. Field tests are being made to determine applicability of the new process to the manufacture of heavy war goods.



STEEL INGOT PRODUCTION BY MONTHS

Net Tons, 000 omitted

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1943	7,408	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1942	7,124	6,521	7,392	7,122	7,386	7,022	7,148	7,233	7,067	7,584	7,184	7,303
1941	6,922	6,230	7,124	6,754	7,044	6,792	6,812	6,997	6,811	7,236	6,960	7,150

PIG IRON PRODUCTION

1943	5,194	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1942	4,983	4,500	5,055	4,896	5,073	4,935	5,051	5,009	4,937	5,236	5,083	5,201
1941	4,666	4,206	4,702	4,340	4,596	4,551	4,766	4,784	4,721	4,860	4,707	5,014

Ingot Rate at 99½ Per Cent; Up ½-Point

Production of open-hearth, bessemer and electric furnace ingots last week advanced ½-point to 99½ per cent. Four districts gained, two declined and six were unchanged. A year ago the rate was 97 per cent; two years ago it was 94½ per cent, both based on capacity as of those dates.

The advance was principally on the 1-point rise at Chicago, aided by better production at Cincinnati and Detroit and in the eastern Pennsylvania area. Cleveland and St. Louis made small declines.

Relighting of repaired open hearths after repairs caused the higher rate of production sufficient scrap supply allowing use of all furnaces in condition for operation.

DISTRICT STEEL RATES

Percentage of Ingot Capacity Engaged in Leading Districts

	Week ended Feb. 20	Change	Same week 1942	Same week 1941
Pittsburgh	99	None	95	94.5
Chicago	101	+1	104	95.5
Eastern Pa.	95	+2	90	95
Youngstown	97	None	87	90
Wheeling	80	None	88	88
Cleveland	92.5	—0.5	94	84.5
Buffalo	90.5	None	79.5	90.5
Birmingham	100	None	95	100
New England	95	None	100	92
Cincinnati	95	+5	88	95
St. Louis	91	—2	72.5	93
Detroit	93	+3	92	95
Average	99.5	+0.5	°97	°94.5

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

Alloy Steel Production Increased 40 Per Cent

Production of high-strength, high-quality alloy steel ingots and castings in the United States in 1942 was 11,351,000 tons, an all-time record, the American Iron and Steel Institute reports. This was nearly 40 per cent greater than the prior peak of 8,206,000 tons established in 1941 and nearly four times the tonnage required to meet average yearly alloy steel requirements in peacetime.

From 1910 to 1913 an average of about 716,000 tons of alloy steel was made annually, about one ton of alloy steel to every 50 tons of total steel production. The first World War increased demand and by 1918 production was nearly threefold, about 2,002,000 tons, about one in every 25 tons of steel being alloy.

The record production in 1942 meant that over the entire year somewhat more than one out of every eight tons of steel was of alloy grade. At the end of 1942 the rate had increased to one in every six.

Steel Orders Specify Mechanical Properties

Wartime steel consumers are beginning to order steel by specifying mechanical properties desired rather than by stipulating precise chemical composition, possibly creating the third new era in steel-ordering practices since the turn of the century, according to the American Iron and Steel Institute.

Many consumers now simply specify strength or hardness required for the job. They leave to the steelmakers the task of selecting a steel of suitable chemical composition to meet requirements.

This innovation, which stemmed originally from shortages in certain alloying elements, already shows signs of working out so well in practice that it may be widely adopted in the postwar world.

JANUARY PIG IRON OUTPUT LESS THAN IN DECEMBER

Pig iron production in January totaled 5,136,543 net tons, with ferromanganese and spiegeleisen output 57,702 tons, a total of 5,194,245 tons, American Iron and Steel Institute reports. This compares with 5,201,203 tons in December and 4,983,229 tons in January, 1942. Per cent of capacity engaged in January was 100.7, against 101.1 in December and 97.1 in January last year.

Net tons

Districts	Annual capacity	Pig iron	Ferro, spiegel	Total	Per cent capacity
Eastern	11,967,680	970,281	17,609	987,890	97.2
Pittsburgh-Youngstown	24,346,420	2,109,878	20,016	2,129,894	103.0
Cleveland-Detroit	6,068,470	522,967	.....	522,967	101.4
Chicago	12,954,800	1,108,396	.....	1,108,396	100.7
Southern	4,521,910	352,214	20,077	372,291	96.9
Western	822,800	72,807	.....	72,807	104.1
Total	60,682,080	5,136,543	57,702	5,194,245	100.7

During 1941 companies included above represented 99.8 per cent of total blast furnace production. Capacities are as of July 1, 1942.

MEN of INDUSTRY

OSCAR E. KIESSLING

GEORGE TERBORGH

J. A. IRELAND

BEN L. METZGER

Oscar E. Kiessling, Washington, is the newly elected secretary, Machinery and Allied Products Institute, succeeding **George Terborgh,** who has been advanced to research director. Mr. Kiessling, an economist by profession, brings to the institute 15 years' experience in research and administration with the United States Bureau of Mines, National Research Project and Bureau of the Census, having been since 1939 chief of the mineral industries division of the census. Mr. Terborgh was senior economist with the Federal Reserve Board prior to his appointment as secretary of the institute in July, 1941.

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J. B. Du Prau has been appointed assistant to **W. A. Ross,** president, Columbia Steel Co., Russ building, San Francisco. He will be in charge of production planning and other assignments.

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Ray A. Penney has been appointed chief engineer, St. Paul Hydraulic Hoist Co., Minneapolis. He has been assistant chief engineer for several years.

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F. F. Franklin, metallurgist, formerly associated with Republic Steel Corp. at Canton, O., and recently with Armour Research Foundation, Chicago, has been appointed chief metallurgist, Ingersoll Steel & Disc Co., Chicago.

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Clifford W. Schwenn, assistant foundry superintendent, Caterpillar Tractor Co., Peoria, Ill., with which company he has been associated 13 years, has become general superintendent, Brillion Iron Works Inc., Brillion, Wis.

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Stanley Norrick has been appointed general foundry engineer, Perfect Circle Co., New Castle, Ind. Plant manager at New Castle since 1926, Mr. Norrick has been succeeded in that post by **Richard H. Bancroft,** heretofore assistant plant manager.

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J. A. Ireland has been promoted to assistant general manager of sales, Steel & Tubes Division, Republic Steel Corp., Cleveland. Formerly division sales manager, Mr. Ireland joined the operating department of Steel & Tubes in 1922. From there he was transferred to the sales department and was successively salesman, central district sales manager and division sales manager.

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A banquet in observance of the fiftieth anniversary of his association with the company was held for **C. W. Heppenstall,** chairman, Heppenstall Co., in Pittsburgh, Feb. 15. Mr. Heppenstall started to work as an office boy for the Trethewey Mfg. Co., an organization in which his father held a small financial interest. The name was changed to Heppenstall Forge & Knife Co. in 1904 and to Heppenstall Co. in 1930. Mr. Heppenstall was elected president in 1923 and chairman of the board in 1939.

D. A. SHARDELOW

Who has been appointed district sales manager at Indianapolis, Republic Steel Corp., as noted in STEEL, Feb. 15, p. 78

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Ben L. Metzger has resigned as technical supervisor, ordnance department, Willys-Overland Co., Toledo, O., to become operating manager, Allied Screw Machine Co. Inc., Chicago. Mr. Metzger is a nationally known industrial engineer, having previously served Bendix Aviation Corp., Auto-Lite Co., and others, in production engineering capacities.

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Lincoln R. Scafe, vice president and general manager of the Glenn L. Martin-Nebraska Co., Omaha, Nebr., will return to the Glenn L. Martin Co. at Baltimore, and **G. Tom Willey,** former inspection manager at Baltimore, will succeed Mr. Scafe at the Omaha plant.

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Benjamin F. Harris has resigned as president of National Tube Co., Oil Well Supply Co. and Tubular Alloy Steel Corp., subsidiaries of United States Steel Corp., Pittsburgh, effective Feb. 28. Mr. Harris will remain with United States Steel Corp. as a consultant to **B. F. Fairless,** president, in connection with war activities. Mr. Harris has been associated with companies now forming a part of the Steel corporation for over 30 years.

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Albert H. Eggers, vice president and machine tool sales manager, Greenlee Bros. & Co., Rockford, Ill., has been elected president, succeeding **George C. Purdy,** who has become chairman of the board. **Leslie H. Geddes,** assistant sales manager in charge of screw machine sales, has been named second vice-president. **O. Vincent Haegg** succeeds Al-

bert E. Alverson as secretary, who has retired after 42 years of service with Greenlee.

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Charles E. Robinson has been appointed general sales manager, Sommerfeld Machine Co., Braddock, Pa., and will continue as assistant to the president. He succeeds J. W. Hemmerle, who for some time has been sales agent for Sommerfeld boring and turning lathes.

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C. H. Bauer has been appointed general manager, Warren City Tank & Boiler Division of Taylor-Winfield Corp., Warren, O. He succeeds John D. Gordon, who will continue as a director of Taylor-Winfield's welder plant in Warren and two welder plants in Detroit.

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Ralph G. Detmer, general manager, American Frog & Switch Co., Hamilton, O., a subsidiary of Taylor-Wharton Iron & Steel Co., has been elected a vice president. Associated with the company about 22 years he served successively as chief draftsman, chief engineer, general superintendent and general manager.

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Dr. P. W. Leppla has been appointed chief chemist, Research Division, Cardox Corp., Chicago. He formerly was associated with Continental Can Co. as assistant to director of manufacturing research.

Gunnar B. Taube has been appointed superintendent of Cardox Corp.'s plant manufacturing airport fire trucks which is scheduled to go into production in the near future. He formerly was chief plant engineer, Warren City Tank & Boiler Division of Taylor-Winfield Corp., Warren, O.

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Ralph R. Kimes has been appointed general manager, Aircraft Tools Inc., Los Angeles. He formerly was purchasing agent for the three West coast plants of Douglas Aircraft Corp., Santa Monica, Calif. He has been identified with the aircraft industry six years, having sold his radio and sound engineering business in Cleveland in 1937 to go to California.

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John K. Johnson, senior engineer, Hazeltine Electronics Corp., Chicago, formerly Hazeltine Service Corp., has resigned to become special representative assigned to the Office of Procurement and Materials of the under secretary of the Navy.

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Andrey A. Potter, dean of engineering, Purdue University, Lafayette, Ind., and chairman of the National Advisory

CHARLES E. ROBINSON

RALPH G. DETMER

RALPH R. KIMES

Committee on Engineering and War Training, has been made recipient of the Washington award for 1943. Founded in 1916 by John Watson Alvord "in recognition of devoted, unselfish and pre-eminent service in advancing human progress", the award is administered by a commission representing five leading engineering societies.

First award was made in 1919 to Herbert Hoover. Other recipients have been Arthur N. Talbot, Orville Wright, Michael I. Pupin, Charles F. Kettering, Frank B. Jewett and Ralph Budd.

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Warren G. Bailey, formerly comptroller, Fruehauf Trailer Co., Detroit, has joined the staff of McKinsey, Kearney & Co., Chicago, management consultants. Mr. Bailey was a consulting management engineer for 18 years and regional director of the Office of Production Management in Chicago before joining the Fruehauf company.

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Ormond F. Lyman, the past 12 years executive vice president, Peoria Association of Commerce, Peoria, Ill., has been named executive secretary, Illinois Chamber of Commerce, effective March 15. He succeeds Carleton G. Ferris, resigned.

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Dr. G. Potapenko has been appointed technical director, Aircraft Specialties Co., Los Angeles. An associate professor of physics at California Institute of Technology since 1930, Dr. Potapenko will continue to teach at the institute.

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E. H. Fritschel has been placed in charge of sales of industrial electronic tubes, in addition to having responsibility for the sale of radio transmitter tubes, Radio, Television and Electronics Department, General Electric Co., Schenectady, N. Y. He succeeds Dr. H. A. Jones, who is now a lieutenant-colonel in the United States Army Signal Corps.

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L. W. Christenson has been promoted from assistant sales manager to sales manager, Cleveland Graphite Bronze Co., Cleveland, while D. R. Schoales, assistant treasurer, has been advanced to treasurer. W. G. Laffer, heretofore in charge of production planning of aviation and diesel products, has become chief of the company's newly established planning department.

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J. C. Foster, from March, 1938, to September, 1940, president, Northwestern Steel & Wire Co., Sterling, Ill., has been commissioned a captain in the United States Marine Corps, and is now taking his indoctrination training at San Diego, Calif. Capt. Foster served in the Marine Corps during World War I. Before joining the Northwestern company he was general manager of sales, Jones & Laughlin Steel Corp., with which organization he was associated many years.

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A. W. Van Hercke, sales manager, Tractor Division, Allis-Chalmers Mfg. Co., Milwaukee, has been made assistant manager of the division. A. F. McGraw

has been promoted to general sales manager, and **R. A. Crosby,** of the advertising department, temporarily loaned to the salvage section, WPB, has been named advertising manager.

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Mary M. Donovan, former graduate assistant at the University of Pittsburgh, has been appointed to the technical staff of Battelle Memorial Institute, Columbus, O., and assigned to the division of physics research.

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Otto W. Winter has resigned as vice president in charge of manufacturing, Republic Drill & Tool Co., Chicago, to become president and works manager, Sav-Way Industries, Detroit, manufacturer of internal grinding machines, spindles, gages, precision aircraft and tank parts, end mills and special tool items. Mr. Winter is national president, American Society of Tool Engineers and is national chairman of that society's committee on education and emergency training. He is a member, American Society of Mechanical Engineers, American Society for Metals, American Society of Welding Engineers and Society of American Military Engineers.

OTTO W. WINTER

Prior to his Chicago connection he was factory manager of Columbus McKinnon Chain-Chisholm Moore Hoist Corp., Tonawanda, N. Y.

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Chester Malysiak has been appointed to the research staff of Battelle Memorial Institute, Columbus, O., where he will assist in conducting research in the division of nonferrous metallurgy. Heretofore he has held chemical and metallurgical positions with Bingham Stamping Co., Owens-Illinois Glass Co. and Continental Steel Co.

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James C. Hart, former executive vice president, Federal Machine & Welder Co., Warren, O., has been named president, Taylorcraft Aviation Corp., Alliance, O.

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Jack Sandler has joined Aircraft Parts Development Corp., Summit, N. J., as chief plastics engineer. Mr. Sandler's former activity in plastics engineering was with Northern Industrial Chemical Co. and Nixon Nitration Works.

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Lee Kahn, identified for many years in the purchase, production and distribution fields of nonferrous smelting and refining industries in the Chicago area, has become associated with R. Lavin & Sons, Chicago, nonferrous metal refiners.

OBITUARIES . . .

William E. Bee, 72, founder, Palmer-Bee Co., Detroit, manufacturer of power transmission and materials handling equipment, died in that city, Feb. 9. At the age of 12 he joined Detroit Steel Spring Co., later becoming superintendent of the plant. He then became engineer for Gates Iron Works, Chicago, and later was engineer for Sheffield Car Works, Three Rivers, Mich.; chief engineer and superintendent, Webster Mfg. Co., Chicago; one of the organizers of Stephens-Adamson Mfg. Co., Aurora, Ill., and engineer for Pittsburgh Shafting Co., Detroit.

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Nicholas V. Lux, 59, president and manager, St. Paul Corrugating Co., St. Paul, Minn., died in that city, recently.

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Carl Cohen, 48, president, Fort Pitt Steel Co., Toledo, O., died Feb. 10, while on a vacation in Los Angeles.

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George A. T. Long, 85, in charge of the foundry service department, Pickands, Mather & Co., Chicago, died in that city, Feb. 15. He had been associated with the company 40 years. At its convention in Chicago in 1940, the American Foundrymen's Association conferred an honorary life membership upon Mr. Long. He was the only man who had attended all of the association's conventions, starting in 1896.

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Edward W. Botts, 48, secretary-treasurer, Pyle-National Co., Chicago, railroad equipment, died in that city, Feb. 14.

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John Kiely, 77, for 25 years an inspector for Inland Steel Co., Chicago, until his retirement a year ago, died in that city, Feb. 10.

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Joseph R. J. Anderson, 74, vice president, secretary and treasurer, Tredegar Co., Richmond, Va., died Feb. 10, in that city. He had been associated with the firm 53 years.

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Stanley Kitto, 48, treasurer, Belle City Malleable Iron Co., Racine, Wis., died Jan. 30, in that city.

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C. A. Russell, vice president and secretary, James G. Heggie Mfg. Co., Joliet, Ill., died in that city, Jan. 16.

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Carl E. Lingenfelter, 67, manager, machinery sales division, United States Steel Supply Co., Chicago, died Feb. 11, at his home in Oak Park, Ill. He had been associated with the company, formerly Scully Steel Products Co., continuously since 1903.

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Winchester C. Packard, 50, assistant sales manager and treasurer, National Engineering Co., Chicago, died in Oak Park, Feb. 14. He had been identified with the company 13 years.

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James D. Harrison, 58, since 1922 Chicago district sales manager, Combustion Engineering Co. Inc., died in St. Louis, Feb. 11. He had been associated with the company since 1915.

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Frank W. Hogan, 79, owner of Hogan Sheet Metal Works, East St. Louis, died Feb. 5, in St. Louis.

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John M. Hothersall, 67, retired assistant manager of equipment, American Can Co., died Feb. 3, in New York. Responsible for more than 400 patents on household containers, and joining American Can Co. when organized in 1906, Mr. Hothersall was an expert on dies and drawing operation.

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Andrew Richards, 65, general personnel manager and management adviser to all Eaton Mfg. Co. plants, Cleveland, died Feb. 9, in that city. Before joining Eaton eight years ago he was an American Federation of Labor organizer.

PRIORITIES–ALLOCATIONS–PRICES

Weekly summary of orders and regulations issued by WPB and OPA, supplementary to Priorities-Allocations-Prices Guide as published in Section II of STEEL, Dec. 14, 1942

L ORDERS

L-30-a (Amendment): Kitchen, Household Articles, effective Feb. 11. Revokes restrictions on sales by manufacturers of metal pails, buckets, and wash tubs for general civilian use. Increases permitted use of steel in production of these articles of galvanized and painted metal ware to 50 per cent of amount used in the year ended June 30, 1941.

L-114 (Amendment): Safety Equipment, effective Feb. 16. Bans use of copper and copper-base alloys in manufacture of certain items, including safety cans, flame arrestors, lens extension rings for heat-proof goggles. Clarifies prohibition on use of nickel silver in manufacture of items of equipment for which ordinary copper base alloys are permitted.

L-136 (Amendment): Church Goods, effective Feb. 11. Limits use of iron and steel in production of class A articles (essential for conducting religious services, or having definite devotional significances) in first quarter of 1943 to 50 per cent of average weight of all metals used in the like 1940 period; permits use of lead and chromium for plating on iron and steel. Effective Feb. 16, bans use of all critical metals and materials in production of class B church goods (including all goods other than class A) or their repair parts except iron and steel in joining hardware.

L-170 (Amendment): Farm Machinery, effective Nov. 11. Raises permitted production of new machinery to 40 per cent of 1940 output; production of repair parts to 167 per-cent.

L-250: Controllers for Electric Motors, issued Feb. 13. Limits production to specific simplification practices. Prohibits use of stainless steel except where necessary for operation of the controller; eliminates non-functional design; bans use of aluminum, copper, chromium, nickel, cadmium or their alloys for enclosing cases, name plates, etc.; prohibits sales after April 30 unless orders are rated AA-5 or higher. Provisions governing manufacture are effective for purchase orders placed after March 1 and for deliveries after May 14. Controllers for use aboard ship owned and operated by the Army, Navy, Maritime Commission or War Shipping Administration are exempted from restrictions.

L-280: Fans and Blowers, effective Feb. 17. Requires scheduling delivery of all orders for new fans and blowers by manufacturers after Feb. 28. Bans delivery except on orders approved by WPB.

L-226 (Amendment): Printing Machinery, effective Feb. 15. Provides consumer certification of scrapping of old parts concurrent with the purchase of new equipment. Exempts from restrictions transactions under $25 involving graphic arts machinery, as shown on revised schedule "A" of the order. Removes from schedule "B" leads, slugs, rules, replacement foundry type borders and ornaments.

M ORDERS

M-50 (Amendment): Jewel Bearings, effective Feb. 9. Prevents use of scarce jewel bearings in types of precision gauges where they are not absolutely essential. Restricts use of sapphire and ruby jewel bearings and large ring bearings to purposes specifically authorized by WPB.

CMP REGULATIONS

No. 3, issued Feb. 9. Sets up operating procedures under Controlled Materials Plan. Defines place of preference ratings under CMP.

No. 4, issued Feb. 6. Governs sales of controlled materials by warehouses and distributors, effective Feb. 15 in the case of copper and March 31 for aluminum and steel.

No. 5, issued Feb. 9. Provides methods for obtaining maintenance, repair and operating supplies.

PRICE REGULATIONS

No. 4 (Amendment): Iron and Steel Scrap, effective Feb. 11. Reduces maximum prices five cents per gross ton of scrap at shipping points in Hudson and Bergen counties of New Jersey. Maximums in these districts must be computed from the Bethlehem, Pa., basing point.

No. 77 (Amendment): Beehive Oven Furnace Coke Produced in Pennsylvania, effective Feb. 3. Permits increase of 50 cents to maximum prices of $6.50 per net ton f.o.b. Connellsville, Pa., for machine-drawn oven coke; and $7.00 for hand-drawn oven coke for which the total coal supply must be trucked from the mines. Transportation charges from Connellsville to the place of delivery may be added.

No. 120 (Amendment): Bituminous Coal, effective Feb. 12. Permits increases in maximum prices for coal produced in Districts 7 and 8. Increases for low volatile coals range from 5 to 45 cents a ton; for high volatile coals, from 15 to 25 cents.

No. 248 (Amendment): Ferro-Alloys, effective Feb. 20. Exempts following sales of domestic metallurgical manganese ore from price control: to dealers for resale; to users or processors who use ore directly in producing steel or in foundry operations, or in spiegeleisen and other sub-standard ferromanganese. Price control over bulk of manganese ore unaffected.

No. 314 (Amendment): Magnesium and Magnesium Alloy Ingot, effective Feb. 1. Provides that manufacturers of primary magnesium alloy, except those who also produce the metal, may carry out contracts with government agencies at prices prevailing before Feb. 1 to the extent of their inventories of metal on that date.

No. 316: Nonmetallic Minerals, effective Feb. 12. Establishes maximum prices of coated abrasive products to the U. S. government and governments of the United Nations at the net price which each seller charged most frequently on deliveries of three units or more of the same commodity during March, 1942, to such a purchaser; to all other purchasers, the highest net price charged (or offered of no sale made) for the same commodity on a March, 1942, delivery to a purchaser of the same class. Special consideration granted Tennessee Sandpaper Corp., Nashville, Tenn.

Minerals Committee Members Announced by H. I. Young

Membership of the Minerals and Metals Advisory Committee and the Mineral Resources Operating Committee was announced last week by Howard I. Young, director, WPB Mineral Resources Co-ordinating Division, and chairman of both committees.

Function of the committees as outlined by WPB Chairman Donald M. Nelson is to co-ordinate and correlate the broad programs of all governmental agencies for increasing the supply of essential minerals and metals.

The larger advisory committee, composed of representatives of 12 governmental agencies is to consider broad general programs, with specific operating plans left to the smaller Operating Committee.

The Minerals and Metals Advisory Committee is composed of the following:

War Department—Herbert G. Moulton, consultant to the Resources and Production Division.

Navy Department—Lieut. Comm. E. H. Augustus, chief, Materials Branch, Office of Procurement and Materiel.

Board of Economic Warfare—Dr. Alan Bateman, chief, Metals and Minerals Division, Office of Imports.

Reconstruction Finance Corp.—DeWitt Smith, vice president, Metals Reserve Co.

Bureau of Mines—Dr. R. S. Dean, assistant director.

Geological Survey—Donnel F. Hewett, geologist in charge, Section of Metalliferous Deposits.

Bureau of Foreign and Domestic Commerce—Walter Janssen, chief, Metals and Minerals Unit.

Office of Civilian Supply, WPB—Stanley Adams, director, Metals and Minerals Division.

Office of Production Research and Development, WPB—Dr. C. K. Leith, chief, Metals and Minerals Branch.

Facilities Bureau, WPB—Fred Searls, director.

Labor Production Division, WPB—Wendell Lund, director.

Stockpiling and Transportation Division, WPB—Dr. W. Y. Elliott, director.

The operating committee will be composed of Dr. Bateman, Mr. Smith, and the director, Office of Production Research and Development, WPB.

January War Expenditures Aggregate $6,254,000,000

War expenditures by the United States government totaled $6,254,000,000 in January. This was $129,000,000, or 2.1 per cent, higher than in December and 185 per cent greater than in January, 1942.

Average daily rate of expenditure in January was $240,500,000, compared with $235,600,000 in December. The daily rate is based on the 26 days in January and December on which checks were cleared by the Treasury. In January, 1942, $81,200,000 was spent daily for war purposes.

More than 55,000 employes of United States Steel Corp. and subsidiary companies, equivalent to nearly four army divisions, are serving in the military forces of the United Nations.

WINDOWS of WASHINGTON

Economist warns against complacency in post-war period. . . Productive resources must be utilized to avert decline in national income. . . Sees immediate repayment of federal debt as unwise

SOME of the current thinking about how to finance full employment and high productivity in the postwar period, also on how to maintain activities permanently at a high rate, without booms and depressions of the past, was presented in this department last week in the form of a digest of a pamphlet published by the National Planning Association.

Another highly regarded treatise on this subject is that entitled *"After the War—Full Employment"* written by Dr. Alvin H. Hansen, Littauer professor of Economics, Harvard University, and special economic adviser to the Board of Governors of the Federal Reserve System. It has been published by the National Resources Planning Board for the purpose of stimulating thinking in reference to postwar economic planning.

Original Pamphlet Changed

This treatise is of special importance for the reason that the National Resources Planning Board referred Dr. Hansen's original manuscript to members of the Federal Reserve Banks and to a group of business men, economists, and labor leaders for criticism and suggestions. As a result of many comments received Dr. Hansen made numerous changes in the original text. The pamphlet, therefore, can be regarded as expressing the combined opinion of a group of outstanding planners.

Immediate aim of the American people, says Dr. Hansen, is to preserve and safeguard political freedom. But a military victory for the democracies is not enough. If the victorious democracies simply "muddle through" another decade of economic frustration and mass unemployment, we may expect social disintegration and—sooner or later—another international conflagration. A positive program of postwar economic expansion and full employment, boldly conceived and vigorously pursued, he declares, is imperative.

Many people dread to think of what is coming, says Dr. Hansen. Businessmen, wage-earners, white-collar employes, professional people, farmers—all alike expect and fear a postwar collapse. They fear hard times due to demobilization of armies, shutdowns in war industries, unemployment, deflation and bankruptcy.

On the other hand, some are hoping for a postwar boom, such as we had after the first world war. Dr. Hansen thinks that we may get one again. If the war lasts several years, he points out, we may have sufficient accumulated shortages in residential housing, in durable consumers' goods such as automobiles, and in plant equipment required to supply peacetime consumption demands, to give us a vigorous private investment boom. If we do not experience a strong postwar boom the gravest danger is that it may lull us to sleep. We need to be on the alert to prevent postwar inflation. If appropriate action is taken, there need be no necessity for a postwar collapse.

A SPECIAL REPORT TO INDUSTRY

POSTWAR PLANNING

This is the fifth of a series of a detailed study of what is being thought about and accomplished toward making the postwar world a place in which the individual and industry may flourish.

Dr. Hansen has no respect for the fears that when this war is over all countries, including our own, will be impoverished. That view, he says, is not sustained by past experience. No country need be impoverished, he holds, if its productive resources are kept intact. He points out that the productive resources of the United States in the postwar period will be at the highest level in our history. A larger proportion of our population than ever before will be trained workers. We will have the resources to support production in great volume. Hence, we will possess all the material factors required to produce a substantially higher real income for civilian needs than any ever achieved in our history. Whether or not we shall achieve that level of income will depend upon our intelligence and capacity for cooperative action, he holds.

The important thing, says Dr. Hansen, is that when the war is over we must not let our national income slide off. From a level of around 100 billions, in terms of 1940 dollars, we must not let it slide to 90, 80, 70 billion dollars[1]. If we do that we will have to make the uphill fight all over again. We must deliberately set out not only to hold the new income level but also to push it higher just as rapidly as increasing productivity will permit.

The group for which Dr. Hansen is the spokesman has very positive ideas about the place of private enterprise in the postwar picture.

"We do not want the government to run the whole show", he says. "We do not want a totalitarian state. We want freedom for co-operative action. We want freedom of choice for occupation.

"If purchasing power is maintained at a high level, we need have no fears that private manufacturers, retailers, wholesalers, and farmers will not come forward and supply the market with the goods demanded by the public—a rich variety of goods at reasonable prices. Private business can and will do the job of production. It is the responsibility of government to do its part to insure a sustained demand.

Industry and Government Must Act

"We know from past experience that private enterprise has done this for limited periods only. It has not been able to insure a continuous and sustained demand. The ever-increasing gigantic powers of production of the modern industrial system, far exceeding that of any earlier experience in history, means that an enormous output has to be reached before full employment is approached. Private industry and government together must act to maintain and increase output and income sufficiently to provide substantially full employment."

Saying there is an unlimited amount of work to be done in the future—a factor already touched upon and which will be further discussed in this series—Dr. Hansen declares that at the end of the war the government cannot forthwith disband the Army, close down munitions plants, stop building ships, and remove all economic controls. There will have to be an orderly program of gradual de-

[1] To simplify his presentation, Dr. Hansen used 100 billions annual income so as to be able to figure in round numbers. For those readers who want to bring the calculation into line with the 1943 picture it may be pointed out that most recent estimates announced by the Office of War Information indicated that the annual income in 1943 would fall somewhere between 125 and 135 billions, of which some 90 billions would be direct war expenditures.

mobilization and planned reconstruction. He then proceeds to answer these questions: "Can private enterprise survive such a program?" "How about taxes and public debt?"

In regard to the first question, he holds that a positive governmental program looking toward full employment would greatly vitalize and invigorate private enterprise.

The notion that we cannot finance our own production is quite without foundation, according to the beliefs of the influential group for which Dr. Hansen speaks. He points out that we have seen how it is possible to mobilize the productive capacities of the country for the war. On this premise he declares we also can mobilize them for peace just as effectively.

"Can Not Afford Idleness"

In discussing taxes and the public debt, Dr. Hansen advances the following thesis:

"Every cent expended, private and public, becomes income for members of our own society. Costs and income are just opposite sides of the same shield. We can afford as high a standard of living as we are able to produce. We cannot afford to waste our resources of men and material. We cannot afford to use them inefficiently. We cannot afford idleness. The idleness of the decade of the 1930's was responsible for the loss of 200 billions of income.

"The public expenditures required to rebuild America, to provide needed social services, and to maintain full employment, can be provided for out of the enormous income which the full utilization of our rich productive resources, material and human, makes possible. The costs of producing this income are merely payments to ourselves for the work done. There is not—there cannot be—any financing problem which is not manageable under a full employment income. From a 100 billion income we can raise large tax revenues—large enough to service any level of debt likely to be reached and to cover all other government outlays—and still retain for private expenditures more than we had left in former years under a 70 billion dollar income with lower taxes. Taxes are merely one way of paying for social services and public-improvement projects which we need. It is not necessary or desirable under all circumstances to finance all public expenditures from taxes. Whether taxes should equal, fall short of, or exceed expenditures must be decided according to economic conditions."

Dr. Hansen dismisses as unsound the general belief that we must tighten our belts and pay off our government debt when peace returns. In fact, he sees this as undesirable, even dangerous.

"When," he asks, "is it desirable to pay off part of the debt? Certainly not when there is danger of an impending depression. Under certain conditions it would be desirable to do so. Under other conditions it would be quite unsound policy to retire the debt. Financial responsibility requires a fiscal policy (including governmental expenditures, loans and taxes) designed to promote economic stability. It would be quite irresponsible to cut expenditures, increase taxes, and reduce the public debt in a period when the effect of such a policy would be to cause a drastic fall in the national income. Equally, it would be financially irresponsible to raise expenditures, lower taxes, and increase the public debt when there is a tendency toward an inflationary boom."

Dr. Hansen next explores the assumption that after the war tax money will be available for payment of the public debt.

"Some holders of bonds receiving the repayment may wish to spend the proceeds, but most will want to reinvest," he says. "If new private investment in housing, factories, and other projects are adequate to absorb these funds together with the amount normally saved from income, the process of debt retirement will operate in a quite satisfactory fashion.

"But if there are not enough houses, factories and other projects being built, the government has no recourse (if unemployment and fall in national income are to be avoided) except to borrow the money back again and devote it to public improvements or other useful public projects.

"Institutions Hold Debt"

"About 75 per cent of the public debt, direct and guaranteed," he continues, "is held by institutions performing useful and necessary services which cannot be performed without adequate income. Another 5 per cent is held in the form of nonmarketable United States savings bonds. The institutions referred to include the social security trust funds, savings institutions, educational and charitable institutions, life insurance companies, and commercial banks.

"For the rest—marketable securities held by individuals and business firms—we should not forget that financial stability is frequently encouraged by investment in gilt-edged government bonds. This aspect was stressed by the famous Colwyn Committee in England in its report issued in 1927. Stated broadly, we should keep clearly in mind the fact that balanced against the taxes required to cover interest charges are the interest receipts of institutions and individuals who own the bonds. Thus the fact is that our public debt, owned as it is mainly by institutions performing useful and necessary services, is no such burden on the community as is commonly supposed. The tax funds collected to meet interest charges are not lost. They are paid right back again, largely to institutions that benefit the community as a whole. At the worst, the taxes are collected from one group of citizens and paid out to another group—the bondholders."

The group for which Dr. Hansen speaks believes that the public debt is something very different from the private debt of an individual.

"An individual will always improve his asset position if he is able to pay off a part of his debt," this group believes. "But a nation may make itself poor by repayment of public debt. This is true because such repayment tends to cause deflation, depression, and unemployment. It is a good thing to pay off a part of the public debt if you want to check an excessive boom. It would be ruinous to pay off the public debt in a postwar period when unemployment was spreading."

War Spending Brought Employment

Dr. Hansen contends that debt internally held has none of the essential earmarks of the private debt of an individual. A public debt is an instrument of public policy. It is a means to control the magnitude of the national income and, in conjunction with the tax structure, to affect income distribution.

It will readily be recognized that the sort of thinking which has been done of late by men in the influential group for which Dr. Hansen prepared the pamphlet published by The National Resources Planning Board, represents a profound change from a good deal of the thinking that prevailed during much of the New Deal era. It will be seen that a goodly amount of study has been devoted to the history of the relationship of government spending to our national income. In particular, there has been borne in mind the fact that our war spending actually has brought full employment.

Dr. Hansen's group also has developed interesting conclusions as to the distribution of national income. It believes that there are certain limitations on how far profits can be encroached upon—either through wage increases or price decreases—without stirring up unfavorable economic repercussions. This portion of Dr. Hansen's treatise will be digested in this spot in next week's issue.

Survey Reveals 92 Per Cent of Public Favor Postwar Planning

Ninety-two per cent of the persons in all wage groups favor immediate postwar planning, the National Association of Manufacturers reported last week from

a survey made for the group by the Psychological Corp.

Only 6 per cent were opposed to such planning.

Variable differences of opinion were shown on other issues. Opinion was evenly divided on whether price control should continue in the postwar era but 82 per cent were opposed to rationing after the war. Wage and salary control was voted against by a 52 to 37 per cent margin.

About 61 per cent felt the government should plan a vast public works program. But the vote was five to one against government management of business, with 47 per cent as compared with 30 per cent recommending less control over business than at present.

Electric Motor Controller Simplifications Established

Controllers for electric motors must conform to specific simplification practices designed to conserve critical materials, under the terms of General Conservation Order L-250.

Simplification requirements imposed on the manufacture of controllers and parts include:

1. Buses, connecting straps and terminals shall be of the smallest size possible.

2. The use of stainless steel is prohibited except where necessary for the operation of the controller.

3. Nonfunctional design is eliminated, and no aluminum, copper, chromium, nickel, cadmium or their alloys may be used for enclosing cases, name plates, etc.

4. A schedule of maximum permissible ampere ratings is established for contractors of specified types of controllers (listed in Schedule A attached to the order) to eliminate the present practice of using electric control equipment of a capacity much larger than actually necessary.

5. Control transformers, control circuit fuses, meters and instruments are permitted only where they are essential to the satisfactory operation of a controller.

In addition, to the specific provisions, controllers and their parts must be of the simplest practicable design.

Controllers for use aboard ships owned or operated by the Army, Navy, Maritime Commission or War Shipping Administration are exempted from the restrictions.

The simplification measures, it is estimated, will save from three to three and one-half million pounds of copper, 150,000 pounds of stainless steel, and 12,000 tons of carbon steel.

Vice Chairman Eberstadt Dismissed; Wilson's Powers Strengthened

IN THE most controversial shakeup of the War Production Board in a year, Chairman Donald M. Nelson last week dismissed Vice Chairman Ferdinand Eberstadt and promoted Vice Chairman Charles E. Wilson to executive vice chairman.

Mr. Wilson in his new position will have charge of all materials distribution which heretofore has been handled by Mr. Eberstadt, and also will retain control of the production phase of the war program.

CHARLES E. WILSON

"I have made this move to solve organizational problems which have come about because carefully scheduled production is now the most pressing problem before us," said Mr. Nelson.

"It is my conviction that this change will bring harmony to WPB and the end of jurisdictional questions which, if permitted to continue, could only hamper the war effort.

"Mr. Eberstadt has worked hard and diligently in setting up the Controlled Materials Plan and I regret the circumstances which make it necessary for me to transfer his functions to another. However, Mr. Wilson is a production man and our job today is primarily a production job."

FERDINAND EBERSTADT

The Controlled Materials Plan will remain in effect and no major modifications in it are expected as a result of Mr. Eberstadt's resignation, it was said by WPB officials. However, distribution of materials in the future will follow decisions made on production scheduling.

Both Mr. Eberstadt and Mr. Wilson joined WPB last September. Mr. Eberstadt, a New York financial man, had been chairman of the Army and Navy Munitions Board and was strongly supported by the services. Mr. Wilson, formerly president of General Electric Co., accepted the position as vice chairafter repeated requests by Mr. Nelson.

Conflict between the two was apparent from the start, with the Army backing Mr. Eberstadt in inter-agency squabbles. Mr. Wilson was backed by Mr. Nelson.

The question of the extent of military jurisdiction over actual production in war factories was a leading factor in the disputes between Mr. Eberstadt on one side and Mr. Nelson and Mr. Wilson on the other. Mr. Eberstadt leaned toward permitting military "expediters" to supervise actual production work. Mr. Wilson and Mr. Nelson maintained that military supervision lacks the overall cohesion which can best be supplied by WPB.

Washington observers noted that the dismissal of Mr. Eberstadt by Mr. Nelson marked a strengthening of his independence as White House approval of the change was not asked and the President said at a press conference that he had only read of the shakeup in the newspapers.

Closely following the announcement of Mr. Eberstadt's dismissal came the resignation of Lou E. Holland, recently supplanted by Col. Robert Johnson as head of the smaller war plants program. Mr. Holland's eventual resignation as deputy chairman of WPB and chairman of the Smaller War Plants Corp. has been expected, although he had announced his intention of sticking to the job when Johnson was brought into the picture at President Roosevelt's request.

Principal Operating Procedures Established in Regulations 3 and 5

ESTABLISHMENT of virtually all principal operating procedure which will govern industry under the Controlled Materials Plan has been completed with the issuance of CMP Regulations Nos. 3 and 5.

Regulation No. 3 defines the place of preference ratings under CMP, while No. 5 provides methods for obtaining maintenance, repair and operating supplies.

Regulations Nos. 1, 2 and 4, previously issued deal respectively with applications for recovering and passing on allotments; inventory limitations; and sale of controlled materials by warehouses and distributors.

By the terms of Regulation No. 3, preference ratings will be assigned to deliveries of all materials necessary to complete an authorized production schedule for which allotments of any of the three controlled materials—aluminum, copper and steel—are made to a prime contractor manufacturing Class A or B products.

When an allotment is passed on to a secondary consumer manufacturing Class A products, the prime consumer making the allotment applies to the secondary's authorized production schedule the same rating he has received for his own related schedule, for use with the appropriate allotment number or symbol.

A delivery order bearing a preference rating and an allotment number or symbol out-ranks an order bearing the same rating but no allotment identification. It is not, however, superior to another order bearing a higher rating.

For example, a rating of AA-2X with an allotment number takes precedence over another AA-2X rating without an allotment number, but is secondary to a rating of AA-1 with or without an allotment number.

AAA Rating for Emergency

Any authorized controlled material order as defined in CMP Regulation No. 1, rated AAA, placed with a warehouse or another who is not a controlled material producer, takes precedence over all other orders.

However, authorized controlled material orders placed with a producer of controlled materials must be accepted and filled as provided in CMP Regulation No. 1, without regard to ratings and in preference to all other orders. To the extent that producers are able to fill other orders, prior to July 1, 1943, they must do so in accordance with the preference ratings assigned or extended. After July 1, 1943, no controlled materials may be delivered except on orders bearing allotment numbers.

A prime consumer who manufactures Class B products and has received an authorized schedule, accompanied by a preference rating to be used with his allotment number, may not extend any other rating received from a customer, except an emergency rating of AAA. This rating may be extended in such cases only to obtain production material required to fill the order to which it is applicable and not for the purpose of replenishing inventory.

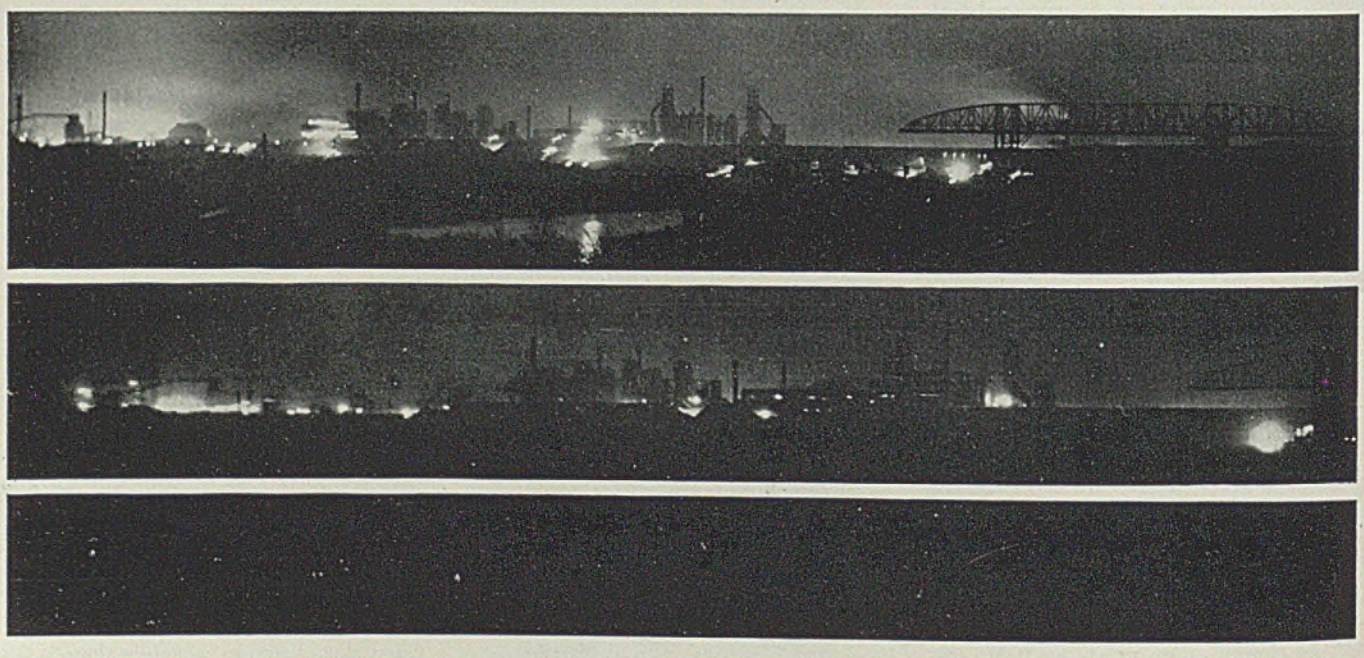
Use of the allotment symbols MRO (maintenance, repair and operating supplies) and SO (small order) in connection with preference ratings is also provided for in Regulation No. 3.

The new regulation prescribes a form of certification which must be filed by a prime or secondary consumer when placing an allotment number or symbol on a rated delivery order.

A prime secondary consumer who receives a preference rating for an authorized production schedule may use the rating with the appropriate allotment number or symbol only to obtain production materials in the minimum practicable amounts required to complete the schedule, or to replace production materials in his inventory.

Regulation No. 5, controlling purchases or maintenance, repair and operating supplies, establishes required procedures

NO SKY-GLOW WHEN THIS STEEL PLANT CAPS ITS FIRES



ONE plant of the National Tube Co., operating full-blast on war work at night: First, before siren sounded; second, dimout; third, blackout. "Changed like magic . . . into virtual total darkness in just a few minutes." As a result, it is further reported "total loss of production at this U. S. Steel plant was just about 10 minutes. During the trial a glaring slag dump was made invisible by spraying with water pumped from a nearby river"

for obtaining both controlled and non-controlled materials.

Persons engaged in the manufacture of products or in the business activities listed in Schedules I and II of the regulation are permitted to obtain necessary controlled materials, other than aluminum, by the use of a specified form of certification. Such persons may obtain aluminum required for essential maintenance, repair and operation from a producer or an approved aluminum warehouse in amounts not to exceed 100 pounds from all sources in any one calendar quarter, by endorsing a designated certification on their purchase orders.

Regulation No. 5 assigns a preference rating of AA-1 to deliveries of all materials needed for maintenance, repair and operation by persons covered by Schedule I, and of AA-2X to those covered by Schedule II.

All other businesses are authorized to make use of an A-10 rating in purchasing non-controlled materials for maintenance, repair and operation.

Use of any of these ratings must be accompanied by a prescribed certification.

Acquisition of materials for maintenance, repair and operation under the regulation is restricted to the amounts obtained during a specified base period.

The preference ratings assigned by Regulation No. 5 supersede those assigned by orders in the "P" series for maintenance, repair and operating supplies, in the case of materials or products to be delivered after March 31, All "P" orders, however, are specifically continued in existence and all restrictions and requirements contained in them remain in full force.

Class B Products Manufacturers Granted Advance Authorizations

Advance authorizations, which may be used by manufacturers of Class B products to obtain steel, copper and aluminum for delivery during April under the Controlled Materials Plan, have been announced by WPB.

Authorizations are in the form of a letter sent to those manufacturers who have already made CMP applications for their requirements of materials during the second quarter of 1943.

Purpose of the advance allotments is to insure continued flow of materials to support production schedules during the early part of the period of transition to CMP.

Companies whose CMP-4B applications are now on file with WPB are being assigned numbers to enable them to obtain during April up to 30 per cent of the amount of controlled materials for which they have applied for the entire second quarter. Preference ratings are also assigned so that manufacturers may obtain up to 30 per cent of their stated requirements of other materials.

Curtis E. Calder, Director General for Operations, warned the companies receiving letters that the 30 per cent advance allotments for April do not indicate the amount of total quarterly allotments which will be made when all applications have been processed by WPB.

Manufacturers of Class B products who have submitted their CMP-4B applications may place orders for April delivery with the benefit of allotment numbers immediately upon receipt of their letters of authorization. However, as soon as manufacturers receive allotments for the full quarter beginning April 1, they must make adjustments necessary to keep their total receipts of controlled and other materials during the second quarter within the limits of the final allotment.

The letter sent to producers of Class B products points out that prime consumers should advise those manufacturers to whom they make re-allotments of a portion of the 30 per cent advance allotment that the provisions in Paragraph S-1 of CMP Regulation No. 1, as amended, limiting the use of allotments to specified percentages during each month of a quarter, do not apply in this instance. As a result, manufacturers may place orders for all or any part of the 30 per cent advance allotment which they may require for delivery in April, subject to other regulations and rules of WPB.

WPB Copper Division Re-Aligned To Simplify Operation Under CMP

ORGANIZATION of the Copper Division of WPB has been re-aligned to simplify operations of the Division under the Controlled Materials Plan. The Division now consists of four staff sections and nine operating branches under the direction of H. O. King, director.

Direction and co-ordination of the activities of the Division are centered in the office of the director, which includes Michael Schwarz and J. C. Von Daacke as Deputy Directors; J. B. Hungate, C. V. Blackburn and J. H. Reed as special assistants; and Francis R. Kenney, chief statistician.

Functions of the Staff

Staff functions cover Programs, under Mr. Kenney; Distribution, under A. R. Mosler; Resources, under G. B. Holderer as acting chief; and administrative under V. H. Arnold.

The operating branches, which deal with all phases of the copper industry, are as follow:

Primary Production Branch, Frank A. Ayers, Chief; F. H. Hayes and L. F. Hersey, Assistant Chiefs;

Secondary Production Branch, J. J. Hines Jr., Chief;

Brass Mill Branch, J. W. Douglas, Chief; W. H. Maxwell, Assistant Chief;

Wire Mill Branch, E. H. Hammond Jr., Chief; J. W. Mullally, Assistant Chief;

Foundry Branch, L. W. Taylor, Chief;

Mill Facilities Branch, F. R. Pyne, Chief;

Scrap Branch, G. P. Norton, Chief;

Copper Recovery Branch, J. A. Wright, Chief;

Conservation Branch, (position vacant).

Members of the Requirements Committee are as follow: Lt. Col. W. A. Amelung, Army; Lt. Comdr. P. B. Andrews, Navy; Maj. M. C. Durbin, Aircraft School; R. K. Stoner, Maritime; Calvin J. Nichols, Board of Economic Warfare; Frederick Strauss, Civilian Supply; R. H. Catlett, Lend-Lease; V. D. Nicholson, Agriculture; J. H. McCarty, Petroleum Administrator for War; Warren Kelly, Office Defense Transportation; B. E. Silver, Rubber; W. E. Mullestein, Facilities; and J. B. Hungate, Secretary.

A listing of the current memberships of the various industry advisory committees follows:

Copper Producers

Government presiding officer, H. O. King; K. C. Brownell, American Smelting & Refining Co.;

Robert E. Dwyer, Anaconda Copper Mining Co.; J. F. McClelland, Phelps Dodge Corp.; A. J. McNab, Magma Copper Co.; A. E. Petermann, Calumet & Hecla Consolidated Copper Co.; Carl T. Ulrich, Kennecott Copper Corp.; B. N. Zimmer, American Metal Co.; Wm. H. Schacht, president, Copper Range Co.

Government presiding officer, Michael Schwarz; B. J. Flaherty, Johnson Bronze Co.; Wm. C. Hardy, Wm. A. Hardy &

Sons Co.; G. H. James, Richmond Foundry & Mfg. Co.; J. P. Jefferis, Janney Cylinder Co.; A. H. Lee, Lee Brothers Foundry Co.; Damon Wack, National Bearing Metals; L. M. Nesselbush, Falcon Bronze Co.; W. C. Peare, E. A. Williams & Sons; N. H. Schwenk, Camp Brass & Iron Foundries division, Baldwin Locomotive Works; W. V. Storm, Western Brass Works; W. W. Rarity, National Brass Works.

Brass and Bronze Ingot Makers

Government presiding officer, Michael Schwarz; George Avril, G. A. Avril Smelting Works; W. J. Bullock, W. J. Bullock Inc.; Melvin Butter, Harry Butter & Co. Inc.; L. Chapman, H. Kramer & Co.; E. L. Newhouse Jr., Federated Metals division, American Smelting & Refining Co.; David B. Rosenthal, Eastern Iron & Metal Co.; Clarence White, White Brothers Smelting Corp.

Brass Mill Products Distributors

Government presiding officer, J. W. Douglas; T. M. Bohen, Whitehead Metal Products Co.; H. V. Douglas, Central Steel & Wire Co.; Robert E. Grote, Metal Goods Corp.; J. H. King, Seaboard Brass & Copper Co.; Walter Schroeder, Pacific Metals Co. Ltd.; J. M. Tull, J. M. Tull Metal & Supply Co.

Copper Wire and Cable Mill

Government presiding officer, F. R. Kenney; H. L. Erlicher, General Electric Co.; F. C. Jones, Okonite Co.; Everet Morse, Simplex Wire & Cable Co.; D. R. G. Palmer, General Cable Corp.; C. A. Scott, Rome Cable Corp.; W. E. Sprackling, Anaconda Wire & Cable Co.; Wiley Brown, Phelps Dodge Copper Products Corp.

Brass Mill

Government presiding officer, F. R. Kenney; John A. Coe Jr., vice president, American Brass Co.; John S. Coe, Chase Brass & Copper Co.; J. A. Doucett, vice president, Revere Copper & Brass Inc.; W. M. Goss, vice president, Scovill Mfg. Co.; J. P. Lally, president, C. G. Hussey & Co.; H. L. Randall, president, Riverside Metal Co.; F. L. Riggin, president, Mueller Brass Co.

Combined Copper Committee Formed; Headed by H. O. King

United States, United Kingdom and Canada have united in creating a Combined Copper Committee, advisory body.

The committee, appointed by the Combined Production and Resources Board and the Combined Raw Materials Board, has the primary responsibility for assembling and reviewing data relating to the supply, requirements, inventory and consumption of copper in order that the copper supply available to the three countries may be utilized to the best advantage in war production.

Harry O. King Jr., director, WPB Copper Division, is chairman of the copper committee, and will be assisted by a staff of American, British and Canadian representatives.

Second Quarter Allotment for Farm Machinery Authorized

Allotment of critical materials to be delivered in the second quarter with a view to completing the 1943 farm machinery program as recommended by the Secretary of Agriculture has been authorized by the Requirements Committee.

All of the materials carry the top priority rating of AA-1, the same that is given the principal "must" military programs.

The Committee also directed that Limitation Order L-170, issued last fall covering the production of farm machinery, be amended as necessary to permit the schedule of quotas to conform with the approved program.

With the new action the manufacture of new farm machinery will be possible at a rate 40 per cent of 1940 production, as requested by Secretary Wickard, an increase to slightly less than double the amount permitted by L-170. Production of repair parts, set at 135 per cent of the 1940 figure by L-170 was raised to 167 per cent.

Included in the second quarter allotments were 185,000 tons of steel; of which at least 50,000 tons is expected to be bessemer steel or other alternate steel products such as top-cuts and re-rolled rail.

Preference Ratings for Ten Detinning Plants Revoked

Following the policy of deferring the construction of additional detinning plants in the United States, announced recently, WPB has revoked preference ratings of ten detinning and recovery plant projects having a total cost of $12,059,507.

The ten plants which were halted by the action were to be located in Chicago, New York, Los Angeles, Dallas, Buffalo, Baltimore, Birmingham, Neville Island (Pittsburgh), and Sewaren, N. J.

FEDERAL BUDGET—INCOME AND OUTGO

(BILLIONS OF DOLLARS)

SOURCES OF FUNDS		FEDERAL BUDGET	EXPENDITURES	
1942				
Personal income tax	3.3	34.0	Army	14.1
Corporation taxes	5.0		Navy	8.6
Other revenues	4.2		Other war activities	5.6
Borrowings from Social Security and other trust funds	1.9		Other nonwar	4.4
Borrowing from public	19.6			
1943				
Personal Income and Victory tax	7.8	84.0	Army	44.0
Corporation taxes	10.1		Navy	17.5
Other revenues	4.8		Other war activities	15.8
Borrowings from Social Security and other trust funds	2.8		Other nonwar	4.8
Borrowing from public	58.3			
1944				
Personal income and victory tax	13.1	106.9	Army	62.0
Corporation taxes	14.9		Navy	22.0
Other revenues	4.7		Other war activities	15.7
Borrowings from Social Security and other trust funds	3.7		Interest	3.0
New taxes	16.0		Other nonwar	4.2
Borrowings from public	54.0			

UNDER the budget recommended by President Roosevelt for 1944, increases in expenditures over the present year are to be met entirely by increased yields of existing taxes and by $16,000,000,000 of new taxes. Borrowings from Social Security and other trust funds will be $900,000,000 higher than in 1943, while borrowings from the public will be $4,300,000,000 less. Major increases in expenditures are estimated for the Army and Navy only

Tanks To Require All Existing Castings Capacity, Convention Hears

CHICAGO

WORK of the steel foundry industry in conservation of critical alloys and the ability of its producers to meet continuing war demands in addition to supplying essential civilian needs were praised by George F. Hocker, chief, forgings and castings section of the Steel Division, War Production Board, in the convention of the Steel Founders' Society here, Feb. 10 and 11.

Present expansion programs in aluminum and magnesium, steel and petroleum are producing heavy requirements for steel castings, Mr. Hocker stated, and in 1943 requirements for tank castings will utilize all of the existing production facilities, despite the projected cutback in the tank program. Announcing that the Steel Division has a directive for the conversion of capacity in centrifugal and static steel castings to replace forgings in aircraft construction and other uses, he indicated that new demand would be developed.

Mr. Hocker traced the industry's growth since 1940, when 1,600,000 tons of steel castings were produced against an estimated output of 985,600 tons, to the end of 1942, with production reaching 1,578,000 tons on near-capacity operation. By the end of 1943, he said, there will be approximately 335 steel foundries in the United States with an estimated capacity of 3,154,000 tons. Total requirements for the present year will be equal to the production capacity.

Panel on Centrifugal Casting

An exceptionally interesting session was conducted by six speakers in a panel discussion on centrifugal casting of steel. Charles W. Briggs, technical and research director of the Steel Founders' Society, acted as chairman of the meeting in which were outlined some of the developments which have sprung from this process. While the first patent covering manufacture of a metal object by spinning the mold was granted in 1809, most of the developments have taken place in the past 20 years, he explained. The Watertown Arsenal was credited by Mr. Briggs with having been a leader in the work, casting guns centrifugally of a molyvanadium steel in 1930. Sawbrook Steel Castings Co., National Malleable & Steel Castings Co., Ohio Steel Foundry Co. and the Ford Motor Co. were said to have contributed substantially to perfecting the process in production of gears and other castings.

Phases of the centrifugal casting process were described by Mr. Briggs as 1—method of rotation; 2—method of pouring; 3—construction and form of the mold. They may be divided into the following: True, or those cast about their own axis; semi, or those cast in cores; and pressure, or those cast in clusters about a center axis. The application of both vertical and horizontal spindles and examples of castings produced by each method were discussed. He pointed out that yields of approximately 100 per cent can be obtained in the production of true centrifugal castings.

Explain Company Methods

P. C. Power, Maynard Electric Steel Castings Co., Milwaukee, discussed the casting practice of that organization in a paper "Centrifugal Castings by the Use of the Vertical Spindle Machine." C. K. Donoho, American Cast Iron Pipe Co., Birmingham, Ala., presented a paper on the subject "Centrifugal Castings by the Use of the Horizontal Spindle Machines and Permanent Molds." A. T. Baumer, Weir Steel Co., Milwaukee, described "Centrifugal Castings Using Vertical Poured Molds." Other papers in the panel were presented by Anton Johnson, Oklahoma Steel Castings Co., Tulsa, Oklahoma, who described the practice followed by his company in "Centrifuging During the Pouring of Steel," and by J. B. Caine, Sawbrook Steel Castings Co., Lockland, O., who discussed "Centrifuging After Filling the Mold with Steel," a treatise prepared in conjunction with W. F. Wright of the same company.

Another session was addressed by C. S. Ching, director of industrial and public relations, United States Rubber Co. and a member of the War Labor Board, who analyzed the structure of the board and its relation to industry. He stated that in his opinion the tripartite set-up, in which industry, labor and the general public have representation, is a most sound procedure. But he expressed dismay at the lack of responsibility in the wage stabilization program on the part of American employers. The best service that industry can render today, he said, is to fight wage increases, not only before the board, but back home. He begged industry not to make wage agreements and then put the onus of the procedure on the WLB, but to let the wage increase discussion come to the board as a wage dispute.

The first session of the annual meeting. at which Oliver E. Mount. vice president, secretary and treasurer of American Steel Foundries, Chicago, and president of the Steel Founders' Society of America, presided, featured reports of several committees. Report of the committee on Occupational Classifications was made by Lloyd C. Farquhar, American Steel Foundries, East St. Louis, Ill., and chairman of the committee; report on raw materials was by committee chairman W. W. MacMillen, National Malleable & Steel Castings Co., Cleveland; on specifications, by Charles W. Briggs; on advertising, by committee chairman Clarence Tolan Jr., Dodge Steel Co., Philadelphia; and on technical and operating, by Mr. Briggs.

Raymond L. Collier, secretary and treasurer of the society presented the annual report which indicated the society is pursuing a sound financial policy. Col. Merrill G. Baker, executive vice president, in his annual report, indicated that 96 per cent of the industry is supporting the society financially. He listed 25 organizations which recently have become affiliated with the society and then reported on the various activities of the organization, including the assistance which has been rendered the various war agencies. He paid tribute to the service which steel castings have rendered the war effort during the past year.

Research Program Started

Chauncey Belknap, counsel, speaking on "Recent Developments Affecting the Industry", discussed the various provisions of the maximum price act as they affect the steel castings industry.

President Oliver E. Mount discussed the research program of the Steel Founders' Society, authorized recently by the society's board of directors. As a start, he said, 52 research projects relating to cast steels and steel foundry problems have been proposed by Mr. Briggs and sent to the membership in December. After projects have been selected, and upon approval by the research fund committee, they will be referred to the board of directors. Research will be conducted in individual member companies, he stated, by two or more members, or in universities and research institutions. Interesting phases of the research program were dealt with by Edward W. Campion, Bonney-Floyd Steel Co., Columbus, O.; Sheldon V. Wood, Minneapolis Electric Steel Casting Co.; Keith Williams, Pratt & Letchworth Co., Buffalo, and W. D. Moore, American Cast Iron Pipe Co., Birmingham, Ala.

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

MIRRORS of MOTORDOM

Union insists Little Steel wage formula must be scrapped, despite 48-hour week olive branch extended by government. . . Training field force to probe efficiency levels in war plants

DETROIT

INITIAL reaction of business men here—whether operators of a bootblack stand or a large war plant—to the 48-hour week *pronunciamento* was bewilderment over how the order would affect them. Inasmuch as Detroit was one of the 32 originally specified critical areas in the country, shortly to be joined by 100 more, there was no question over whether the order applied; it did, and to every single business in the area. The perplexity was in regard to how it should be applied, why it was necessary and what the exceptions would be. A deluge of questions showered on the local office of the War Manpower Commission, but the best advice it could offer was for the interrogator to read the newspapers, since the whole plan was just another example of the new government technique—government by newspaper directive.

Puzzled executives, now speculating over what to do, should keep a few pertinent things in mind. First, with respect to why the order was issued. Two basic reasons are apparent, and you can take your choice over which is the more important. One is the determination of Mr. Byrnes' OES office to halt inflation by adhering to the Little Steel formula for wage raises. The halting is indirect, to say the least, but the thinking was that, by means of the 48-hour work week, incomes of working people could be boosted without altering their basic rates, and thus unions might be dissuaded from their attempts to break down the Little Steel formula.

Labor Unions Dissatisfied

This may be sound reasoning—and clever too—but it does not look like the unions are going to fall into line. Several days after issuance of the 48-hour week order, R. J. Thomas, president of the UAW-CIO, came out flatly with the following statement, published in the official union paper: "The Little Steel formula for wage determination, which has been used by the NWLB as a pattern for limited wage increases, must be abandoned at once. We must have a realistic formula recognizing an advance of at least 30 per cent in the cost of living since Jan. 1, 1941, so that workers through their unions can commence to bargain now for comparable increases in wages. The Little Steel formula has permitted no more than 15 per cent increases since Jan. 1, 1941."

And further, "The new formula which I urge . . . must recognize a real increase in the living cost of factory workers of at least 30 per cent. It should be worked out on a basis whereby workers would be able to negotiate for and obtain *specific increases based on a specific amount per week, in accordance with living costs; not percentage increases.*"

In other words, what Thomas wants is for the man earning $40 a week to receive the same cash increase to compensate for higher living costs as the man earning $80 a week.

The second basic reason for the 48-hour order, and the one which was played up publicly as being the real motivation, was to drive employes out of nonwar jobs into the war plants. How is this done?

Few "Non-Essential" Jobs

In two ways. First, by listing a heterogeneous group of nondeferrable occupations and specifying that persons in these categories were not eligible for draft deferment even on the grounds of dependencies. The number of men which this would make available for war plants is considered trivial; one estimate is that in the entire Detroit area it would not produce over 2000. Second, by compelling the trimming of employe lists in businesses now working only 40 hours a week, as the result of a 20 per cent lengthening of the work week. Thus, a business hiring 10 persons on a 40-hour week theoretically could dismiss two of them by going to a 48-hour week. How many this would make available is by no means certain. One conservative estimate is that it might produce 12,000 in the Detroit area, where industrial employment incidentally is now up to the record total of 700,000.

There are no official sanctions yet devised to apply to employers who are unwilling or unable to release personnel by shifting to a 48-hour week. But it is readily possible to imagine a few. Public condemnation, revoking of licenses, withholding of material, are just a few. The WMC hopes that a willing spirit of cooperation will make unnecessary the use of any such cudgels.

However, it becomes apparent there will have to be many exceptions made to the ruling and the immediate result will be a swamping of WMC offices with requests for special consideration on this score. Many plants and offices now working only 40 hours will be able to supply or discover work to keep their normal forces busy 48 hours, so how can they legitimately be forced to release employes?

Most war production plants are working 48 hours a week or even more and about the only worry they have is the effect on the work week of temporary reductions caused by materials shortages, changing schedules, bottlenecks in the plants of prime contractors and outside assembly plants, etc. If such things as these reduce the work week for much longer than 30 days, then it seems that steps will have to be taken to release some of the crews so those remaining can be stepped up to 48 hours.

As a matter of fact, such a problem is at hand in Detroit right now. One of the motor plants has had to reduce its schedules on aircraft parts production because completed parts are backing up from a bottleneck in the assembly plant. An air corps officer has come forward with the suggestion that the men involved in this reduction be "loaned" to another plant—Willow Run, for example—where they could be put on a 48-hour week and immediate use made of the skills which they have acquired in training at their present positions. This is a highly delicate matter, for after all human beings cannot be herded around like cattle or like machines. Agreement to such a shift would have to be worked out with managements, unions and with the men and women themselves before it could be accomplished and there are serious obstacles in respect to all three.

Looking ahead toward peak production in the Detroit area, optimists see a backlog of about 120,000 men and women available for jobs in war plants. About half these will be women, and recent surveys made by the United States Employment Service have indicated 50,000 women willing to serve at war jobs. Inmigration of working people, still proceeding at a high rate, will make up a portion, 12,000-20,000 will come from the lengthening of the work week (maybe), and a few thousand from the ranks of those leaving nondeferrable occupations.

Manpower Difficulties Analyzed

In analyzing current difficulties involved in handling manpower and womanpower, old-line industrial relations experts dealing with working people over the past 20-30 years, have put their finger on a single sore spot which is at the root of many of today's troubles. It is the unwillingness of most working people to take their problems directly to

management and industrial relations advisers.

Instead, the smallest grievance is taken at once to the union committeeman or shop steward who usually shunts it to some government agency or bureau, such as the WMC or the WLB, which in turn has to go back to management and attempt to work out a solution for the disgruntled employe, when the whole thing might have been settled quickly if the employe had gone directly to his foreman, superintendent or industrial relations manager.

In the past half-dozen years, there has been a figurative wall erected between management and men, principally as the result of widespread unionization of plants. The union member seems to think that by paying his $1 a month dues, he is at once entitled to the services of union agents in settling any difficulty arising on the job, all the way from job transfers down to the matter of choosing what type of clothes to wear to work.

Essentially, the sole function of a union is to bargain collectively for its members on matters involving wages and working conditions. But it is being compelled to go far beyond this well-defined limit. Union members either have forgotten that plant managements are still anxious to listen to employes' problems and to act on them, or else they have been schooled to a new unAmerican belief that managements and supervisory personnel are members of some higher and untouchable class bent on destruction of the working man—which is altogether ridiculous.

A smart industrial relations man these days would do well to explore this subject a little further and attempt to sweep away such misconceptions where they exist. It is easier to do in a small plant, but that is not to infer it cannot be helped in the large plant.

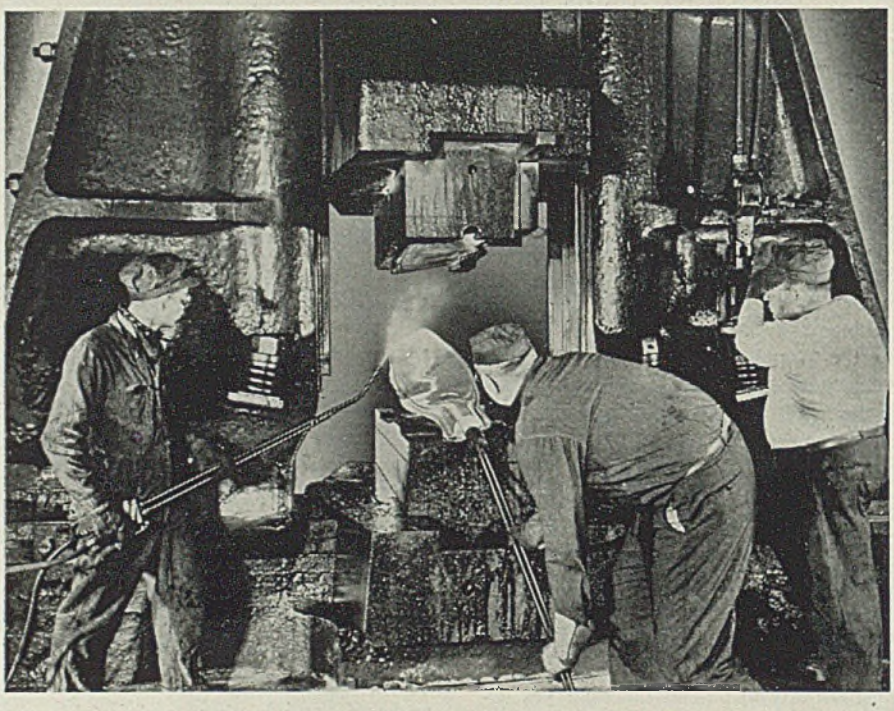
An interesting phase of new activity which the War Manpower Commission is undertaking through its field offices relates to "manpower utilization" or in plain English a study of operating efficiency in war plants, and an attempt to ferret out instances where management actually is "hoarding" its labor against future needs, or where individual production is being held down by such things as union restraints.

Laudable in purpose, this project necessarily will suffer because of the limited and inexperienced personnel available to manage it. Total field staff for the country will be only about 150, which will mean just two or three men in a large center like Detroit. Here again the only means of correcting inefficiencies will be by making public examples of them or by attempting to "unsell" the responsible parties. Obstacles in the way of obtaining any factual data bearing on this problem would appear to be so enormous as to make the proposal appear wasted effort. It is wrapped up inextricably in such groups as local unions, government inspectors and management policies. To bring facts out into the open is hopeless.

There are grounds for believing that in the last few months efficiency levels have been improving generally. Many factors are ascribable—talk of job freezing, increased inroads of the draft, approach of income tax payment dates, news from men in the service abroad, pep talks by military men who have returned from the battlefronts, etc.

Basically, of course, there are only two reasons why a man will work harder at his job: Fear of loss or desire for gain. If you can relate news developments to these two factors you will have the explanation of improved efficiency. They may serve at the same time to lower absenteeism from its level of around 6 per cent down to the normal 3 per cent, although there is opinion that the longer work week will simply accentuate absenteeism.

STEEL HAMMER FORGING ALUMINUM PROPELLER



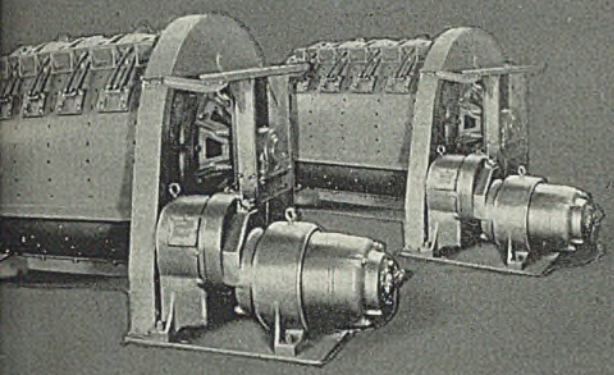
Forging of aluminum alloys for aircraft requires hammers of much heavier capacity than for similar parts forged from steel, as evident from this dramatic closeup of a 35,000-pound steam hammer installed in a Michigan Chevrolet plant and at work here on its first forged aluminum alloy propeller blade. Twelve other large hammers and a press which exerts a 6,000,000-pound squeeze are included in special equipment operated in this plant. More recently, Chevrolet has announced that it has completed negotiations for acquisition of the Anderson, Ind., plant of American Steel & Wire, which will be remodeled and re-equipped for producing aluminum forgings for aircraft engines. Property was acquired by the DPC; production will be scheduled by the Army Air Forces. Operations of this new facility will make Chevrolet one of the largest producers of aluminum forgings in the country.

Estimate 1943 Aircraft Production at 12 Billions

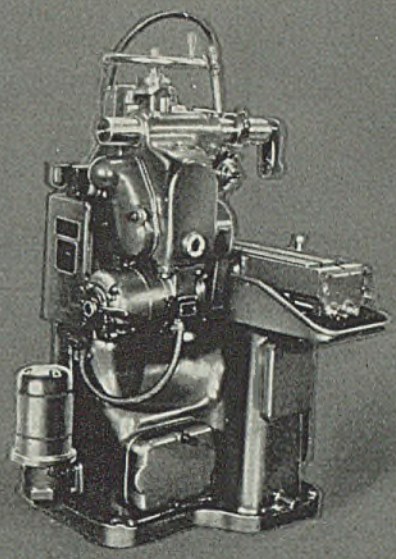
Sales of airplanes, engines and propellers will mount to approximately $12,000,000,000 in 1943, the Aeronautical Chamber of Commerce reported last week. Last year aircraft manufacturers produced $5,000,000,000 worth with the dollar volume of deliveries amounting to $1,750,000,000, an increase of 186 per cent over 1941.

As the "foremost industry in the nation," the aircraft producers have $22,000,000,000 in unfilled orders with output directed to the Army, Navy, Great Britain, and lease-lend clients.

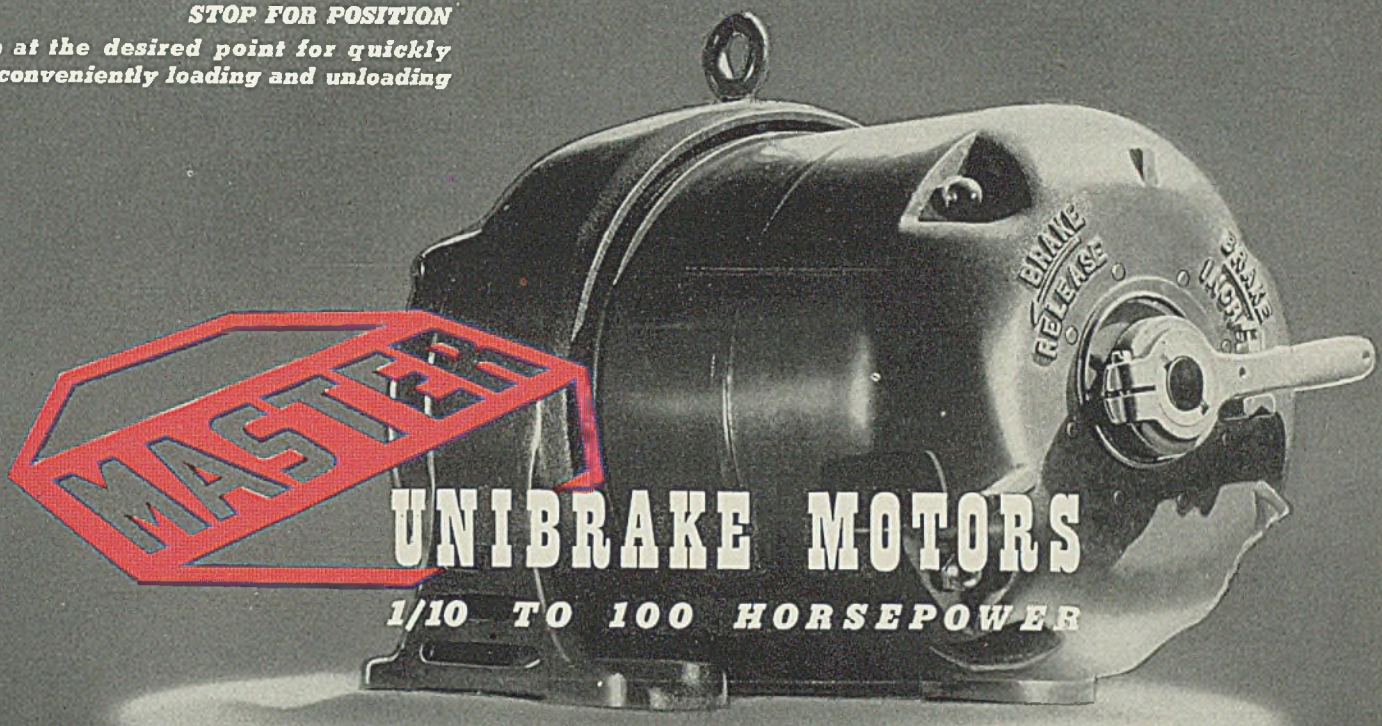
Total number of workers is expected to increase to 1,000,000 from the present 630,000. Productive manufacturing space will advance from 73,000,000 square feet to 100,000,000 square feet. Larger bombing planes are predicted with speeds that will exceed the current 450 miles per hour.



STOP FOR POSITION
Stop at the desired point for quickly and conveniently loading and unloading



SPEED UP PRODUCTION
Save time by stopping quickly with a compact integral brake unit



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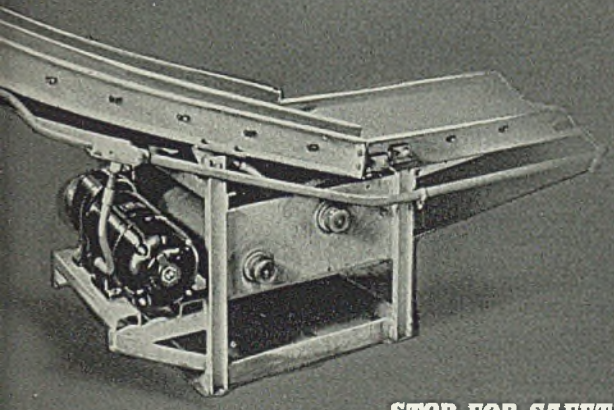
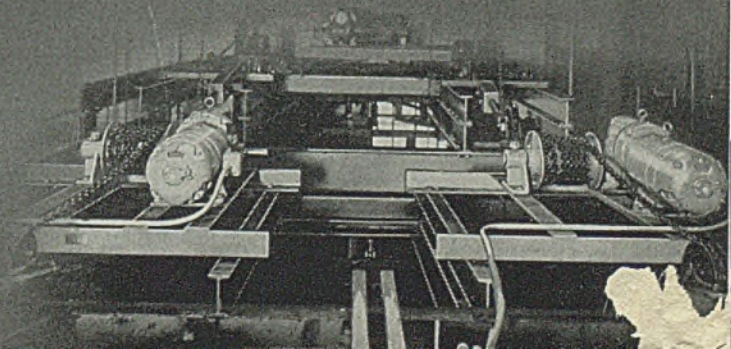


STOP FOR SAFETY
Reduce the hazard of injury to workmen or damage to equipment which might cripple vital production

STOP AND HOLD ANY LOAD
Unibrake motors are very advantageous on hoists, elevators, inclined conveyors, etc. . . .



Greater Use of Steel in Heavy Transport Planes Forecast

PRODUCTION and engineering skill refuse to concede "insurmountable obstacles" in the way of building large planes for carrying heavy cargo, according to Harry Woodhead, president, Consolidated Aircraft Corp., San Diego, Calif., speaking there recently before the Society of Automotive Engineers.

"Tremendously complicated" problems of design and production exist, but despite these, he said, the aircraft industry can and will build planes which will surpass everything hitherto in the skyways. As military bombers these giant craft will deliver bomb loads far greater than any now possible, or will transport men and material in quantity.

"Building large planes is a complicated operation, a fact which the layman doesn't understand even at this late date. First we have a vast number of engineering hours, followed by the mock-up operation. There are thousands of obstacles to be overcome, thousands of problems, relating to each other or even created by each other."

While the hundreds of steps in design and experimentation are going on, explained Woodhead, "production and plant engineers are attacking the problem of the assembly line, and the structure to house it, which must be larger than any existing. There must be other smaller buildings also.

"Tooling engineers are working hand-in-hand with design engineers to create the intricate operation of assembly line production. Only after all of these complicated details have been co-ordinated can actual mass production begin."

Woodhead said that Consolidated soon will have its Coronado PB2Y-3 flying boat in mass production on a conveyor line. This 33-ton Navy patrol bomber exceeds even the B-24 in size and load-carrying capacity.

"However, do not let me make a hero out of the conveyor line. The real heroes of production are the tool men and assembly planners who broke down the complex airplanes into the many small assemblies, and the workers who quickly learned to perform those assembly jobs efficiently."

He declared that Consolidated is already "well along" on its super-plane, capable of carrying 400 persons or an equivalent military load. This plane will require "four years from conception to birth on a production line," he estimated.

"The question is constantly arising as to what materials will be used in the large airplanes to come. It is my personal belief that steel will be used more and more."

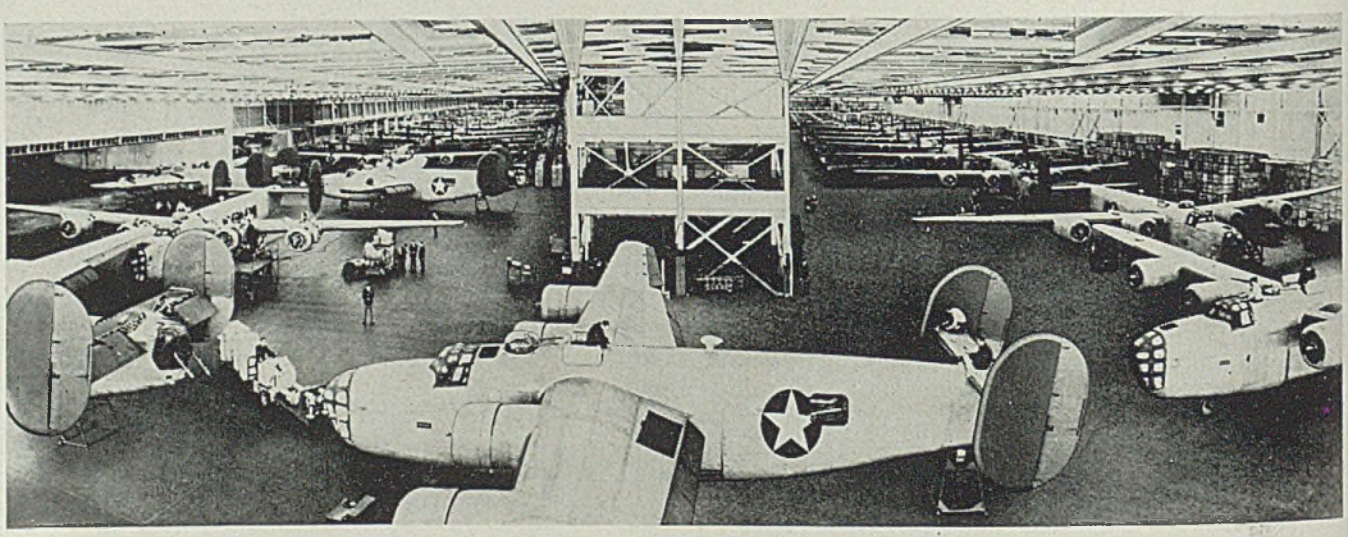
For the future, he predicted adjustable jigs and fixtures to produce changes in basic models right on the assembly line, much as has been done in the automotive industry. "We may not be able to specialize to that extent," he added, "but it will be possible to run 50 units of one model, and then 50 of another.

Woodhead minimized the possibility of converting war types to peace-time use. "There will be some conversion but it will be strictly a stop-gap, and only temporary.

"Even today, our military airplanes are built for high performance and specific missions. Fuselages are small, allowing just enough crew, armament and bombs to get there and do the job as quickly as possible. We have hung on tons of military gadgets; in fact, we have actually designed these planes from first to last as military aircraft.

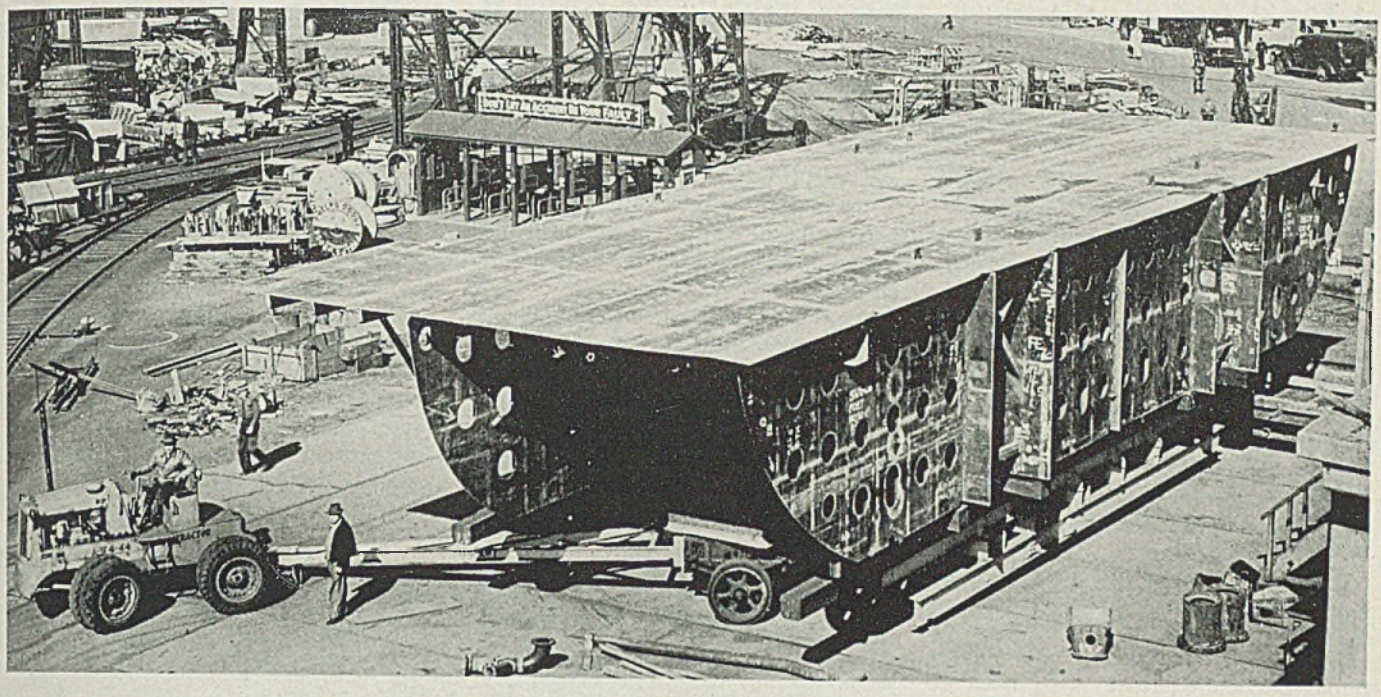
"Remember that for the future we must aim at economy of operation as well as construction. To do this we must redesign and build new airplanes. We will be able to standardize our designs to greater degree than during war-time when constant emergencies of combat experience arise to require rapid change in construction."

WILLOW RUN BOMBER OUTPUT ON SCHEDULE, BUT SCHEDULE IS SECRET

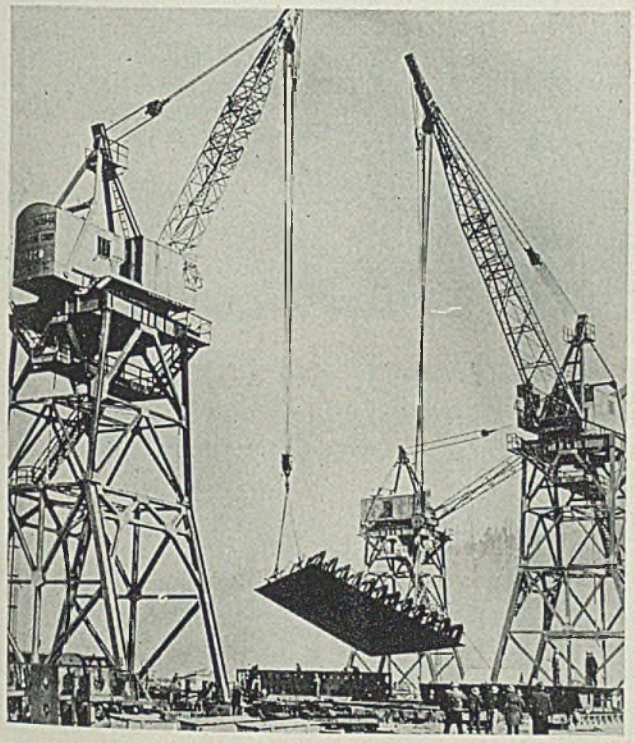


This panorama view was made from a series of six photographs taken at ceiling height, showing B-24 Liberator bombers coming off the two final assembly lines at the Ford Willow Run plant. Planes in the foreground have been turned 90 degrees and are headed toward camouflage and preflight departments of the vast plant. Considerable retouching of the foreground in this photograph is evident.

Willow Run, in construction since May, 1941, has been the subject of more speculative and analytical criticism than any other war plant in the country. Once highly restricted, the operations now have been photographed from nearly every angle, and a flood of publicity is emanating from the Ypsilanti bomber breeder. Production schedules have been revised since construction of the plant started and all that can be said now is that output is up to schedule; what the schedule is will not be divulged. Total output thus far is believed not to have exceeded 75 of the heavy bombers.



All traffic stops when this shipyard building block is hoisted aboard a 16-wheel trailer and lugged across the yard of Federal Shipbuilding & Dry Dock Co. by a jeep



Called "whirleys" because turntables at the top of their superstructures permit control cabs to whirl in a complete circle, these cranes, powered by General Electric motors, can hoist loads as heavy as 60 tons

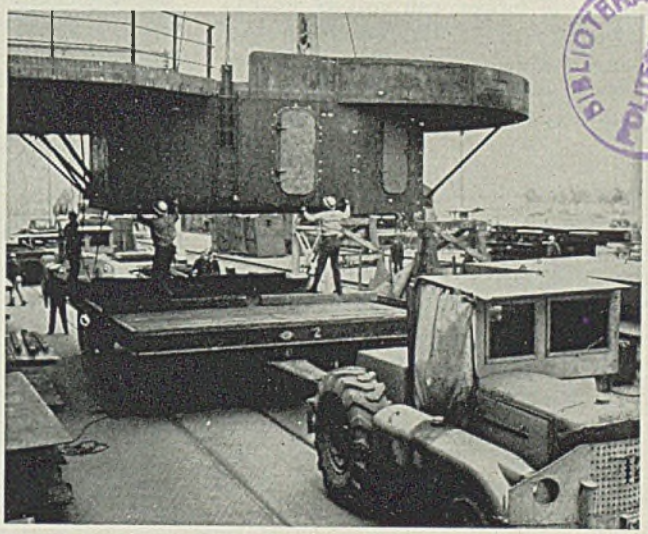
Caterpillar diesel tractor pulls a specially built 16-wheel trailer hauling ship sections at a yard where Liberty ships are being produced in quantity. The unit is capable of hauling 80-ton sections from fabrication shop to assembly

Conveying Machinery Aids Shipbuilding Records

PREASSEMBLY is playing a large part in the records American shipyards are establishing in the building of merchant vessels. In January, 106 such vessels were delivered, adding more than a million tons to this country's shipping.

Prefabrication is made possible by powered manipulation of heavy sections and many of the shipbuilding records which have been hailed as astounding are the results of the conversion of large cranes to the job of lifting heavy sections into position.

Often sections are welded in shops a considerable distance from the assembly yards, then towed to position and lifted into place. When the history of America's shipbuilding records is written, the lifting and conveying machinery must receive due honor.



Machining Operations Help Put Harvester's Torpedo Output Ahead

AIRCRAFT torpedoes, one of the most vital and effective weapons in the war plans of the United Nations, are now being manufactured by the International Harvester Co., several months ahead of schedule, Fowler McCormick, president, said last week.

Manufacturing and assembly operations on the torpedo are being performed in several plants of the company. Description of the torpedo and manufacturing techniques are military secrets, but the Navy has authorized some general information.

While the company has handled jobs that called for equal precision, notably in diesel fuel injection pumps, it has never built any complete product where, throughout, the tolerances were as close as in the torpedo. Few products ever have been built by mass production methods where precision requirements are so great.

Torpedo work is as fine as the best watch or compass. Many small, delicate parts must be machined and hand-finished to almost infinite tolerances and adjusted to extremely close fits. There are in excess of 1,000 parts in the torpedo. In the production of those parts, workers perform between 15,000 to 20,000 separate operations.

A finished torpedo weighs less than a medium-sized tractor, yet because of the close work involved, the total man-hours of work required to build torpedoes are far greater.

Some of the most difficult jobs in torpedo production are the assembly work on small parts. Here problems are similar to assembly of a tiny wrist watch, calling for patience, precision, and individual skill. Much of this work must be done under a magnifying glass. A number of former watchmakers are employed for this work, both to develop techniques and to train other employes.

The precision required in many instances is beyond human measurement, and goes beyond the ability of the finest instruments to measure. These delicate parts either fit or they don't; and if they do not, there is no way of measuring the error except by "feel."

Some parts must be accurate within a limit of 25 one-millionth of an inch. There are parts so small that a man can carry them under his finger nail, yet they must be machined and finished to exact dimensions. Some fit so snugly that a particle of dust on them will destroy the accuracy required. There are fittings so accurate that they are lubricated by tiny drops of oil, injected with a surgeon's hypodermic needle. The poise is so precise that a drop of oil injected on one side, and not on the other, would destroy the delicate balance.

The company received its assignment about a year ago. Departments of several plants were cleared of peacetime facilities. In one plant, 2000 carloads of stored materials were moved. These departments were refinished to afford maximum light for careful torpedo work. Production lines were laid out; processes checked and analyzed; machinery, inspection, and assembly operations located; and procurement of machines and facilities was begun.

One of the first things done was to

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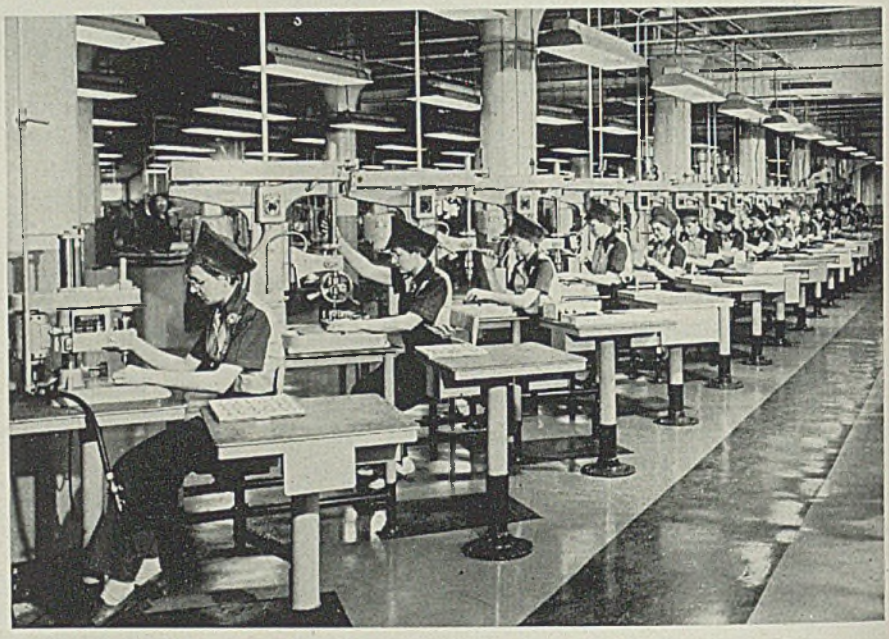

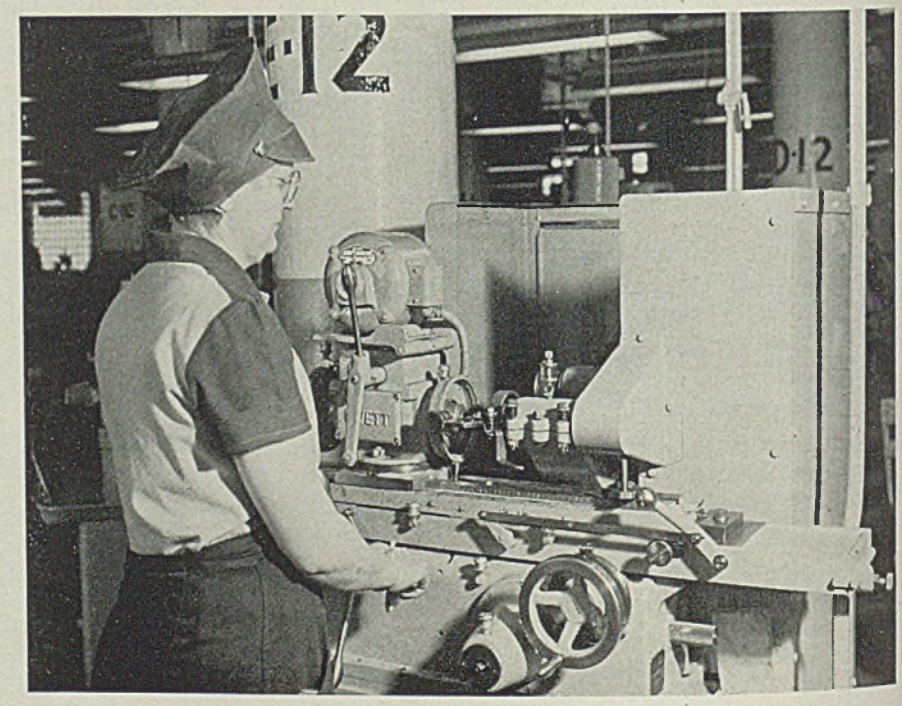

Above, a battery of single spindle drill presses operated by women who are especially adaptable to this type of machine operation because their sensitive fingers enable them to handle small parts more skillfully than men

This woman (right) is operating an internal grinder machine, an operation heretofore regarded as a man's job because of the skill required

send men to one of the naval torpedo stations. They lived and worked there for a period of weeks, familiarizing themselves with every method and technique. These men now supervise and train new employes.

Special training was organized for women. They were given a three-day refresher course in basic mathematics, especially in reading decimal fractions, in shop practice, and in use of gages and micrometers. Following this basic course, women were tested and, if they passed the tests, were placed and given detailed training by supervisors and group leaders. Women inspectors have received more extensive training in mathematics, instrument reading, practice inspection, blueprint reading and inspection gages.

Jobs, Environment Tailored to Physical, Mental Qualifications

EXPERIENCE in the employment and supervision of women workers at the Republic Drill & Tool Co., Chicago, was outlined by Bert I. Beverly, M.D., director of medical and personnel, at the "Manpower Utilization" conference sponsored by the American Management Association, Chicago, Feb. 10-12.

Republic Drill & Tool makes high-speed twist drills which is precision work and the company's attitude is that the highest quality of work is produced by those who enjoy the best possible physical and mental health.

The factory was designed for employment of girls before the onset of the war, and will continue as such after the war is over. It has been in operation nearly two years and has over 2000 employes, over 85 per cent of whom are women.

"Women are biologically and physiologically different than men," Dr. Beverly explained. "In strength, physiological reactions, and mental attitudes, they differ widely from men. If a certain kind of work is to be done by women, we believe it is essential to set up job specifications which meet the qualifications of women. We have, therefore, set up specific jobs for girls and specific jobs for men, so that men and women never do the same kind of work. This system eliminates unfair competition between the sexes. Our machines have been especially designed for women featuring ease and comfort of operation and have safety glasses and devices. The size and weight of pans of drills is limited to the pjhysical capacity of the average girl.

"We have rest periods every two hours and a well developed canteen service which serves nutritious, hot meals. We recognize that the ordinary factory is a man-made institution. It is usually a cold, dirty, noisy, unattractive place and is not interesting to anyone but businessmen and engineers. Women cannot be expected to be comfortable in such an environment. We have provided, therefore, free uniforms and clean washrooms, locker rooms and showers, attractive cafeterias and make every effort to keep the whole place clean.

"We recognize fundamental differences in the attitudes of men and women. To men, a job is an end unto itself.

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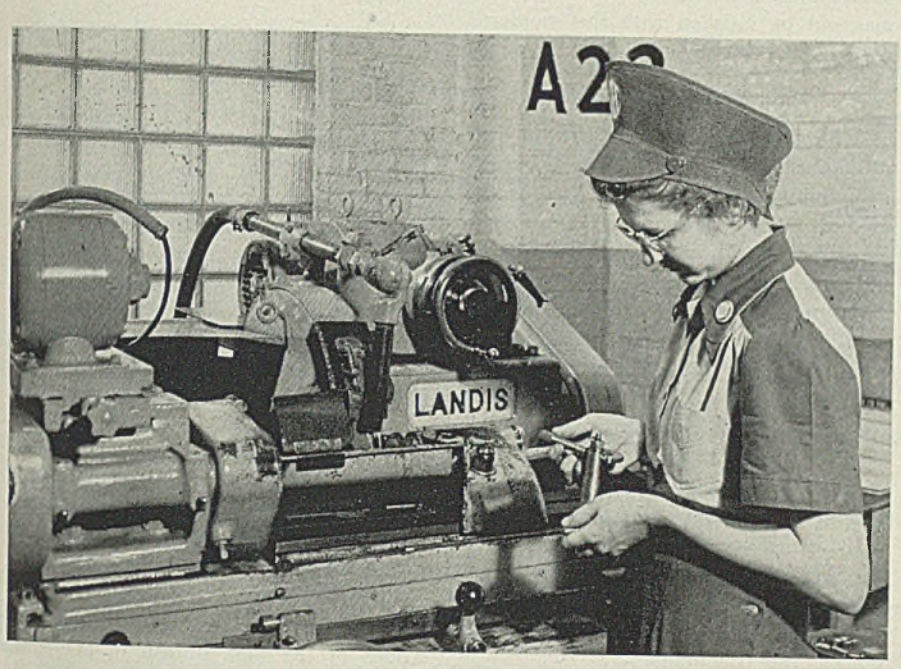
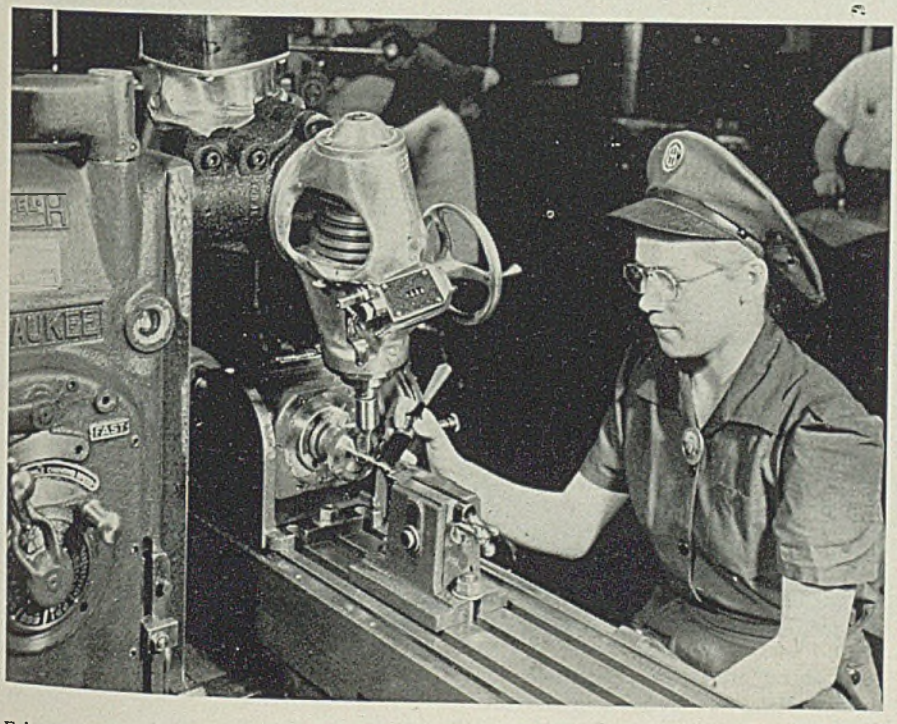




The part the woman shown above is measuring must be machined to a tolerance of .0005 of an inch. She operated the grinding machine after studying a special course for this type of work. The machine is setup by her

The tiny tool on midget mill (left) is cutting spiral grooves in a piece of metal through which oil will flow when the part is assembled. The tool moves at about 3500 revolutions per minute. The woman formerly was a drill press operator

It is his life's work and in it some of his greatest hopes and ambitions are satisfied. In the case of women the job is a means to an end that is usually temporary and is tolerated partly at least, because of the hope that they will some day have homes of their own and be able to give up work. Because of this attitude, girl industrial workers resist transfer from one department to another. When they have learned one job and become more or less attached to their foreman and become acquainted and friendly with the girls in their department, they see no reason why they should have to learn to do another kind of work, get used to new foremen and develop new friendships.

"Because of the above attitude, work becomes more monotonous to women than men, and they require diversion. To that end we have music throughout the plant, a recreation center and are rapidly developing a recreational program. We have frequent company meetings, and the girls themselves have many parties. These activities are extremely important because of their beneficial effect upon morale and therefore mental health.

"We have recently opened a beauty salon. One of the popular items bought here is Russian pine bath oil, which costs $3 per bottle. This may seem extravagant, but women are like that and please remember that most wives manage homes far more economically and efficiently than their husbands could.

"We find girl industrial workers conservative and conscientious. Recently, we changed the 'No Smoking' rule and permitted all employes to smoke on the job. We indicated our lack of understanding of women by predicting that at the beginning, at least, production would suffer. What happened? There was practically no smoking on the job. Changing the rule like many other things which may seem too lenient and which you might call 'coddling women', goes a long way to improving the general morale and we believe is still good business.

"Women have their own standards of production, both as to quality and quantity, which must be satisfied or they are unhappy. We frequently find employes complaining because they are not doing good work even though their foremen assures us that they are satisfactory. In other words, each girl has to come up to her own standards of proficiency and may not be satisfied with the standards set by the company.

"Male Foremen Supervise"

"The immediate supervision of our girl industrial workers is carried out by men foremen with the assistance of the medical and personnel departments. Working closely with the medical and personnel department, we have a safety department with representatives on duty at all times carrying out a safety program, and shift superintendents who are primarily interested in recreation and conditions which affect morale.

"We recognize that all employes—perhaps women more than men—need a feeling of expertness, and a feeling of individual importance in the company. . . . We have found counsellors extremely valuable in helping girls to make an adjustment inside the plant and in their homes," he concluded.

Management Group Advised To Study Re-employment Problem

"DON'T underestimate the importance of industrial relations just because there is a war on." L. H. Hill, vice president, Allis-Chalmers Mfg. Co., Milwaukee, advised the American Management Association's "Manpower Utilization" conference in Chicago, Feb. 10-12.

With the government controlling wage rates and other matters pertaining to labor, it might appear that little is left for the industrial relations department to do.

"Actually," Mr. Hill stated, "industrial relations people are of greater importance now than ever before." The present offers opportunities for vital service, and, "for the future, one need be neither soothsayer nor sage to envision the industrial relations problems of a postwar world and the position and influence which will accrue to those capable of solving them."

"The salient problem at the moment is to organize manpower for most effective utilization. . . . . What is needed is not necessarily a streamlining so much as the development of qualities of elasticity."

Referring to the attention being given to postwar planning, Mr. Hill said: "One way to prepare for whatever problems seem inherent in situations which may arise as an aftermath of the war is to make certain that everything is right in our employer-employe relationships now.

"Procedures have had to be suddenly changed or developed to accord with government regulations with which we have had to familiarize ourselves. The result has been that many of us have neglected our overall reorganizational and co-ordinative responsibilities which also have been affected by the war. Particularly important right now is the proper integration of the industrial relations department into the company organization, the strengthening of functional control within departments and the internal organization of the industrial relations department into areas of responsibility. All of these organizational measures are offered as a method of providing greater flexibility than is ordinarily found.

"Developing concepts of organization as a social process will result in a personalized business structure," the speaker continued. "An industrial relations man must become more than an advisor—he must take his place as a social engineer who bridges gaps as real as any confronting those of the civil variety. Business structures are developed with the object of accomplishing a given purpose. This purpose in wartime can only be a sustained maximum employe output. The present efficiency of the industrial relations man, therefore, is being measured against the yardstick of immediate tangible results outside of the total frame of reference. To a certain extent this is not a new practice but urgency of the war situation has brought it into sharp focus."

Paul V. McNutt, chairman, War Manpower Commission, described the functions of the new Bureau of Manpower Utilization, established with authority over agriculture, industry and federal manpower. The new bureau will operate within WMC under an executive director, divisional chiefs, and a field staff of 200 persons, and will implement the President's executive order of Feb. 9 lengthening the work week to 48 hours for the duration.

Mr. McNutt explained that the new staff of consultants would "help management and labor find out, down in the individual plant and production unit, how effectively the people on the job are performing, and to suggest means of increasing their effectiveness. They will come into your plant, your office, or onto your farm and work with you and for you in:

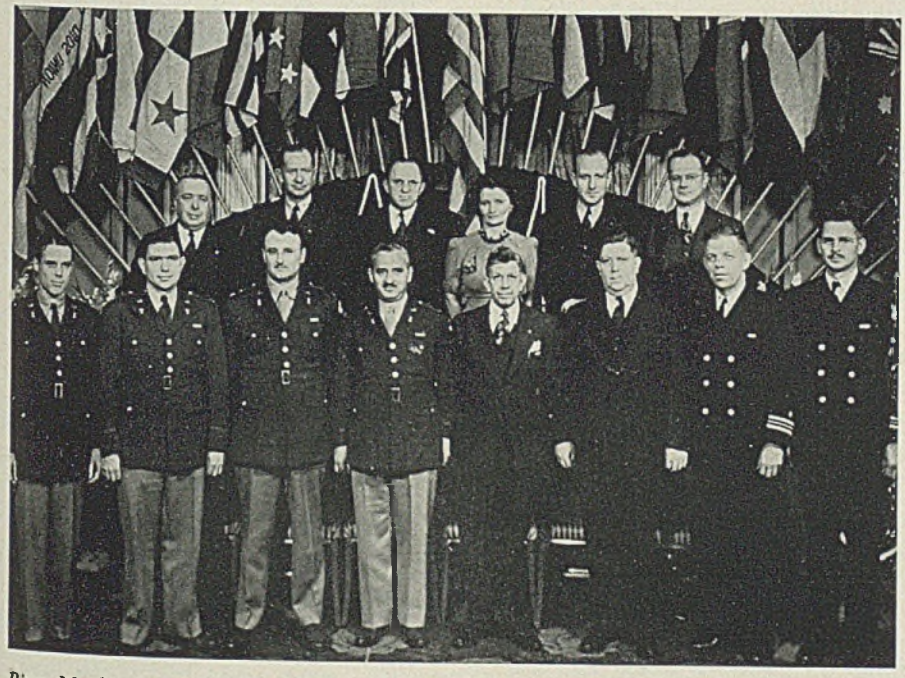
"1. Determining the extent to which man power and woman power are being utilized by analyzing such symptoms as absenteeism, labor turnover, production restrictions and stoppages, low mor-

(*Please turn to Page* 134)

Additional War Plants Receive Recognition for Production

SELECTION of additional industrial plants to receive the joint Army-Navy production awards in recognition of outstanding production was announced last week by the War and Navy Departments. They include:

Aircraft Accessories Corp., Burbank, Calif.
Airesearch Mfg. Co., Los Angeles.
Pittsburgh Steel Co., Allenport, Pa.
American Tube & Stamping Division, The Stanley Works, Bridgeport, Conn.
United-Carr Fastener Corp., Cambridge, Mass.
F. H. Bickford Co., Dayton, O.
Dictaphone Corp., Bridgeport, Conn.
Columbia Steel & Shafting Co., Carnegie, Pa.
Lucas Machine Tool Co., Cleveland.
Colonial Radio Co., Buffalo.
Coosa River Ordnance Plant, Brecon Loading Co., Talladega, Ala.
Caterpillar Tractor Co., East Peoria, Ill.
Faichney Instrument Corp., Watertown, N. Y.
Farnsworth Television & Radio Corp., Marion, Ind.
LaPlant Choate Company, Cedar Rapids, Iowa.
Lone Star Ordnance Plant, Lone Star Defense Corp., Texarkana, Tex.
Mahoney-Troast Construction Co. and associated subcontractors, Plant No. 7 Project, Wright Aeronautical Corp., Wood-Ridge, N. J.
Maumelle Ordnance Plant, Cities Service Defense Corp., Little Rock, Ark.
Metlab Co., Philadelphia.
Pittsburgh Steel Co., Monessen, Pa.
National Tool Company, Cleveland.
Packard Mfg. Corp., Indianapolis.
Magna Mfg. Co., Inc., Haskell N. J.
Stanley Tools Division, The Stanley Works, New Britain, Conn.
International Harvester Co., Tractor Works and West Pullman Works, Chicago
Edward Weck & Co. Inc., Brooklyn, N. Y.
E. B. Badger & Sons Co., West Virginia Ordnance Works, Point Pleasant, W. Va.
Cauldwell-Wingate Co., and the Poirier & McLane Corp., Orangeburg, N. Y.
E. I. du Pont de Nemours & Co. Inc., construction contractors, Chickasaw Ordnance Works, Millington, Tenn.
E. I. du Pont de Nemours & Co., Inc., construction contractors, Wabash River Ordnance Works, Newport, Ind.
Hunkin-Conkey Construction Co., Cleveland Aircraft Assembly Plant, Cliff Park Village, Ohio.
J. A. Jones Construction Co., Hoffman, N. C.
Manhattan Construction Co., and S. E. Evans Construction Co., Camp Chaffee, Ark.
F. H. McGraw & Co., and Freeto Construction Co., Jayhawk Ordnance Works, Baxter Springs, Kan.
Frederick Snare Corp., Intransit Depot, Port Newark, N. J.



Pipe Machinery Co., Cleveland, received the joint citation in a ceremony in Hotel Statler. Shown above is a group of guests and officials attending the presentation

Maritime Commission Honors Shipyards, Industrial Plants

Three shipyards and 20 industrial plants have been designated to receive "M" pennants, the Maritime flag, and labor merit badges for the workers for outstanding production.

Pennant-winning shipyards are Federal Shipbuilding & Dry Dock Co., Kearny, N. J.; Bethlehem-Sparrows Point Shipyard Inc., Baltimore; and Sun Shipbuilding & Dry Dock Co., Chester, Pa. The first yard is building C-type vessels and the latter two are producing tankers. Seven other shipyards, previous pennant winners, will receive gold stars for continued excellence in production.

Twenty industrial plants, manufacturing equipment for the ships of the Victory Fleet, will receive first "M" awards. These factories and the products they are making for the Maritime Commission are:

Turl Iron & Car Co. Inc., Newburgh, N. Y., evaporators, feed water heaters and condensers.
Kelvin & Wilfrid O. White Co., Boston, compasses and binnacles.
Sumner Iron Works, Everett, Wash., winches and windlasses.
Ft. Pitt Steel Casting Co., McKeesport, Pa., castings.
Hesse-Ersted Iron Works, Portland, Oreg., winches and windlasses.
Dri-Steam Products Co. Inc., New York, desuperheaters, separators, and fabricating strainers.
Edwards & Co. Inc., Norwalk, Conn., electrical equipment.
Edward Valve & Mfg. Co. Inc., East Chicago, Ind., valves.
Jenkins Bros., Bridgeport, Conn., valves.
National Tile & Marble Co., New York, deck covering.
Radiomarine Corp. of America, New York, manufacturing and installing radio equipment.
W. & J. Sloan, New York, joiner work.
Steves Sash & Door Co., San Antonio, Tex., joiner work.
Iron Fireman Mfg. Co., Portland, Oreg., engines for Liberty ships.
Lewis Bolt & Nut Co., Minneapolis, special bolts and nuts.
Paxton-Mitchell Co., Omaha, Nebr., metallic packing.
Union Steam Pump Co., Battle Creek, Mich., steam pumps for Liberty ships.
Mine Safety Appliance Co., Pittsburgh, safety items.
Sterling Casting Foundry, Braddock, Pa., stern frames.
L. Thiess & Sons Corp., Maspeth, N. Y.,

electrical equipment, rigging fitting, steel fabrication and brass indicators.

Seven shipyards already flying the "M" pennant for outstanding production of Liberty ships, which will receive gold stars for continued speed-up in deliveries, are as follows:

Bethlehem-Fairfield Shipyard Inc., Baltimore, third star.

Houston Shipbuilding Corp., Houston, Tex., first and second stars.

North Carolina Shipbuilding Co., Wilmington, N. C., third and fourth stars.

Oregon Shipbuilding Corp., Portland, Oreg.. seventh, eighth and ninth stars.

Permanente Metals Corp., (Richmond Shipyard No. 1), Richmond Calif., fourth and fifth stars.

Permanente Metals Corp., (Richmond Shipyard No. 2), third and fourth stars.

California Shipbuilding Corp., Wilmington, Calif., sixth and seventh stars.

At the presentation of the "M" pennant to the three shipyards and 20 industrial plants, the Maritime Commission also will present each worker with a special labor merit badge in recognition of his individual contribution to the shipbuilding program.

Expansions in War Plant Facilities Authorized by Defense Plant Corp.

CONTRACTS for new war plant facilities, expansions and equipment purchases authorized last week by the Defense Plant Corp., which will retain title to the properties, include the following:

With American Rolling Mill Co., Middletown, O., to provide equipment for a plant in Kentucky at a cost approximating $495,000.

With Saco-Lowell Shops, Boston, to provide equipment and machinery for a plant in Maine at a cost of approximately $385,000.

With Burd Piston Ring Co., Rockford, Ill., to provide equipment for a plant in Illinois at a cost of approximately $190,000.

With Glencoe Distillery Co., Louisville, Ky., to provide equipment for a plant in Kentucky.

With Grain Processing Corp., Muscatine, Iowa, to provide plant facilities in Iowa at a cost of approximately $840,000.

With Sylvania Electric Products Inc., Emporium, Pa., to provide additional equipment for a plant in Pennsylvania at a cost of approximately $80,000, resulting in an overall commitment of approximately $250,000.

With Ohio Steel Foundry Co., Lima, O., to provide additional facilities for a plant in Ohio at a cost of approximately $138,000 resulting in an overall commitment of approximately $1,640,000.

With Goodyear Aircraft Corp., Akron, O., to provide additional plant facilities in Ohio at a cost of approximately $2,140,000, resulting in an overall commitment of approximately $3,600,000.

With United Distillers of America Ltd., Baltimore, to provide equipment for a plant in Illinois.

With Chrysler Corp., Detroit, for additional equipment for a plant in Michigan resulting in an overall commitment of approximately $800,000.

With Buffalo Arms Corp., Buffalo, for additional equipment in a plant in New York state at a cost of approximately $673,000, resulting in an overall commitment of approximately $15,000,000.

With National Distillers Products Corp., New York, to provide additional facilities at a plant in Kentucky resulting in an overall commitment of approximately $118,000.

With A. Overholt & Co. Inc., New York, to provide additional equipment at two plants in Pennsylvania.

With Intercontinent Aircraft Corp., Miami, Fla., to provide plant facilities at a plant in Florida, resulting in an overall commitment of approximately $2,047,000.

With New Jersey Powder Co., New York, to provide plant facilities in New Jersey at a cost of approximately $9,650,000.

With S K F Industries Inc., Philadelphia, to provide additional plant facilities in Pennsylvania at a cost approximating $3,000,000, resulting in an overall commitment of approximately $12,000,000.

With Central Specialty Co., Ypsilanti, Mich., to provide additional equipment for a plant in Michigan resulting in an overall commitment of approximately $126,000.

With Commercial Shearing & Stamping Co., Youngstown, O., to provide additional equipment for a plant in Ohio, resulting in an overall commitment of approximately $435,000.

With Curtiss-Wright Corp., Buffalo, to provide additional plant facilities in New York at a cost of approximately $4,000,000, resulting in an overall commitment of approximately $36,900,000.

With H. K. Porter Co. Inc., Pittsburgh, to provide equipment for a plant in Pennsylvania at a cost of approximately $100,000.

Dominion War Spending Nearly Six Millions Daily

TORONTO, ONT.

War expenditures by the Dominion in January totaled $185,031,534, an average of $5,968,759 per day. In January, 1942, the total was $144,651,208. For the first ten months of the 1942 fiscal year, which ends March 31, war expenditure was $1,826,619,861, compared with $997,347,052 for the like period in the 1941 fiscal year. The report by the controller of the treasury showed that the entire $1,000,000,000 gift to Great Brittain was spent by the end of January, bringing total special expenditures for the ten months to $2,850,206,410, against $1,028,326.838 in the previous year.

During last summer and fall it was estimated the budget figure for government costs for the fiscal year would be $3,900,000,000 but it now appears it will total $4,500,000,000.

Government figures show the people of Canada are being called on to bear a greater burden in proportion to national income than either Great Britain or the United States. Canada is estimated to be spending 39.1 per cent of its national income for war, compared with 36.8 per cent by Great Britain and 24.5 per cent by the United States.

Since the beginning of 1940, Canada has built almost 7000 airplanes, of which 1200 have been delivered to fighting fronts, the remainder being used for training purposes in Canada, it is stated by Ralph P. Bell, director of aircraft production. Canada has built and equipped aircraft plants with total floor space of more than 7,000,000 square feet and has trained more than 80,000 workers.

Desmond A. Clarke, director general of shipbuilding, states that Canada's warship production has reached almost 800,000 tons annually and is expected to reach 1,000,000 tons by the end of this year. In the increased shipbuilding program additional workers may be transferred from other war work, several thousand being needed. Most of the added activity will be on fighting ships rather than cargo carriers.

Soviet news agency, Tass, reported last week that the first section of the Chelyabinsk steelworks, Russia's largest production unit for "high quality steel", situated east of the Ural Mountains, has been completed.

Largest Fleet in History Will Operate on Great Lakes in 1943

COMFORTABLE carryover of Lake Superior iron ore at Lake Erie docks and furnaces at the beginning of navigation is anticipated by blast furnace operators dependent on this material. Current consumption of about 7,500,000 tons monthly indicates a balance of 17,000,000 tons on May 1, plus whatever may be delivered by vessel from the upper lakes up to that time.

No guesses as to the probable opening of 1943 shipping season are being hazarded by shippers, but it probably will be difficult to match the record established last year when the first vessel passed through the Soo locks March 22. By the end of the month, 792,602 tons had been moved.

Ice conditions on Lake Superior are less favorable at this time than a year ago and the possibility exists that the first Minnesota ore will by-pass the Soo and be shipped via Escanaba on Lake Michigan. The Office of Defense Transportation has planned supplemental dock and rail facilities to move ore by this route if necessary as a temporary measure. Construction of new docks and other work have been under way for some time.

Anticipated movement for the 1943 season of 100,000,000 tons will eclipse the 1942 total of 93,477,000 tons which included an estimated 1,400,000 tons shipped by rail. Actual total for 1941 was 81,210,327 tons.

In moving the record tonnage required this season, ore operators will have the largest fleet in history at their disposal. George J. Dietrich, Lake Carriers' Association, Cleveland, reports 311 American ships were in service last year, including 297 steamers, two diesel (Ford) vessels and two barges full time and five steamers and five barges part time. Five large new carriers were placed in service last year by the Pittsburgh Steamship Co. and the opening of the season will find eight new vessels of the United States Maritime Commission in operation. Eight additional Maritime ships will be commissioned by Aug. 1. The 16 ships will be allocated among several shipping companies. At least 35 Canadian vessels will be back in the American ore trade this year.

100,000,000 Tons Needed

As for consumption, consumers say 96,000,000 and possibly 97,000,000 tons will be needed for the calendar year 1943 and 100,000,000 tons for the 12 months ending May 1, 1944. This checks fairly closely with the WPB's estimate of 100,100,000 gross tons of Lake Superior ore required on an annual basis when all 24 blast furnaces in the expansion program are finally placed in operation this year. The last of these furnaces is scheduled to go in by June.

The consumption picture, of course, is colored by a number of variables. Ore imports from Chile to Atlantic Seaboard plants were cut off early in 1942 which meant replacement by Lake Superior ores hauled in by rail. Ore production in the Eastern area will have increased by 100 per cent by early 1944 to around 7,000,000 or 8,000,000 tons, thus relieving the pressure on all-rail shipments from lake ports. Much also is dependent upon scrap supplies which for the time being are somewhat freer. If it is necessary to charge more iron in openhearths, additional ore also will be required. An estimate made by W. A. Hauck of WPB several months ago, placed open-hearth ore requirements at 9,000,000 tons for 1943 and 10,000,000 tons for 1944.

A number of new mines have been opened and others re-opened. At least six new open-pit conveyor installations are underway and a notable increase has been made in the use of trucks and tractors for handling ore as far as the conveyor systems. A considerable amount of new ore has been uncovered by stripping in preparation for spring operations.

Several de-watering projects are in progress, including the Mountain Iron mine, idle since 1908, and making available a reserve of 25,000,000 tons for use this year. More ore washing and concentrating plants are on the drawing boards in addition to several placed in operation last year. Concentrate shipments this year may reach 20,000,000 tons, as compared with 17,000,000 tons in 1942, 15,000,000 tons in 1941 and 9,000,000 tons in 1940.

Several long-idle properties in the Crystal Falls area of Michigan are being readied for the 1943 season. The Mather mine near Ishpeming on the Marquette range wil be making shipments this year and the Sherwood, opened in the Iron River District last year, will continue. The Mather shaft already is down to 2400 feet and it is planned to go to 4000 feet.

Manpower presents a problem to mine operators on the Lakes region which will be difficult to solve inasmuch as an estimated 25,000 workers will be required this year, compared with an average employment of about 23,000 in 1942. The mines have lost many men to the armed services and to other industries but fortunately steadier employment this winter has been offered through extensive stripping, construction and rehabilitation operations at open-pit mines. Underground mines have continued in full operation, stockpiling ore in preparation for the 1943 season.

Development of iron ore properties in the East, of course, has been revived and accelerated by war requirements. The McIntyre mine, in Essex county in the

LAKES ORE VESSELS, 1943

All vessels listed were in commission during 1942 with the exception of the 16 Maritime Commission boats. 8 of which are scheduled to go into service with the opening of the 1943 season and the balance by Aug. 1, 1943. Several additional vessels which operated in the ore trade part time in 1942 also may be available for service in 1943. Thirty-five Canadian vessels which operated in 1942 again will serve in 1943. Capacities based on 2-foot draft.

Fleet	Gross Ton Capacity	Number of Boats
Pittsburgh Steamship Co.	757,200	74
Interlake Steamship Co.	400,600	43
Hutchinson & Co.	283,350	35
U. S. Maritime Commission	240,000	16
Cleveland-Cliffs Iron Co.	183,400	22
M. A. Hanna Co., Agent	148,900	14
Great Lakes Steamship Co.	147,200	18
Bethlehem Transit Co.	132,600	13
Wilson Transit Co.	118,200	13
Columbia Transit Co.	95,500	11
Reiss Steamship Co.	85,690	10
G. A. Tomlinson	79,300	8
Midland Steamship Co.	57,100	7
Nicholson Universal Steamship Co.	50,300	8
Interstate Steamship Co.	43,000	4
H. & G. M. Steinbrenner	37,700	4
Shenango Furnace Co.	36,600	3
Boland & Cornelius	33,300	4
Ford Motor Co.	23,750	2
Wisconsin Steel Co.	22,300	2
Brown & Co.	21,400	3
D. Sullivan & Co.	17,100	2
Hickman Williams Co.	6,700	1
Dolores Steamship Co.	5,300	1
Cargo Carriers, Inc.	5,600	1
Nicholson Transit Co.	6,000	1
Jupiter Steamship Co.	5,000	1
Total	3,018,140	321

COMPANIES' SHIPMENTS, 1942

	Number of Mines	Gross tons Shipped
Oliver Iron Mining Co.	21	40,476,666
Pickands Mather & Co.	22	17,666,025
Cleveland-Cliffs Iron Co.	12	7,497,900
M. A. Hanna Co.	18	4,877,906
Inter-State Iron Co.	2	4,143,231
Butler Bros.	13	3,640,791
Evergreen Mines	19	3,529,899
Republic Steel Corp.	6	2,755,556
Oglebay, Norton & Co.	2	1,832,820
North Range Mining Co.	3	1,588,524
Snyder Mining Co.	3	1,298,876
Wisconsin Steel Co.	3	943,269
Inland Steel Co.	3	790,328
Algoma Steel Co.	1	472,871
Wheeling Steel Corp.	2	383,203
Pittsburgh Coke & Iron Corp.	3	361,487
Charleson Mining Co.	2	223,527
Argonne Ore Co.	3	216,552
E. W. Coons Co.	3	168,762
York Iron Mining Co.	1	110,816
Carl Hedman & Co.	2	85,187
Globe Iron Co.	2	64,305
Jackson Iron & Steel Co.	1	40,555

Adirondack mountains of New York was placed in operation in August, 1942 by the National Lead Co. as a source for titanium dioxide for pigment but as a by-product it has an annual capacity of 600,000 tons of magnetic iron ore concentrates.

The Clifton, N. Y., mine of M. A. Hanna Co. with a capacity of 300,000 tons annually went in late last year. A new mine of the Jones & Laughlin Steel Corp. at Benson, N. Y., will start producing at the rate of 800,000 tons annually about July 1, 1943. At about the same time, the Fisher Hill, N. Y., mine of Republic Steel Corp. will come in with an annual capacity of close to 1,000,000 tons. Republic also has operations at Mineville and Lyon Mountain.

Warren Pipe & Foundry Co.'s Mount Hope No. 2 mines will be producing at the rate of 600,000 tons annually about mid-1943. Alan Wood Steel Co. will add 200,000 tons annually at Washington, N. J. and 250,000 tons at Ring Wood, N. J., about the same time.

Construction of two new blast furnaces in Texas, one at Houston by Sheffield and the other at Daingerfield by Lone Star, again has brought that state into the ore picture. The furnaces will draw on reserves in northeastern Texas in Cherokee, Cass and Morris counties estimated by the Bureau of Mines at 150,000,000 to 200,000,000 tons. The ore, after crushing and concentrating will run about 45 per cent iron with phosphorus ranging from 0.1 to 0.3 per cent, plus relatively high silica and alumina content.

Production of ore in Utah, which is nonbessemer and runs about 55 per cent iron is being stepped up to supply the three new blast furnaces of the Columbia Steel Co. at Geneva, Utah, and a fourth furnace moved from the American Steel & Wire Co.'s Joliet, Ill., works to Columbia's plant at Provo. Colorado Fuel & Iron Co. also has found it necessary to expand operations at the Sunrise mine in Eastern Wyoming.

Development of Low-Grade Ore Concentration Methods Urged

Warning that "methods must be developed which will make it commercially feasible to treat the billions of tons of low-grade iron deposits in the Lake Superior region or the entire economic situation in the United States from Chicago to Pittsburgh is going to be adversely affected," was sounded recently by Prof. Kenneth H. Donaldson, head of the department of metallurgical engineering, Case School of Applied Science, Cleveland.

Professor Donaldson was one of a group of American engineers who in 1931 and 1932 went to Russia to advise the Soviet government on methods of moving much of its steel producing industry back to the Ural mountains, a circumstance which has since proved to be of inestimable importance because Russia could not otherwise have continued in the war with so many of its rich iron ore deposits in the hands of the Nazis.

Ore being shipped from the head of the lakes averages about 55 per cent iron natural, which deposits at the present rate of production may be nearing exhaustion late in the 1950s, says Professor Donaldson.

Affects Nation's Standards

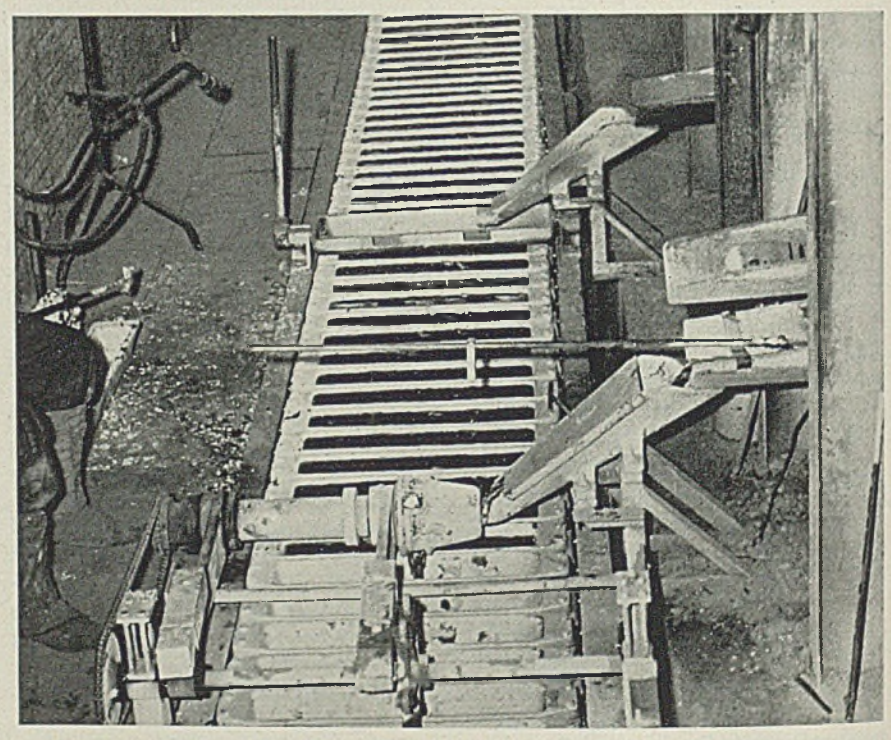
"Undoubtedly there are large mineral deposits which contain more than 40 per cent iron natural, but these deposits cannot be considered as ore because the cost of producing a ton of steel when using them is considerably higher than when using the type of ore now being shipped.

"Something must be done to assure a continued supply of a product suitable for blast furnace operation. To take away the steel plants from Chicago, Detroit, Gary, Lorain, Cleveland, Youngstown and Pittsburgh, because of lack of raw material, would cause a shift in the entire population of the country, for not only would the people employed in the steel plants be thrown out of work, but tens of thousands of those employed in the fabrication of steel would have to find employment elsewhere, as it has been the custom of steel fabricators to locate near the plants that produce the steel.

"It does not seem possible that this country can allow hundreds of millions of dollars worth of plants to be abandoned because of lack of a supply of iron ore. The history of most metal production has been that, as the ores remaining to be worked deteriorated in grade, new processes were developed to treat lower-grade ores, keeping the cost of producing the metal by the new processes at about the same figure as when higher grade ores were smelted.

"These processes cannot be developed overnight, and the very best brains in the country should be thinking and working on this problem because of its tremendous importance to the whole standard of living of the central United States," Professor Donaldson concluded.

MOLTEN METAL METERED ONTO PIG MOLD CONVEYOR



NOVEL type of automatic pouring device has been developed to meter molten aluminum from 30,000-pound remelt furnace into moving pig mold conveyor at Packard aluminum foundry in Detroit. Metal flows into cylindrical head which is rotated slowly by chain drive to shaft carrying spider in foreground. Moving molds rotate this spider and speed ratio is calculated so that just enough metal will pour from slots in head to fill one mold, and pouring slots will be in top position until next mold is ready to receive its charge. The foundry, converted from a former gray iron shop, supplies castings for Rolls-Royce aircraft engine and for Packard marine engine used in PT boats

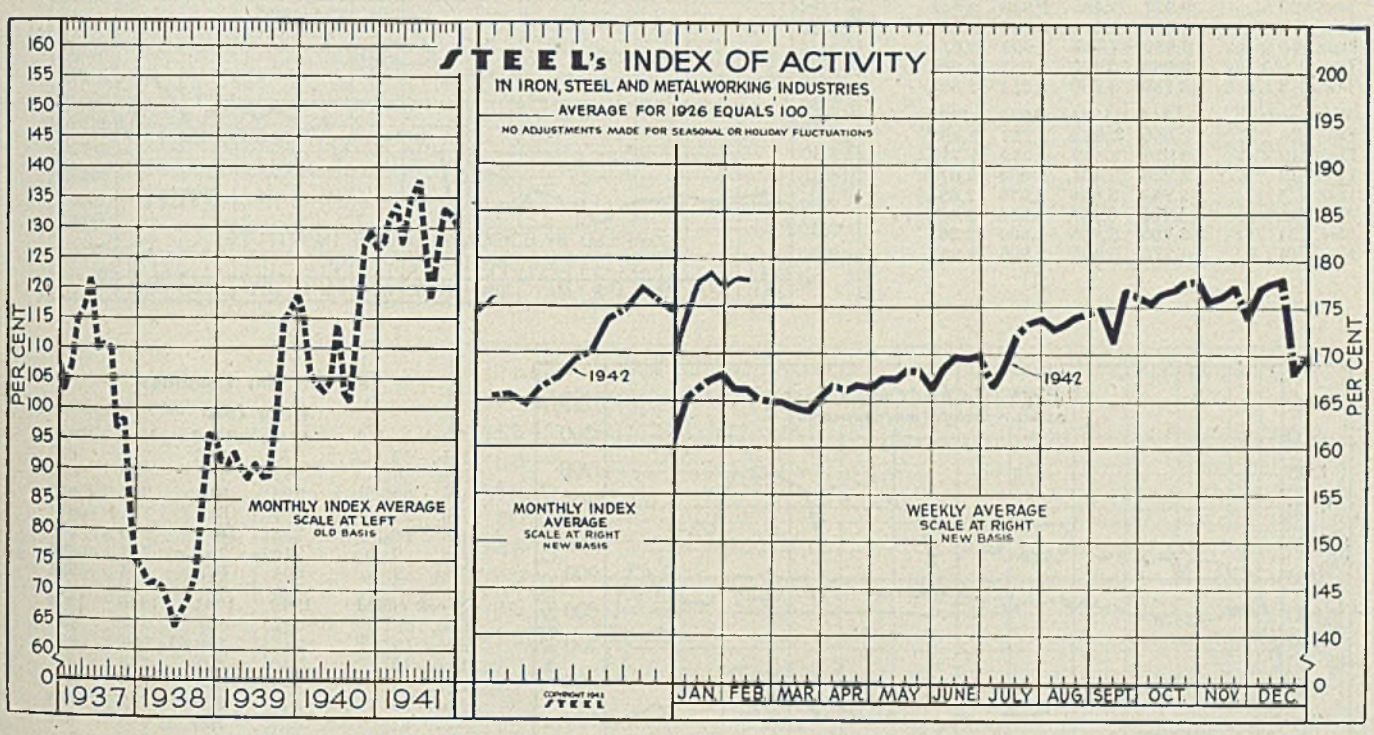
Activity Sustained At High Levels

WITH the major portion of industry geared to maximum production for war and a number of new facilities for increasing the flow of essentials coming into operation, effects of actual and projected cutbacks in schedules for basic armaments and labor supply difficulties appear to have been offset.

The volume of business in the week ended Feb. 13, as measured by STEEL's index of activity, was appreciably larger. Preliminary index stood at 177.9, equaling the highest point of the year to date, attained on Jan. 16. Interrupted only by a fractional recession in the third week of January, the index advanced to 177.6 on Jan. 30 from 170.0 at the first of the year. No change was recorded for the period ending Feb. 6. Latest high compares with 166.3 in the corresponding week in 1942. For the month of January the index average was 175.7.

Application of the longer work-week has made possible a 10.3 per cent increase in output of bituminous coal during the industry's first six-day operation ending Feb. 6 over the comparable period last year. Production in the recent week is estimated at 11,870,000 tons, or a daily average of about 1,978,000 tons, compared with 10,760,000, or 1,793,000 tons per day, in like 1941 week.

The national steel rate rose ½ point to 99.0 per cent in the period ending Feb. 13, against 97.0 a year ago, restoring operations to a level of Jan. 23. In the week closed Feb. 15, 1941, the rate was 96.5 per cent of capacity. Production of open-hearth, bessemer and electric furnace ingots during January was the second highest on record, 7,408,744 tons, exceeded only by 7,584,864 tons in October 1942. Electric power distributed in the week totaled 3,939,708 kilowatt hours, an increase of 15.1 per cent.



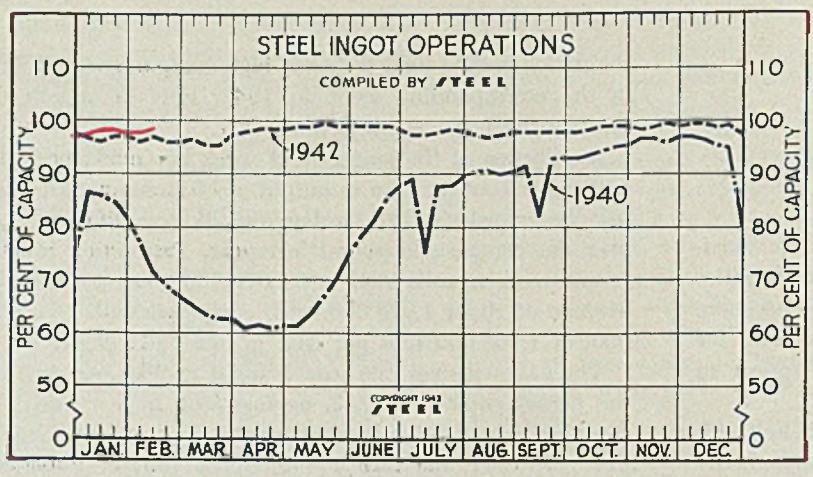
STEEL'S index of activity leveled off at 177.9 in the week ending Feb. 13:

Week Ended	1943	1942
Feb. 13	177.9	166.2
Feb. 6	177.6	166.3
Jan. 30	177.6	167.9
Jan. 23	177.2	167.4
Jan. 16	177.9	166.6
Jan. 9	175.7	165.6
Jan. 2	170.0	161.0
Week Ended	1942	1941
Dec. 26	167.8	120.5
Dec. 19	178.0	132.9

†Preliminary.

Mo. Data	1943	1942	1941	1940	1939	1938	1937	1936	1935	1934	1933	1932
Jan.	175.7	165.7	127.3	114.7	91.1	73.3	102.9	85.9	74.2	58.8	48.6	54.6
Feb.	.....	165.6	132.3	105.8	90.8	71.1	106.8	84.3	82.0	73.9	48.2	55.3
March	.....	164.6	133.9	104.1	92.6	71.2	114.4	87.7	83.1	78.9	44.5	54.2
April	.....	166.7	127.2	102.7	89.8	70.8	116.6	100.8	85.0	83.6	52.4	52.8
May	.....	167.7	134.8	104.6	83.4	67.4	121.7	101.8	81.8	83.7	63.5	54.8
June	.....	169.4	138.7	114.1	90.9	63.4	109.9	100.3	77.4	80.6	70.3	51.4
July	.....	171.0	128.7	102.4	83.5	66.2	110.4	100.1	75.3	63.7	77.1	47.1
Aug.	.....	173.5	118.1	101.1	83.9	68.7	110.0	97.1	76.7	63.0	74.1	45.0
Sept.	.....	174.8	126.4	113.5	98.0	72.5	96.8	86.7	69.7	56.9	68.0	46.5
Oct.	.....	176.9	133.1	127.8	114.9	83.6	98.1	94.8	77.0	56.4	63.1	48.4
Nov.	.....	175.8	132.2	129.5	116.2	95.9	84.1	106.4	88.1	54.9	52.8	47.5
Dec.	.....	174.1	130.2	126.3	118.9	95.1	74.7	107.6	88.2	58.9	54.0	46.2

Note: Weekly and monthly indexes for 1942 and 1943 have been adjusted to offset the forced curtailment in automobile production and to more accurately reflect expanding steel production



Steel Ingot Operations

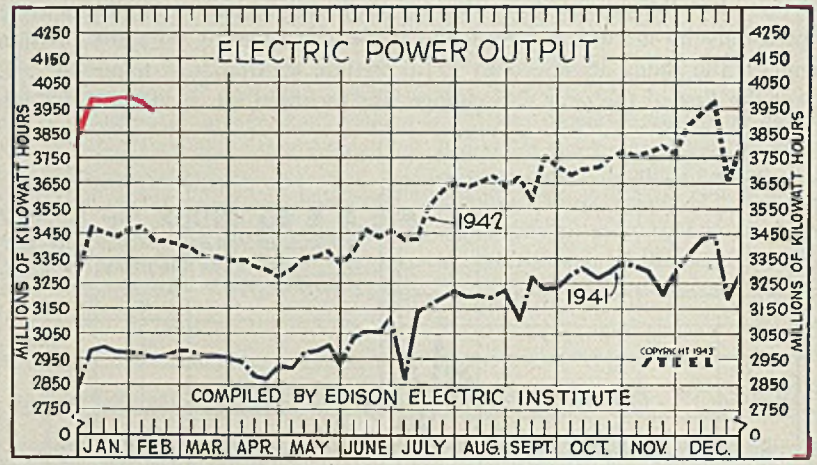
(Per Cent)

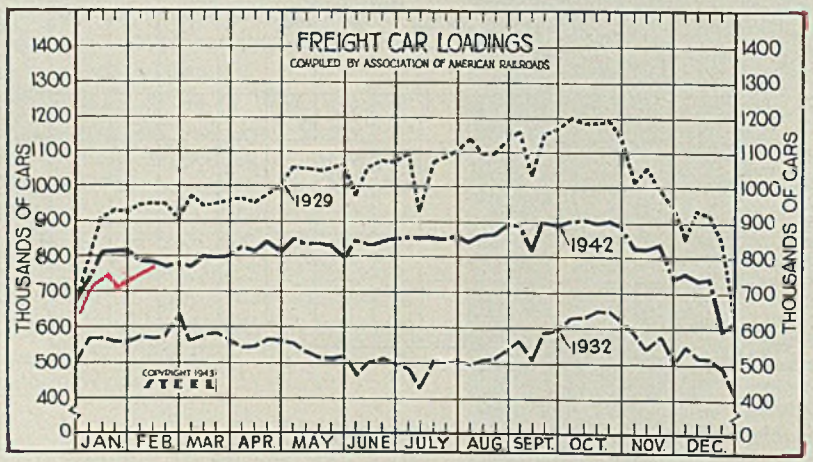
Week ended	1943	1942	1941	1940
Feb. 13	99.0	97.0	96.5	69.0
Feb. 6	98.5	96.0	97.0	71.0
Jan. 30	98.5	97.0	97.0	76.5
Jan. 23	99.0	97.0	95.5	81.5
Jan. 16	99.0	96.0	94.5	84.5
Jan. 9	97.5	96.5	93.0	86.0
Jan. 2	97.5	97.5	92.5	86.5
Week ended	**1942**	**1941**	**1940**	**1939**
Dec. 26	99.0	93.5	80.0	75.5
Dec. 19	99.0	97.5	95.0	90.5
Dec. 12	99.5	97.5	95.5	92.5
Dec. 5	99.5	96.5	96.5	94.0
Nov. 28	99.0	95.0	97.0	94.0
Nov. 21	99.5	95.5	97.0	93.5
Nov. 14	99.0	97.0	96.0	93.5
Nov. 7	98.5	97.5	96.5	93.0

Electric Power Output

(Million KWH)

Week ended	1943	1942	1941	1940
Feb. 13	3,939	3,422	2,810	2,476
Feb. 6	3,960	3,475	2,824	2,523
Jan. 30	3,977	3,468	2,830	2,541
Jan. 23	3,974	3,440	2,980	2,661
Jan. 16	3,952	3,450	2,996	2,674
Jan. 9	3,953	3,473	2,985	2,688
Jan. 2	3,780	3,289	2,831	2,558
Week ended	**1942**	**1941**	**1940**	**1939**
Dec. 26	3,656	3,234	2,757	2,465
Dec. 19	3,976	3,449	3,052	2,712
Dec. 12	3,938	3,431	3,004	2,674
Dec. 5	3,884	3,368	2,976	2,654
Nov. 28	3,766	3,295	2,932	2,605
Nov. 21	3,795	3,205	2,839	2,561
Nov. 14	3,776	3,305	2,890	2,587





Freight Car Loadings

(1000 Cars)

Week ended	1943	1942	1941	1940
Feb. 13	770	783	721	608
Feb. 6	755	784	710	627
Jan. 30	735	816	714	657
Jan. 23	709	818	711	649
Jan. 16	755	811	703	646
Jan. 9	716	737	712	668
Jan. 2	621	674	614	592
Week ended	**1942**	**1941**	**1940**	**1939**
Dec. 26	592	607	545	550
Dec. 19	743	799	700	655
Dec. 12	740	807	736	681
Dec. 5	760	833	739	687
Nov. 28	844	866	729	689
Nov. 21	836	799	733	677
Nov. 14	827	884	745	771

†Preliminary.

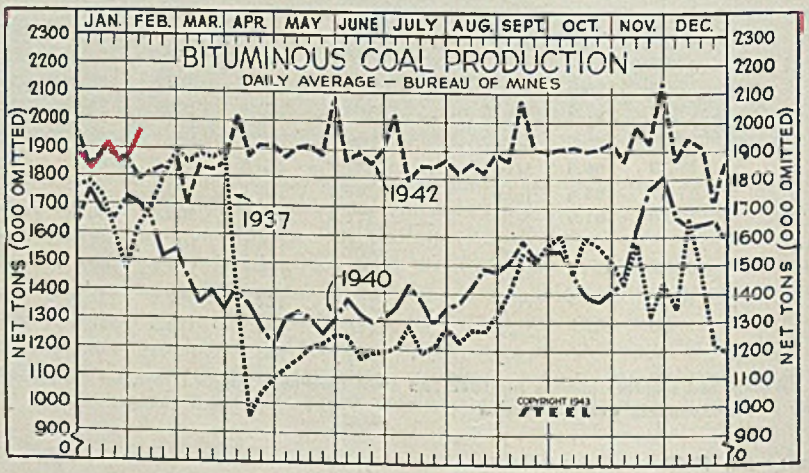
Bituminous Coal Production

Daily Average

Net Tons (000 omitted)

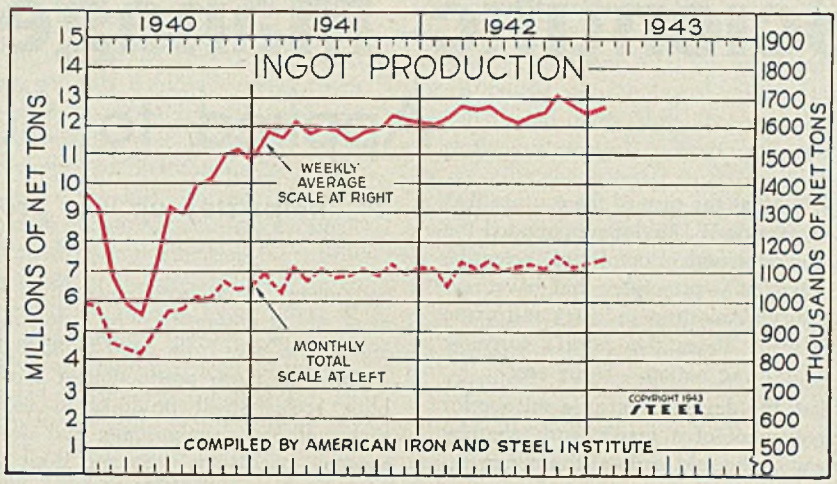
Week ended	1943	1942	1941	1937
Feb. 6	1,978†	1,793	1,683	1,634
Jan. 30	1,900	1,866	1,684	1,466
Jan. 23	1,867	1,886	1,656	1,605
Jan. 16	1,929	1,883	1,609	1,731
Jan. 9	1,833	1,842	1,691	1,780
Jan. 2	1,860	1,960	1,762	1,764
Week ended	**1942**	**1941**	**1940**	**1937**
Dec. 26	1,714	1,632	1,591	1,230
Dec. 19	1,913	1,792	1,656	1,477
Dec. 12	1,944	1,817	1,645	1,669
Dec. 5	1,853	1,813	1,636	1,347
Nov. 28	2,149	1,958	1,674	1,444

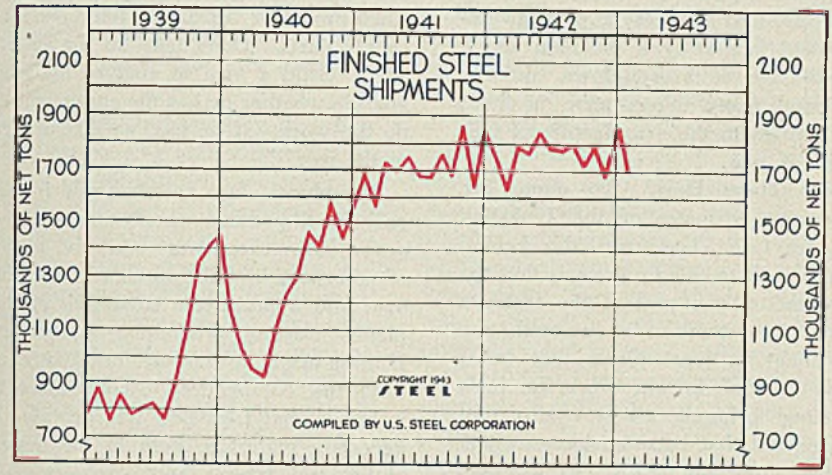
†Preliminary.



Steel Ingot Production
(Unit 100 Net Tons)

	Monthly Total		Weekly Average	
	1943	1942	1943	1942
Jan.	7,408.7	7,124.9	1,672.4	1,608.3
Feb.	.....	6,521.1	.....	1,630.3
Mar.	.....	7,392.9	.....	1,668.8
Apr.	.....	7,122.3	.....	1,660.2
May	.....	7,386.9	.....	1,667.5
June	.....	7,022.2	.....	1,636.9
July	.....	7,148.8	.....	1,617.4
Aug.	.....	7,233.5	.....	1,632.8
Sept.	.....	7,067.1	.....	1,651.2
Oct.	.....	7,584.9	.....	1,712.2
Nov.	.....	7,184.6	.....	1,674.7
Dec.	.....	7,303.2	.....	1,652.3
Total	.....	83,092.2	.....	1,651.2



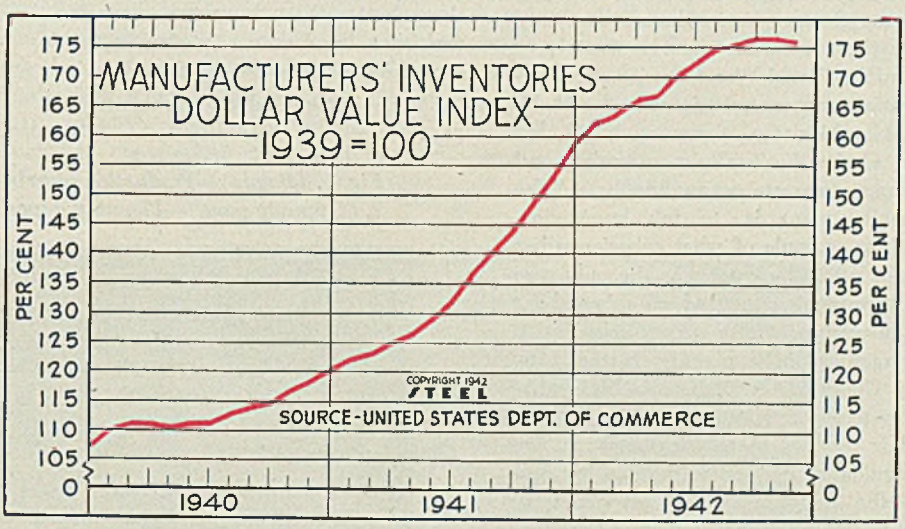


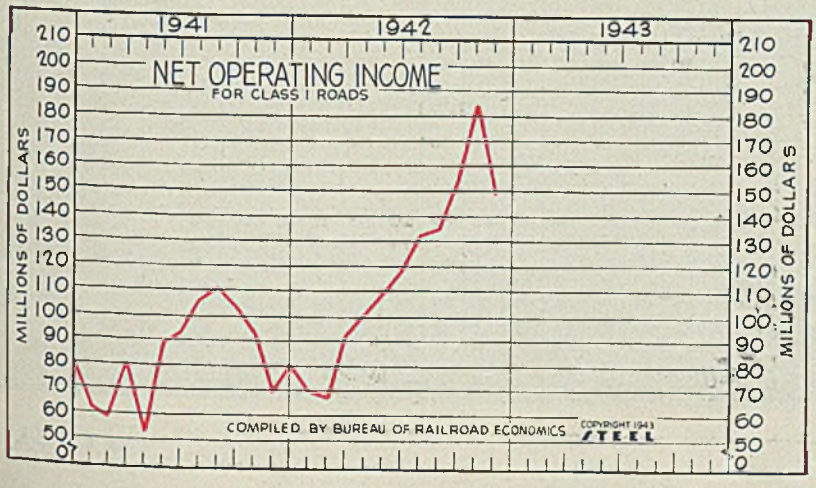
Finished Steel Shipments
U. S. Steel Corp.
(Unit 1000 Net Tons)

	1943	1942	1941	1940	1939
Jan.	1685.9	1738.9	1682.5	1145.6	870.9
Feb.	.....	1616.6	1548.5	1009.3	747.4
Mar.	.....	1780.9	1720.4	931.9	845.1
Apr.	.....	1758.9	1687.7	907 9	771.8
May	.....	1834.1	1745.3	1084.1	795.7
June	.....	1774.1	1668.6	1209.7	807.6
July	.....	1765.7	1666.7	1296.9	745.4
Aug.	.....	1788.7	1753.7	1455.6	885.6
Sept.	.....	1703.6	1664.2	1392.8	1086.7
Oct.	.....	1787.5	1851.3	1572.4	1345.9
Nov.	.....	1665.5	1624.2	1425.4	1406.2
Dec.	.....	1849.6	1846.0	1544.6	1444.0
Tot.	.....	20,458.9	15,013.7	11707.3	

Manufacturers' Inventories
Dollar Value Index
1939 = 100

	1942	1941	1940	1939
Jan.	161.9	121.8	109.5	100.9
Feb.	163.0	122.7	110.6	100.4
March	165.6	124.1	110.5	99.5
April	167.0	126.0	110.0	98.5
May	170.4	128.7	110.5	97.9
June	172.9	132.0	110.6	97.4
July	174.2	136.4	112.2	98.1
Aug.	175.0	140.0	113.3	98.8
Sept.	175.4	143.4	114.1	98.9
Oct.	176.4	148.3	116.2	101.3
Nov.	175.7	152.7	117.7	104.5
Dec.	....	158.5	119.9	107.2
Mo. Ave.	....	136.2	113.0	100.3





Class I Railroads
Net Operating Income
(Unit: $1,000,000)

	1942	1941	1940	1939
Jan.	$68.97	$62.02	$46.01	$32.95
Feb.	66.49	58.48	32.86	18.64
Mar.	92.39	80.63	37.03	34.38
April	102.03	52.57	34.12	15.32
May	109.63	88.63	47.41	25.17
June	118.73	93.26	48.09	39.17
July	133.00	106.31	57.73	49.00
Aug.	135.26	111.32	66.53	54.57
Sept.	154.63	104.07	74.72	86.53
Oct.	184.68	93.66	87.64	101.72
Nov.	148.95	68.76	72.00	70.41
Dec.	....	80.55	78.79	60.95
Average	....	$83.29	$56.84	$49.02

Scientific Management

Applied to Subcontracting

. . . helps step up war production at Link-Belt Ordnance Co.

By REGINALD TRAUTSCHOLD

IT WAS at the turn of the century that Dr. Frederick W. Taylor propounded the four fundamental principles of "scientific management"—principles that have revolutionized American industry and made the United States the world's foremost manufacturing nation. These are:

First, the development of a science for each element of a man's work, thereby replacing the old rule-of-thumb methods.

Second, the selection of the best worker for each particular task and then training, teaching and developing the workman—in place of the former practice of allowing the worker to select his own task and train himself as best he could.

Third, the development of a spirit of hearty co-operation between management and men in the carrying on of the activities in accordance with the principles of the developed science.

Fourth, the division of the work in almost equal shares between management and workers, each department taking over the work for which it is the better fitted—instead of the former condition, in which almost all of the work and the greater part of the responsibility were thrown on the men.

During World War I the practical application of these principles at the H. H. Franklin Mfg. Co., Syracuse, N. Y., led Carl C. Barth, Taylor's co-worker and disciple, to state unqualifiedly: "The Franklin plant is, to my knowledge, the best example of what experience has taught me to look upon as the only sure result-producing method of going about the development of a system of scientific management in a plant." Installed by Maj. George DeA. Babcock, this Franklin system was also outstanding in 1917 and is thought to be the first to utilize the guidance of "control boards" to govern the carrying out of all necessary acts in the execution of planned production schedules.

It is the sound psychology underlying Taylor's teachings that established American production supremacy in World War I. It is the same psychology that has now enabled W. L. Berry of Link-Belt Co., Chicago, to farm out successfully a major portion of the production of that company's ordnance plant at Chicago within five months of starting operations—to farm out or subcontract to such good purpose that a couple of hundred subcontractors within 100 miles of Chicago, 99 per cent of whom had never before been engaged in war work, are at present busy on orders ranging all the way from $500 to $500,000.

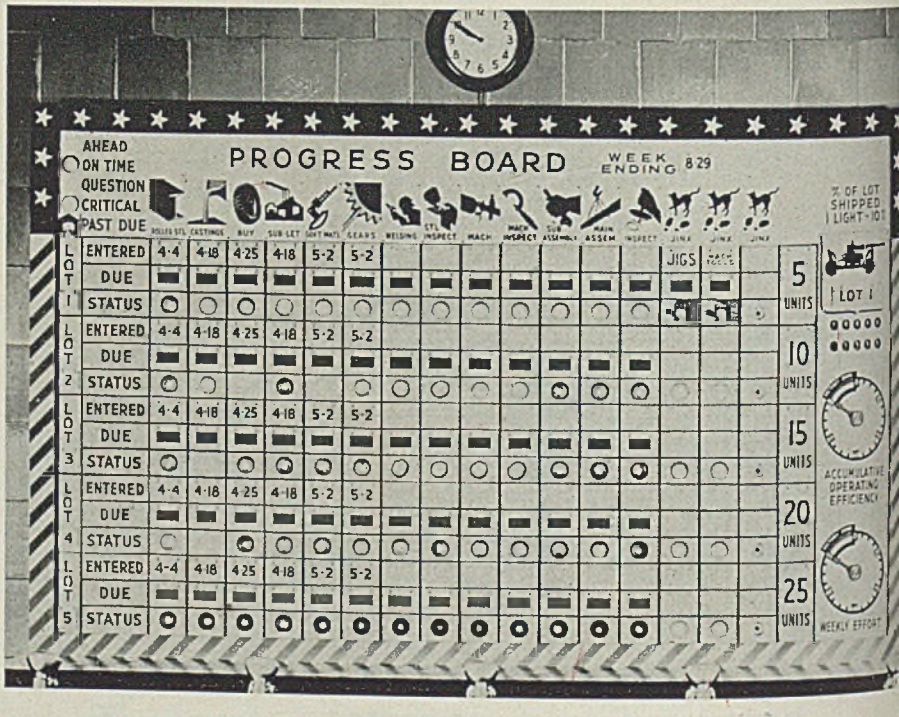
Some of these productioneer recruits built ecclesiastical products in normal times; others, corn popping and peanut roasting machinery, neon and front door signs; some repaired printing presses, designed business systems; a package development laboratory is included and a reconditioner of broken-down automobiles; and many others were in fields quite foreign to the manufacture of munitions of war.

Show Them How: To quote Mr. Berry, now manager of the Link-Belt Ordnance Co.: "The main idea behind our approach to this program is that the subcontractor is a part of the factory's production system on a par with any department in (our) plant; that being always "green" in war work, he must be trained to handle a new type of production; and that he often has excellent facilities (machine tools, etc.)—sometimes better than the prime contractor; and that he deserves a chance to do something besides the toughest jobs.

"We soon learned that subcontractors shied at the sight of most ordnance blueprints, and felt sure they could never do such difficult work. So we adopted the policy, 'Don't begin by showing drawings, specifications and finished products. Break the job down into simple parts. Don't take no for an answer. Send a man to analyze his shop and see whether he has the equipment to do the work. If he has, we'll take care of the rest.' "

Procedure: One cardinal rule is that only well-qualified shop supervisors—never office executives—visit the plants of prospective subcontractors to look over and appraise the suitability of the plant's existing production equipment. If these essential tools are found satisfactory, the co-operating establishment is informed that Link-Belt will provide all necessary materials, help in the design of jigs and fixtures, and plan sequences of operations—if necessary. When new machines and supplementary equipment are required, as has been the case in many instances, Link-Belt's know-how

Fig. 1. (Below)—Production scoreboard showing progress on subcontracts. Fig. 2. (Opposite page)—Planning department centers around production scoreboard



and the resources of the organization are drawn upon freely to secure the best obtainable setups, as are the same reservoirs of experience for the "break up" and advisable rearrangement of existing equipment and operating procedures in the subcontractor's plant—to facilitate production in accordance with specifications demanding extreme accuracy.

Time and motion studies are made, simplifying each job as much as possible, not only to determine basic labor times, but even more to enable the subcontractor to bid intelligently on the work. By making these preliminary studies, it was found that estimates on the work can be made within 4 or 5 per cent of the actual cost of the job, thereby removing risks of underbidding on the part of the subcontractor. It is wisely held that one satisfied subcontractor is worth more than two operating in the red.

Instructors are furnished by Link-Belt when advisable and also supervisors to assist over the difficult conversion period. The training of men in all-around shop work is urged upon the subcontractors—to expedite plant conversion and lay the foundations for definite, flexible work schedules. All phases of planning, time and cost study are stressed as well as ability in all-around shop work. One of the more common snags encountered is a tendency on the part of the average subcontractor to tie up a valuable machine by attempting too complicated an operation when, by dividing the job into simple operations performed simultaneously on different machines, production not only can be stepped up, but the breaking in of less experienced men to new tasks can be much simplified.

Buying and Estimating: The buying of all materials for the subcontractors is, likewise, an important feature in the Link-Belt sub-letting system. By such practice, not only is full advantage taken of the close buying large-scale purchases afford, economies that are passed on to the subcontractor, but the subcontractor is protected against the uncertainties attendant to deliveries on orders too small to command prompt attention for a mill —particularly at the present time. Thus, the necessity of placing even orders of limited size through jobbers—involving premiums for handling—is quite generally avoided. Link-Belt, buying for all subcontractors, also avoids having to help each subcontractor separately with individual buying problems.

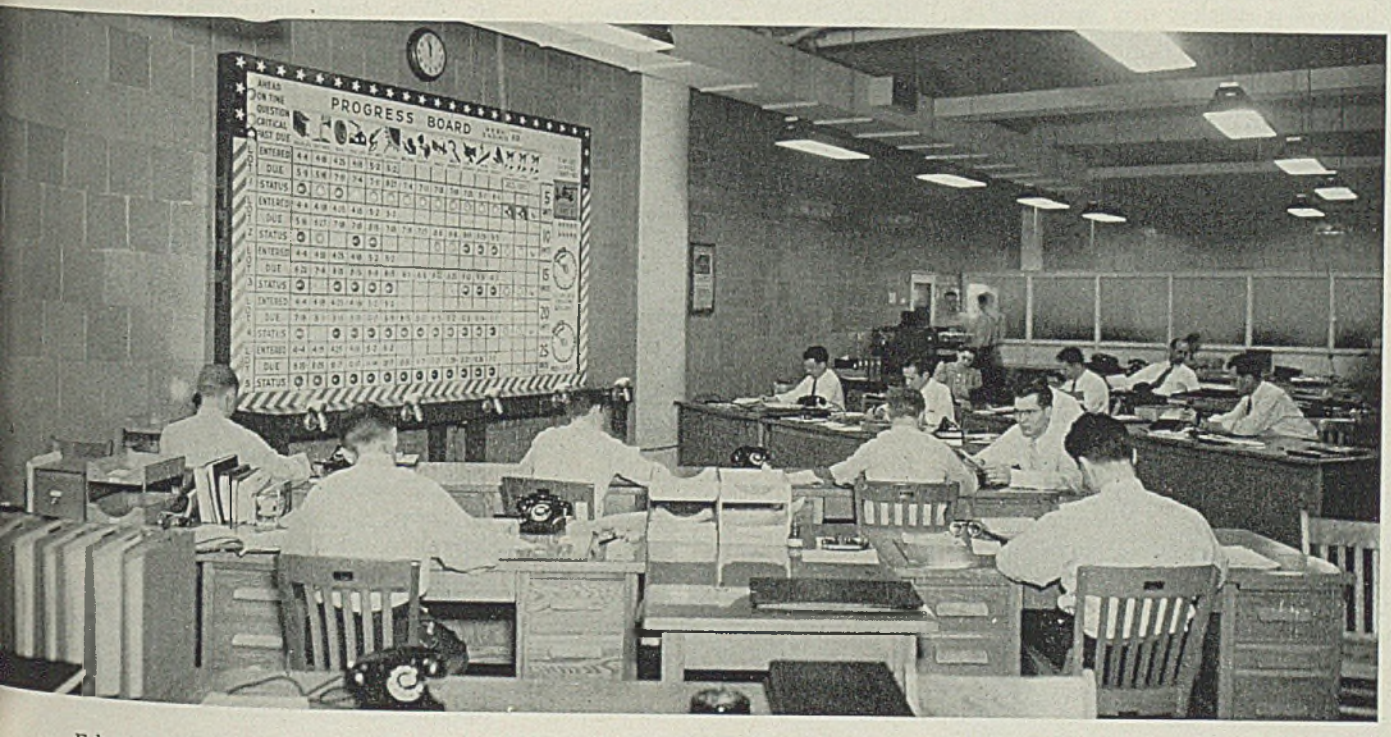
The synthetic time and motion studies made by Link-Belt for the subcontractors and the close analysis of the work involved are also of considerable value in arriving at fair and equitable prices for the work performed at each collaborating plant, as is also the close contact maintained between the company and the subcontractors. Daily touch is kept, on the average, with all the smaller jobs sublet. The work of each subcontractor is tied in with the main plant's operations and progress and posted on a 7 x 10-foot "progress board" at headquarters. See Fig. 1.

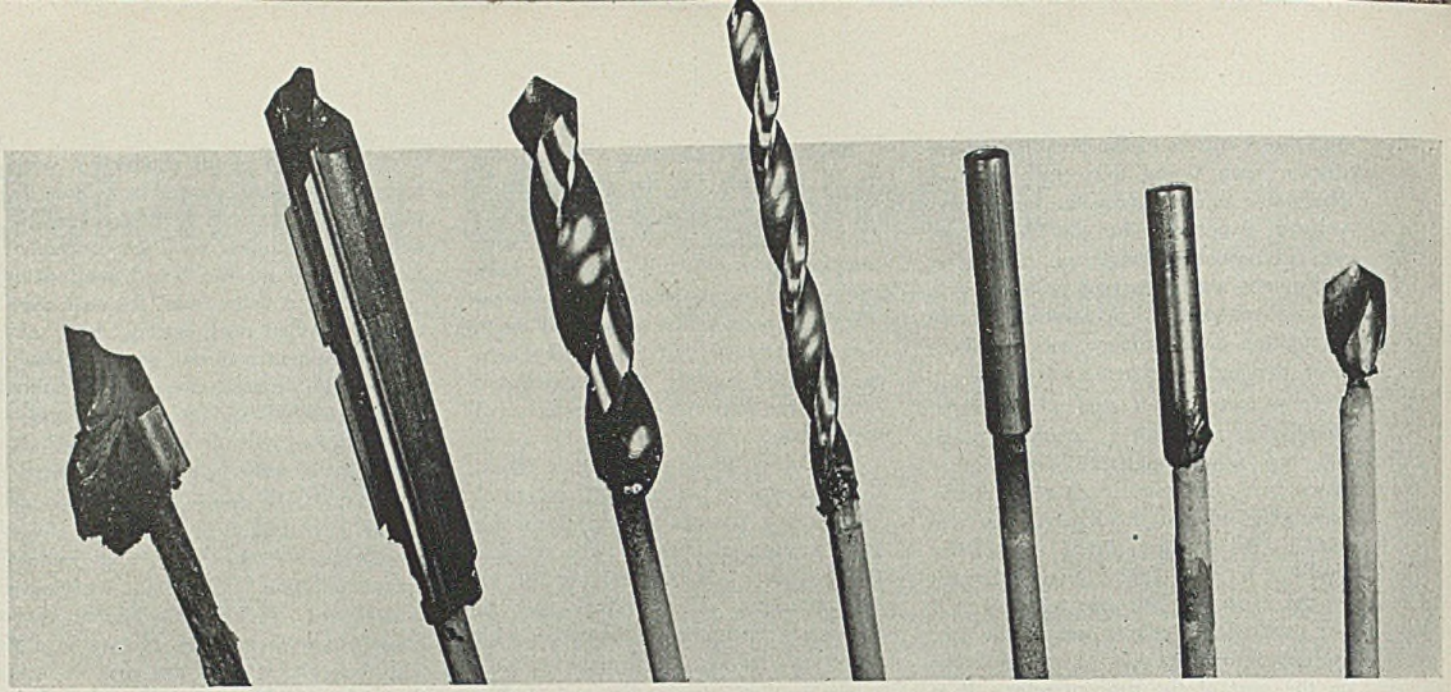
Production Scoreboard: This ingenious scoreboard, like the Franklin control board that made history a quarter of a century back, constitutes the nerve center of the entire setup—makes each subcontracting plant an integral part of the main factory's production system. The board is constructed with systems of colored electric lights that serve to keep a visual record of all productive progress clearly and constantly before the planning department. Divided horizontally in lot numbers, each job contracted for is posted on the board with dates "entered" and dates "due" for each class of work—rolled steel, castings, buy, sublet, government material, gears, welding, inspection, machinery, subassembly, main assembly and final inspection—and progress made is continuously indicated by a series of colored lights.

A white light signifies that production on the part or parts in question is ahead of schedule; a blue light, that production is on time; a red light signifies a critical state of affairs; while a "doghouse" light is warning of trouble and that the part or parts are past due. At the right of the main chart are dials that show the "accumulative operating efficiency" and the aggregate "weekly effort". A record is also maintained by a series of lamps of the percentages of lot shipments made—one light indicating a 10 per cent shipment; two lights, 20 per cent; etc.

So complete and important is this history of lot progress to the operation of the ordnance plant that the desks of supervisors in the planning department are arranged diagonally across the floor so that the board's challenging records are constantly before the eyes of the department personnel, as shown in Fig. 2. Thus the planning department knows at all times just how production is progressing and the exact status of each lot.

The excellent results made possible at Link-Belt Ordnance Co. by this system suggest that its adoption might prove of value to many prime contractors.





REMOVING BROKEN

Highly effective method requires small amount of equipment, involves no complicated procedure, yet has excellent record of successful application on most difficult types of work

By HENRY J. BURNETT
Production Engineering Department
And
CHARLES E. HANSLING
Salvage Department
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A VEXING problem in every shop is the removal of broken drills, reamers and plug gages from drilled holes. Pratt & Whitney Aircraft Division of United Aircraft Corp., East Hartford, Conn., has developed an extremely effective method of doing this very job. In this method, an electric arc butt-weld is made between a stainless steel welding rod and the broken part. Then the broken part is extracted by tapping upward on a lathe dog or clamp fastened onto the welding rod.

This has replaced other methods such as trying to drive or break out the broken part, piece by piece, with a prick punch and hammer. Such methods were seldom successful and frequently resulted in burred surfaces or other forms of distortion and eventual scrapping of the part. Under the new method of removal, not only are more parts being saved from the scrap pile but the time required for the salvage operation is being reduced constantly.

The scope of the work at Pratt & Whitney Aircraft covers all sections of engine crankcases, crankshafts, propeller shafts, various small parts, tools, jigs and fixtures. Such a range of successful applications indicates the great possibilities of the method for other producers.

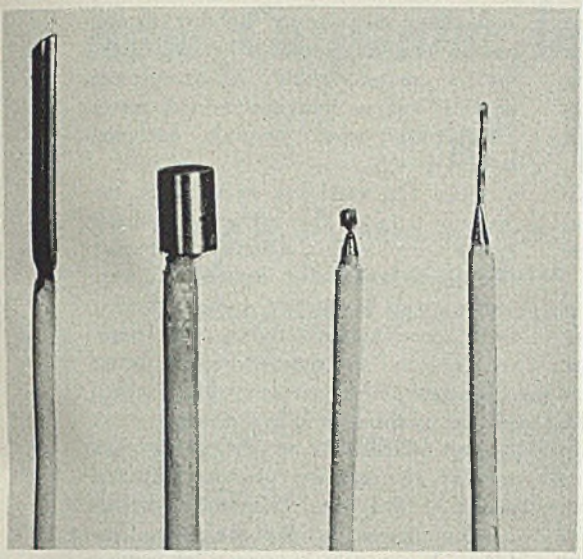
Through the co-operation of Presto Battery Service, and Industrial Welding Co., both of Hartford, Conn., demonstrations of alternating-current and direct-current welding equipment were held in order to observe its performance in the field and to determine the best type for this application.

A magnesium test block, containing an assortment of drilled holes of varying depths into which plugs of steel were driven, was used in the demonstrations to determine whether butt welds of sufficient tensile strength could be made to withstand the forces necessary to extract the steel plugs. The percentage of success in extraction from this test block was sufficient to indicate a real possibility in this method if proper technique could be developed.

In observing the action of alternating-current and direct-current equipment, it appeared that less arc flashing occurred with an alternating-current welder than with the direct-current welder. This factor was important in that at Pratt & Whitney Aircraft most of the work involves magnesium or aluminum castings or forgings. It is especially important to avoid excessive heating or splashing of hot metal in order to positively preserve the quality of finished surfaces and the heat treatment of these metals in the area adjoining the broken drills.

A Westinghouse alternating-current Flex Arc welder, with a current range from 20 to 250 amperes, was purchased. General purpose welding rods were found not best suitable for the special job of removing broken drills, reamers, etc. Tests clearly showed that the bond between the broken part and the welding rod was strongest when the welding rod consisted of stainless steel. As a result fluxed stainless steel welding rods were substituted for the ordinary type. The hard flux on the outside of the stainless steel welding rods also serves effectively as an electrical insulator when inserting a rod in a drilled hole. This prevents forming an arc against the side of the hole when the top of the broken drill may be several inches below the opening of the hole.

In addition, a nonfuming compound known as Spatter-off was obtained to protect adjacent finished surfaces. Having the consistency of medium lubricating grease, this is spread easily in a light layer over any finished surface where protection from weld spatter is desired. After the welding operation is completed and the broken part extracted, this protective coating can be quickly removed, and by de-greasing the part, the original bright quality of the finished

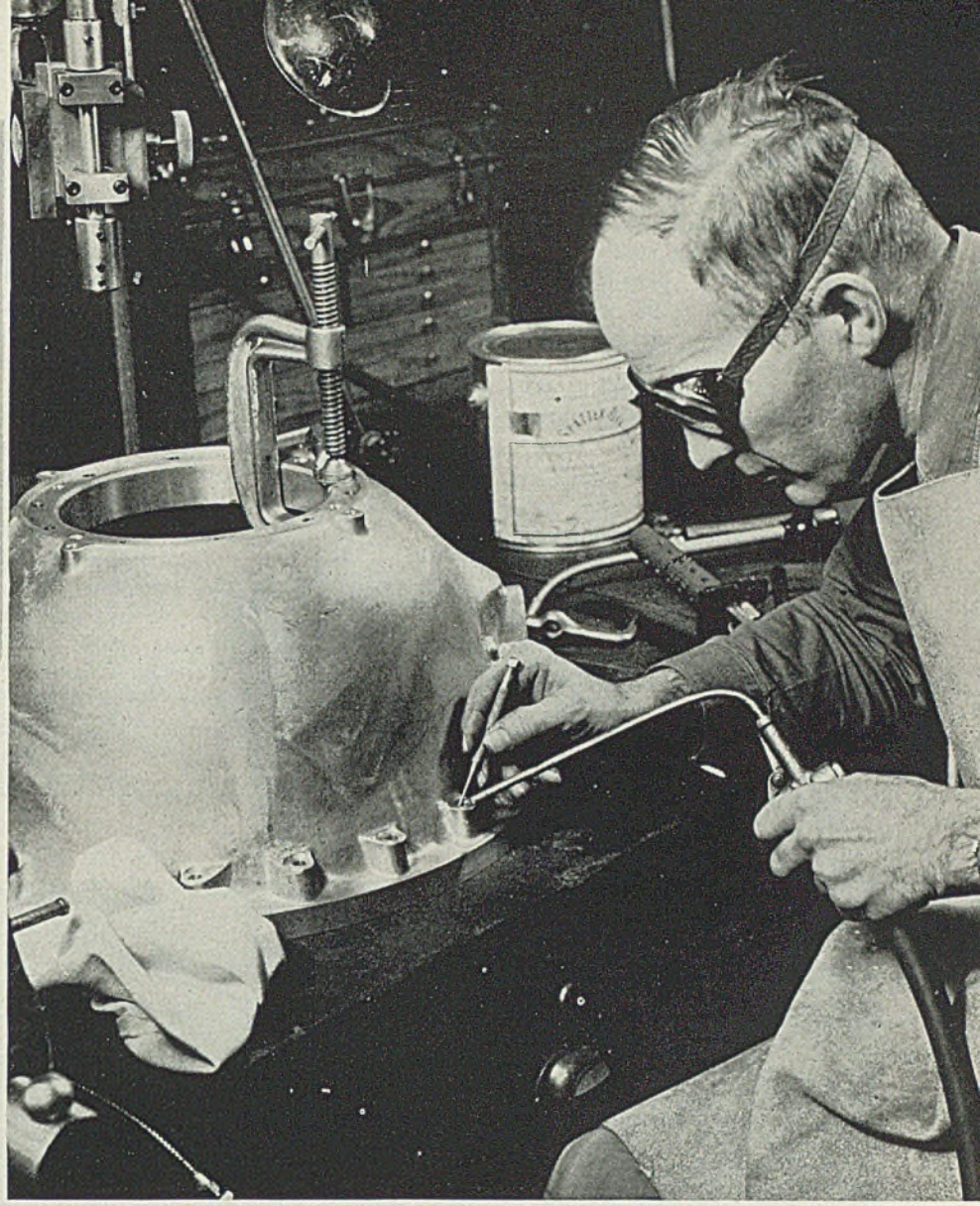


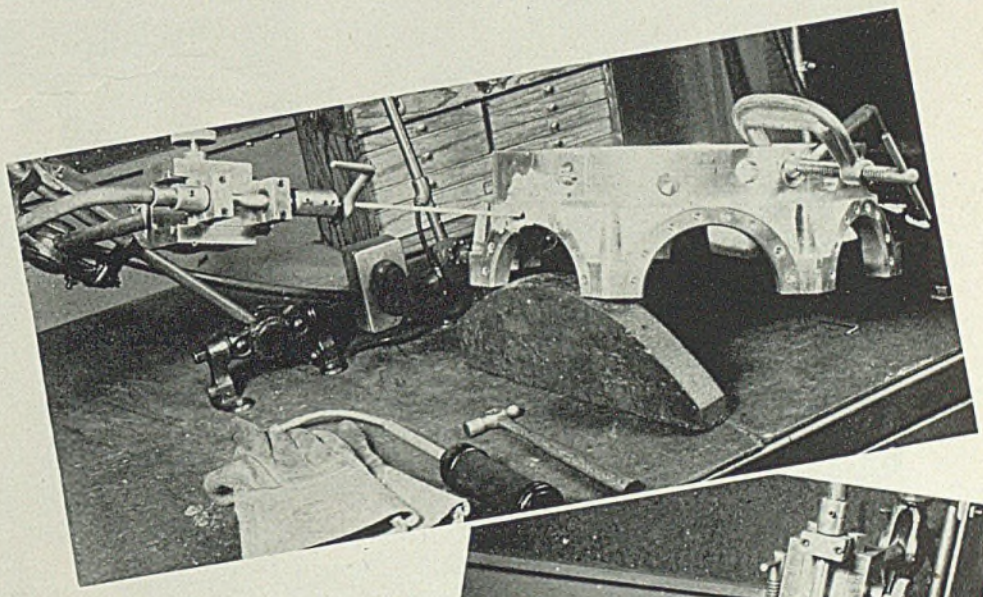
DRILLS

surface is restored.

In specific cases, other forms of protection from weld spatter are used. For example, wet asbestos powder, fibre washers or bushings, a ¼-inch brass plate drilled to fit over the opening of the drilled hole (especially when the broken drill is at the surface of the hole) and other similar devices, depending upon the requirements of the job to be done.

Technique: Fig. 2 shows the operator preparing an engine part for the extraction of a broken drill. By using a high pressure air hose, the hole containing the broken drill is blown clear of all extraneous matter such as metal chips, oil, dirt and bits of shattered drill. A small prod carefully used often helps considerably in removing metal chips





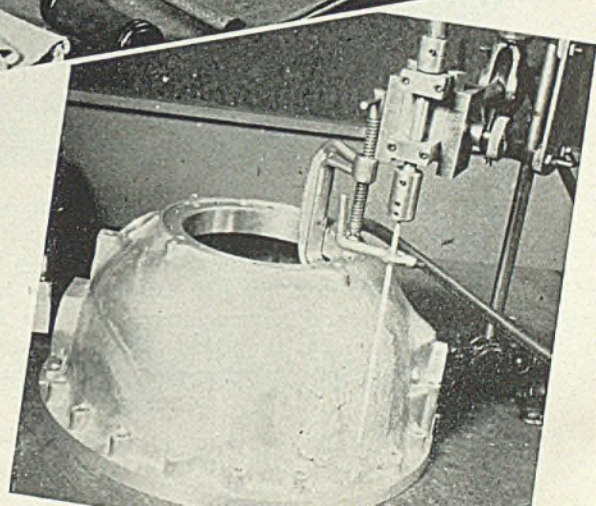


Fig. 1. (Top, opposite page)—Group of typical broken drills, reamers, etc. that were removed by butt-weld extraction method described here. Note extreme range in size

Fig. 2. (Top, right)—Operator cleaning out hole before setting up to remove broken drill. Compressed air applied through small metal nozzle is aided by judicious use of small prod

Fig. 3. (Center, right)—Flexibility of the equipment is shown by this setup employed in extracting a broken pilot in a drilled hole in a cylinder pad of a radial aircraft engine

Fig. 4. (Right)—Here "Spatter-Off" has been applied in and around hole to protect finished surfaces. This avoids necessity of reworking hole after broken drill is removed. Note how electrode is mounted in vertical guides. This is the setup that works so well in extracting broken drills, reamers, etc.

jammed into the area between the cutting edges of the broken drill where the butt-weld is to be made. Particularly if the chips are aluminum or magnesium, it is always good practice to minimize the possibility of blow-back and unnecessary oxides in the vicinity of the welding surface from ignition of the chips at the moment the arc is made.

As proper cleaning prior to the welding operation usually pays dividends in labor saved, carbon tetrachloride should also be used to wash out any cutting oil or coolant films remaining in the vicinity of the broken tool. This is important.

Fig. 4 demonstrates further preparation. Here the welding rod is already in the welding fixture, and the Spatter-off applied to protect the finished surfaces of the part. In preparing the coated welding rod prior to its insertion into the welding fixture, it is good practice to round off the end of the rod on a grinding wheel to insure a good welding contact. Also, a "dog" should be tightened onto the rod near the end which is to be inserted into the welding fixture. The "dog" provides a place to apply impact with a hammer after the weld is made in order to provide an extracting force to the broken part.

The welding fixture shown serves a dual purpose. First, it guides the welding rod into the drilled hole in proper alignment with the center line of the broken drill. Secondly, after the weld is made it serves to hold the rod steady when applying the extracting impacts with hammer blows. It is particularly useful when extracting small broken parts where the diameter of the drilled hole is in the vicinity of 0.040 to ⅛-inch.

The welding fixture is supported by a modified heavy-duty lighting fixture, having its tubing replaced by solid shafting for greater rigidity. An arrangement of this sort is inexpensive and serves satisfactorily when properly anchored to the bench.

When the weld has been made, the operator applies the extracting impacts to the "dog" with a hammer. Note that the words "extracting impacts" are used rather than "extracting force". Broken drills when jammed tightly with chips, etc., respond to hammer impacts better than they do to steady pulling with a tensile machine or other means.

Test of Quality of Butt-weld: The test of the quality of the butt-weld comes at this time. Sometimes crystallization occurs in the weld or blow holes due to the presence of cutting oil and various oxides, thus causing the weld to break under hammer impact. In such cases it is usually necessary to re-inspect and regrind the point of contact of the stainless steel welding rod, clean out the chip oxides from the drilled hole, and re-adjust the current setting on the welding machine to better suit the size and material of the broken drill.

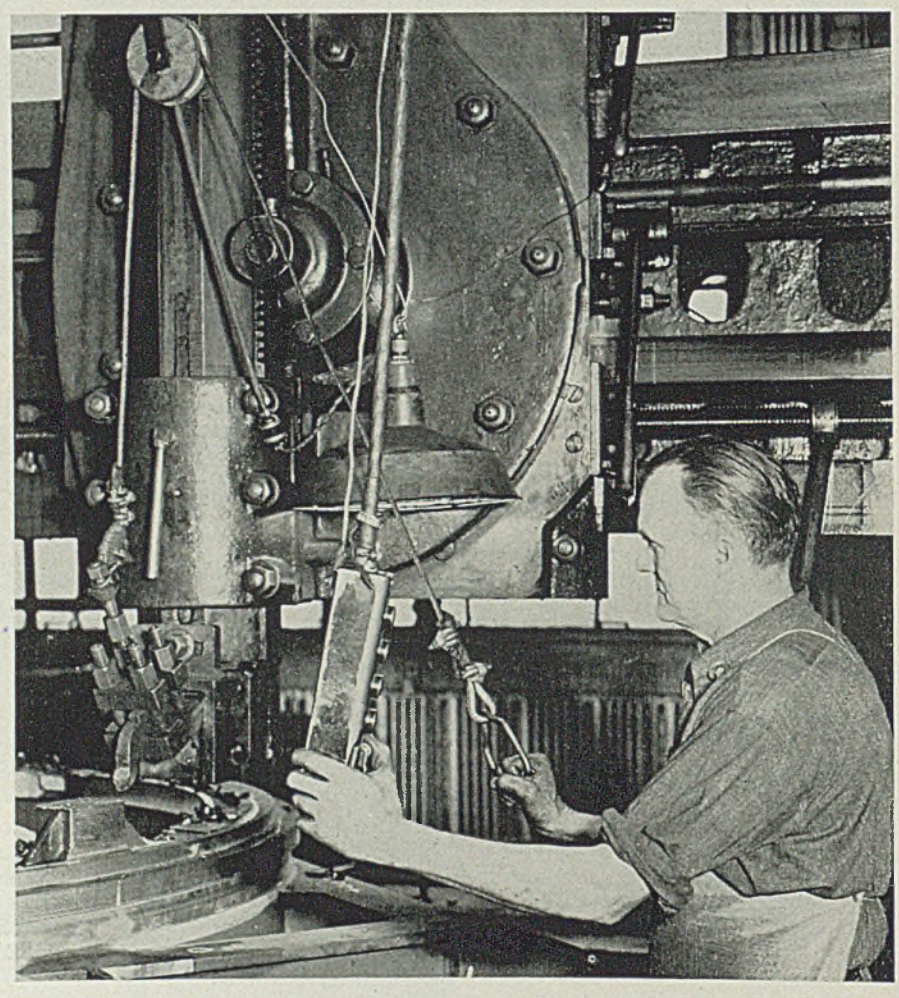
Frequently, however, it is discovered that the broken drill was shattered when it broke in the drill hole. This necessitates several welding attempts before the solid part of the drill is reached. Experience shows that occasionally as many as five to ten tries have to be made before a solid part of a drill can be removed. Also this frequently happens when unauthorized attempts are made to remove the drill by pounding the part, or by trying to drive it out with a prick punch, etc.

At this point it is advisable to stress the importance of having machine operators or setup men make absolutely no attempts to remove any broken tool from engine parts. Frequently, a feeling of embarrassment on the part of the operator in having to report a broken drill or reamer to his foreman is the incentive which causes the operator to seek means of removing the broken tool himself. The usual crude method employed by an operator is to try to drive it out, or break it out piece by piece with a prick punch and hammer.

Experience shows that this method is seldom successful and usually results in burred surfaces and other forms of distortion which directly cause scrap or which tend to defeat the purpose of the arc welding method of removal. Also the use of a prick punch and hammer frequently results in broken punch points being tightly lodged in the hole above the broken drill, or jammed in between the flutes and the drilled hole, thereby making the removal operation more dif-

(*Please turn to Page* 119)

"TIMELY" SUGGESTION



FIVE HOURS are saved in machining of a 60-inch ring for an ordnance item being manufactured at one of General Electric's works due to the use of a clapper box on a vertical boring mill—a suggestion made by E. M. Reamy, machine operator. Ring is designed with two 6-inch lugs opposite each other, and old method of machining involved stopping the machine to raise the head to clear each lug and resume the operation. As shown the clapper box simplified the operation, a pulley setup enabling the operator to raise the tool easily to clear the lugs

How Carpenter has INCREASED THE USEFULNESS of *Another* Metal . . .

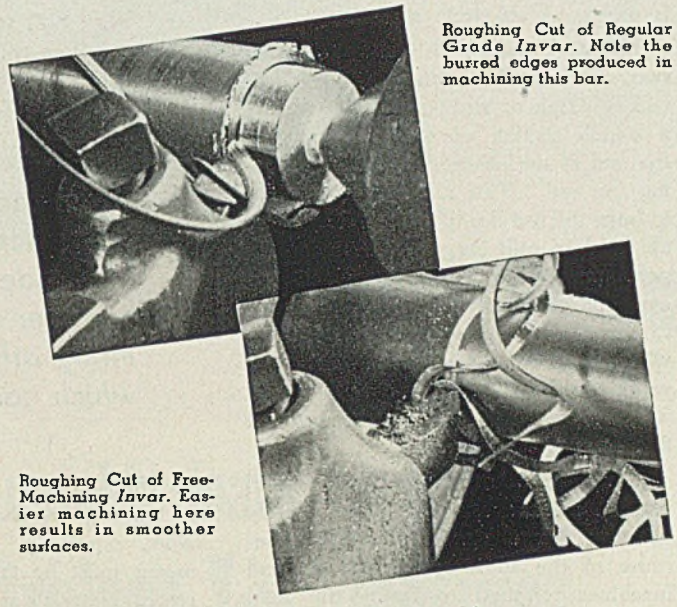
Just as you have been able to use Stainless Steel to greater advantage since 1928 when Carpenter invented *Free-Machining Stainless*—you can now take full advantage of the properties of INVAR, as a result of this timely new development.

Invar, a 36% nickel alloy that expands only a tenth as much as carbon steel when subject to temperatures up to 400° F., used to be as tough to machine as straight 18-8 Stainless Steel. *Invar* was so tough to machine that engineers often gave up the idea of using it, even when they needed the metal's low expansion properties.

So Carpenter research went to work, and now we announce an *Invar* that is actually easy to machine . . . *Carpenter Free-Cut Invar "36"*. Through the addition of selenium to the alloy, its cutting qualities have been improved, while its low expansion properties remain exactly the same.

Invar (in the form of strip) is being used in making parts for aircraft controls, thermostats, special radio parts and other devices that must remain accurate even where temperatures vary. But now that bars of *Invar* can be easily machined, this unusual metal will be able to take over new jobs. Designers will be able to adopt it without fear of their recommendations being called "impossible" by production men. .

For more information about *Carpenter Free-Cut Invar "36"* and its properties, get in touch with our Metallurgical Department. Or, ask for our latest bulletin.



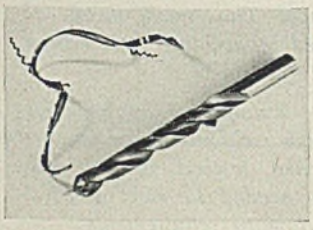
Roughing Cut of Regular Grade *Invar*. Note the burred edges produced in machining this bar.

Roughing Cut of Free-Machining *Invar*. Easier machining here results in smoother surfaces.

Tests Made To Determine Machinability of Carpenter Free-Cut Invar "36" . . .

The comparative tests described below were made in order to provide data on the relative machining properties of the regular grade of *Invar* and *Carpenter Free-Cut Invar "36"*. In each case, standard high speed cutting tools, ground with standard angles, were used.

DRILLING—Standard drill press with automatic feed and 7/16" round high speed drills used on test blocks 2 3/16" thick. Feed: .004" per revolution; Spindle Speed: 665 R.P.M.



Tool used and chips produced in drilling regular grade *Invar*.

Tool used and chips produced in drilling free-machining *Invar*.

The drill used on the test block of regular Invar failed completely after penetrating to a depth of only 1 1/16" (see photo). An identical drill used on the block of free-machining Invar drilled through the 2 3/16" block without difficulty, and was in good condition at the end of the test (see photo). Note the differences in the chips produced by each of these drilling operations. They provide further evidence of the machining qualities of Carpenter Free-Cut Invar "36".

ROUGHING CUT—1" round bars cut with high speed tools on a standard lathe; feed .0055" and cut 3/32".

COMPARATIVE ROUGH MACHINING TESTS

(See above photographs)

REGULAR GRADE INVAR		Carpenter FREE-CUT INVAR "36"	
Speed sur. ft./min.	Results	Speed sur. ft./min.	Results
28.80	*Satisfactory*		
49.22	*Tool failed after cutting 1" along bar*		
82.47	*Tool failed after only a few revolutions*	82.47	*Excellent*
		137.45	*Excellent, with no evidence of tool failure*
		137.45 was top speed for lathe used, so feed was increased from .0055" to .0125"—with results still excellent.	

Our latest engineering bulletin provides additional information on the properties of Carpenter Invar "36" and Carpenter Free-Cut Invar "36". We'll gladly send you a copy.

THE CARPENTER STEEL CO., 139 BERN ST., READING, PA.

From an interview with
G. G. LANDIS
Chief Engineer
Lincoln Electric Co.
Cleveland

Do you save your electrode stub ends?

As pointed out here, avoiding stub-ends by tacking a piece of mild steel to the end of the rod so entire electrode can be burned is about the last thing to consider in electrode conservation, for there are many other things that should be done first—things which can effect much greater savings

CAN STUB-ENDS be used? Yes, it is quite possible to produce weld metal from that portion of the stub-end which still retains the coating. Fig. 1 represents a heavily coated electrode. Ordinarily it is discarded when it is burned to a length of 2 or 3 inches. About an inch of the rod, that portion at A, Fig. 1, is bare since the coating has been removed from this portion during manufacture of the rod in order to allow the electrode holder to make electrical contact with the rod. This means that there is 1 to 2 inches of rod at B which still carries the coating and which still is usable as electrode material.

To avoid wasting this usable inch or two of electrode, some companies are tack welding or resistance butt welding a 3-inch section of mild-steel rod on the end of the electrode at A before using the rod. This allows the operator to burn the rod down to the bare portion at A, thus utilizing as weld metal all portions of the electrode which are coated. Obviously, it is not possible to use that portion of electrode at A which is uncoated since poor weld metal would be deposited if this were burned without the protective atmosphere and flux from the coating.

Salvaging Alloys: Many plants will not find the above method of completely utilizing the electrode practicable because of the additional man-hours and machines required to fasten the mild steel rod to the end of the electrode. However, in any case, and especially with alloy steel rod such as stainless steel in which important quantities of critical nickel and chromium are employed, users should see that electrode stub-ends of this material are segregated and returned through regular scrap channels to the steel manufacturer as alloy scrap of that particular grade. If such material is not properly segregated, it means that the plant does not obtain the full possible return as scrap since it takes a low rate when sold mixed. Now, especially, when every possible means must be taken to conserve such critical materials as chromium and nickel, it is more important than ever that stub-ends from high-alloy electrodes be segregated and sent back through proper channels to the steel mill.

Why Do Not Electrode Manufacturers Apply Mild Steel Stubs? The question has been asked as to why electrode manufacturers do not conserve these critical alloys by applying a mild-steel stub-end on the rod when it is manufactured. The answer to this is that as far as electrode materials are concerned, the critical bottleneck is in man-hours and machine capacities rather than in material. Every electrode manufacturer in the country is operating at maximum capacity. Many expansions have already been made, and a further

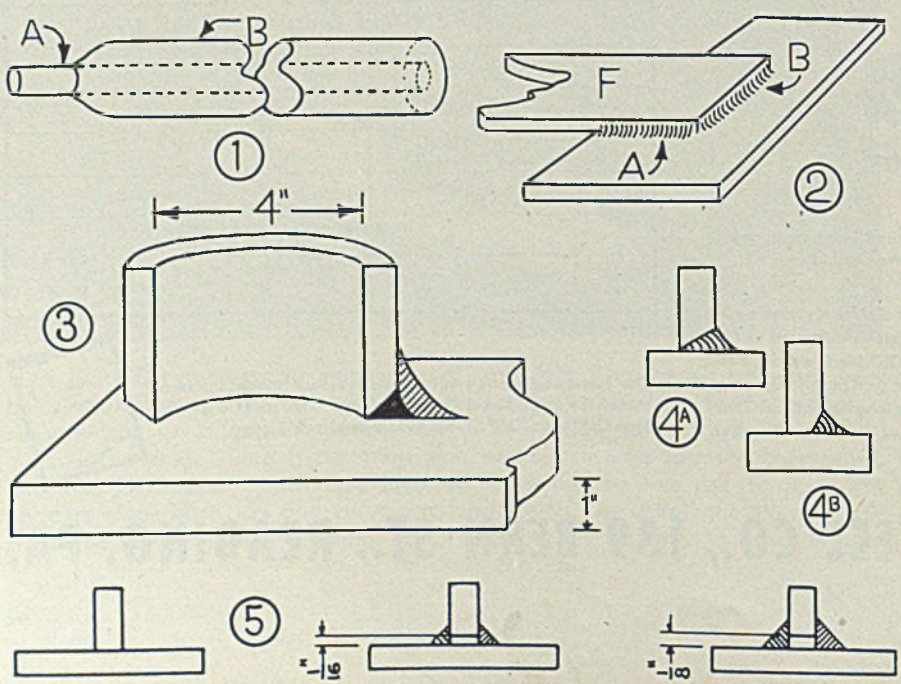


Fig. 1—Portion of typical arc welding electrode. A is metal rod; B is heavy extruded coating. Section at A is bare to allow contact with electrode holder

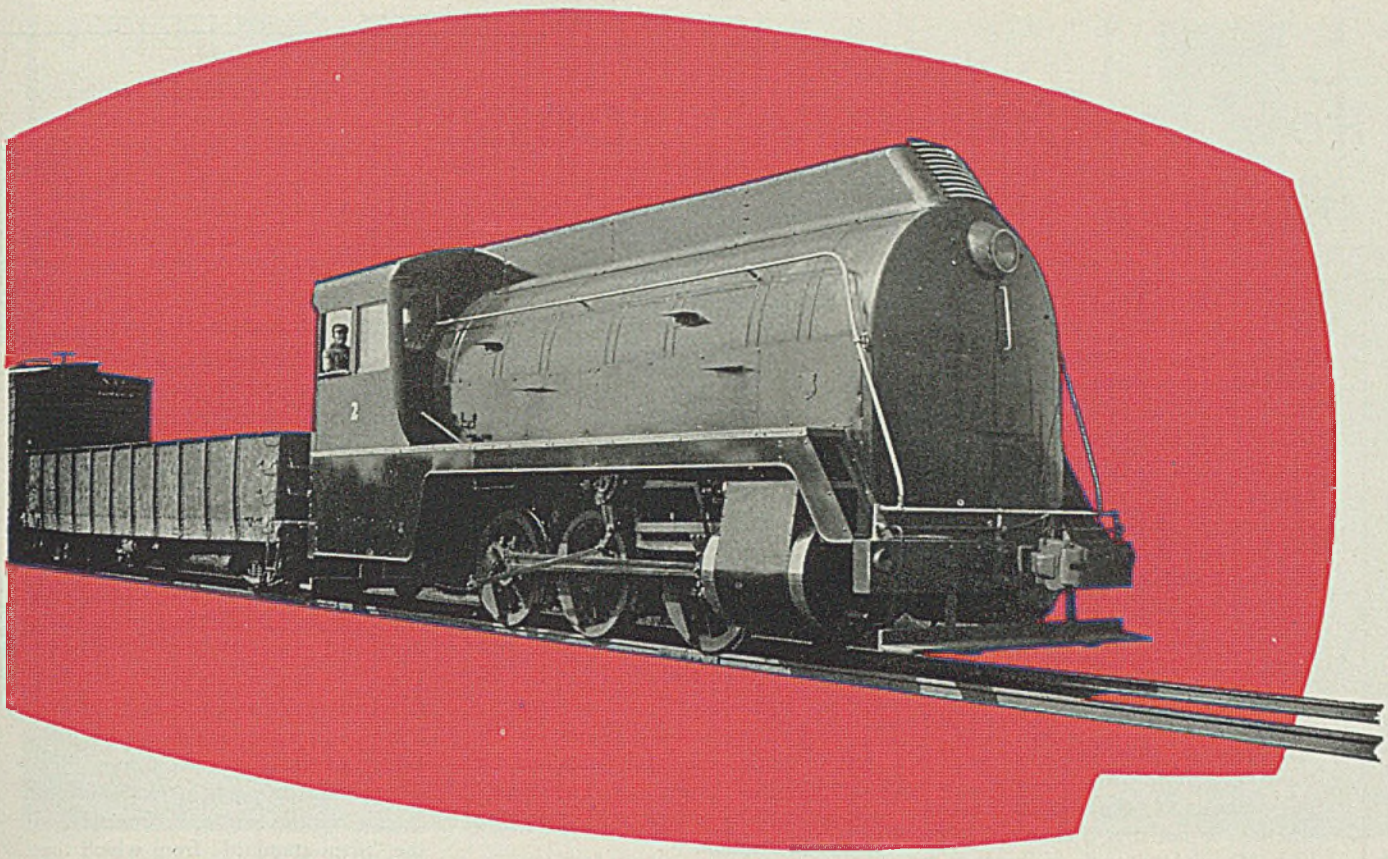
Fig. 2—Weld metal in tension as at B is 1.3 times as efficient at weld metal in shear as at A. Unequal load distribution through the weld metal at A cuts down its efficiency. Thus much metal can be saved by welding at B instead of at A

Fig. 3—Example of applying far too much weld metal for appearance sake instead of just the amount needed to meet physical property requirements

Fig. 4A—This type of joint requires much more weld metal than others such as Fig. 4B

Fig. 4B—Compared with Fig. 4A, this type of joint saves large amounts of welded metal

Fig. 5—Proper fitup, left, needs only 0.4 pound of weld metal per foot of joint. Medium poor fitup in center requires 0.58 pound; bad fitup at right, 0.80 pound



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HOW TO **Conserve Tools** THROUGH STANDARDIZATION

By PAUL MILLER
Chief Engineer
Carboloy Co., Inc.
Detroit

IN VIEW of the current emphasis on the conservation of strategic materials, and the increased rate of tool breakage characterizing plants in which considerable number of "green" workers are being employed, a plan whereby tool requirements can be minimized is of vital importance in virtually all plants. Application of a program of standardization in the average plant involves only a few very simple steps.

First requirement of course is a fairly complete record of what tools are being used on various jobs and operations. Next is to analyze these operations to determine how many could be performed satisfactorily with the same tool type—regardless of whether or not it is a standard stock tool. In making such an analysis it usually is found that one tool shank size and grade of carbide can be used on a great many operations and, that the large majority of all turning, boring and facing operations for instance, can be performed with a small group of tools that differ only as to shank size, grade of carbide and basic shape of tool.

This small group then becomes "plant standard," and will be found to take care of an average of 60 per cent of the operations involved.

Of the remaining 40 per cent, it is usually possible to take care of as many as three out of every four by slightly altering a standard tool. For instance suppose an operation requires a ⅝-inch chamfering tool. This is easily obtained from the "plant standard" by grinding a standard tool to the shape required, as shown in Fig. 1. The same tool can be used to produce many other varieties, such as the "specials" shown in Fig. 2, of which the one at the left is for forming a fillet radius, while the one at the right is for undercutting.

Other special tool types can be obtained from other "plant standards." Thus the three tool types shown at the left in Fig. 3 are easily obtained by grinding the simpler "plant standard" shown at the extreme right in the same illustration.

It is evident that the required 15 or 20 "plant standards" ordinarily required can be ordered in fairly large quantities so that a good stock can be carried without involving large total tool inventory.

If special tools are broken it is now possible to pull a "plant standard" out of plant inventory and quickly grind it to the required shape.

It might be pointed out that the procedure of carrying smaller stocks of "specials" also reduces considerably the normal tool loss involved when the changing of job specifications obsolete the special tools.

To carry the tool standardization program a step further, it is usually desirable to adopt a standard system of markings for all tools used as or developed from "plant standards." Thus, the tool number of the "plant standard" shown at the right in Fig. 3 is given a series of suffixes designating individual special shapes. The process makes possible ready identification of the particular special and the "plant standard" from which that special was obtained.

Fig. 1

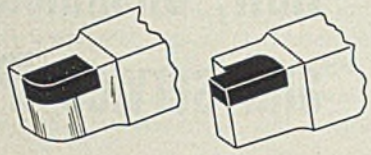

Fig. 2

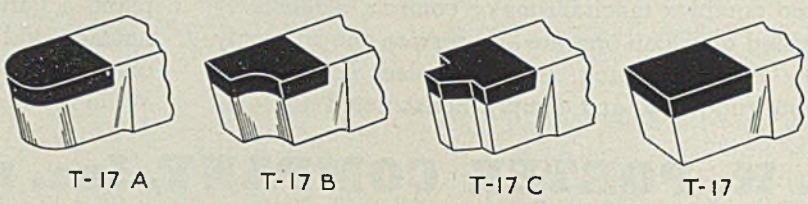

Fig. 3

expansion in electrode production capacity of 25 to 50 per cent is being contemplated. Applying a mild-steel stub-end on the electrode at the plant would introduce further operations, which would further bottleneck electrode production. Therefore it is not practicable . . . at least at present.

Other Conservation Possibilities More Important: There are a considerable number of factors which affect the most efficient use of electrodes. By proper consideration of some of these it is possible to effect electrode savings of 50 to 60 per cent, or even higher. Thus it is evident that these factors are much more important than utilizing stub ends which, in the most favorable case, would amount to utilizing possibly 2 additional inches of material on a 3-inch stub and from a 14-inch electrode—a maximum saving of no more than 14 per cent. Contrast this with the 50 to 80 per cent saving possible as explained below.

The factors which offer important possibilities in conservation of electrodes are:

Correct Design of Weldment: Most important single factor and that offering the greatest possibilities is in the design of the weldment itself. Often a long joint can be eliminated by bending the material instead of welding together two flat pieces. Likewise, chain or skip welds in which a bead length of only 2 or 3 inches separated by a space as large as a foot or more can be substituted for a continuous bead to save as much as 80 per cent of weld metal. In many structures, continuous beads will be found merely for appearance's sake where they are not needed at all for strength or other structural requirements.

Too, the point at which the weld is placed greatly affects the amount of weld metal required. In Fig. 2, for example, 1 inch of weld bead at A is equivalent to 1.3 inches of metal at B be-

(*Please turn to Page* 116)

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By JOSEPH A. SETTER
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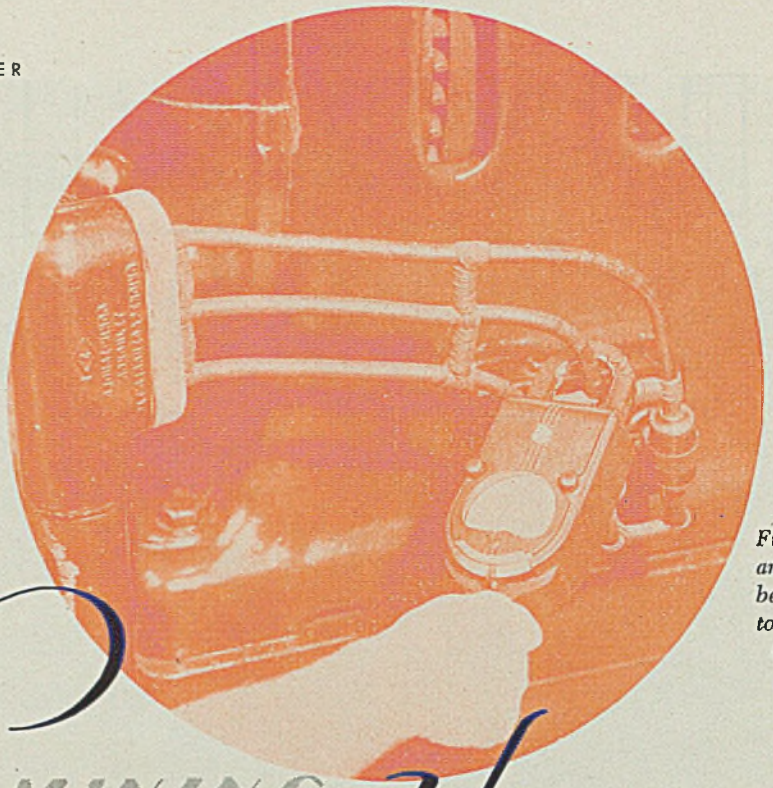

Fig. 1—Here is a hook-on ammeter, G-E Type AK-1, being used to measure motor current as described in the accompanying article

DETERMINING Exact Horsepower

. . . . needed for a particular job may reveal important possible savings

WITH THE accelerated pace of the war-production program, many machines and factories are now working around the clock. This means in many instances that some machines are being loaded with heavier production schedules than they were originally designed for, while others are underloaded. Too the great demands for new machinery have led to the installation of much used equipment which in many cases is overmotored in relation to the immediate job.

It is a well-known fact that underloaded induction motors operate at very poor power factor and draw an excessive amount of lagging current. This in turn wastes vitally needed power in all feeders and in distribution equipment clear back to the generating station power.

Frequently these difficulties can be overcome by checking the load and, on the basis of such a check, changing motors on some of the machines to improve the load factor. The purpose of this article is to present a simple method whereby loading on integral-horsepower induction motors can be determined with practical accuracy by means of a hook-on volt-ammeter.

This method is of unknown origin but has been used with practical results by several plant electricians for a number of years and has been checked for accuracy with design data of motors. With this method it is not necessary to lose productive time because the leads to the motor need not be disconnected to make the tests.

Here are the seven simple steps to be taken in using this method:

—Plot a chart with "per cent horsepower" against "per cent full-load amperes" for each motor. Such a chart is shown in Fig. 2.

—Locate point A as 100 per cent from motor nameplate reading of amperes at rated horsepower of motor. (Also it is assumed that the nameplate voltage is maintained.)

—Disconnect motor from load and read no-load amperes with ammeter and locate point C in per cent of full-load current (approximately 25 to 45 per cent, depending on speed of motor).

—Locate point D halfway between O and C and draw line DA.

—Locate point B on line DA at 50 per cent of the motor horsepower rating and draw CB.

—Then line ABC will be the approximate curve of the per-cent horsepower output of the motor plotted against per cent of motor current.

—For any motor current, read in amperes, calculate the percentage of the full-load current, follow horizontally until line ABC is intersected. Then drop down vertically and read the percent load of the rated horsepower of the motor.

If it is not convenient or feasible to disconnect the motor from the load as suggested in step 3, then the no-load

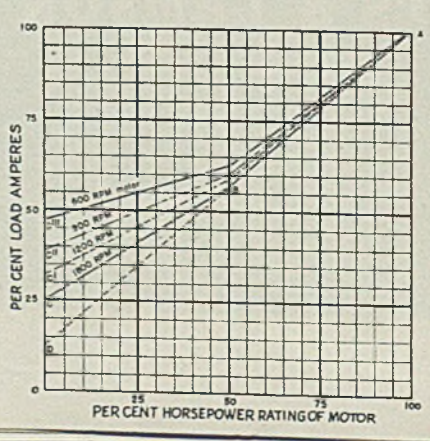

Fig. 2—This is the chart for estimating horsepower output of a motor at any load by using the hook-on ammeter. The accuracy of this method is within 2 or 3 per cent

current can be taken from Fig. 2. For example, an 1800-revolutions-per-minute motor has a no-load current of approximately 25 per cent which is the average for motors up to 100 horsepower. Lower speed motors have higher no-load currents, in the order of 45 per cent of the full-load current for 600-revolutions-per-minute motors.

It may be surprising to find that the no-load currents are as high as that shown in Fig. 2, but it should be remembered that the no-load current is nearly all magnetizing current at practically zero lagging power factor and that the actual horsepower input from the power system is very low. This accounts for the rather high currents below one-half load where the efficiency of the motor is also lower.

From one-half to full load, it can be seen that the motor current is roughly proportional to horsepower output because both efficiency and power factor are higher and more nearly constant.

Thus we have a timely, practical and time-saving way to determine the horsepower that an alternating-current motor is delivering just from an ammeter reading. Accuracy of between 2 and 3 per cent can be expected, subject of course to the ammeter accuracy tolerance.

Another advantage to be obtained by the hook-on volt-ammeter is that the voltage applied to the motor can be read simultaneously with the current. It is obvious that a motor must have the proper voltage applied or the current will be too high and overheating will result. This will also give an indication of the loads on feeder copper so that remedies can be applied.

It is hoped that this method will serve as an additional tool to help in the war program of utilizing all materials to the best advantage. *Proper motoring is a patriotic necessity to conserve vital materials. Overmotoring is a tacit admission of insufficient knowledge of the machine. During wartime it is almost a crime. Today, we should err on the side of reasonable overloading to get maximum use of the motor horsepower available to produce for victory.*

TIN-FREE BRONZE

. . . . appears superior to conventional gear bronze

PRESENTED before the American Society for Metals at the 1942 National Metal Congress was an interesting report by Chester B. Hamilton Jr., president of Hamilton Gear & Machinery Co., Toronto, Ont., Can., on the development by his company of substitutes for the tin bronzes formerly used in gears. *This company reports finding a tin-free gear bronze which is not merely a substitute or ersatz material but is actually superior to the conventional metal for this purpose.* Beginning in 1931 and carried on to 1935, a lengthy series of researches was conducted on all phases of worm gear design, including materials. A copper-tin-nickel bronze (87½/11/1½ per cent) was standardized as the best. This resembles SAE 65, plus nickel.

For this reason, the loss of tin from the available resources was a very serious blow, and soon after Pearl Harbor a substitute was sought. All the known copper alloys were tried in succession except beryllium copper, which was not commercially available. Special attention was given to several trademarked bronzes known to be good for other purposes than gears. Then the large job of trying all the combinations of all the commercially available alloying metals was begun.

The aluminum bronzes were found to be not as good bearing metal as the tin bronzes. And when they fail they have the unfortunate characteristic of damaging the worm. The copper-silicon and copper-silicon-iron groups were a failure. So were copper-nickel-zinc, copper-nickel-lead and quite a number of others.

Copper-nickel-silicon and copper-nickel-silicon-silver and copper-aluminum-antimony appeared moderately satisfactory. These would qualify as "ersatz" materials.

Something good was found when copper-nickel-antimony was tried. This is really good—better for worm gears than the peace-time bronze.

The whole object of these investigations was to find a metal which, used as a worm gear, would have high load-bearing ability, including both strength and resistance to wear, and would operate at a moderate temperature rise. All tests were of worm gears mated with hardened and ground worms, rigidly aligned in enclosed speed reducers with bath lubrication. The output power and the bath temperature were measured.

Little is known yet about the value of this bronze for other purposes or for shock values. The tests are not complete in those directions.

Then, to determine the best proportions of the mixture, it was assumed from previous experience that 2 per cent nickel would be about right. Using this value, the antimony content was then varied. The best results lay between 7 and 8 per cent antimony. With the antimony determined, the nickel was varied and best results found between 1½ and 2½ per cent.

With usual copper-tin-nickel bronze, gears were cast in a chill ring with considerable improvement over plain sand-cast gears. Therefore all the copper-antimony-nickel tests were made in duplicate, both chilled and unchilled. It appears at present that chilling this metal produces no improvement, a plain sand-cast gear being as good.

A peculiarity of this metal is that it has never been found to pit or spall. When it fails, it is by simple abrasive wear of the surface.

Another odd feature is that double the rated full load (catalogue)—i. e., about 45 per cent of breakdown load—can be applied immediately to a new gear without causing prompt destruction, which is not the case with all gear bronzes. Some otherwise good bronzes must be carefully run in with low initial and rising increment loads to cold-work the surface. This antimony bronze either does not need cold working or cold works instantly under applied overload without damage.

Roughly stated, worm gears of this metal will carry about 25 per cent more load than in bronze or will run about 15 degrees Fahr. cooler at the same load. The reason for this may be in the micro-character of the crystaline structure. C. H. Bierbaum, metallurgist, Lumen Bearing Co., Buffalo, has made and tested this alloy. He reports that it is a triplex structure composed of three constituents of widely different microhardness. It has long been known that a duplex structure is essential for good bearing metal. *Perhaps a triplex structure is still better.*

The average physicals of this metal of mean composition are 19,000 pounds yield (limit of proportionality); 31,900 pounds ultimate; 7½ per cent elongation in 2 inches; 15 per cent reduction in area. No patent has been applied for, nor are any restrictions being imposed on its use. This is a free gift to the Allied nations.

In this work, Mr. Hamilton wishes to acknowledge the co-operation of O. W. Ellis, of Ontario Research Foundation and thank him for his encouragement and help. He also thanks the Canada Metal Co. of Toronto, who did the foundry work.

YOUR *Scrap* CAN POSTPONE 1950

FROM these reserves, two extra pounds of ore must be used for each pound of scrap you fail to turn in.

Vast as they are, America's precious iron deposits are not limitless. Considering the terrific drain on them now for those extra pounds to win the war, experts say our high-grade Lake Superior district reserves will be exhausted in a few more years . . . by 1950 . . . or sooner.

So the steel industry needs every pound of scrap you can muster . . . today, next week, next month, every month. Scrap is vital for Victory over the Axis . . . and vital also, to conserve the natural resources we shall need for reconstruction after Victory.

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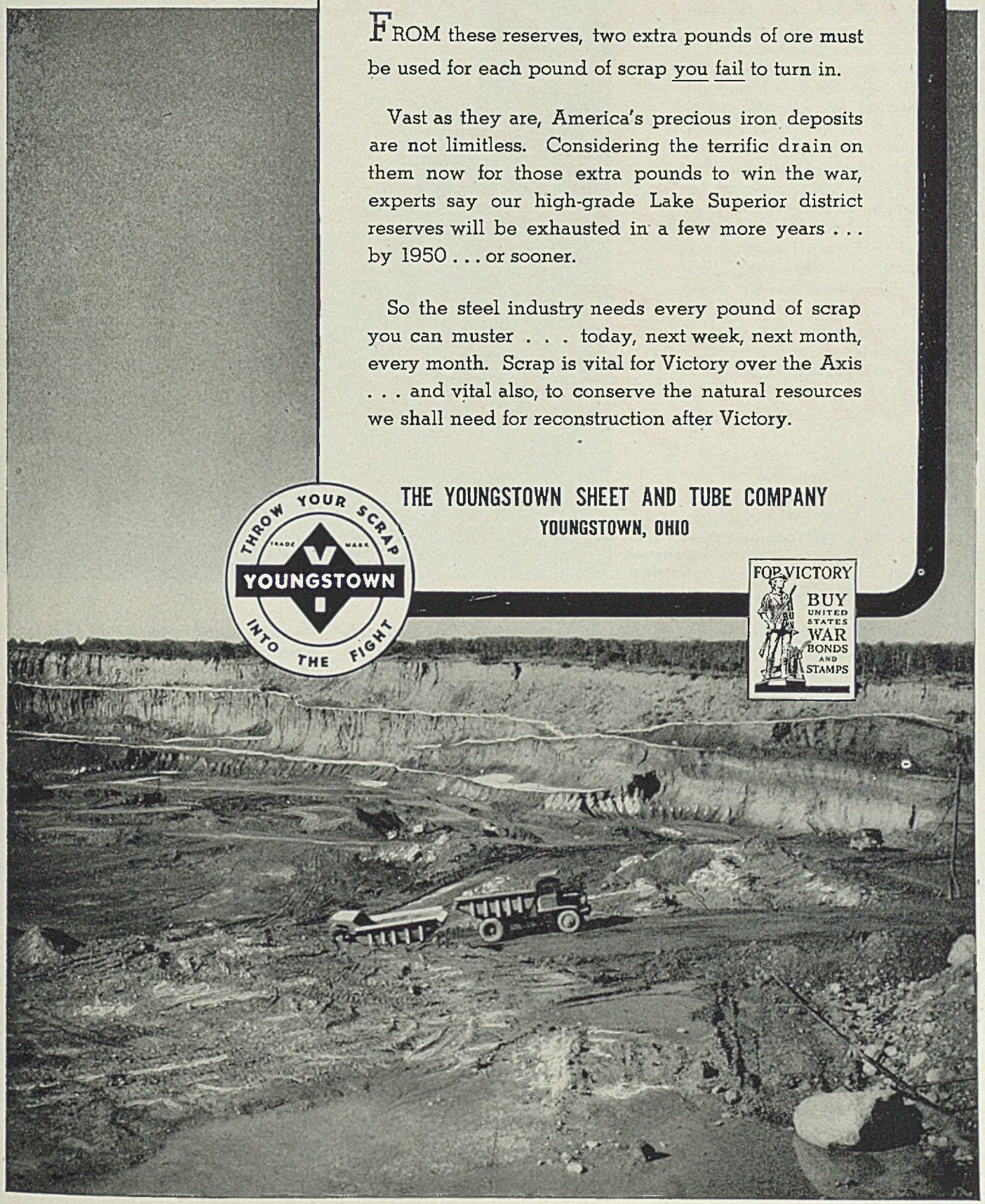
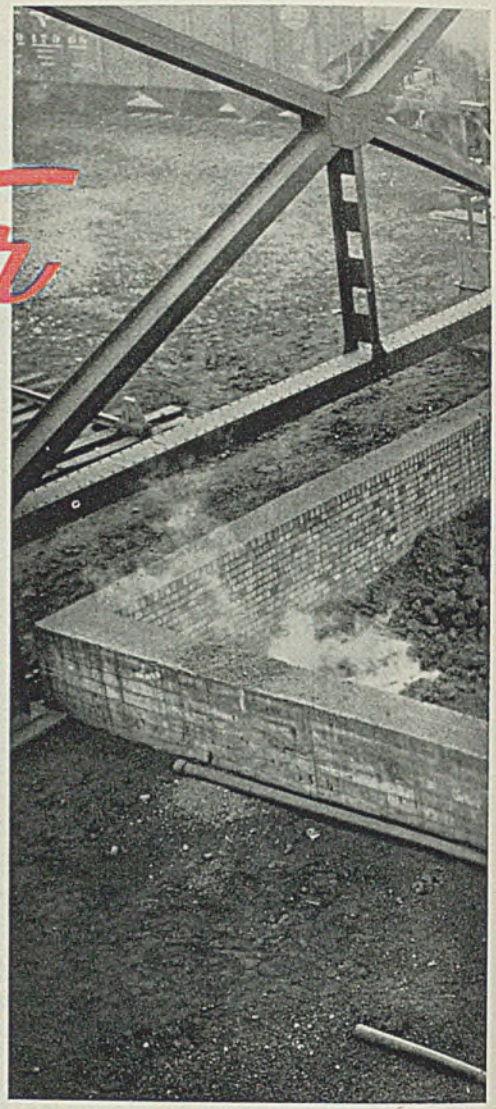


Smelting Sinter in the Blast Furnace



By CHARLES E. AGNEW
Consultant, Blast Furnace & Sintering Plant Operations
Cleveland

(Concluded from last week's Issue)

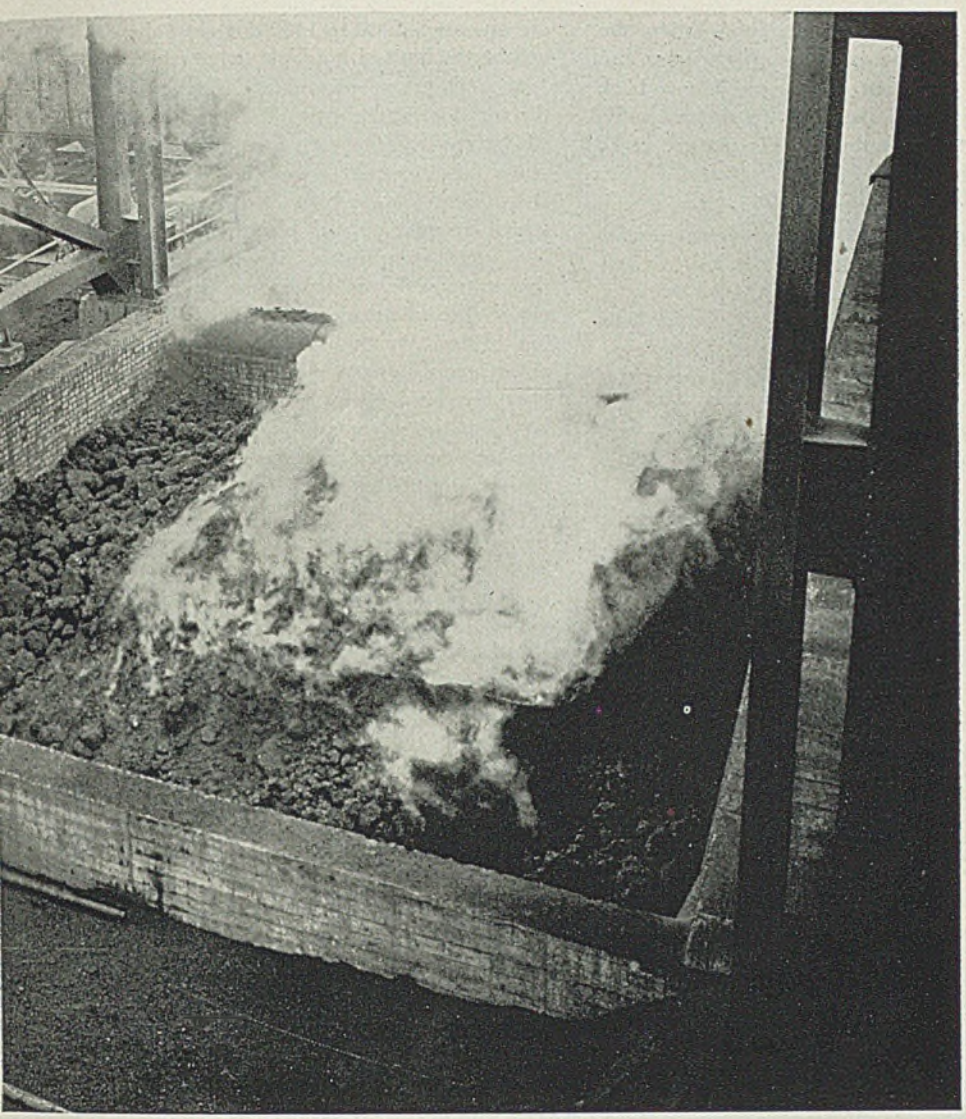
SINTERING was first introduced into the ferrous industry to salvage the flue dust accumulating with the use of fine ores. Production of flue dust is still a matter of concern to the soft ore operator. The causes of flue dust production are cumulative. Primarily it is the force of the velocity of the gas stream against the force of gravity. It is commonly stated that the volume of gas from the furnace is approximately one-third greater than the volume of air blown, but to that figure must be added all the moisture of the mix, all of which is converted to water vapor, if the total volume of gas leaving the furnace is considered. The water vapor is condensed in the gas washer but the volume of it added to the furnace gas has the effect of increasing the velocity of flow from the furnace and it is the velocity of the total flow which causes dust entrainment. Hanging and slipping of the furnace and checking the blast cause violent rushes of gas through the stock column and such intermittent increases in the rate of gas flow increase the dust production proportionately.

A sinter operation is free from such variables because there is little or no moisture in the sinter burden to create water vapor and hanging, slipping, or checking are extremely rare. The volume of air blown and consequently the volume of gas leaving the sinter burden operation is less than with soft ore operation and the lessened volume reduces the velocity of the gas stream leaving the furnace. The volume of air for a sinter operation is discussed later.

The sintering operation is itself a form of concentration in that the elimination of the volatile elements increases the percentage of nonvolatile elements in direct proportion to the percentage of volatile elements eliminated; consequently, the burden is enriched in iron per pound of material charged. Because of this enrichment and the more economical use of heat due to the absence of volatiles in the mix any operation, if changed from soft ore to the same ore sintered, could reasonably be expected to effect an increase in production of 18 to 20 per cent.

Myriads of technical papers may be written upon the subject of the production and use of sinter for the blast furnace but the opinion is offered that in the last analysis the factors of greatest practical value to the blast furnace operation are, the freedom from volatiles, the ability to absorb, conduct, and hold heat, and a small uniformly graduated particle size which makes the efficient recovery of heat possible.

Sinter and the Use of Heat.—Development of the American iron industry is representative of the development in all countries in that a more efficient use of heat is the predominating influence. This appears to have been the thought back of the change from the open hearth to the "high furnace" of the late Middle Ages, which was the forerunner of the present day blast furnace. Certainly it has been the thought back of the development of blast furnace for the past 100 years. The height of the present day furnace, however, was made possible only by the complementary development in the strength of a coke which could support the weight of the tall stock column without crushing and to the development of blowing equipment powerful enough to force the gas through



Stockpile of sinter. Sprays of water cool this iron-bearing material before it is transported to blast furnaces. Photo, Youngstown Sheet & Tube Co.

the tall stock column. The combustible furnace gas was the result of closing the top of the stack. Use of this gas to preheat the blast (English patent 1828) and thus recover some of the latent heat of the fuel has been followed by a steady development in the equipment devoted to that purpose.

Since the importance of the application of heat to raw materials has been so long recognized it seems strange that the importance of the factors governing their ability to receive that heat has been so slowly recognized. For purpose of analysis we need only consider American blast furnace practice for the 19th Century.

In the first half of that century Eastern Pennsylvania was the leading iron producing district of the country with a scattering of furnaces in other states and in the western part of that state. The furnaces were built close to the ore deposits and used the ores native to the localities. The ores covered the range of magneitte, hematite, limonite, and carbonate, with the lump physical characteristic predominating in all and with the Eastern Pennsylvania magnetite ores serving the greatest number of furnaces. The fuels used were charcoal, anthracite coal, block bituminous coal, and bituminous coke, with charcoal; and after the use of hot blast, anthracite coal was the preferred fuel. Bituminous coke was the least favored of all fuel.

In the last half of the century the Middle West district, using the soft fine Lake hematite ores, and bituminous coke for fuel, assumed the position of leadership in production.

In the first half of the century with lump ore predominating a soft fuel was preferred. In the second half of the century with soft fine ores predominating a hard lump fuel was preferred. In both periods the chemical composition of the materials was basicly the same—iron oxides and carbon. In the first half the Eastern district operated with the lower fuel rate. In the second half the Middle West district had the lower fuel rate. In recent years several Eastern furnaces using fully beneficiated Eastern magnetite ores exclusively have operated with a fuel rate which has not been equaled by any natural soft ore operation.

The lesson seems clear—the physical characteristics of the materials are of equal, if not greater, importance to the economical operation of a blast furnace than is their chemical composition.

The Lake hematite ores were naturally rich in iron but no richer than some of the natural magnetite ores. At the time of their discovery the Lake hematite ores reduced faster than the lump magnetite ores because their particle size permitted a more rapid absorption of heat than the lump magnetite. But with the magnetite ore prepared to an equally small particle size it will reduce faster than the hematite because it is usually free from the volatile chemical elements which the soft hematite ore has always contained.

Again the lesson seems clear—the elimination of the heat absorbing volatiles and the preparation of the material to a preferred particle size provides the ideal material for the absorption of heat.

To continue the comparison between the two half centuries, we had in the first half the beginning of the use of hot blast. The use of hot blast would increase the amount of heat delivered to the bottom of the furnace and undoubtedly helped in carrying a hotter hearth but in the light of later knowledge we know that the minimum of resistance offered by the open lump stock column would permit a rapid loss of heat because of the too free passage of the gas and only a light ore burden could be carried. With the too free passage of gas the blowing rate, or heat production rate, would have to be held down to protect the top of the furnace from excessive heat.

In the latter half of the century the soft fine Lake hematite ores, by forming a more compact stock column, acted as a blanket to hold more of the heat in the furnace which consequently aided in the reduction effort. The benefit from the hot blast would be further enhanced by this blanketing effect of the soft fine ores and the combination of the two benefits permitted the carrying of a heavier burden than was ever possible with the lump ores, with proportionate increases in production and a lowering in the fuel rate.

Ability of the soft, fine, moist ores to hold a safe top temperature permitted a harder blowing rate and consequently a faster rate of heat production. The co-ordinating of these thermal factors has been the guiding influence in the

development of the present day furnace practice and design.

Simple virtues of the soft fine ores are also their greatest detriment. With any soft ore operation the higher the furnace and stock column becomes the greater will be the weight of the column and the greater will be the tendency to pack and to offer prohibitive resistance to the passage of the gas. Since the only passage for the gas is the interstices of the stock anything which tends to restrict those interstices will interfere with the gas passage.

The furnace gas, rising through the stock column, must pass entirely through the column to reach an outlet from the furnaces. The cold stock when lowered into the furnace begins to absorb heat and vaporize the surface and absorbed moisture followed by the release of the chemically bound volatile matter of the stock. The interstices of the stock in the material preparation zone, at the top of the furnace working volume, must accommodate these vaporized volatiles as well as the rising column of furnace gas. Under such conditions when the restriction to gas passage becomes too great to permit a uniform flow a back pressure will build up until it is sufficient to break through the mass of stock and the furnace is said to "slip."

This same restrictive condition to the passage of gas is the governing factor for the temperature of hot blast which it is possible to carry. Like all gas, blast furnace gas is subject to the laws of expansion under heat. As the temperature of the hot blast is increased the temperature of the stock column mass also is increased and the volume of gas passing through the stock column is expanded in proportion to the increase of temperature. In the vernacular of the industry a furnace may be "moving" regularly but will "stick" with an increase in blast temperature. That is simply a short way to say that with the increase in the volume of the gas, due to the expansion from increase of temperature, the interstices of the stock are not large enough to accommodate the increased volume of the gas. For the average soft ore operation 1200 to 1400 degrees Fahr. will be the limit of hot blast temperature.

It is the rapid absorption of heat by the moisture and chemically-bound volatile matter of the soft ores which enables them to hold down the top heat. It is this ability to blanket the top heat which permits a hard blowing rate, or heat production rate. At first thought this may seem an advantage but obviously the advantage desired is the holding of heat in the furnace. The fine moist cores have a decided advantage over the hard lump ores for this purpose but the advantage is paid for with the heat consumed in the elimination of the volatile matter.

Here again the lesson seems clear—the desired blanketing effect is caused by the fines. Volatile free fines will serve the same purpose and at the same time conserve the heat consumed in the elimination of the volatiles.

A simple cure for the objectionable features of the soft ore is the sintering of the earthy material. The preferred particle size can be had by crushing the sinter. Sinter, having the structural strength to prevent packing, provides a self-supporting stock column, and when properly sized there will be the desired blanketing effect plus a uniform resistance to the flow of gas but free from the restrictions to flow inherent with the soft ore.

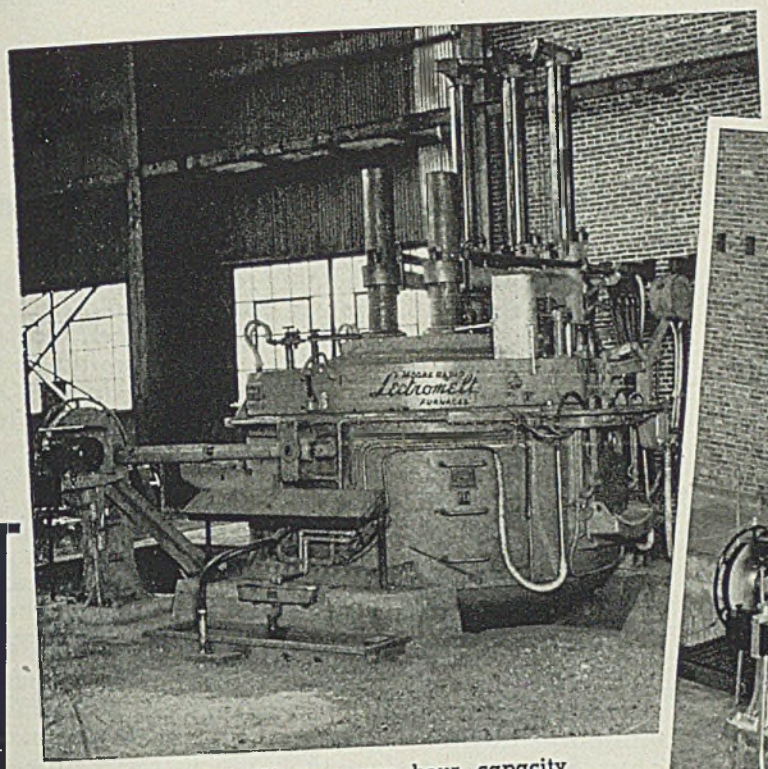
The sinter stock column will permit the use of much higher hot blast temperature than the soft ore column. Since the limit to the use of hot blast temperature is governed by the necessity for free gas passage, and that passage is governed by the interstices of the stock, and the interstices are governed by particle size of the stock, it seems reasonable to say that the only limit to the use of hot blast temperature with sinter would be the ability to provide the temperature. In an actual full scale operation 1850 degrees Fahr. line heat has been used without difficulty and the only restrictions to the use of higher temperature was the inability to obtain it.

Use of soft ore, with the limitations to gas passage and use of high blast temperature inherent with the use of such ores, led to the ever larger furnace to provide a larger working volume within the furnace in which to produce more heat. With the limitations of his mix the soft ore operator must resort to hard driving to get tonnage; he must think in terms of heat generation and must sacrifice that part of the generated heat needed for the preparation of his material for reduction. All heat consumed in the elimination of volatile matter is taken from the furnace as sensible heat of the gas.

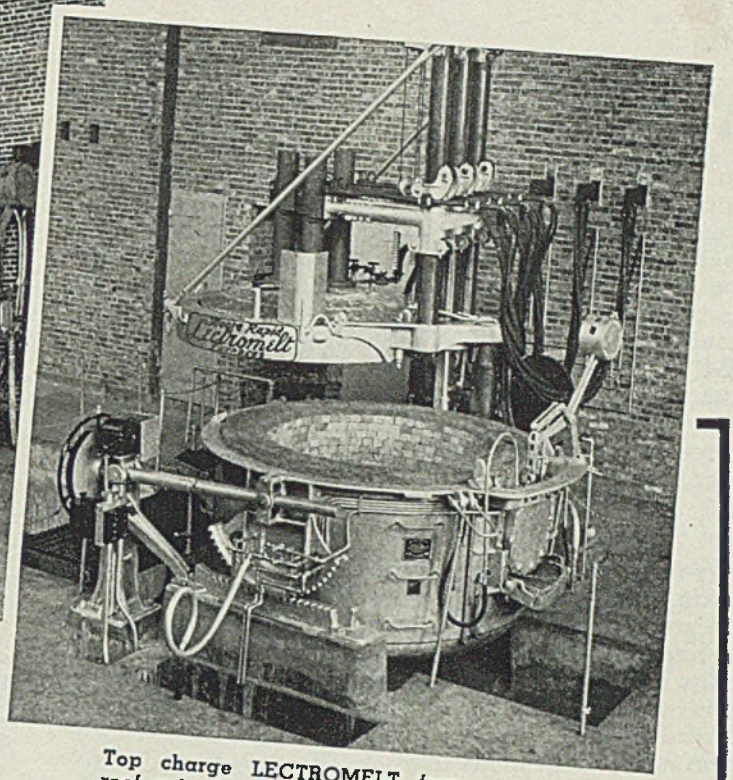
The sinter operator, having a mix free from volatiles, and one which will take

INFRA-RED LAMPS SPEED DRAFTING

DRAWINGS are produced 10 per cent faster by using an infra-red lamp in the patent department of the Westinghouse Lamp Division. After tracing over a pencil drawing with ink, this draftsman turns the infra-red lamp on the drawing for about a minute. This takes all moisture out of the ink and paper so after pencil marks are erased the ink lines remain sharp and black. Before this procedure the draftsman had to go over the drawing in ink a second time for the erasure produced gray lines



Size "OPT" 4½ tons per hour capacity LECTROMELT top charge type furnace in normal operating position.



Top charge LECTROMELT furnace with roof raised and rotated to one side for quick charging by a drop bottom charge bucket.

Modern STEEL MELTING

Lectromelt furnaces offer the modern means of handling your melting requirements. LECTROMELT furnaces are used throughout the world for the rapid and economic production of plain carbon and alloy steels for ingots and castings; for the production of gray and malleable irons; for melting copper, monel metal and other products.

The top charge type is built in standard sizes from 100 tons to 250 pounds. Their use results in greater production, lower power consumption, savings in electrode and refractory costs, and increased tonnage per man hour. LECTROMELT FURNACES are ruggedly built for maximum production and long life. Write for complete details.

MOORE RAPID *Lectromelt* FURNACES

Pittsburgh Lectromelt Furnace Corporation
Pittsburgh, Pennsylvania

The Furnace of Today and Tomorrow

MORE STEEL AND

LESS COST WITH SALEM

AN INGOT HEATING FURNACE, NOT JUST ANOTHER SOAKING PIT

Salem Soaking Pits, unlike all others, are in principle and practice INGOT HEATING FURNACES, and have a circular shape. Operating men generally accept the fact that the most important requirement for proper rolling of steel is TEMPERATURE UNIFORMITY. It has been proven by actual tests that Salem circular pits maintain A MORE UNIFORM TEMPERATURE FROM TOP TO BOTTOM than do the pits of other designs. It is not surprising, therefore, that years of production data on Salem Circular Ingot Furnaces reveal new production achievements that include increased tonnage, better quality, and lower costs.

IT WILL DO MORE

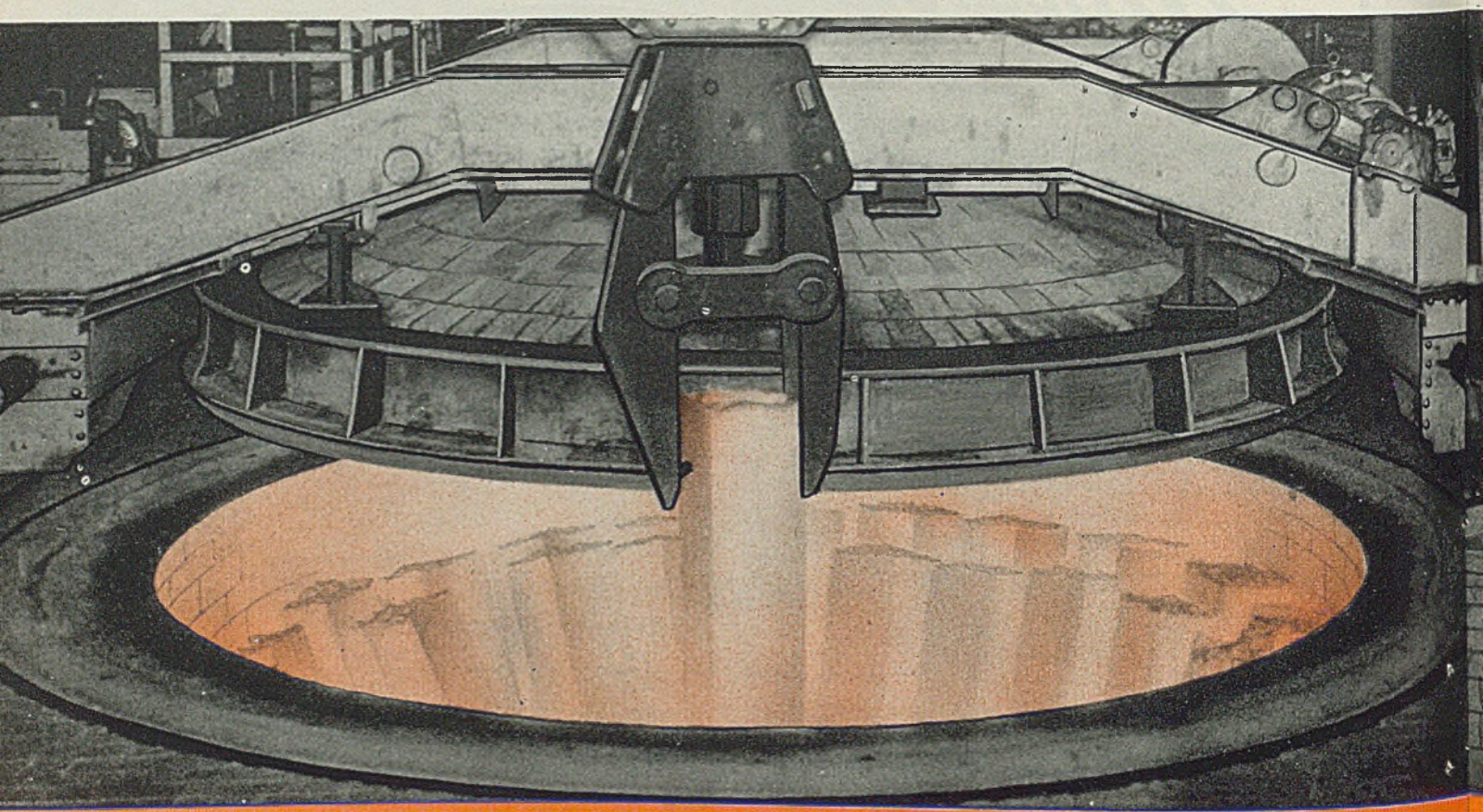
Twenty-five percent faster cycle than with other types of soaking pits—that's the result of heating cold or hot carbon steel, or alloy ingots in Salem Circular Soaking Pits. There's no better method, especially for alloy steel since the empty pit may be quickly cooled to the proper temperature for charging. Having accurately controlled temperature—as accurate as any heat treating furnace—Salem equipment heats ingots uniformly from top to bottom. Better yet, all the ingots in a charge and in each subsequent load have the same temperature. This permits faster, safer rolling, plus steel with better surface. And best of all, since Salem Pits are circular, thus having NO FORGOTTEN CORNERS, they will heat more ingots more uniformly per square foot of occupied floor space than square or rectangular pits.

FOR EXAMPLE: The heating rate for a 16 foot Salem Furnace is about 15 tons per hour with cold steel, and as high as 38 tons per hour with hot steel. One case shows where nine cold ingots, each weighing 26,000 pounds, a TOTAL OF 234,000 POUNDS IN ONE 16 FOOT HOLE, are uniformly heated from cold to rolling temperature of 2450° F. in 7 hours, 15 minutes. Furthermore, the scale is unbroken and the ingots are in excellent condition for rolling. THAT IS NOT ALL—in comparison with the results of using the regenerative practice, it is found that edge cracking from overheating is about 40% less with Salem Pits. Hence, the savings in chipping costs are enough to pay for the entire fuel consumption of Salem Ingot Heating Furnaces.

SAVINGS—Salem's accurate control of ingot temperatures eliminates all guesswork, thus permitting a minimum thickness, single jacket scale formation. Thus, Salem Ingot Heating Furnaces reduce the scale formation by at least 1%. In addition to this scale saving by superior heating, the yield also increases as much as 1%. Therefore, Salem Circular Furnaces provide savings through faster production in less space, more uniform quality, better rolling, better finish, higher yield, and lower costs.

INGENIOUS DESIGNING

Since Salem Pits are circular in shape, there are NO



SALEM ENGINEERING

BETTER STEEL AT

CIRCULAR SOAKING PITS

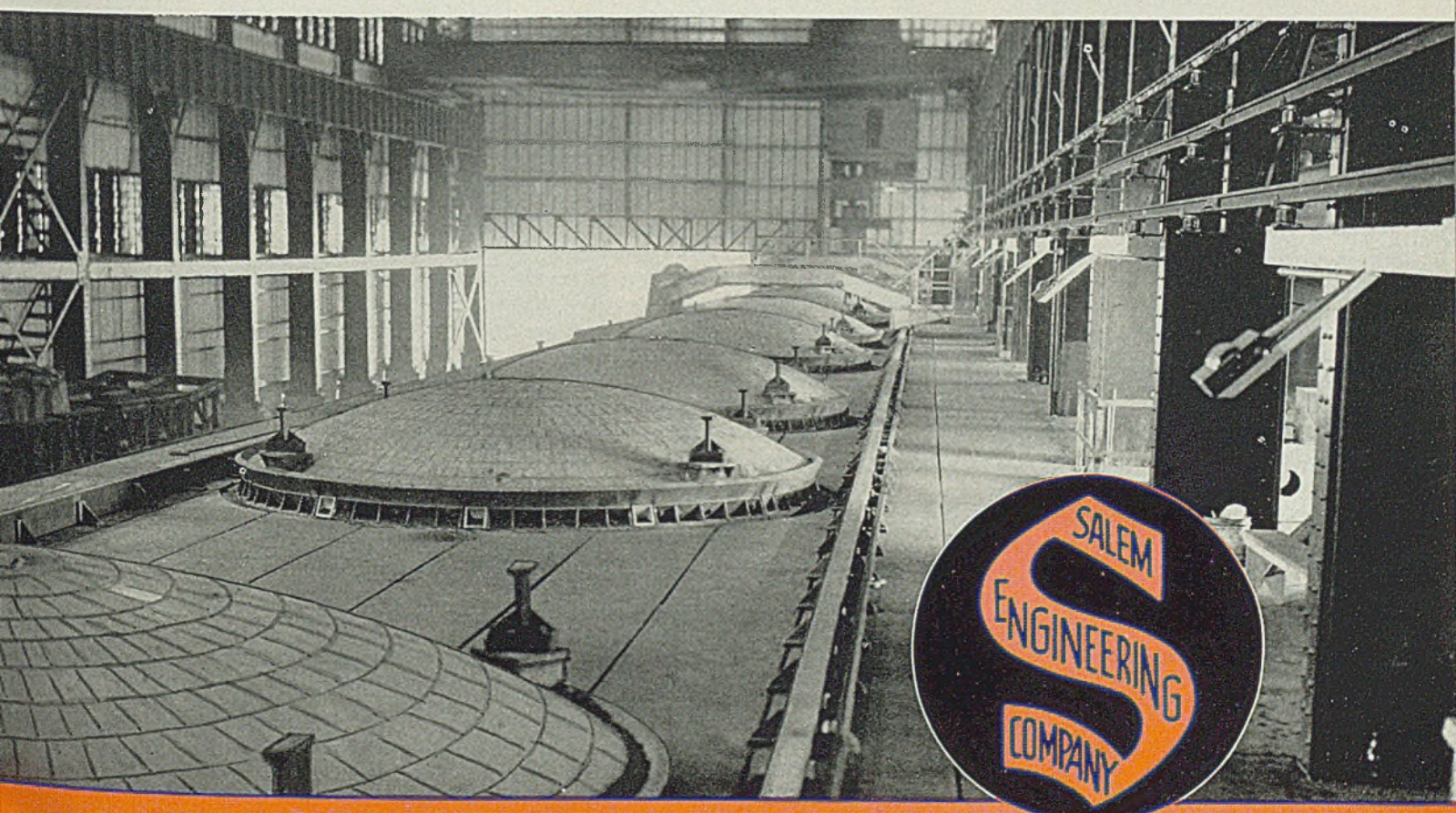
COLD POCKETS and NO FORGOTTEN CORNERS. A multiplicity of burners is placed outside the furnace near the bottom for accessibility, and heat from them enters the combustion rim at a tangent to the circular furnace wall. This method avoids direct impingement on either the ingot or the furnace lining. The active heating gases move in a spiral path as a result of the circular shape of the pits as well as the tangent method of directing the heat into the chamber. Hence, the hot gases are in contact with the ingots longer than in any other type of pit and with relatively low burner velocities. Furthermore, brickwork maintenance is kept to a minimum due to this method of firing and circulation whereby there's no direct impingement. This firing method also provides for better combustion.

The circular design of Salem Pits materially aids the maintenance of accurate temperature. Salem engineers go still further by adding the same control equipment as that used on outstanding heat treating furnaces: pressure, temperature, and combustion control mechanisms. Hence, circular pits plus heat treating furnace controls, give DOUBLE assurance of heat uniformity at all times. Another advantage lies in the fact that in circular furnaces, only a single thermocouple is required instead of a multiple of them as are found in square type pits.

Salem Circular Ingot Heating Furnaces, with all these worth-while advantages, are built in various sizes to meet any production or building requirement. Remember please, they utilize less space for a given tonnage, and in addition to giving 25% increased production plus greater yield with lower maintenance cost, they also show other big savings.

ADVANTAGES FROM SALEM'S EXPERIENCE

During the designing of Salem Soaking Pits, our engineers were striving for an efficient production method which would give comparable performance to that obtainable from heat treating furnaces. With Salem's broad experience in building furnaces of all kinds as well as steel mill equipment, it is not surprising that its engineers designed and built circular soaking pits that are right now delivering outstanding performance. It is also noteworthy that the world's largest ingot heating furnace was built by Salem. Since experience became the basis for Salem design, and since the design and construction have been substantiated by actual performance records in EVERY Salem installation, you can't go wrong by selecting them. Salem Ingot Furnaces GIVE YOU SIXTEEN DECIDED ADVANTAGES: higher production in a given area, higher heating rate, remarkable heat uniformity, better rolling, better steel, less scale, less chipping, 1% higher yield, a very minimum of cinder, less fuel consumption, no flame impingement on ingots or the furnace wall, no washing of ingots, less maintenance, lower fuel expense, foolproof cover for greater safety, and lower over-all production costs. Here's THE solution to one of your war production problems.



CO. . . . SALEM, OHIO

high blast temperature, thinks in terms of conservation of heat. There is no need to generate heat faster than the stock can absorb it and all the heat that is absorbed by the sinter is retained and used for reduction purposes. The ability to use high blast temperature permits the recovery of a greater percentage of the latent heat of the fuel than is possible with the soft ores. Because of this efficient and economical use of heat it is possible to carry a heavier burden than with a soft ore mix and there is a compensating increase in production and a lower fuel rate than with the soft ore. The blowing rate, or heat production rate, can be reduced to the extent of that part of the heat used for the elimination of volatile matter in the soft ore. The heat absorption rate of sinter is a variable depending upon the particle size and cell structure of the sinter. Sinter produced from volatile free materials, for example some of the Eastern magnetite concentrates, will be of a denser structure than a sinter produced from material containing bound volatile matter, such as Lake hematite ores, and the latter sinter will absorb heat faster than the former. Because of this variable in the heat absorption rate of different sinters there cannot be any fixed blowing rate any more than there can be a fixed blowing rate for soft ore operations. In actual full scale sinter operations 75 to 85 per cent of the soft ore blowing rate has given excellent results.

When a blast furnace is constructed and ready for operation the working volume (center line of tuyeres to stock line) of that furnace is fixed and it is the only factor about the operation which is fixed. Every other factor contributing to the operation is subject to variation. The materials entering the top of the furnace are subject to wide variations in chemical composition and in physical characteristics. The air entering the bottom of the furnace is subject to wide variations in density and in water vapor content. Any and every change in material or air entering the furnace, whether consciously or unconsciously on the part of the operator, has a beneficial or a detrimental effect upon the working volume of the furnace and so affects the overall economy of the operation.

Approaches Theoretical Perfection

In any manufacturing process or operation reason develops theoretical perfection and practical economy governs the approach to that perfection. In the blast furnace operation properly sized sinter and conditioned air appears to be the closest approach to theoretical perfection which reason has developed. Sinter or conditioned air is in either case alone a partial approach because each contributes a part to the theoretically perfect furnace operation.

Concentration, sintering, and sizing, or where concentration is impractical, sintering and sizing offers an economical practical solution of the problem of ideal material preparation. The benefits from such preparation are available and contribute to the economy of the furnace operation.

Air conditioning offers the solution of the problem of ideal combustion conditions within the furnace. The desire for such conditions exists in every furnace operation but the degree of benefit attained will vary with geographical locations and the seasons of the year. The relative merits of different grains of water vapor content in the air will not be discussed here, the advantage of uniformity of such content will be conceded by any experienced operator.

The advantage to the furnace operation of a fully beneficiated material alone has been proven in full scale operation. The advantage to an operation of conditioned air alone has been proven in full scale operation. The advantage of the two together has yet to be demonstrated and while there probably would be some overlapping of benefits the combined advantages, if fully exploited, should be most gratifying.

Variables Affect Working Volume

Obviously the variables in the raw materials entering the top of the furnace affect the upper part of the furnace working volume and the variables in the air entering the tuyeres affects the lower part of the furnace working volume. Again obviously, the extent of the ill effects of the respective variables depends upon the nature of those variables and an analysis of their nature leads to their beneficiation and so to an increase in the efficiency of the working volume. With the variables eliminated the effectiveness of the working volume for reduction purposes is increased. With proper beneficiation the raw materials are prepared for the rapid absorption of heat and the restrictions to the delivery of heat are removed. With uniform conditions in the combustion zone at the bottom of the furnace working volume, and absence of volatiles in the material preparation zone at the top of the working volume, the temperature of the mass of stock will be graduated uniformly throughout it's depth, providing the ideal condition for uniform operation and the approach to maximum recovery of heat generated, maximum reduction from the reducing agent, and maximum regeneration of the reducing agent.

Sinter and Silicates. The presence of silicates in sinter and the effect of that presence upon the reduction rate of the iron is one of the most controversial subjects regarding the use of sinter in the blast furnace burden. There cannot be any controversy regarding the formation of the silicates during the sintering operation or regarding the effect of the formation upon the particle size of the sinter because those factors are in evidence in any operation sintering ferrous materials. The controversy is whether or not the presence of silicates affects the rate of iron reduction in the blast furnace operation.

Offers Comments on Silicates

Without any desire to continue a controversy, and certainly without any intention of questioning the results of laboratory tests, which have been made to determine the reduction temperatures of different sinters, the following comments are offered.

The term silicate is as inadequate to fully describe all the various possible molecular compounds of silicate and the effect of the different compounds upon sinter as the term sinter is inadequate to fully describe the various combinations of chemical elements and physical characteristics which are possible in that material.

A silicate is a compound of silica and some other element or elements. In the presence of a fusing temperature chemical law compels the acid silica to seek a union with some basic element or elements. In the ferrous materials those basic elements are usually aluminum oxide, calcium oxide, magnesium oxide, manganese and iron. In materials commonly used in the blast furnace burden and in those commonly sintered the percentages of these various compounds and elements and the ratio of their percentages to the percentages of others of the group will cover a wide range. Since the sintering operation is a fusion the formation of silicates during the operation is inevitable and is beyond the control of the sintering machine operator because it is governed by chemical law. The molecular formation of the silicates formed will vary with the percentages, and the ratio of the percentages, of the various chemical elements in the mix.

All the silica in the mix will be converted to the silicate. Chemical law rules that the silica must be satisfied and if the percentages of the other gangue elements present do not balance the silica percentage the excess silica will satisfy itself with iron alone. The percentage of silica in the sintering mix governs the total percentage of silicate in the sinter and the ratio of the silica percentage to the percentages of the other gangue elements determines the character of the molecular formation or formations.

Undoubtedly each of the possible molecular compounds of silicate has some influence upon the sinter but the

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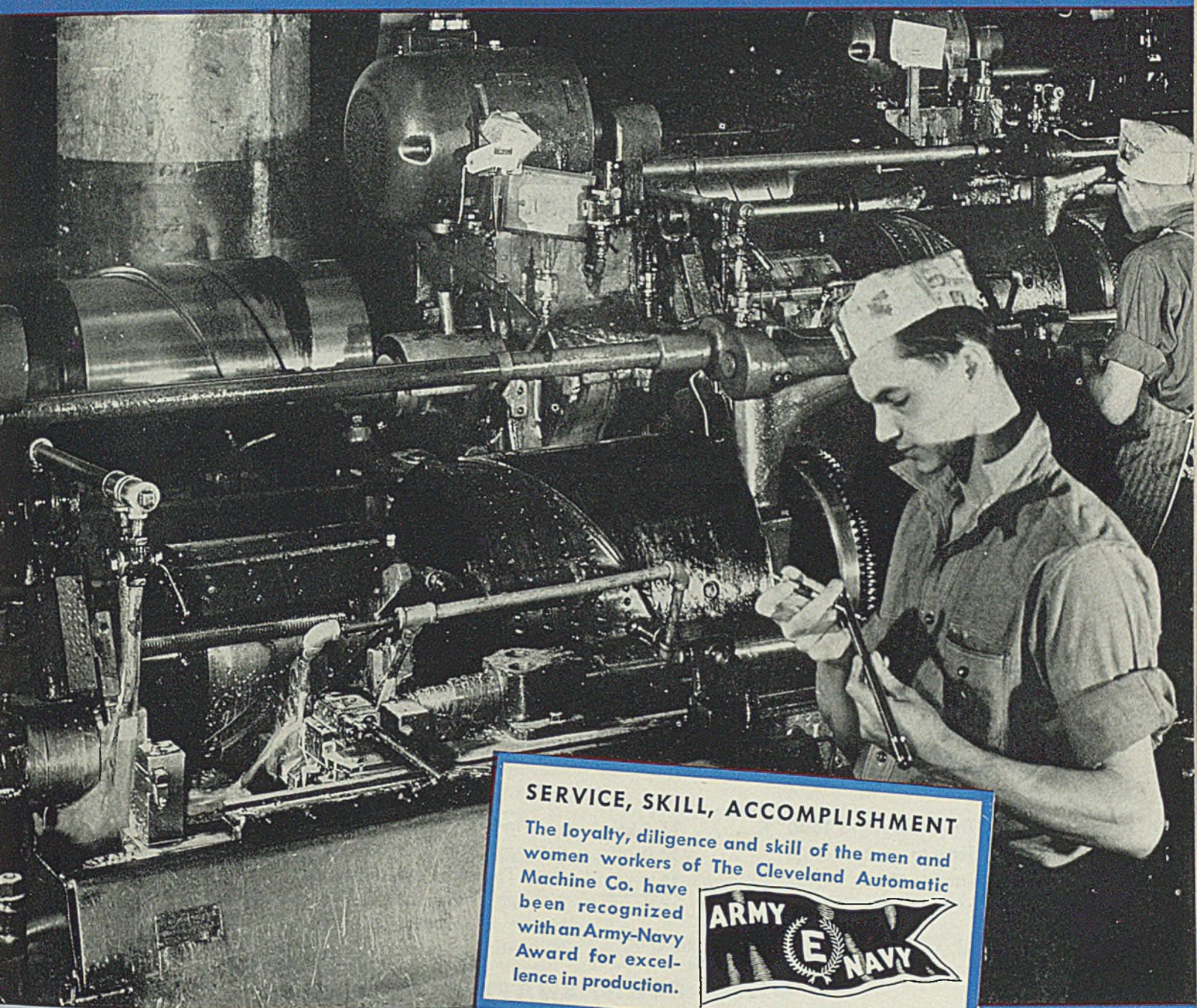

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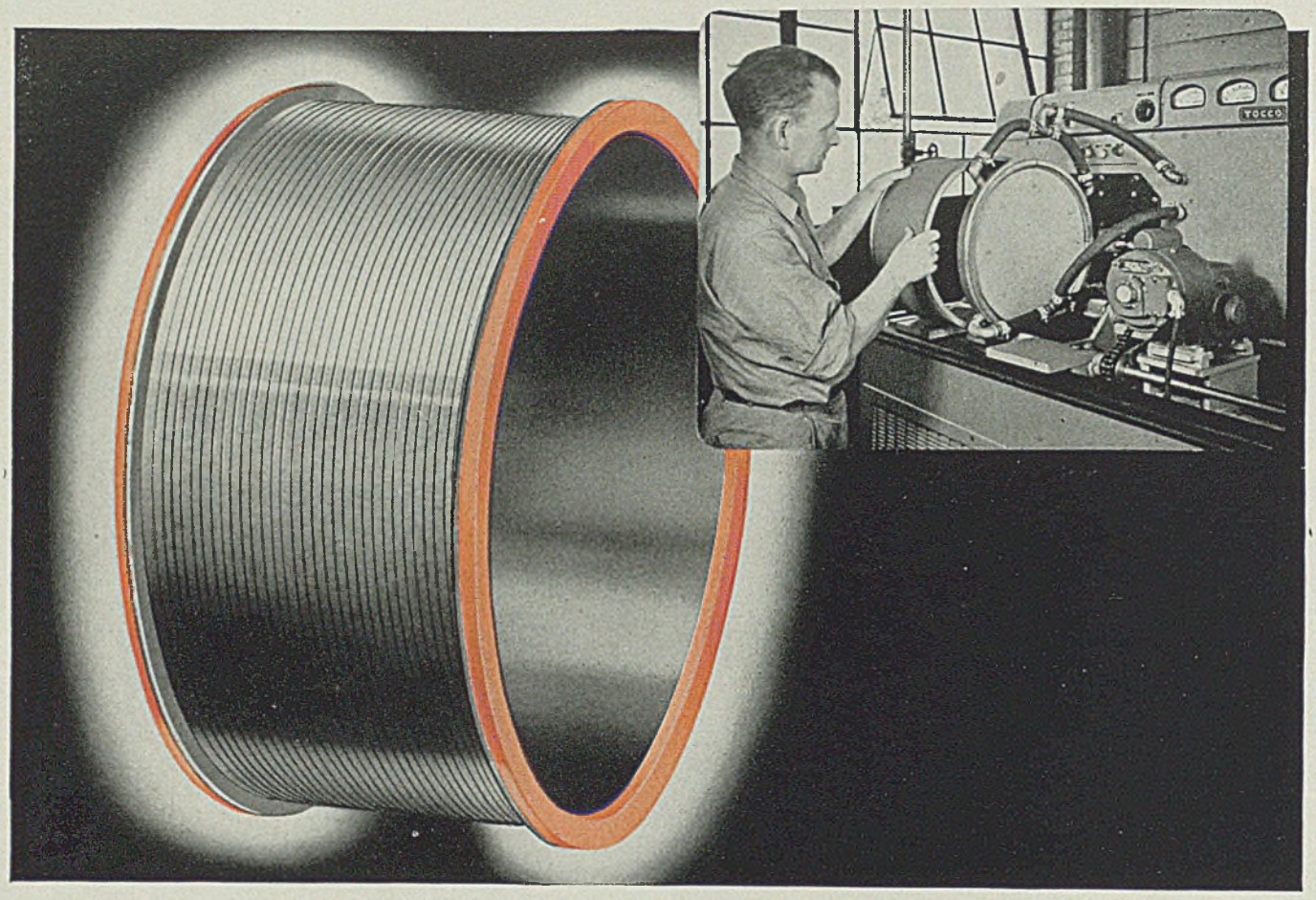

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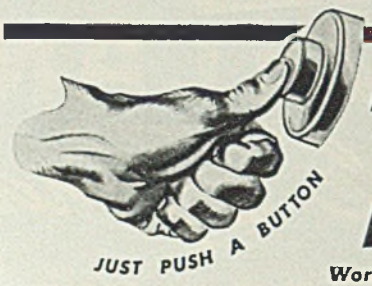

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influence of greatest practical importance to the blast furnace operation is the structural strengthening effect imparted to the sinter by the iron silicate compounds formed. The structural strengthening effect of iron silicates increases with the percentage of such silicates in the sinter and the strengthening effect of the different molecular compounds of iron silicate increases with the percentage of iron in the compound. The truth of this statement is in evidence in any sintering operation using ferrous materials.

A degree of structural strength in sinter is most desirable because without it there would not be any purpose in sintering fine materials but excessive strength can be just as objectionable as too little because it prevents the natural formation of the preferred particle size of sinter for blast furnace use.

Structural Strength Varies

The importance of the degree of structural strength in the sinter increases as the percentage of sinter in the furnace burden increases. When a small percentage of sinter is introduced into a soft ore furnace burden the particle size of that sinter is not of major importance because any size tends toward opening up the soft ore to a better passage of gas; but if the percentage of sinter in the burden is increased until the critical point is reached where the stock column becomes too open, the particle size of the sinter becomes of major importance because there must be intimate contact between the gas and the stock to assure an efficient recovery of heat.

Previously it was said that a sinter—minus 1-inch to minus 100 mesh—worked well in the furnace. With a full sinter burden it would be far better to have the sinter within the range of 75 per cent minus 0.5-inch and 25.0 per cent plus 0.5-inch rather than 75 per cent plus 0.5-inch and 25 per cent minus 0.5-inch. It is in this seemingly fine distinction in structural strength that the percentage and character of the iron silicates in the sinter are important because of the influence they exert upon the natural friability of the sinter.

It was stated previously that the blast furnace operator's only requirement of the knowledge of the chemical reaction of the reduction of the iron was that the temperature necessary to effect the reduction was available in his furnace. With that fact established the economy of the operation depends upon the rapidity with which he could heat the iron-bearing material to that temperature. With the temperature available in the blast furnace the reduction temperature of any iron silicates in the sinter is not of practical importance to the economy of the operation but the effect of that iron silicate upon the particle size of the sinter and the effect of that size upon the time element needed to heat the silicate-bearing material to the necessary reduction temperature is of vital importance.

In addition to the structural strengthening effect the iron silicates formed during the sintering operation have the objectionable feature of forming like a coat of enamel around a crystal of iron oxide and the oxide so coated is forbidden contact with the furnace gas until the silicate has been melted away. This interference with the indirect reduction of the oxide by the carbon monoxide of the gas is objectionable because it retards the reduction of the oxide and increases the work which must be done in the lower region of the furnace.

Because the furnace operations, which have had a large percentage of iron silicates in the mix, are rare the opportunity for full scale demonstration of the effects of such a mix have been limited.

That the effect of the iron silicate formation upon the particle size of the sinter is of greater importance to the reduction of the iron than the chemical composition of the silicate itself is readily conceded.

That the chemical composition of the silicate is an important factor in the degree of structural strength imparted to the sinter is strongly asserted.

That in the blast furnace a charge of sinter, if properly sized, containing a given percentage of silica existing as an iron silicate, will reduce more economically than a charge of soft ore of an equal silica content, is readily conceded.

Improvement Is Possible

That a charge of sinter free from excessive silicates will reduce more economically than a charge of sinter containing a large percentage of iron silicates is strongly asserted.

Conclusion. It may be said that theoretically so long as the temperature of the gas leaving the top of the furnace is higher than the temperature of the stock charged into the furnace there is opportunity for improvement in the recovery of heat. Use of beneficiated iron-bearing materials is simply another step in the old problem of a better application of heat to the materials. By preparing the materials to receive the heat efficiently and economically the value of the mechanical equipment heretofore developed for delivery of heat is greatly enhanced.

Beneficiated material eliminates the principal cause of irregularity in furnace operation by eliminating the restriction to gas flow through the stock column. The thought to be emphasized here is that the desire to eliminate restriction should not lead to the elimination of resistance. Uniform resistance to gas flow forces the desired uniform distribution of gas and heat throughout the stock column. Resistance to gas flow without restriction to flow is attained by eliminating the volatile matter and the tendency of earthy materials to pack but retaining the small particle size of material necessary to force the desired resistance.

Control of particle size gives control of the interstices of the stock column and permits the use of an increased recovery of the latent heat of the fuel (the carbon monoxide in the gas) by the use of higher hot blast temperature.

How Heat Is Conserved

The thought to be emphasized here is the opportunity for conservation of heat. The factor governing the economy of the use of heat is the ability of the stock column to absorb the heat delivered to it. With the heat absorbing volatiles eliminated and the ability to recover and use a greater percentage of the latent heat of the fuel by the use of a high blast temperature the blowing rate, or the heat production rate, can be reduced and so conserve much of the heat normally taken from the furnace with the gas. This increase in the efficiency and economy of the delivery and use of heat is reflected in an increase in production and a decrease in fuel rate. The blowing rate of any furnace should be based upon the character of the materials used and not upon furnace lines. There cannot be any economy in generating heat and then blowing it out of the top of the furnace as sensible heat of the gas to be absorbed by the water of the gas washer.

The use of beneficiated materials increases the efficiency of the furnace working volume for reduction purposes and consequently gives the same benefit to production as building a larger furnace. The thought to be emphasized here is the opportunity of getting the increased production of a larger furnace plus the increased economy from the more efficient reduction rate and the more efficient use of heat.

Throughout this treatise emphasis has been put upon the necessity for fines in the sinter. The only objection to fines in any blast furnace operation is to their character and percentage. Beneficiation of materials permits control of both character and percentage of fines.

Practical economy governs all industrial development. Opportunity for development in the field of beneficiation of iron-bearing materials is where the field of development in the mechanical handling of those materials was 40 years ago when the skip method of filling a furnace was new.

Truck Work Period Doubled

. . . . with only a 50 per cent increase in battery capacity

By GEORGE E. STRINGFELLOW
Division Manager
Storage Battery Division
Thomas A. Edison Inc.
Orange, N. J.

BY THE ADOPTION of increased battery capacities for its fleet of industrial trucks, the Fairmount Glass Works, an extensive producer of glass containers, has successfully met the demands of increased production during the past few years and, more recently, the further increases brought about by the production of new types of containers to replace those made of other materials which are suffering from war-induced shortages.

Especially noteworthy is the fact that an increase of only 50 per cent in the battery capacities has increased the truck operating hours per charge by 100 per cent.

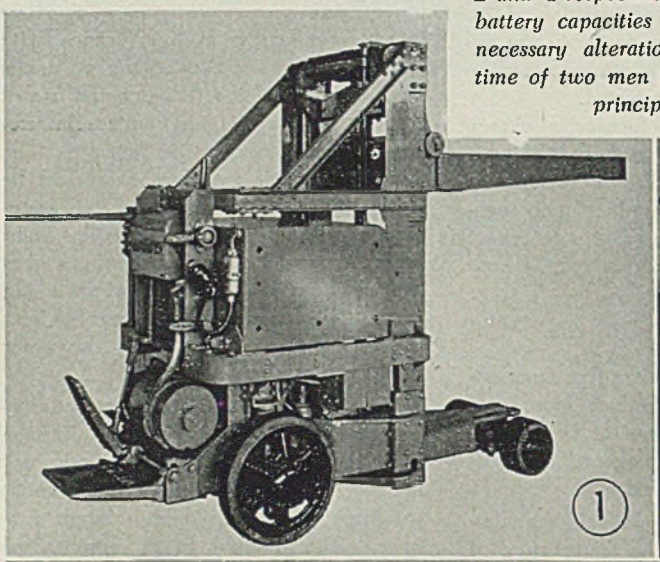
Installation of the higher batteries was accomplished by a very simple change in the compartments. At the same time, the facilities for servicing the trucks were removed from a small, congested corner in the power house, where they originally had been located, and were transferred to a new building, provided especially for the purpose, where a service station, which is a model of its kind, was laid out and installed.

All of the work was done by Edward Litz, chief electrician, who now has the satisfaction of knowing that he has accomplished the result so urgently sought in every industry since the war began—making the best use of equipment already at hand.

The company's present fleet of five battery trucks, consisting of both low-lift and high-lift types, dates from 1930, when the skid-lift truck system was applied to the handling of containers from the point where they are inspected and packed in shipping cartons to outgoing carriers and storage.

From the glass-blowing machines, the containers are automatically conveyed through lehrs (where they are annealed by control of the rate of cooling) and out onto tables where they are inspected and packed into shipping cartons, which are put on waiting skid platforms.

Comparison of the two trucks taken before (Figs. 1 and 3) and after (Figs. 2 and 4 respectively). Change to higher battery capacities shows how easily the necessary alterations were made. The time of two men for two shifts was the principal expense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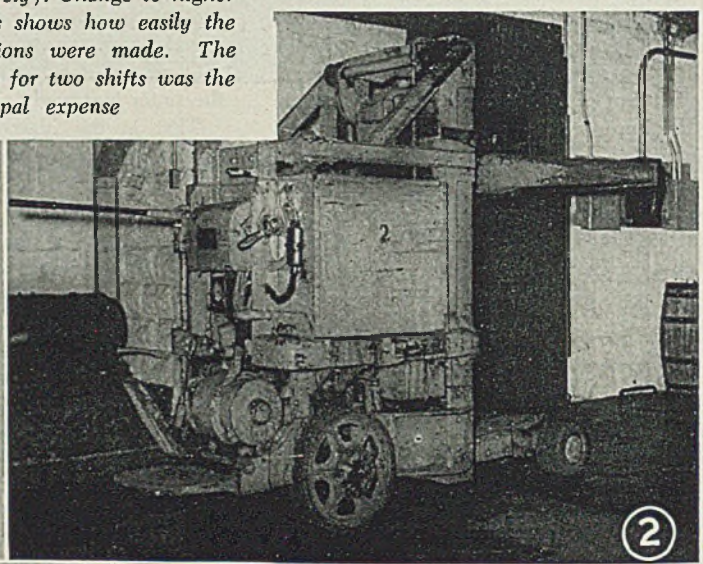
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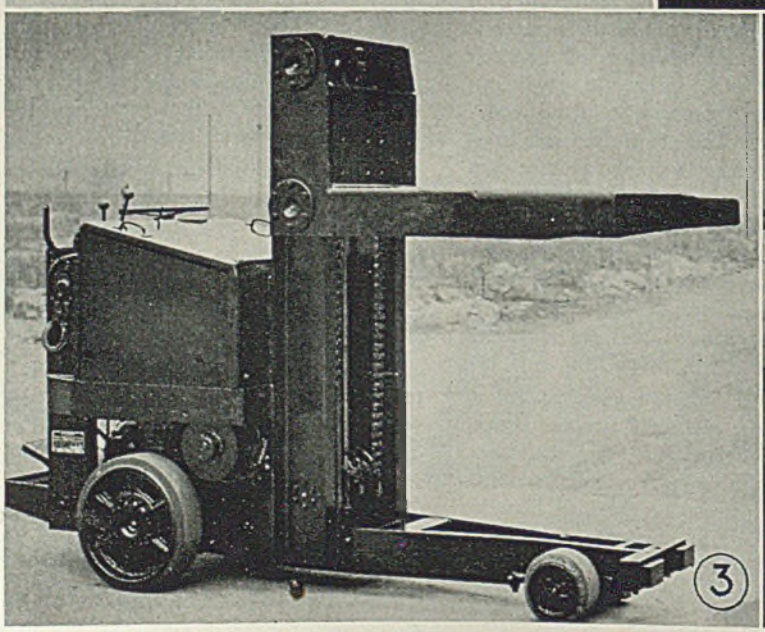
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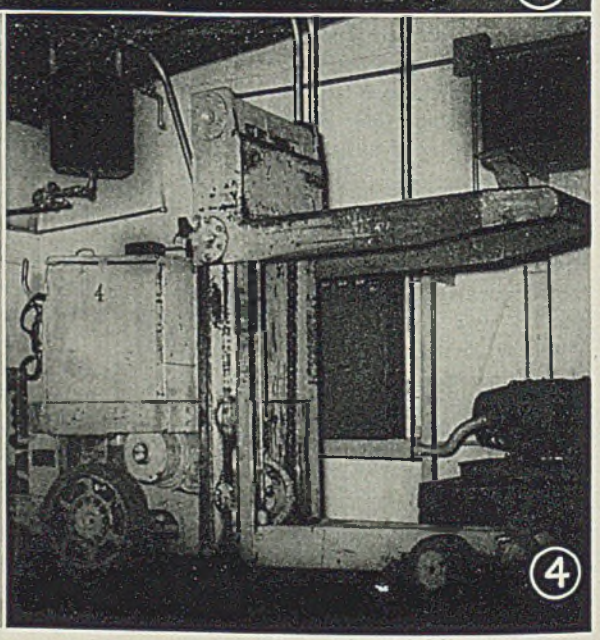
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Steel *makes good rat traps*

Funny thing about rat traps, they don't all look like rat traps. Take *coke ovens.* You need *coke* to make iron, *iron* to make steel, *steel* to crush international rats. When the steel industry put into operation currently-built Koppers coke ovens vast enough to produce five million *more* tons of coke annually, that was a major Allied victory. Or take couplings. You can't get enormous steel tonnages if couplings go bad and shut down machinery. That used to happen often, but the steel industry for years has been putting Koppers Fast's Couplings at all vital spots; today, the non-stop records of these couplings are like shots heard round the world. Koppers also serves the Steel industry with coking coal, plants to recover chemicals, D-H-S Bronze and other products.—Koppers Company, Pittsburgh, Pa.

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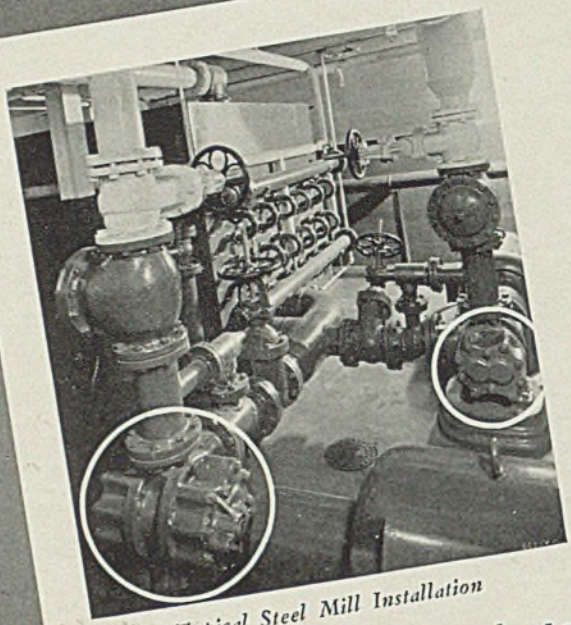
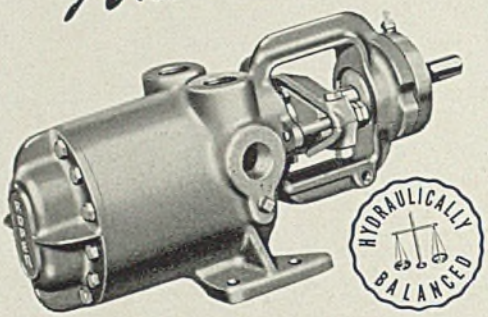


Typical Steel Mill Installation



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The lift trucks remove the loads as they accumulate.

The production rate of the glass-blowing machines nearly always greatly exceeds the rate at which it is convenient for the customer to accept shipments. On the other hand, the greater the volume of production of any one item per machine setup, the lower will be the unit cost.

Therefore, in the interests of production efficiency individual runs are almost always considerably larger than current shipments, with the result that extensive provision must be made for storage. This increases the number of necessary handlings between production and final shipment so that any substantial increase in production multiplies very rapidly the work required of the trucks.

When the trucks were originally installed, they were provided with 24-cell A8 batteries, which carried the trucks through one shift of operation per charge. This was adequate at the time because the trucks were then operating one shift a day. However, as production increased and the working hours of the trucks were extended (the plant is now working 24 hours a day) a point was reached when more truck operating hours had to be provided.

Of the two possible solutions—more trucks or higher battery capacities for the existing trucks—the latter was investigated first. As an experiment, one of the trucks was equipped with a 24-cell C8 battery in place of the 24-cell A8 originally applied. As the C8 has a rated capacity of 450 ampere hours compared to 300 for the A8, its use should theoretically provide 1½ shifts of truck operation compared to one shift with the A8. On the same theory, the use of two sets of C8 per truck should provide continuous three-shift operation at any time that such a schedule might be necessary, with only two exchanges per 24 hours.

But the actual results after five days of test were better than that, as shown by the following tabulation and paragraph taken from Mr. Litz' records:

Hours in Service	Amp.-Hr. Used
14	330
14	450
14	440
14	300
12	390

"These records show clearly that these batteries will carry the trucks two shifts instead of one as our present batteries do. These batteries will therefore relieve the tractor situation without the purchase of any more tractors."

The necessary alterations in the battery compartments were easily made, the time of two men for two shifts being the principal expense. Since the changeover it has been found that, with all of the trucks available for service throughout two full shifts, they have been able thus far to handle the work without spare batteries. This has merely required a scheduling of the charging intervals so as to keep an adequate number of trucks on duty throughout the various shifts.

However, provision has been made for the time when exchange of batteries may be necessary by installing in the new service station a tramrail, from which a hoist can be operated, as well as sufficient motor-generator capacity to charge up to four batteries simultaneously.

Conduits for the charging leads and pipes for distilled water are both brought to within easy reach of the batteries to be charged. The charge-test fork is used for determining the charge requirements, and the standard nozzle and bell for flushing.

A modern feature not shown in the photographs is a greasing pit.

Means Used To Increase War Output Described in Report

Carefully planned production control in plants—small, medium, or large—enabled manufacturers of wartime goods to double their output without undergoing serious disruptions despite machine and manpower limitations.

The means used to help accomplish such intensive controlled production are made the subject of a report recently issued by the Policyholders Service Bureau, Metropolitan Life Insurance Co., New York.

The report, entitled, "Controlling Factory Production" represents a study based on the practices of 44 manufacturers operating in a wide variety of industries who are believed to represent a cross-section of sound management practices.

The report stresses scheduling of materials and machines and is concerned with the time element of manufacturing and in related functions—the questions of how and when goods are to be produced. It discusses problems of meeting promised delivery dates, maintaining a steady flow of work in the shop, utilizing available equipment and manpower properly, and avoiding congestion.

Separate descriptions are given of the scheduling of the small, medium, and large-size shops, and forms used are reproduced. In the interest of furthering war production, Metropolitan is making this report available to executives who address the bureau on their business letterhead.

Handbook on Gas Welding Covers "All Angles"

Oxy-Acetylene Welding and Cutting, by J. W. Giachino; cloth, 196 pages, 6 x 9 inches; published by Manual Arts Press, Peoria, Ill., for $2.50.

An illustrated handbook on gas welding and cutting, this volume is especially prepared to show step by step details of a general and specialty work. It includes illustrated instructions on welding of aluminum alloys and 18-8 chromium steels, in addition to coverage of equipment and methods involved in regular plate and tube welds.

Each job is explained with direct application to everyday problems of construction and repair. Features include charts on metal identification; official qualification test for United States aircraft welders, including illustrated practice welds for the test; a complete reprint of official association rules for preventing welding and cutting fires; and a reprint of official regulations for gas systems.

New Protective Coating Saves Time and Coils

Koilkote, a new protective coating material developed by Michigan Chrome and Chemical Co., 6340 East Jefferson avenue, Detroit, especially for use on steel coils in rustproofing systems is reported to provide the means to save hours of time usually spent in removing deposits and to lengthen the useful life of the coils.

In ordinary practice, it is explained, the coils in rustprofing systems which are in constant use must necessarily be removed and cleaned approximately every two weeks. Method used to remove the deposits consisted of pounding with a sledge, with the obvious possibility of damaging the coils besides requiring almost a full day of a man's time.

With the new material, it is said, it is not necessary to clean the coils more than once in five or six weeks, and actual cleaning time is usually less than one hour. Since deposits do not form as heavily or as quickly on the coating, there is little appreciable difference in the heating efficiency of the coils between cleaning periods.

Comparison Data Showing Relationship Between Standard Steels and . . .

NE (National Emergency) ALLOY

IN TABLE I will be found a list of AISI-SAE steels and NE-8000 series steels, grouped according to their hardenability values, together with the alternate or alternates having approximately the same hardenability values. To determine whether each steel listed is similar in hardenability for the full length of the end-quench test, it will be necessary to study the details in the charts accompanying this article and appearing on pages 103, 104, and 105. Additional charts in this issue will appear next week.

In the standard end-quench hardenability charts included here, hardenability test data from production heats of AISI-SAE steel and NE-8000 series steels have been compared with the experimental test data of the possible alternate steel type. It should be noted that the recommended alternate composition range shown does not in some cases conform exactly to the alternate type tested. That is because it was necessary to adjust the experimental composition slightly to allow for the difference found to exist between the steel actually tested and the recommended alternate composition range. Such adjustments are necessary in order to present compositions similar in hardenability characteristics to the steels which are to be replaced and also to establish the smallest number of composition types, thereby reducing to a minimum the number of steels to be manufactured.

In preparing the information in this article, the Technical Committee on Alloy Steel of the American Iron & Steel Institute recognized that hardenability tests do not necessarily describe all the properties inherent in or desired in a given steel, but because of the short time permitted to complete the study it would have been impossible to investigate all types of physical property test results before presenting the list which is urgently needed for present melting schedules for those consumers of steel who are satisfied with hardenability tests only.

In the meantime, however, a physical property testing program has been started, and as soon as results are available American Iron & Steel Institute will issue data sheets bearing the results of the tests, according to the same procedure as now followed on the test results on the NE-8000 series steels.

The fact that the physical property test data which have been accumulated to date on the NE-8000 series steels conform in all essential respects to the ordinary physical property test data available for standard steels leads the committee to the conclusion that the new NE steels will exhibit similar characteristics.

That conclusion is substantiated by the work of Baeyertz and Janitzky and Boeghold, and the summaries herein presented of normal expectancies for the NE-8000 series steels.

In all that work it is shown that a predictable relationship exists between brinell hardness and tensile strength, and yield point, tensile strength and elongation, tensile strength and reduction of area. This is particularly true of alloy steels heat treated to hardness levels of 225 to 400 brinell, or from about 110,000 to approximately 200,000 pounds per square inch tensile strength, a range in which the greater portion of heat-treated alloy steels are used.

In the chemical composition tables it will be noted that no low-carbon carburizing grades of manganese-silicon-chromium steels have been listed. That is because an increase in either manganese or chromium, or a combination of both, presents certain problems in the manufacturing procedures which are not conducive to the average quality required of low-carbon steels, except by the use of extremely low-carbon ferroalloys. Because of these conditions and the necessity for the use of large quantities of ferromanganese and ferrochromium, it is not feasible, in view of the problems presented in procurement and availability, to include a low-carbon steel of high chromium or high manganese content.

For information on development of NE steels and their properties, see STEEL, Feb. 9, 1942, p. 70; March 16, p. 72; June 8, p. 66; June 15, p. 66; July 13, p. 80; July 20, p. 86; Aug. 3, p. 70; Aug. 17, p. 40; Aug. 31, p. 41, p. 76; Sept. 7, p. 78; Oct. 19, p. 66; Nov. 9, p. 96; Dec. 28, p. 27; Jan. 25, 1943, p. 84.

For reports of users of NE steels, see Nov. 16, p. 106; Nov. 23, p. 90; Nov. 30, p. 62; Dec. 7, p. 112; Dec. 14, p. 99; Dec. 21, p. 70; Jan. 11, 1943, p. 60; Jan. 18, p. 66; Feb. 1, p. 100.

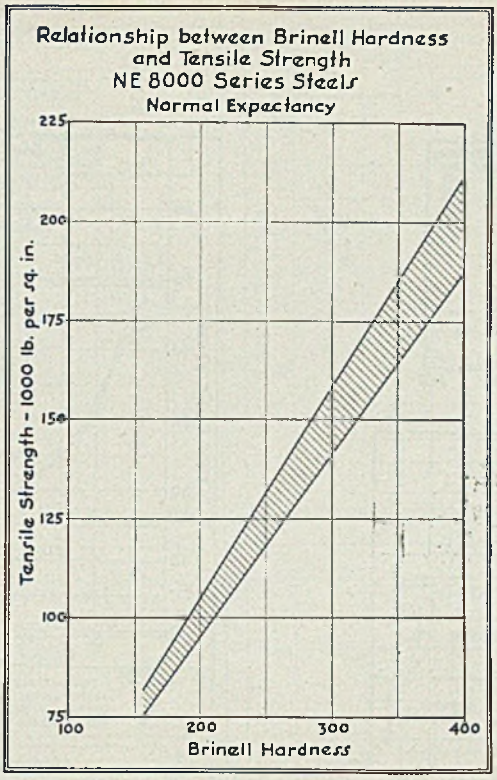
For latest revised listing of NE steels, see Jan. 25, 1943 issue, p. 84.

TABLE I—Standard and NE Steels Grouped According to Average Hardenability Values

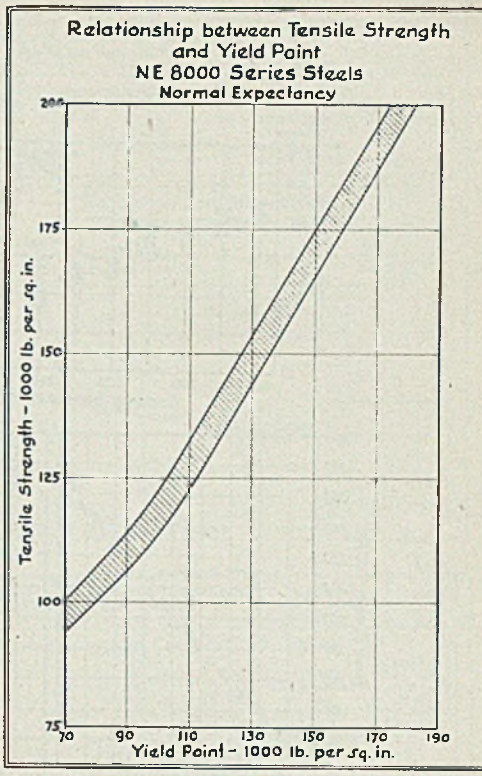
AISI-SAE Number	NE Steel Number	AISI-SAE Number	NE Steel Number
A-2317, A-2320	NE-8020, NE-9420	A-5135	NE-1335, NE-9435, NE-9635
A-3115, A-3120	NE-8020, NE-9420	A-5140	NE-1340, NE-9435, NE-9635
A-4023, A-4024	NE-8020, NE-9420	A-6135	NE-1335, NE-9435, NE-9635
A-4119, A-4615, A-4620, A-5120, A-6120	NE-9420	A-6140	NE-1340, NE-9435, NE-9635
A-4027, A-4032, A-4120	NE-9422	A-4137, A-4640	NE-1340, NE-9637, NE-9437
A-4320	NE-8720, NE-9422	A-3045, A-3140, A-4140, A-4645, A-5145, A-6145	NE-1345, NE-9640, NE-9440
A-4815	NE-9420		
A-4820	NE-8720, NE-9422		
A-2512	NE-9415	A-2340, A-3141, A-3240, A-4142	NE-1345, NE-9642, NE-9442
A-2515	NE-8720, NE-9422		
A-4337, A-4340	NE-9537, NE-9540		

AISI-SAE Number	NE Steel Number	AISI-SAE Number	NE Steel Number
A-2330, A-3130, A-4037, A-4042	NE-1330, NE-9430, NE-9630	A-2345, A-3145, A-4145, A-5150, A-6150	NE-1350, NE-9645, NE-9445
A-4047	NE-1335, NE-9435, NE-9635	A-2350, A-3150, A-3250, A-4150	NE-9650, NE-9450
A-4130, A-5130, A-6130	NE-1330, NE-9430, NE-9630	A-4063, A-4065	NE-9255, NE-9260
A-2335	NE-1340, NE-9435, NE-9635	A-4068, E-52095, E-52098, E-52099	NE-9262, NE-52100C, NE-52100B
A-3135	NE-1335, NE-9435, NE-9635	E-52100, E-52101, E-52107	NE-52100A

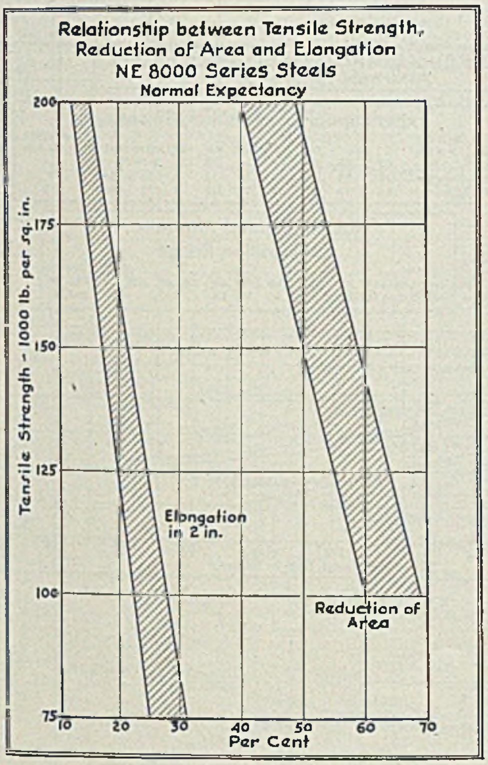
STEELS



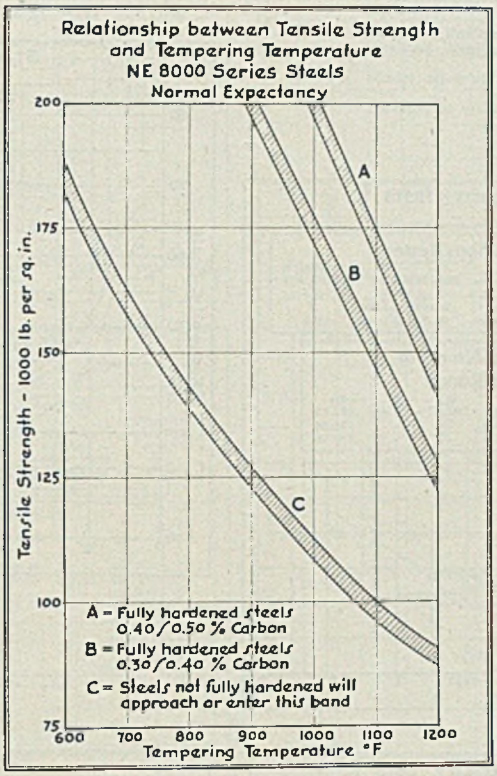
Relationship between Brinell Hardness and Tensile Strength
NE 8000 Series Steels
Normal Expectancy



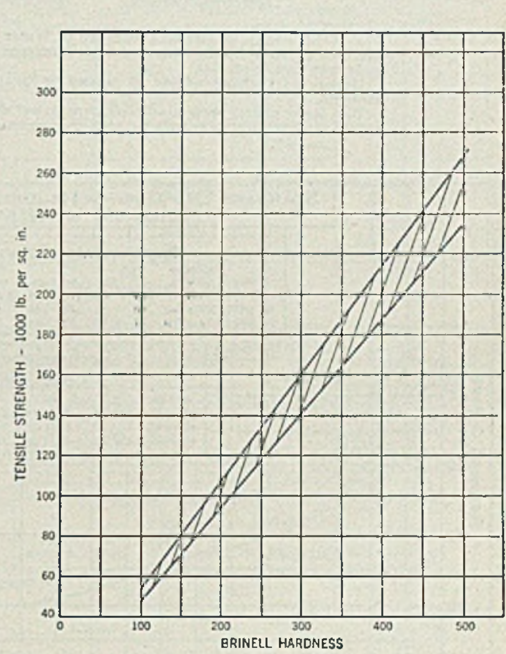
Relationship between Tensile Strength and Yield Point
NE 8000 Series Steels
Normal Expectancy

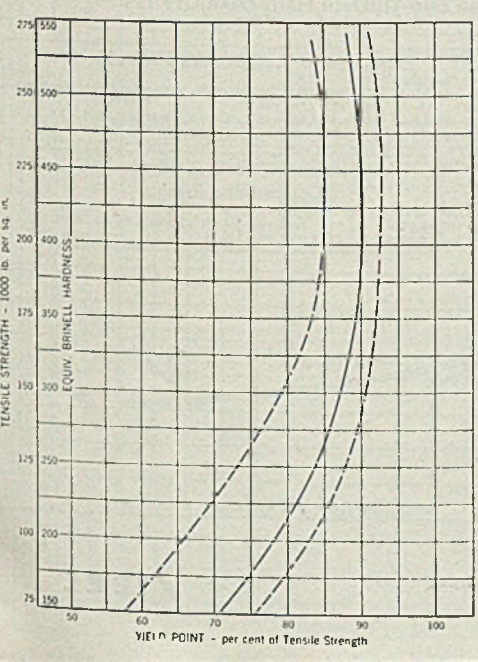


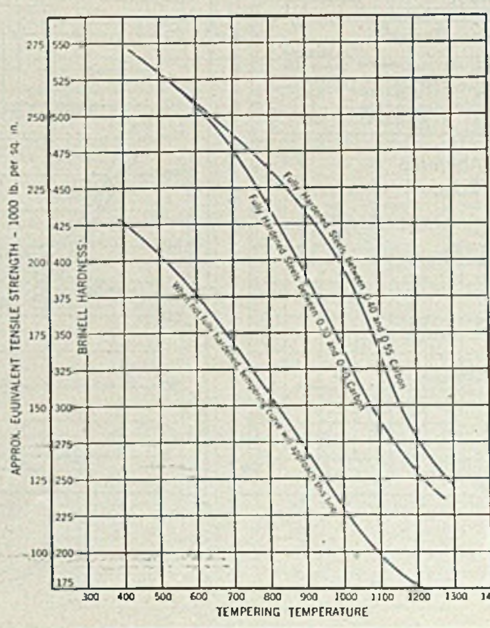
Relationship between Tensile Strength, Reduction of Area and Elongation
NE 8000 Series Steels
Normal Expectancy

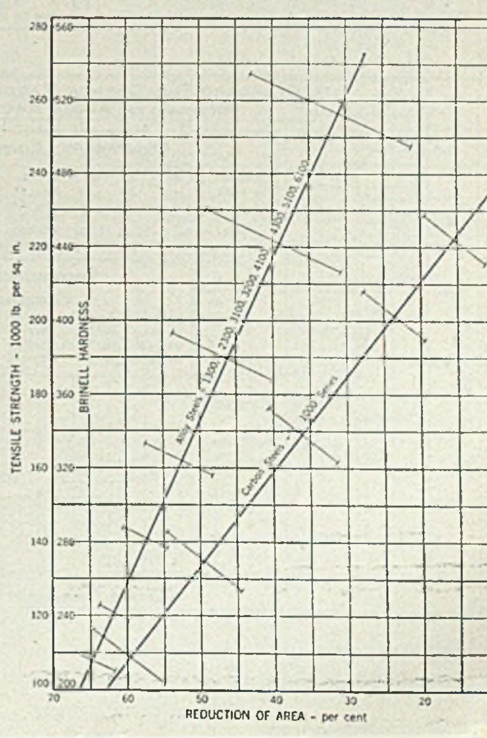


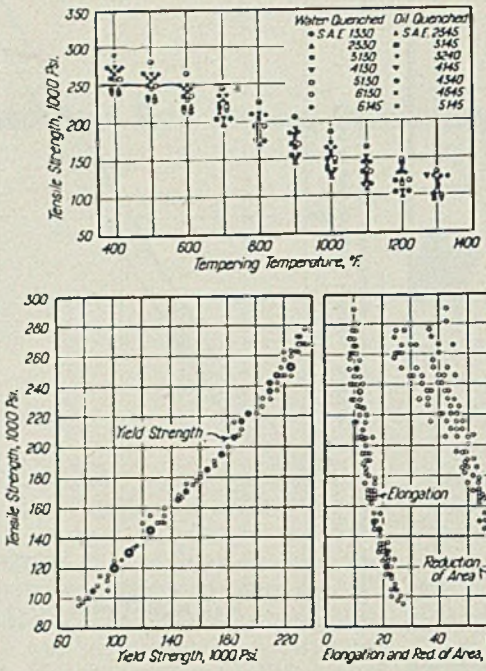
Relationship between Tensile Strength and Tempering Temperature
NE 8000 Series Steels
Normal Expectancy







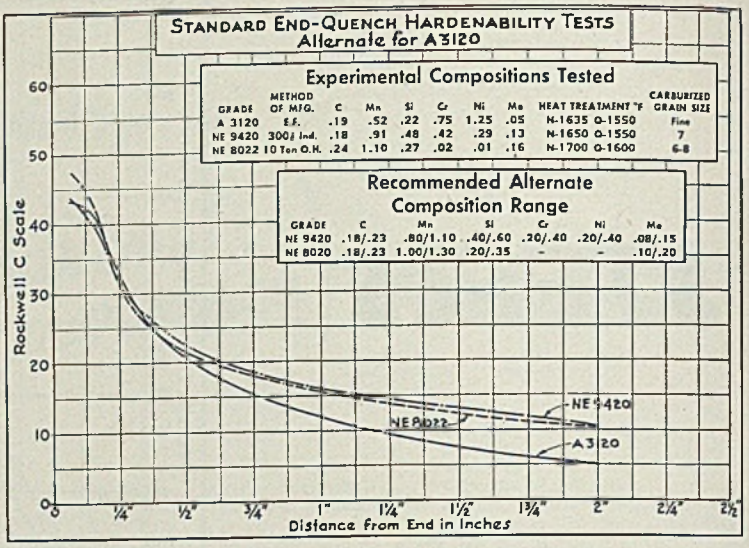


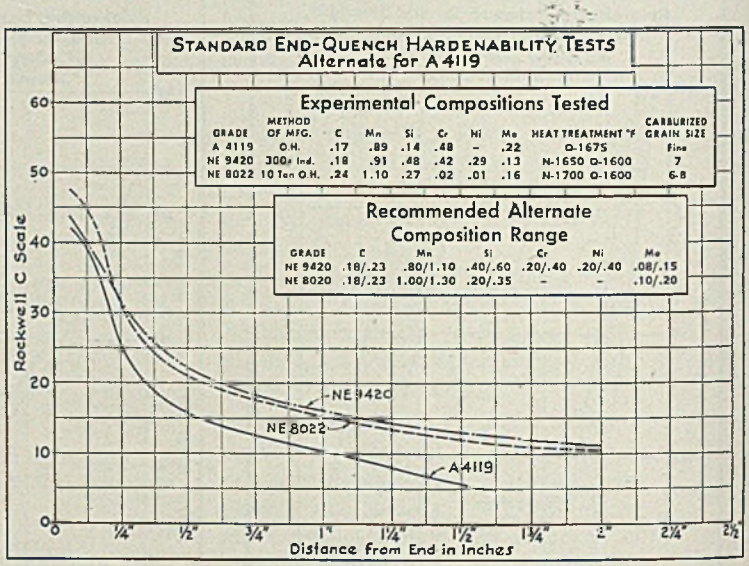


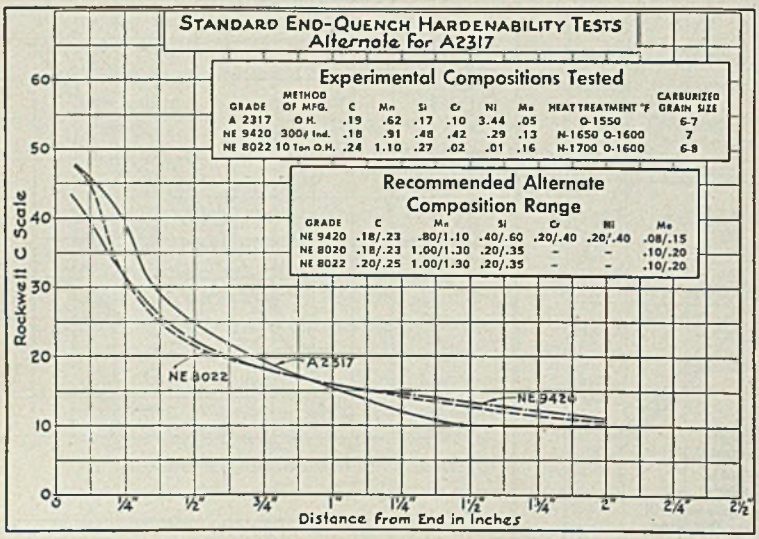
Similarity in Tensile Properties of Water Hardening and Oil Hardening Alloy Steels Quenched and Tempered in Small Sections. *(Janitzky and Baeyertz).*

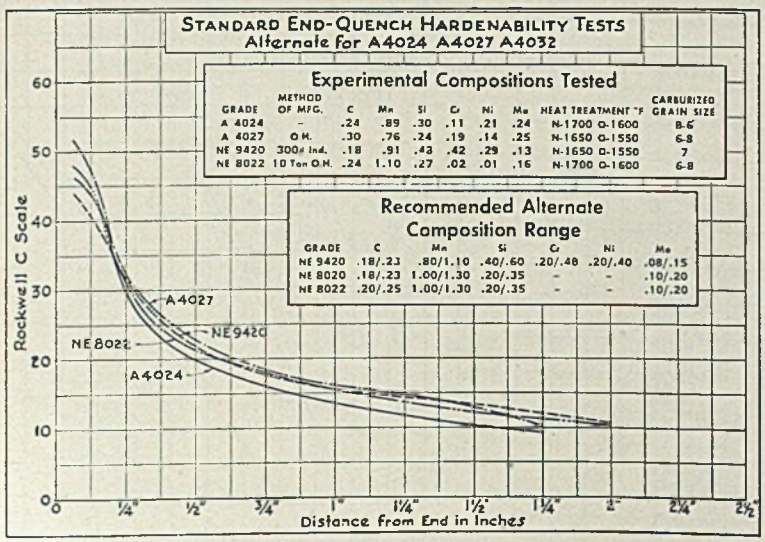
Upper chart shows effects of tempering temperature on tensile strength.

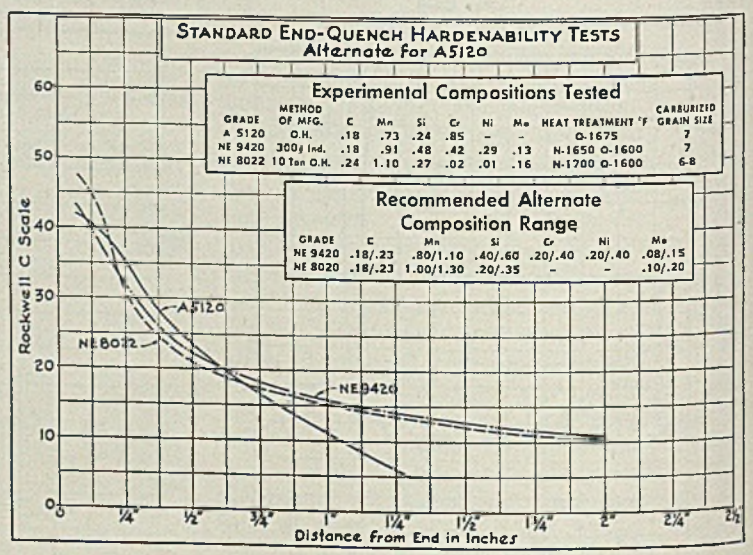
Two lower charts show elastic properties and ductility at different tensile strengths for the steels listed in the upper chart.











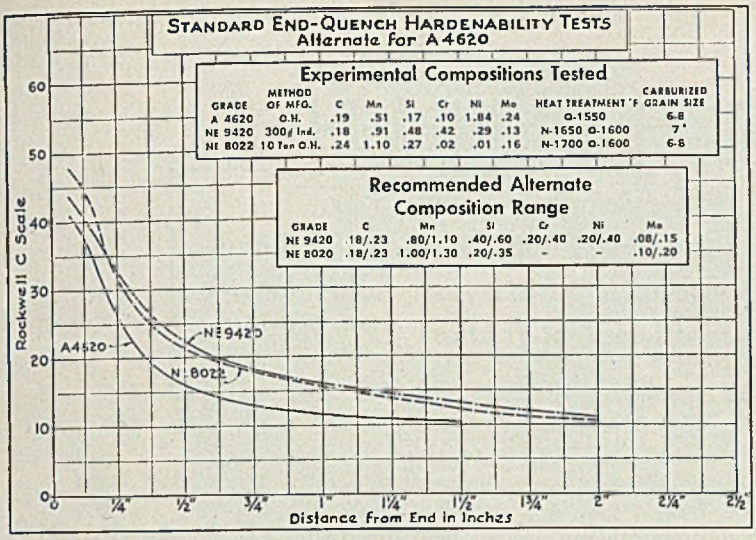
Standard End-Quench Hardenability Tests
Alternate for A 4620

Experimental Compositions Tested

Grade	Method of Mfg.	C	Mn	Si	Cr	Ni	Mo	Heat Treatment °F	Carburized Grain Size
A 4620	O.H.	.19	.51	.17	.10	1.84	.24	Q-1550	6-8
NE 9420	300# Ind.	.18	.91	.48	.42	.29	.13	N-1650 Q-1600	7
NE 8022	10 Ton O.H.	.24	1.10	.27	.02	.01	.16	N-1700 Q-1600	6-8

Recommended Alternate Composition Range

Grade	C	Mn	Si	Cr	Ni	Mo
NE 9420	.18/.23	.80/1.10	.40/.60	.20/.40	.20/.40	.08/.15
NE 8020	.18/.23	1.00/1.30	.20/.35	–	–	.10/.20



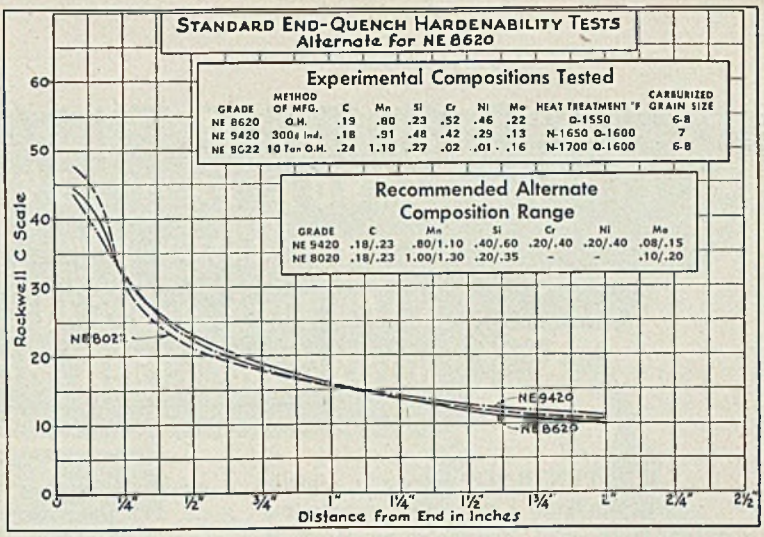
Standard End-Quench Hardenability Tests
Alternate for NE 8620

Experimental Compositions Tested

Grade	Method of Mfg.	C	Mn	Si	Cr	Ni	Mo	Heat Treatment °F	Carburized Grain Size
NE 8620	O.H.	.19	.80	.23	.52	.46	.22	Q-1550	6-8
NE 9420	300# Ind.	.18	.91	.48	.42	.29	.13	N-1650 Q-1600	7
NE 8022	10 Ton O.H.	.24	1.10	.27	.02	.01	.16	N-1700 Q-1600	6-8

Recommended Alternate Composition Range

Grade	C	Mn	Si	Cr	Ni	Mo
NE 9420	.18/.23	.80/1.10	.40/.60	.20/.40	.20/.40	.08/.15
NE 8020	.18/.23	1.00/1.30	.20/.35	–	–	.10/.20



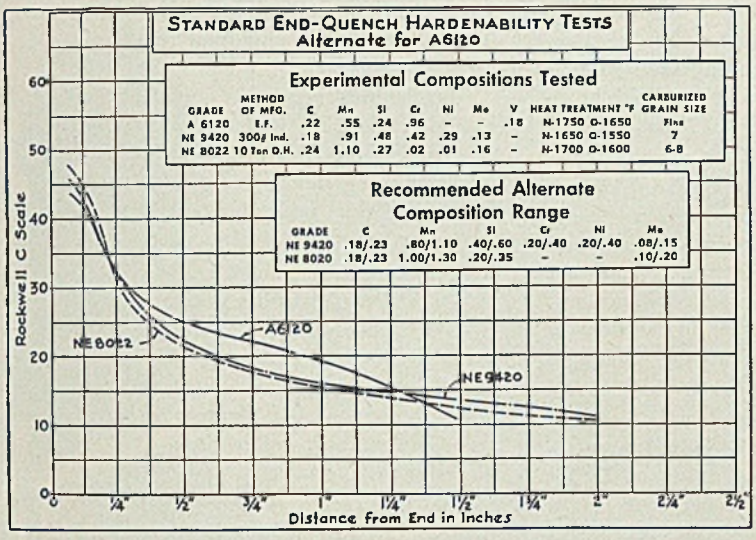
Standard End-Quench Hardenability Tests
Alternate for A6120

Experimental Compositions Tested

Grade	Method of Mfg.	C	Mn	Si	Cr	Ni	Mo	V	Heat Treatment °F	Carburized Grain Size
A 6120	E.F.	.22	.55	.24	.96	–	–	.18	N-1750 Q-1650	Fine
NE 9420	300# Ind.	.18	.91	.48	.42	.29	.13	–	N-1650 Q-1550	7
NE 8022	10 Ton O.H.	.24	1.10	.27	.02	.01	.16	–	N-1700 Q-1600	6-8

Recommended Alternate Composition Range

Grade	C	Mn	Si	Cr	Ni	Mo
NE 9420	.18/.23	.80/1.10	.40/.60	.20/.40	.20/.40	.08/.15
NE 8020	.18/.23	1.00/1.30	.20/.35	–	–	.10/.20



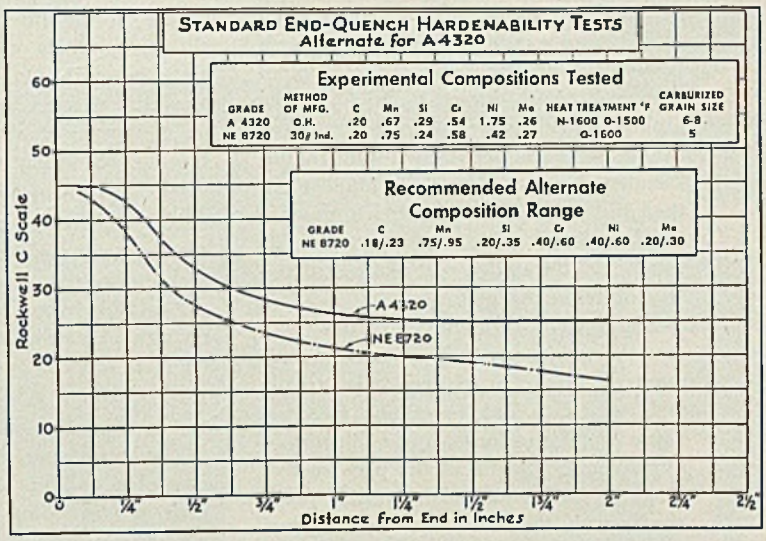
Standard End-Quench Hardenability Tests
Alternate for A 4320

Experimental Compositions Tested

Grade	Method of Mfg.	C	Mn	Si	Cr	Ni	Mo	Heat Treatment °F	Carburized Grain Size
A 4320	O.H.	.20	.67	.29	.54	1.75	.26	N-1600 Q-1500	6-8
NE 8720	30# Ind.	.20	.75	.24	.58	.42	.27	Q-1600	5

Recommended Alternate Composition Range

Grade	C	Mn	Si	Cr	Ni	Mo
NE 8720	.18/.23	.75/.95	.20/.35	.40/.60	.40/.60	.20/.30



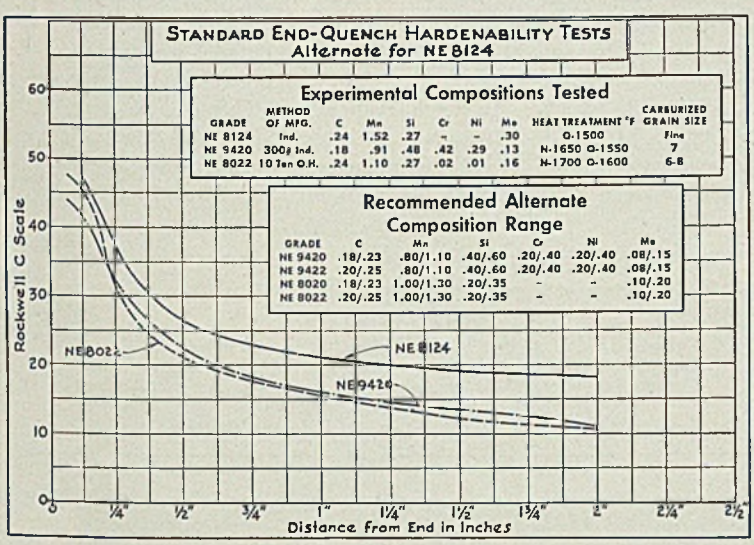
Standard End-Quench Hardenability Tests
Alternate for NE 8124

Experimental Compositions Tested

Grade	Method of Mfg.	C	Mn	Si	Cr	Ni	Mo	Heat Treatment °F	Carburized Grain Size
NE 8124	Ind.	.24	1.52	.27	–	–	.30	Q-1500	Fine
NE 9420	300# Ind.	.18	.91	.48	.42	.29	.13	N-1650 Q-1550	7
NE 8022	10 Ton O.H.	.24	1.10	.27	.02	.01	.16	N-1700 Q-1600	6-8

Recommended Alternate Composition Range

Grade	C	Mn	Si	Cr	Ni	Mo
NE 9420	.18/.23	.80/1.10	.40/.60	.20/.40	.20/.40	.08/.15
NE 9422	.20/.25	.80/1.10	.40/.60	.20/.40	.20/.40	.08/.15
NE 8020	.18/.23	1.00/1.30	.20/.35	–	–	.10/.20
NE 8022	.20/.25	1.00/1.30	.20/.35	–	–	.10/.20



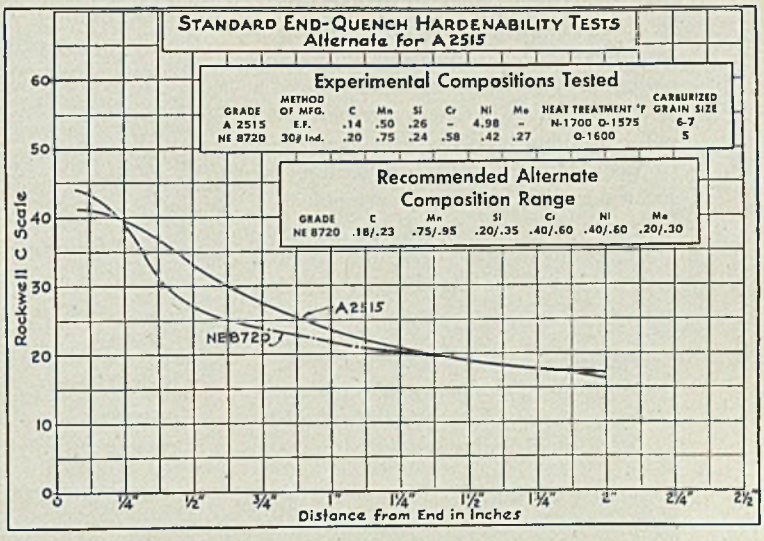
Standard End-Quench Hardenability Tests
Alternate for A 2515

Experimental Compositions Tested

Grade	Method of Mfg.	C	Mn	Si	Cr	Ni	Mo	Heat Treatment °F	Carburized Grain Size
A 2515	E.F.	.14	.50	.26	–	4.98	–	N-1700 Q-1575	6-7
NE 8720	30# Ind.	.20	.75	.24	.58	.42	.27	Q-1600	5

Recommended Alternate Composition Range

Grade	C	Mn	Si	Cr	Ni	Mo
NE 8720	.18/.23	.75/.95	.20/.35	.40/.60	.40/.60	.20/.30



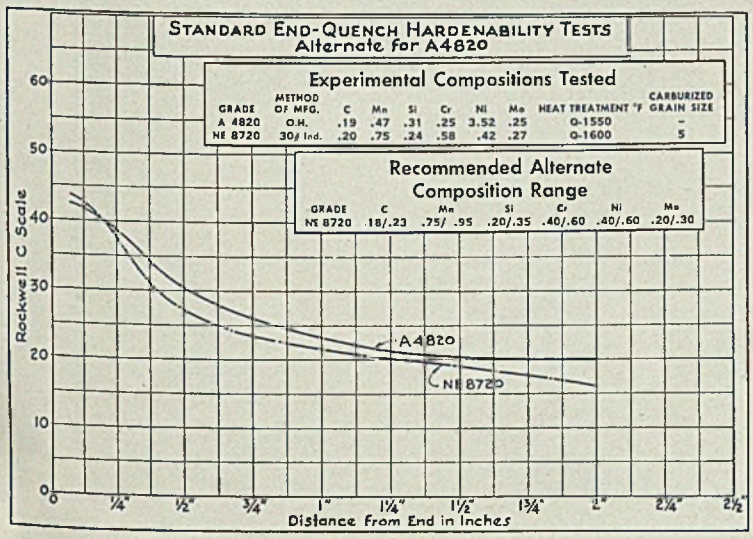
Standard End-Quench Hardenability Tests
Alternate for A4820

Experimental Compositions Tested

Grade	Method of Mfg.	C	Mn	Si	Cr	Ni	Mo	Heat Treatment °F	Carburized Grain Size
A 4820	O.H.	.19	.47	.31	.25	3.52	.25	Q-1550	–
NE 8720	30# Ind.	.20	.75	.24	.58	.42	.27	Q-1600	5

Recommended Alternate Composition Range

Grade	C	Mn	Si	Cr	Ni	Mo
NE 8720	.18/.23	.75/.95	.20/.35	.40/.60	.40/.60	.20/.30



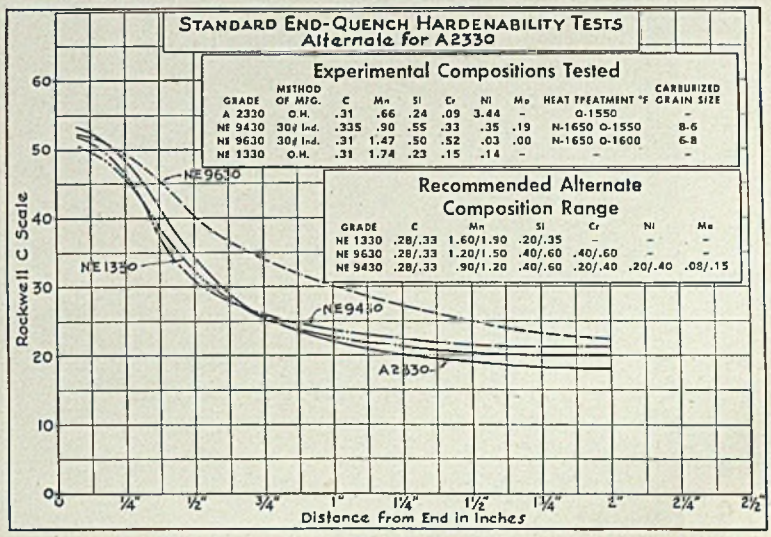
Standard End-Quench Hardenability Tests
Alternate for A2330

Experimental Compositions Tested

Grade	Method of Mfg.	C	Mn	Si	Cr	Ni	Mo	Heat Treatment °F	Carburized Grain Size
A 2330	O.H.	.31	.66	.24	.09	3.44	–	Q-1550	–
NE 9430	30# Ind.	.335	.90	.55	.33	.35	.19	N-1650 Q-1550	8-6
NE 9630	30# Ind.	.31	1.47	.50	.52	.03	.00	N-1650 Q-1600	6-8
NE 1330	O.H.	.31	1.74	.23	.15	.14	–	–	–

Recommended Alternate Composition Range

Grade	C	Mn	Si	Cr	Ni	Mo
NE 1330	.28/.33	1.60/1.90	.20/.35	–	–	–
NE 9630	.28/.33	1.20/1.50	.40/.60	.40/.60	–	–
NE 9430	.28/.33	.90/1.20	.40/.60	.20/.40	.20/.40	.08/.15



PROTECTIVE FINISH

. . . . is applied to steel without the use of critical materials. Surface produced resists rust, holds lubricants well, has low coefficient of friction

THE PENTRATE process is a method of applying a protective, penetrating finish to steel, developed by Heatbath Corp., Springfield, Mass. Rich, deep black in appearance, the Pentrate finish is obtained at low temperature through chemical action brought about by the ability of steel surfaces to react favorably to the laboratory-controlled phytanium-blended Pentrate formula. Much more than just colorful and attractive, the finish has found wide acceptance for its substantial durability, rust resistance, and friction-reducing qualities.

The low cost of operation of this process makes it particularly suitable for mass production work, yet it is equally well suited to fine precision parts because there is no build-up or dimensional change in the size of the part treated. Tests in independent laboratories prove conclusively that there is an actual penetration of from 0.00035 to 0.00045-inch. In obtaining this penetration the effect of any previous heat treatment is not impaired in any way. In other words, a steel part with a hardness of rockwell 65 will retain that hardness after Pentrating. Consequently, the finish is as hard as the surface to which it has been applied.

Even more important than its exceptional characteristics of durability and rust resistance is its friction-reducing quality on bearing surfaces, cutting tools, etc. Penetrate users who have run tests on bearings show a highly profitable increase in the life of the bearings due to the qualities imparted by the Pentrate process. On cutting tools in particular, Pentrate's ability to hold lubricant "in place" has in some cases doubled the life of ordinary tools.

At one plant trouble was being experienced in manufacturing cylinders, severe scoring on walls and seizure resulting in pick-up between the furnaces. After the piston jacks were penetrated, there was no sign of scoring either in the bore or on the flanges, and the cylinder bore was extremely sataisfactory.

According to reports recently received, use of this process has resulted in an increase in tool life amounting to 25 per cent in gun rifling, 80 per cent for an automobile reamer, 140 per cent for a circular form tool, 50 per cent for a thread milling cutter, 50 per cent for another circular form tool, and 30 per cent for a parting tool. Lathe tools which normally produced 125 pieces produced 400 pieces after being penetrated. Normal cyanided tools which produced 320 pieces produced 600 pieces after being cyanided and Pentrated.

The above figures and those in Table I are the result of careful investigation. They illustrate the important results obtainable.

The Pentrate process is one of immersion in two low-temperature solutions that are composed of phytanium-blended Pentrate and water. The average installation for this process consists of six tanks in the following sequence:

—Hot alkali cleaner.

—Cold running water rinse.

—Phytanium-blended Pentrate and water boiling at 285 degrees Fahr.

—Phytanium-blended Pentrate and water boiling at 310 degrees Fahr.

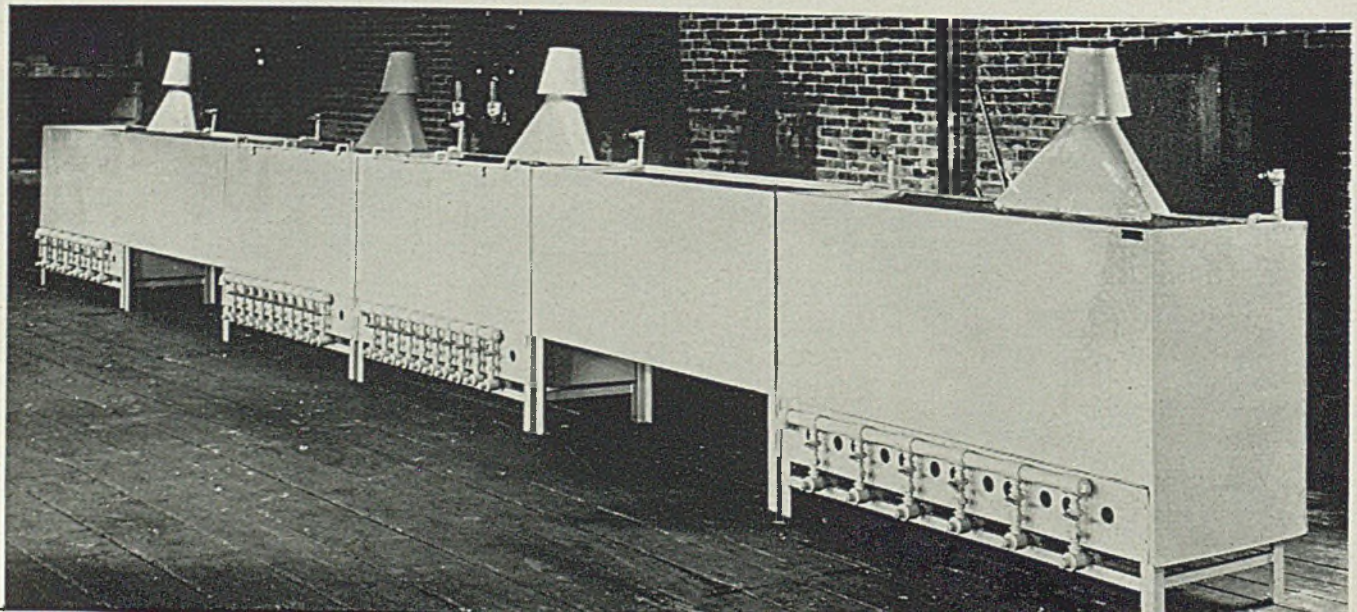
—Cold running water rinse.

—Hot soluble oil.

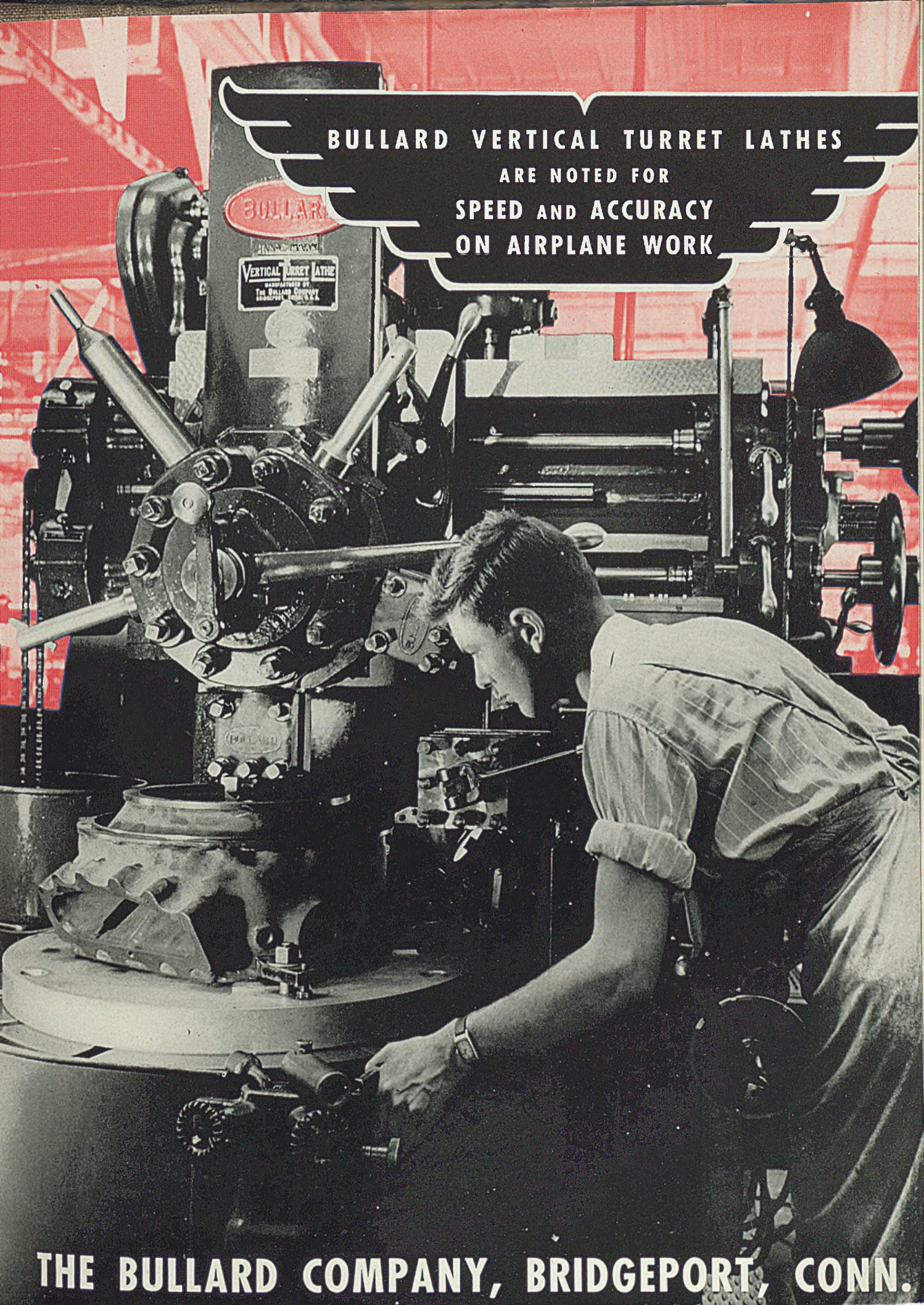
The time cycle is approximately 20 minutes but can be quickly determined for any particular application. The concentration of the Pentrate solutions is controlled by adding the water lost through evaporation. This can be done manually with the aid of a dial-indicating thermometer, or can be done automatically with the aid of the Heatbath

TABLE I—Comparison of Normal and Pentrated Tool Life

Normal		Pentrated	
111 pieces	7 grinds	320 pieces	10 grinds
551 pieces	5 grinds	938 pieces	8 grinds
25½ hrs. work	3 grinds	84½ hrs. work	4 grinds (still going)
200 to 300 pieces per tap		950 to 1038 pieces per tap	
75,000 pieces		795,000 pieces	



Typical setup for production work using the Pentrate process, Illustration furnished by Heatbath Corp., Springfield, Mass.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automatic concentration control panel. Work can be handled in baskets or on fixtures to suit the individual requirement.

Phytanium-blended Pentrate comes in convenient molded cakes and does not deteriorate with continued use. The solutions do not require an energizer, are nonpoisonous, and do not throw off objectionable fumes. The only replacements necessary are those to compensate for the unavoidable mechanical dragout or carry-over on the parts being treated.

The equipment involved in the process need not be expensive. The smallest equipment available has tanks 12 inches square.

Beyond this particular size, equipment is built to meet individual requirements, and tanks with a thousand-gallon capacity are in daily production. Gas is the most popular heating medium, although many installations are operated successfully with high-pressure steam or electric immersion heaters. The process is easily adaptable to conveyors and automatic machines or other production facilities.

The Pentrate process has been tested and approved by many government departments and is widely specified on war production contracts along with a multitude of civilian applications. Steel products now being treated range from steel paper clips to huge steel propeller blades.

A typical installation of processing equipment for application of the Pentrate finish to propeller blades is shown in the accompanying illustration shown on page 106.

Poster Explains How Tools Are Salvaged

An instructive poster which explains how tools may be salvaged is being offered by Eutectic Welding Alloys Co., Worth street, New York.

Prepared for distribution to war plants, it represents an effort on the company's part to help keep America's production tools in operation as long as possible, saving vital material and irreplaceable man-hours.

The poster, it is reported, already has been instrumental in saving tools costing up to $180 and requiring 50 weeks for delivery at insignificant cost. It gives in detail procedure for salvaging broken broaches, milling cutters, slitting saws, form tools, reamers, undersized flat broaches, drills and drill shanks; and making cutters from scrap materials; welding extension reamers from standard reamers; and, tipping tools with tungsten carbide or stellite.

The poster is available on request at no cost from the company.

Issues Third Wartime Maintenance Manual

Another maintenance manual—"Handbook for Wartime Care of Centrifugal Pumps," third in a series which already includes books on the wartime care of motors and V-belts, is announced by Allis-Chalmers Mfg. Co., Milwaukee.

Abundantly illustrated, the new maintenance guide makes specific recommendations for putting pump care on a wartime basis. Step by step a centrifugal pump is actually built, and as each part is added, the way it is built and functions are seen to determine proper maintenance.

Valuable wartime tips included in the book describe: How a change in liquid can blitz a pump, easy ways to find leaks, common mistakes in packing stuffing boxes, how tight is "too tight" for a gland, how to figure head, how to protect pumps against cavitation, the vital role of water as a lubricant in pumps, quick diagnosis of pumps ills and others.

The manual applies to all makes of pumps. It is being offered free of charge by writing the company.

Tungsten Production To Offset Shortages

With the development of new sources for tungsten, the increase in tungsten output rates, etc., major shortages are not expected to develop in the Western Hemisphere, Adam MacKenzie, vice president in charge of manufacturing, Carboloy Co. Inc., Detroit, told the Ottawa section of the Canadian Institute of Mining and Metallurgy recently, in describing a general picture of the intense development of tungsten carbide during recent years.

One important development to which he referred was the "hot press method" in which the pressing and sintering operations are carried on simultaneously, materially expediting processing of cemented carbide large die nibs, etc., such as used in large shell dies.

In this process powder is placed in a suitable and closed mold, usually of graphite. The mold and its contents are heated to sintering temperature while sufficient pressure is imposed in one direction to overcome the forces which cause shrinking in the other two directions when a cold-pressed compact is freely heated.

. The molds ordinarily are heated electrically to approximately the sintering temperature used in the cold press method. Heat may be applied indirectly from a resistance furnace or may be generated within the mold itself by resistance or by high frequency current. Suitable protection against oxidation serves to prevent undue deterioration of the mold. Pressures of 400 to 2500 pounds per square inch are commonly used.

Another process mentioned by Mr. MacKenzie, is that of extrusion, capable of making rods, tubes, non-symmetrical cross sections, such as angles, flats, half-rounds, ovals, etc., and in lengths not hitherto obtainable.

The transition from laboratory scale to productive stature has brought about the development of equipment capable of producing cemented carbides in large and varied shapes and sizes up to a 50-pound piece.

Extent of increase in carbide usage was indicated by Mr. MacKenzie when he said that one carbide manufacturer alone produced during 1942 approximately 120 times amount of steel cutting carbide produced during 1939.

Gathmann Issues Second Edition on Ingot Molds

Gathmann Engineering Co., Baltimore, designer of ingots and molds, issued recently a second edition of its book, *The Ingot Phase of Steel Production*, written by Emil Cathmann.

The new edition details basic information contained in the first, with the exception of some material pertaining to big-end-down ingot production. The author's conclusion that big-end-up ingots are superior leads him to use available space for new developments in that respect, of which the thin-wall multitaper contour is regarded as the most important improvement.

A review of cross sectional contours of various types has been included for what benefit the steel producer may obtain from a knowledge of what has been tried before. A chapter has been added on the economic value of big-end-up production in which it is attempted to point out the fallacy of basing production gages on ingot tonnage rather than on finished product tonnage, because unless the steel is fit for the purpose for which it was produced the economic loss in cropping, rejections, resurfacing and remelting as scrap is enormous. Another section gives highlights of a test conducted by the Bureau of Standards on rail steels.

The book is available free to steelmakers who would be benefited by reading it.

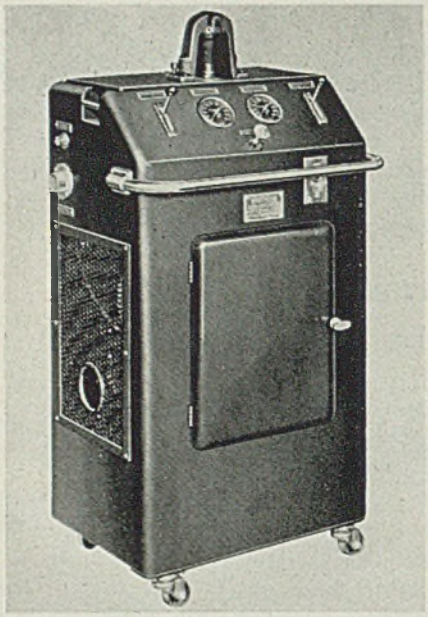
INDUSTRIAL EQUIPMENT

Spark-Plug Tester

Denison Engineering Co., 1160 Dublin road, Columbus, O., is offering a new model HSPT3 spark-plug tester for testing the firing precisions of aircraft spark plugs. It develops an air pressure up to 750 pounds per square inch within 15 seconds and maintains that pressure for at least a full minute.

Testing time averages about 30 seconds per plug. A plug is seated in an adapter, and action of the hydraulic cylinder clamps the plug into an airtight chamber. The desired voltage and pressure are selected and the action of the plug recorded.

In operating, the operator is forced to move two levers — one with each hand—in opening or closing the clamp-



ing mechanism. The circuit to the spark plugs is completed only after the plug is clamped into position.

The testing stand consists of a welded steel frame mounted on swivel casters and equipped with start-stop push buttons, high and low pressure air gages, low-pressure needle valve, adaptors, oil-level gage, high-voltage connector, low-voltage terminal and operating levers.

Lapping Plate

Smith Tool & Engineering Co., 816 North Sandusky avenue, Bucyrus, O., is offering a new precision lapping plate designed for developing a true plane of close tolerance, insuring perfect fit when lapping metal-to-metal joints and other uses requiring accurate flat-lapped surfaces. Its outstanding feature is its elliptical rib construction.

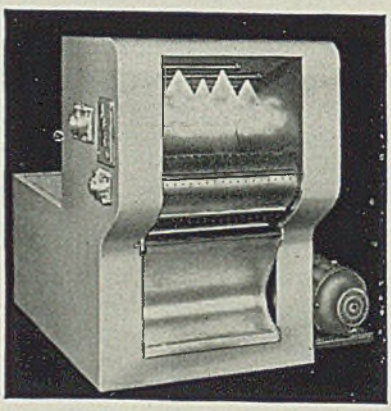
The large elliptical rib with internal spider rib construction and supporting ribs to other edges are designed so that their depth and placement give maximum rigidity and stiffness with a minimum of deflection. The close tolerance

accuracy of the plate is checked with the three-plate system which method is considered fundamental for arriving at primary standards for flatness, including optical flats.

Metal Washer

American Foundry Equipment Co., 555 South Byrkit street, Mishawaka, Ind., announces a new Tumbl-Spray metal washing machine designed around an endless tumbling belt. It receives and discharges parts to be cleaned through a large front opening.

Work is tumbled to expose all surfaces to the powerful cleaning action of the sprays. The open type barrel is said to give complete access to the parts while in process. The spray system also is readily accessible for cleaning and inspecting. The machine may be used for cleaning small screw machine products which can withstand a slight tumbling action. Where parts are handled in batch form, they can be washed only, or the wash can be followed with a fresh water rinse with the rinse water draining to a sewer to prevent contamination of the washing solution. Another layout provides a power wash and a power rinse followed with a compressed air blow-



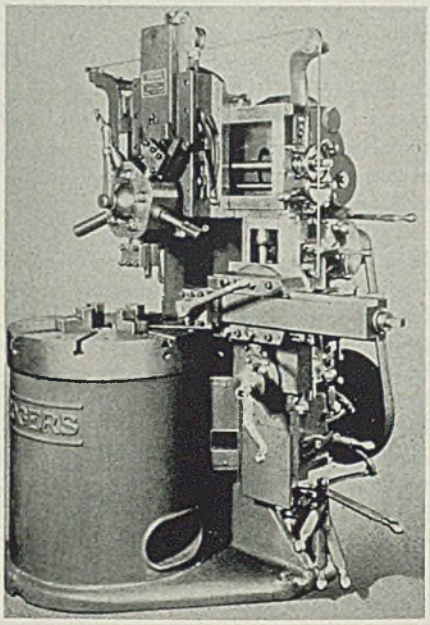
off to remove excess liquid. A special arrangement keeps the two solutions separate and permits washing and rinsing in one compartment without transfer of the parts.

To unload the machine, the mill is run in reverse which will discharge all parts over a chute. The unit is available either in steam, gas or electrically heated types and can be supplied with automatic controls.

Vertical Turret Mill

Rogers Machine Works Inc., 125 Arthur street, Buffalo, is introducing a new special high-speed vertical turret mill for boring, drilling and turning nonferrous castings and forgings in aircraft and similar high-speed high-production industries. It features a swivel slide head that is adjustable at any angle each side of vertical up to 35 degrees to facilitate quicker tool setting for irregular shaped pieces.

Built-in graduated dial facilitates making set-ups for original and second runs. The horizontal chuck embodied



permits the work to slide easily and quickly in exact position in a minimum amount of operator's time and subsequent reduction of mill "down time". Main drive sheave of this unit runs at 760 revolutions per minute. Working model capacity is 36-inch diameter.

Thread Millers

Hill-Bartelt Machine Co., 229 South Church street, Rockford, Ill., is offering two models of a newly designed thread milling machine, one, a single-purpose machine set up for production runs on a specific job, the other a general-purpose machine with adjustments permitting change of set-up for a wide variety of work.

Of modern design throughout, these units are fully motorized, with all driving elements completely enclosed. Electrical controls and the coolant system also are fully enclosed, with suitable access doors

MAKING MUSCLES FOR MACHINES

Today, as never before, the equipment of war as well as the machines of industry need tough stress resistant forged parts — "muscles" to take the punishing abuse of combat and the wrack of three shift operation.

We're making these "muscles" in ever increasing quantities for planes, for ships, for guns, tanks, ordnance and machine tools — drop forgings, upset forgings, hammer forgings — parts from a fraction of an ounce to many tons each in weight — forgings of every shape and size to meet the insistent demands of greater war production.

Ours is the will to serve. If your requirements for forgings carry a high priority maybe we can help you. Our facilities today are, of course, limited to making forgings for producers of essential machines of war. After the emergency, we will welcome the inquiries of consumer goods manufacturers.

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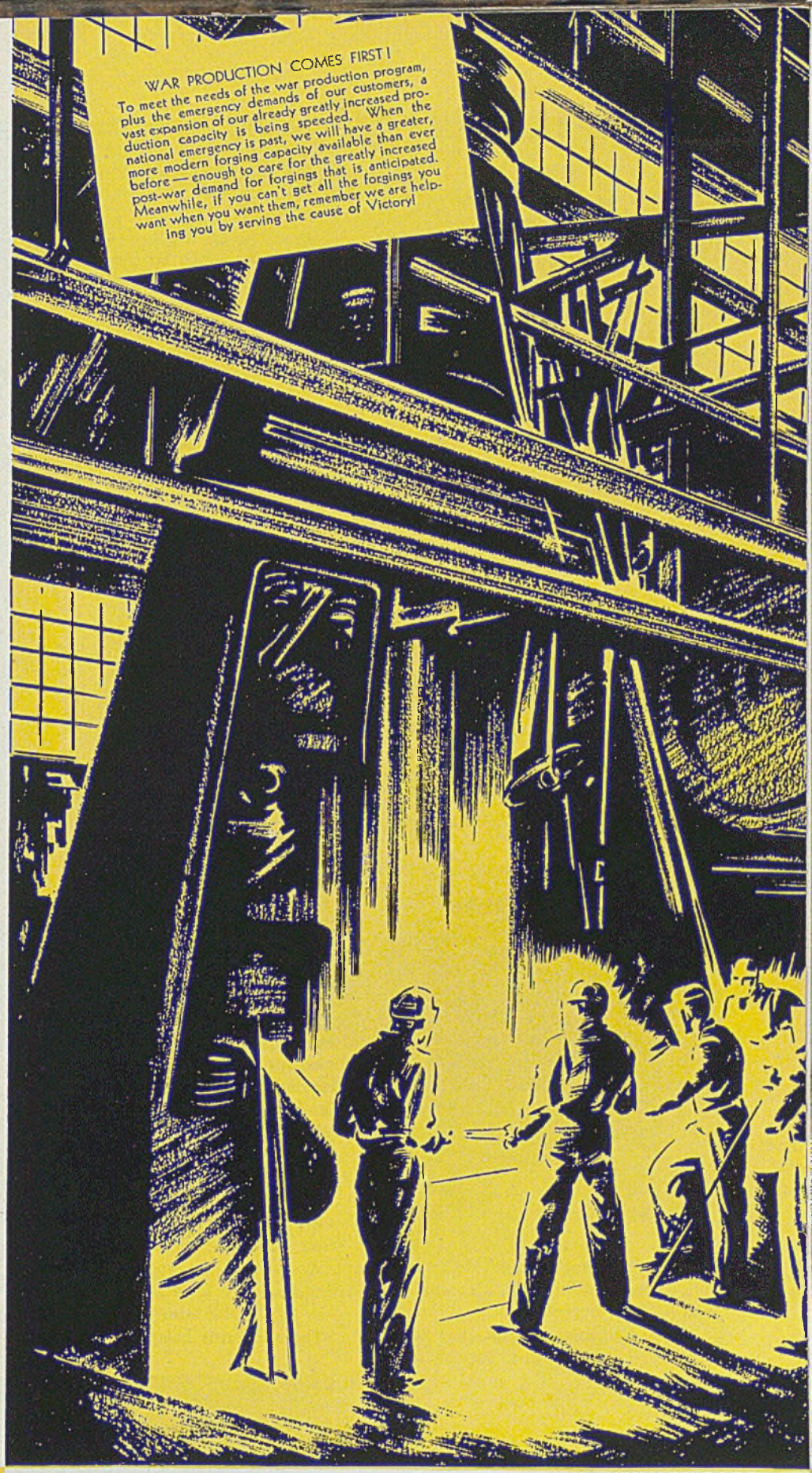

Making airplane parts on a 20,000 pound drop hammer in the Kropp shops

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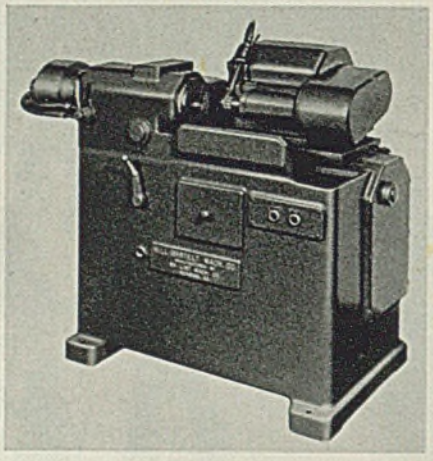
KROPP

and plates. The spindle on each is 40 inches from the floor, each machine requiring only 42½ x 28 inches of floor space.

The single-purpose model can be made up for cutting either right hand or left hand external or internal threads, using a multiple thread mill. Feed is accomplished with a cam, synchronized with work spindle which governs complete cycle including rapid return and a dwell for relaading. Work up to capacity of 3 inches diameter, is held in an air-operated collet chuck. Controls include start and stop buttons for the motor, a feed clutch release lever and the chuck-operating handle. This model is well-suited to the threading operation on the nose of 75-millimeter shell.

General-purpose model, with the same basic elements, has a much wider range of applications. Its cutter head has a tilting adjustment for aligning the cutter with the helix angle of the thread. Either single or multiple cutters can be used. Two types of feed are available, either cam feed or lead screw, and may be selected as desired. The machine will cut threads from 5 to 32 pitch, up to 9 inches in length with a single cutter

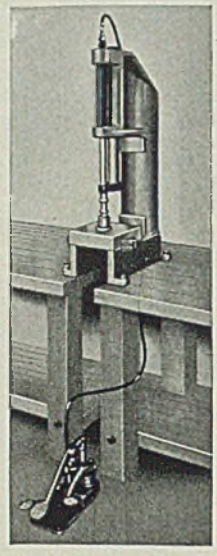


and up to 2 inches in length with a multiple cutter. Additionally, a controllable cross feed permits cutting of pipe threads, or partially tapered threads. For added work support, a tailstock is included, riding on V-ways. The model also can be made into a fully automatic thread miller.

Hydraulic Press

Studebaker Machine Co., 9 South Clinton street, Chicago, is introducing a completely new Speedpress (hydraulic arbor press) which provides pressures to 20,000 pounds. Entirely foot-controlled, it leaves the operator's hands wholly free for the work. In addition it can be operated easily by women.

Movement of the press is controlled by a hydraulic foot control connected to press by steel tube. One movement of the applicator pedal and the ram moves downward to contact work. Another foot pressure on the booster pedal, and



any holding grip desired up to 20,000 pounds is applied. A release pedal breaks the pressure, and the ram automatically returns to the top of its travel. Release takes less than a second.

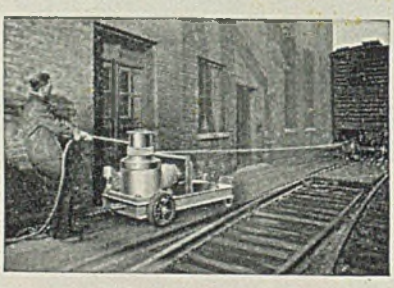
The press handles work up to diameters of 15¾ inches. Its arbor opening is 6 inches and capacity over table plate is 11⅞ inches. Ram stroke of the press is 7 inches.

According to the company, the unit is quite versatile. It handles operations that formerly tied up large equipment handling broaching, assembling, piercing, oil-grooving, riveting, sizing, flanging, staking, forcing, small die tryouts, forming and pressing operations etc.

Car Spotters

Link-Belt Co., 2410 West Eighteenth street, Chicago, reports its line of motorized electric car spotters, heretofore furnished only for stationary mounting, now is available also in portable form.

The spotter is balanced so one man



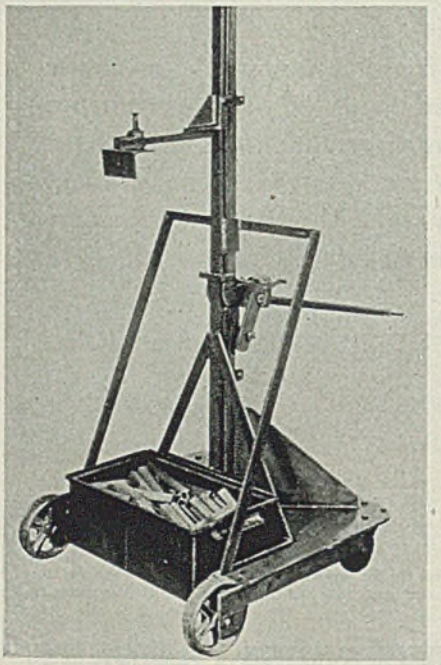
can lift the one end and roll the unit to any desired location. Operator need but anchor the frame with a chain; plug electric cord into nearest power outlet; hook one end of haulage cable to car or object to be moved; wrap the other end around capstan; turn on the motor; and feed away the cable while the machine does the actual pulling.

Stacking Box Carrier

Ernst Carrier Sales Co., 1456 Jefferson avenue, Buffalo, announces a new stacking box carrier designed specially to handle a column of self-nesting boxes of finished parts, scrap, castings and similar materials. Use of a skid is eliminated by a built-in wedge at bottom of lift post that slides under stack.

After sliding the wedge under the stack, pressure on the handle raises the stack of boxes from the floor. When the handle reaches the horizontal position it automatically locks into position. The load is 3 inches off the floor and can be easily moved without tipping.

Forward tipping or swaying is eliminated by an adjustable clamp that lowers over the back edge of the top box. Side



sway is eliminated by a reinforcing bar mounted diagonally from the top of post to the base. The carrier is equipped with four large diameter wheels. Its capacity is 1500 pounds.

Respirator Cartridge

American Optical Co., Southbridge, Mass., announces a new AD air-filtering cartridge for its R-1000 respirator. It is said to protect the lugs against a combination of all types of dusts, including toxic, pneumoconiosis-producing, and nuisance dusts.

Face-piece of the AO R-1000 respirator contains a compartment into which

a cartridge can be inserted, seven of which are already designed for interchangeable protection against common respiratory hazards faced by industrial workers.

Dust Collector

Aget-Detroit Co., 2040 Book building, Detroit, announces the addition to its line of industrial dust collectors a new portable unit especially built for operation on 25 or 60-cycle alternating current. The new model features rated volume of 600 cubic feet per minute and 4.1 inches S.P., making it suitable for collecting dust and dirt from tool, cutter, precision and similar grinding operations.

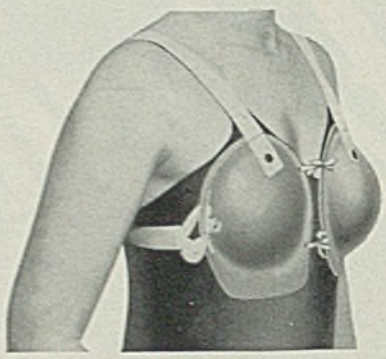
To maintain the air velocity at about

6000 feet per minute the fan is mounted on an over-drive counter-shaft. A motor drives it through a V-belt drive. In operation, the dust and dirt-laden air which is pulled away from the grinder wheels by the fan, is first cleaned in the dust removal pan located below the drum-type filter and while passing through the baffles in the drum-type filter. A final cleaning stage is the filter material itself. The collected dust is removed from the unit by lifting off the drum-type filter and dumping the dust collecting pan.

Breast Protectors

Strauss Co., 970 Ewart building, Liberty avenue, Pittsburgh, announces development of a set of molded, vulcanized, fiber breast protectors to help solve a serious problem among women engaged in industrial war work.

The protectors, which are flesh-colored and available in three sizes, have extended ledges at the bottom of the cups to provide a base to resist blows. They are adjustable between cups, for width between breasts, and the light web har-

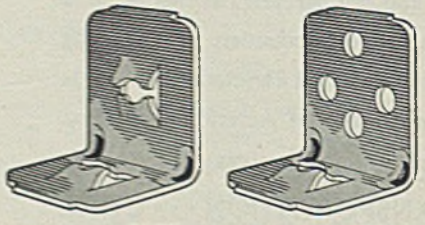


ness also is adjustable in the back. It is recommended that breast protectors be worn over a slip or brassiere as illustrated. The harness, completely detachable, can be laundered and the cups can be sterilized.

Angle Brackets

Tinnerman Products Inc., 2039 Fulton road, Cleveland, announces a complete line of new angle brackets with self-contained fasteners for use in reducing weight in aircraft and other war equipment. The combination brackets and fasteners are for non-structural attachments.

Feature of the bracket is an integrally formed Speed nut in one or both sides of the bracket, according to application need. Formerly aircraft plants manufactured their own plain brackets and assembled them with separate, self-locking nuts. Now, with the new develop-



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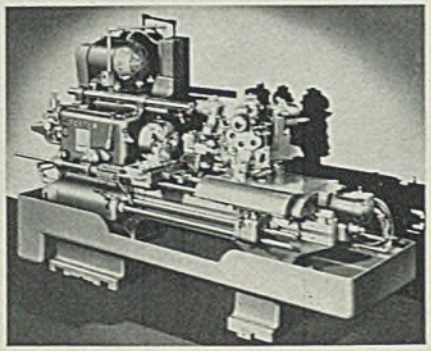
ment the nut is part of the bracket—reducing the number of parts as well as weight. When used in connection with conduit and piping this new bracket also permits the use of standard bonding clamps it is said.

Turret Lathe

International Machine Tool Corp., Foster Division, Elkhart, Ind., announces a new Foster Fastermatic turret lathe said to be so fully automatic that the operator need only concern himself with loading and unloading the work. Offered in two types—No. 1F and 2F—, the machine is equipped with a flexible hydraulic feed system which provides an independent feed for each face of the turret.

Multiple cutting and various combinations of machine movements may be readily performed on unit due to its hydraulic feeding mechanisms. Latter is built into the machine, and the pump which operates the controls is mounted inside the bed between the headstock and is driven by a double solid roller chain from the main drive shaft.

Motion of the hexagon turret slide provides the necessary feed to the front and rear cross slides by means of cams. The forward and reverse movements of



the hexagon turret slide indexes the hexagon turret and cam roll. Adjustments are provided to set the machine for a wide variety of cross facing operations. Any group of automatic speeds within the specified range of these machines may be quickly made by the proper set of pick-off gears.

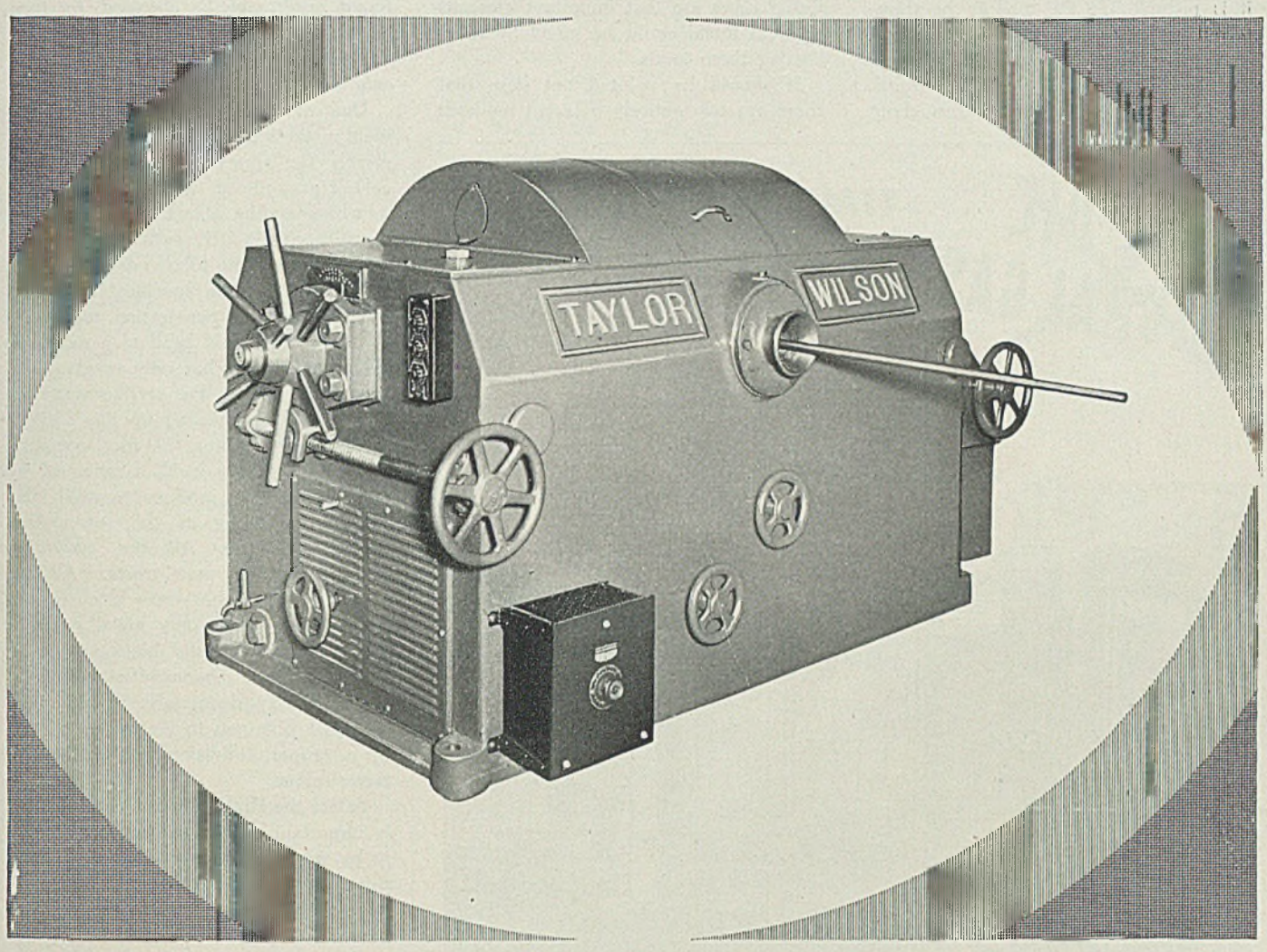
The 1-F machine has a range of 27 spindle speeds from 22 to 332 revolutions per minute arranged in nine sets of three automatic changes. The other unit has a range of 28 spindle speeds from 17 to 263 revolutions per minute arranged in seven sets of four automatic changes.

Speed changes may be made at any time while the machine is in operation, during the cut or at the end of the turret stroke. Also a number of changes to a single turret face may be made as required. The 1-F Fastermatic is furnished with either 7½ or 10-horsepower motor while the 2-F is supplied with 10 or 15-horsepower motor depending upon the nature of the work on hand.

All headstock gears are of the helical type, likewise the pick-off gears. A powerful multiple-disk clutch acts as a spindle brake when the spindle control lever is shifted to the left. This eliminates waiting for the spindle to coast to a stop and also holds the spindle while chucking a new piece.

TAYLOR-WILSON

Machine for Straightening, Sizing, Burnishing Rods, Bars and Tubes



This Machine Is Speeding War Production In the Processing of Airplane Tubing

Because of their greater speed and unvarying accuracy Taylor-Wilson Machines are delivering twice the production formerly considered maximum, thereby contributing important time saving to the war effort. They occupy about half the floor space formerly required. Now being used in many plants throughout the country engaged in processing Airplane Tubing.

WRITE FOR DESCRIPTIVE FOLDER

TAYLOR-WILSON MFG CO.

15 Thomson Ave., McKees Rocks, Pa.

PITTSBURGH DISTRICT

Electrode Stub Ends

(*Continued from Page 82*)

cause the weld metal at A is stressed in shear and has much less effective strength in the direction of the load at F than weld metal deposited at B, which is in tension. Part of this is due to the fact that in the bead at A the metal farthest to the left must carry the load, for here it is possible for the load to be transferred to the weld metal at the right only after the weld metal at the left has begun to yield. In other words, the load is not distributed throughout the bead uniformly. On the other hand, weld metal in the bead at B is loaded uniformly throughout the length of the bead.

This effective utilization of weld metal is not often completely understood. Unless a welding engineer who is fully acquainted with load distribution throughout a welded joint has analyzed your weldments from this point of view, the chances are that important amounts of weld metal could be saved by redesigning these joints.

It should be pointed out here that there are two entirely different methods of approach, the results as far as weld metal required being considerably different. If the welding engineer is given a number of pieces to be joined together and told that joints are to be made, say, here and there, one result will be obtained. *But where a welding engineer is given the parts to be joined and told to design the position of the joints as well as the type of joint, an entirely different result may be obtained, for then he is given the opportunity to most effectively use the weld metal and to use only that amount necessary for the job.*

One of the most serious wastes of weld metal is using more than is required merely for appearance's sake. An excellent example of this is shown in Fig. 3, where a tube 4 inches inside diameter and with ½-inch walls is joined to a 1-inch plate. The tube end was beveled as shown, and the specifications called for 100 per cent penetration and building up of the weld bead to a radius of 1¼ inches. One has only to glance at Fig. 3 to realize the terrific waste of weld metal in building up this entirely uncalled-for radius. With complete penetration of the weld, a radius of ¼-inch would have produced a weld joint equally as strong as the surrounding tubular structure. *All the additional metal applied is pure waste.* All the metal shown in the cross hatched area is wasted, for the only metal required is that shown as solid black in Fig. 3. Right here is a demonstration of how a saving of approximately 50 per cent could be obtained in electrode material by a proper understanding of this one factor alone.

Select the Right Type of Joint: Equally important savings can be made merely by selecting the proper type of joint. For example, in Fig 4A a T-butt joint is made in which the vertical member is beveled to aid 100 per cent penetration. However, this means that much weld metal will be required to fill the opening, as shown in Fig. 4A.

While, of course, many constructions may require this type of joint (Fig. 4A) in order to develop maximum strength at that point, it is quite possible that the joint in Fig. 4B may be found to develop sufficient strength for the particular application at hand. If this is true, it is apparent that about 33 per cent saving can be made in the amount of weld metal required. It should be emphasized that while the strength of the joint in 4B will not be as great as that in Fig. 4A, the type of joint shown in Fig. 4B may be perfectly satisfactory for the application at hand. This demonstrates the importance of selecting the right type of joint if most efficient utilization of electrode material is to be made.

Watch Joint Fit-Up: A serious waste

Helpful Literature

1. Welding Alloys

Welding Equipment & Supply Co.—4-page illustrated bulletin and price list on "Eureka" alloy electrodes gives characteristics, uses and procedures to be employed with heat resisting, cast iron, bronze, copper, "Drawalloy" and stainless steel rods. Also covered are special alloy electrodes of S.A.E. specification type.

2. Power Transmission

Webster Manufacturing, Inc.—127-page illustrated catalog No. 60, section 3 presents full data on shafting, collars, bearings, hangers, take-ups, couplings, clutches, gears, pulleys and similar mechanical power transmission equipment. Specifications are given on all parts and prices listed.

3. Rheostats

Ward Leonard Electric Co.—4-page illustrated bulletin No. 69 deals with pressed steel rheostats with rectangular and round contacts. Round contact models have eleven steps of resistance and square contact units provide 43 resistance steps. Construction details, features and specifications are given.

4. Records Systems

Visible Index Corp.—8-page illustrated broadside, "Keep These Vital Records Up to the Minute," describes method of keeping personnel records, allocation and material control, purchase and stores records in readily usable form. Use of system to facilitate production is also discussed.

5. Production Presses

E. W. Bliss Co.—24-page illustrated catalog No. 27 on "High Production Presses" gives full details on standard and high speed machines in capacities ranging from 12 to 350 tons. Various models are shown and application features of each type are covered briefly. Complete dimensions and specifications are included.

6. Electric Hammers

Syntron Co.—16-page illustrated catalog No. 430 describes line of electric hammers and concrete vibrators which are designed to speed production in construction, maintenance and industrial operations. Various accessories for use with these tools are covered.

7. Processing Equipment

S. Blickman, Inc.—16-page illustrated bulletin, "What To Look for When You Specify Stainless Steel for Your Processing Equipment," discusses major factors to be stressed when selecting this type of equipment. Such matters as design, round corner construction, sound welds, finish and fabrication are covered. Typical stainless steel equipment is pictured.

8. Materials Handling

American Monorail Co.—48-page illustrated catalog, "How Handling Problems Have Been Solved with American Monorail," presents in pictorial form many solutions to industrial handling problems. Suggested methods for reducing costs and conserving manpower are offered in typical case studies in all types of industries.

9. Controls

Allen-Bradley Co.—8-page illustrated bulletin No. 836 describes line of pressure and temperature controls. Suggested methods of application, construction and operation of these bellows actuated units for direct control of small motors are covered. Units are available for pressures ranging from 30 inches of vacuum to 500 pounds per square inch for temperatures from minus 40 to plus 415 degrees Fahr.

10. Metal Fabrication

All-Steel-Equip Co.—16-page illustrated booklet No. G5 outlines facilities of this company which are available for production of any kind of metal parts or assemblies for war work on subcontracting basis. Engineering, shearing, forming, stamping, drawing, perforating, welding, finishing and assembling departments are described and typical work shown.

11. Motor Calculator

Allis-Chalmers Manufacturing Co.—Dial type slide-rule calculator offers method for quickly selecting various types of squirrel-cage motors for wartime needs, conforming fully to recent WPB recommendations. Only three simple steps are required to choose correct motor for specific application. Over thirty standard types of motors cover range of horsepower from ½ to 75.

12. Power Transmission

Dodge Manufacturing Corp.—392-page illustrated catalog No. 42 on mechanical power transmission equipment gives complete data and prices on all types of appliances in this field. Engineering data section deals with design, installation and operation of mechanical power drives. Also covered are belt conveyors for bulk material handling.

13. Industrial Lift Truck

Crescent Truck Co.—4-page illustrated bulletin No. S-116 describes "Lo-Lif-Toer" electric power lift truck which performs functions of load carrier, lift and towing truck. Furnished complete with industrial storage battery and battery charger, this unit has list price of $1750.

14. Protective Finish

National Lock Washer Co.—4-page illustrated bulletin describes "National Stanlus" finish which is used as non-corrosive coating for all types of spring washers. Finish permits flexing of washer without chipping, cracking or flaking.

15. Gas Engines

Worthington Pump & Machinery Corp.—8-page illustrated bulletin No. S-550-B21 is descriptive of vertical, four cycle, totally enclosed gas engines in capacities ranging from 200 to 535 horsepower. Full specifications are given for these units which are designed for continuous heavy duty loads.

16. Capacitors

General Electric Co.—24-page illustrated bulletin No. GES-3039 is entitled, "How Industrial Plants Can Increase Power Capacity." Typical examples of how capacitors are effecting savings in various types of industries are discussed. Standard styles of "Pyranol" capacitors for various applications are shown.

17. Industrial Lighting

Holophane Co.—16-page illustrated technical manual, "Lighting for the Aircraft Industry," presents detailed information regarding equipment, design and application of lighting for all phases of aircraft manufacture. All factors dealing with specific lighting applications in various types of plants and departments are covered. Point-by-point charts facilitate calculation of illumination.

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18. Wire Rope Shears

Watson-Stillman Co.—8-page illustrated bulletin No. 740-A describes hand operated shear for cutting wire rope up to 1⅛-inch diameter, flat bars up to 2½ x ½ inches and round bars up to ⅞-inch diameter. Also covered are hydraulically operated shears for wire rope, flat bar iron and round iron up to 2½ inches.

19. Crane Assemblies

Shaw-Box Crane & Hoist Division—8-page illustrated folder No. 352 gives complete details of top running bridge crane, jib crane and underhung bridge crane assemblies in capacities ranging up to 6 tons. Essential parts for making finished assemblies are supplied in knock-down form.

20. Lubricants

Wells Petroleum Co.—64-page file card size catalog to fit desk file lists lubricating problems and offers solutions. Wide variety of lubricants, including related products such as cutting oils and drawing compounds, are covered. Booklet is intended to aid users of lubricants in making correct product selection for specific applications.

21. Electric Motors

Westinghouse Electric & Manufacturing Co.—20-page illustrated bulletin No. B-3188 outlines "Calling All Horsepower" program which is designed to conserve critical materials and aid in obtaining maximum production from every electric motor. Program points out how overload capacity can be used to get more production from every available unit of horsepower.

22. Car Hearth Furnaces

R-S Products Corp.—8-page illustrated bulletin No. 68-F describes high and low temperature direct fired furnaces, as well as convection types for stress relieving and drawing. Emphasis is given to self-contained electric car drive and method of motorizing door lift mechanism to permit operation of doors, furnace cars and transfer car from central control station.

23. Industrial Trucks

Rose Manufacturing Co.—18-page illustrated catalog, "Industrial Handling Equipment," is descriptive of line of factory trucks, trailers and casters. Also covered are skid platforms, welded box platforms, corrugated steel trucks, dump hoppers and accessories. Industrial casters are fitted with "Timken" thrust bearings and "Hyatt" roller wheel bearings.

24. Metal Cleaning

Oakite Products, Inc.—24-page illustrated manual reviews detergent steam-cleaning method employing "Oakite" cleaning solutions in conjunction with solution lifting guns for thorough removal of dirt, grease, grime and other deposits from wide range of production, processing and miscellaneous plant equipment. Steam-detergent method is recommended for all types of cleaning operations.

25. Heat Treating

The Ohio Crankshaft Co.—16-page illustrated bulletin No. 16 is entitled "Faster Production with TOCCO Hardening, Brazing, Annealing and Heating." In addition to explaining full details about induction heating process, typical applications are covered. Machines ranging from 20 to 200 kilowatts output are available with from one to three hardening stations.

26. Metal Duplicating

O'Neil-Irwin Manufacturing Co.—32-page illustrated catalog No. 43-4 gives complete information regarding "Di-Acro" system of metal duplicating without use of dies. Typical parts fabricated or formed from many types of metal are shown. Precision duplicating brakes, benders and shears in various capacities are described.

27. Pneumatic Tubes

Lamson Corp. — 8-page illustrated folder, "Wasted Steps Sabotage Production," shows typical designs of pneumatic despatch tube systems which are being employed to speed production in all types of industries. Standard and special purpose carriers for dispatching through tube system are shown.

28. Worm Gear Reducers

Link-Belt Co. — 40-page illustrated catalog No. 1524 and price list presents complete data on line of worm gear reducers. Information will enable designers and users of power transmissions to readily select size, type and ratio best suited to drive layout. Single, helical and double worm gear types are described.

29. Cutting Tools & Blanks

McKenna Metals Co.—40-page illustrated catalog No. 43 gives full details of standard and special "Kennametal" steel and metal cutting tools and blanks. In addition to describing various styles of tools, general information is included regarding sharpening, chip breakers, brazing tips and special applications.

30. Files

Nicholson File Co.—48-page illustrated booklet, "File Filosophy," is intended to aid tool users in selecting right file for any application and to use file correctly. File history, terminology, types of files, filing methods and file maintenance are but few of many subjects covered.

31. Milling Machine

Lincoln Machine Specialty Co.—4-page illustrated bulletin describes high speed milling machine base which will accommodate any make of high speed milling head. Also covered is high speed milling head for milling, boring or drilling. Descriptions of accessories are included.

32. Electric Hoists

Manning, Maxwell & Moore, Inc., Shaw-Box Crane & Hoist division—4-page illustrated bulletin No. 347-B covers "Load Lifter Jr." electric hoists for lifting loads weighing up to 500 and 1000 pounds. Hoists are available with three styles of mounting; lug suspension, hook suspension and push type trolley. Devices are operated by push button controls.

33. Lathe Lubrication

South Bend Lathe Works—19-page illustrated bulletin No. H-2, "Oiling the Lathe", is second of series of lathe service bulletins. It emphasizes importance of proper lathe lubrication in maintaining maximum performance and accuracy. Regular procedure for oiling with proper lubricants at definite intervals is outlined.

34. Pickling

American Chemical Paint Co. — 52-page illustrated bulletin No. 13 is descriptive of application of "Rodine" to pickling. Covered are principles of pickling, instructions for pickling and information on specific classes of pickling. Typical "Rodine" proportions, acid strengths and temperatures are given in chart form. Surface dimensions and weights of sheets are included.

35. Fabricating Facilities

Young Radiator Co.—4-page illustrated bulletin No. 518 describes company's facilities for the manufacture of spare parts boxes, ammunition boxes, control boxes and covers, duct assemblies, military instrument holders, surge tanks, heavy-duty oil pans and similar sheet metal war products. Typical views are shown of metal fabricating equipment including press brakes, punch presses.

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of weld metal results from poor fit-up, as is shown graphically in Fig. 5. Also, proper fit-up greatly affects the performance of the finished product as a whole. This means that proper fit-up not only saves weld metal in making the joint, but it also provides a stronger product, in turn permitting a smaller fillet and a further saving of weld metal.

As an illustration of the effect of fit-up on amount of electrode material required, examine the simple case shown in Fig. 5. This is a T-weld in ¼-inch plate. If the joint is properly fitted up with no gap, 0.40-pound of weld metal will be required per linear foot of joint. Now if a gap is introduced between the vertical plate and the horizontal plate amounting to only 1/16-inch, it means that 0.58-pound of metal is required per foot of joint. This is an increase of almost 50 per cent.

Again, if poor fit-up results in a gap of ⅛-inch, weld metal requirement jumps to 0.8-pound per foot of joint—a 100 per cent increase.

Choose Correct Type of Electrode: While a general purpose electrode will produce satisfactory welds under virtually every condition, special electrodes will prove much more efficient for any particular application. For example, a heavily coated fast-flowing type proves more efficient for flat downhand welds. The electrode should be chosen with proper consideration for physical properties required, type of joint being made, position in which the welding is done—that is, flat, vertical, overhead or horizontal—and the condition of fit-up of the work.

Use Flat Beads: Depositing excess weld material in the form of heavy, convex beads merely means that not only is the welding material wasted but also much time in the removal of the excess metal from the weld joint. In fact, it is entirely possible to weaken a welded joint by applying too much metal in this manner.

Use Longer Electrodes: Obviously, if an 18-inch electrode is employed where previously a 12-inch electrode had been employed, the loss in stub ends is cut 50 per cent for two of the 18-inch electrodes will do the same work that formerly required three 12-inch rods. The 18-inch length is recommended for practically all work with rods ¼-inch in diameter and larger.

Avoid Bending: Whenever an electrode is bent, anywhere from one-fourth to one-third of the electrode is lost because the protective coating has broken away and that portion of the rod without the coating cannot be used to deposit good weld metal. In every case, use the electrode straight and get the maximum of deposited weld metal from each rod.

Proper Voltage and Current: Every electrode manufactured is designed to operate at a certain voltage and within a specified current range. If current is too high or too low, it will manifest itself either in excessive splatter loss or inferior welds.

Procedure Specifications: Accompanying each different electrode manufactured will be found detailed specifications regarding procedures to be employed. In all cases these specifications have been prepared with extreme care by the electrode manufacturer, and only after painstaking investigation.

Cut Number of Beads: Where one bead of weld metal will meet design requirements, it is pure waste of electrode material to add additional beads. The same comment applies to applications where two beads will suffice. Additional beads are simply a useless waste of electrode.

Avoid Wetting: It is vital that electrodes be carefully protected against absorption of moisture into the coating. This means they should be stored in sealed containers or off the floor in a dry room. And if they accidentally become exposed to rain or moisture, dry them out at once.

Removing Broken Drills

(*Concluded from Page* 78)

ficult, or impossible. If instances of this type can be avoided by having operators and setup men immediately set aside the part containing the broken tool, without any tampering whatsoever, the results will be a greater chance of salvaging the part and a real saving of time in the salvaging operation.

In the setup shown in Fig. 4, a ½-inch length of a 11/32-inch drill was extracted from the hole in the bolting flange of the engine part. Due to protecting the finished surfaces with Spatter-off, no damage was done to the part. As a result, it was immediately returned through the usual channels to the production lines. Under the old method of burning out with electricity and compressed air, complete removal of the broken drill would have required several hours of labor including subsequent repair of hole. But by the improved welding method described, entire time of removal was only a few minutes and the drilled hole did not require plugging or any other form of repair.

Fig. 3 illustrates an extracted pilot which had been broken in a drilled hole in a cylinder pad. The same removal technique was used to extract this pilot as was used in removing the broken drill from the engine part shown in Fig. 4. Note that Spatter-off again protected the finished surfaces in and around the drilled hole.

Ratings from 20 to 250 amperes on the welder are ample to cover the requirements of any job using welding rod from 3/32 to ¼-inches in diameter. So far 3/16-inch diameter stainless steel welding rod has been sufficiently strong to handle the toughest extraction job which was the removal of a 4-inch long ⅞-inch diameter reamer having eight flutes.

The smallest size drill removed by this method was a 0.040-inch drill in the bottom of a 5/16-inch hole that was 3 inches deep. A previous method of removal would have been to trepan around the broken drill and insert a plug of the same material. This would then have necessitated the re-operation of the 0.040-inch oil hole in the production line. The trepanning, plugging, re-locating in the fixture and re-operating would have involved several hours of labor. But by the new welding method actually used, a 3/32-inch welding rod was ground down to a sharp point at the contact end and covered with an insulating coat of glycerothalate in the ground-down area.

The current setting of the welder was reduced to 30 amperes, the welding rod was inserted in the 3-inch deep hole, centered on the 0.040-inch drill. Contact was made with the broken part of the drill and the power to the transformer turned on. The result was a butt-weld of sufficient strength to permit extraction of the broken drill. As no damage was done to the 0.040-inch oil hole, the crankcase section immediately went back into production.

Instances of this kind are now being repeated daily, and with greater savings of time as the operator becomes more proficient in the art of using this equipment. The scope of the work has now increased to include the effective salvaging of all sections of engine crankcases, crankshafts, propeller shafts, cages, various small parts, tools, jigs and fixtures which are made useless by a broken drill, reamer, pilot or plug gage.

In another case, a ⅛-inch reamer became broken while it was in a bushing pin hole in the inside of a ½-inch diameter gear assembly. When received at the salvage station, there were nicks and burned marks around the edge of the hole which indicated that an attempt had been made to remove the broken reamer by heating with an electric etching pencil to soften the reamer material and then using a drill. As this method of removal failed, it was decided to try the welding method which worked successfully. No further damage to the pin hole occurred due to the welding operation.

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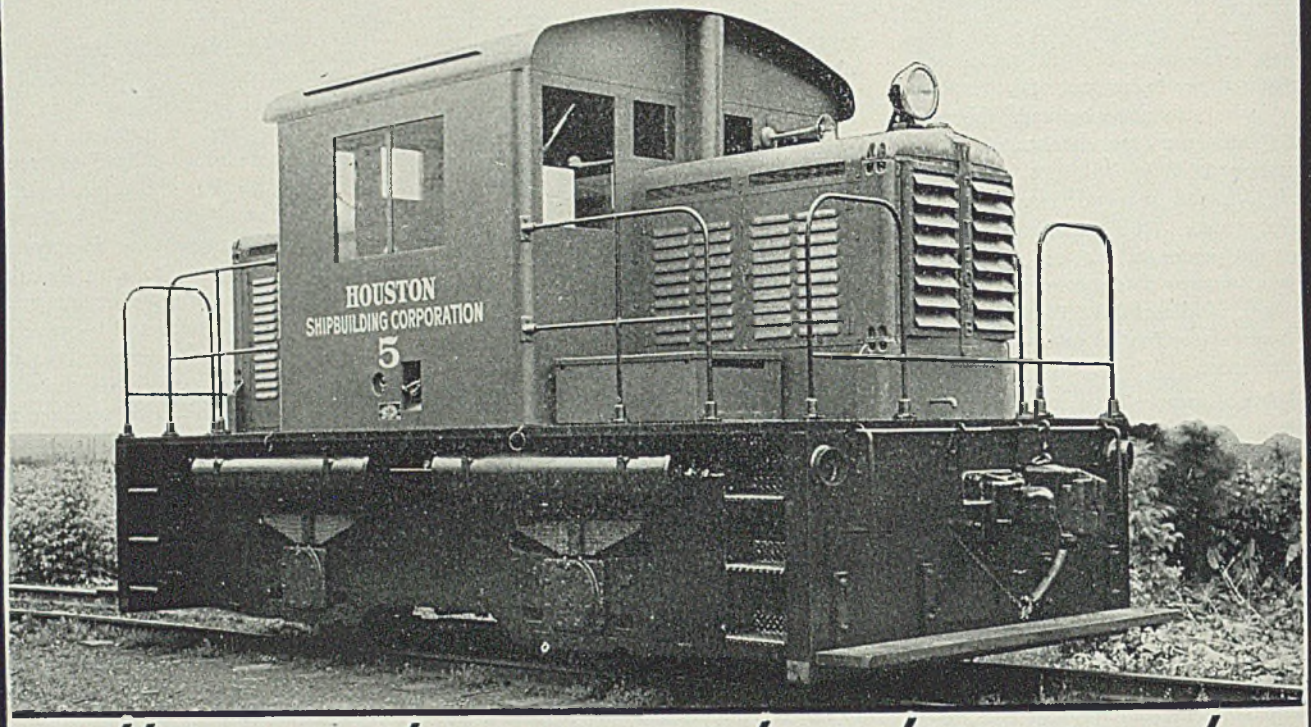

Hours saved in repair work can be re-invested in increased production

Every WHITCOMB LOCOMOTIVE is so well built, so thoroughly designed and so utterly capable for switching and hauling, repair men seldom see them except in operation. In all history, time was never so important as it is now—and the reduction of hours spent on repairing WHITCOMB LOCOMOTIVES is a decided asset. Time thus saved can be used for other vital purposes, to the benefit of all.

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Steel Controls Improve Balance in Distribution

Some tightening in deliveries noted. . . Transition to CMP moving smoothly. . . January pig iron output shows decline. . . Scrap meets steelmaking requirements

DEMAND
Increasing for war.

PRODUCTION
Up ½-point to 99½ per cent.

PRICES
Steady in all lines.

INCREASINGLY good balance is evident in the steel market as application of new methods of control is broadened.

In general little change is noted, though sellers in the East feel a slightly stronger demand, mainly in small orders rather than large lots, while in the Midwest a lull in activity has appeared. On the other hand cancellations have practically ceased.

A factor in the situation is permission for consumers to place orders for second quarter under PRP up to 70 per cent of first quarter allowances, with the remaining 30 per cent to be placed after March 31 on the same basis. Some orders are being issued now with information that CMP numbers will be furnished later. These orders carry priority ratings, which will govern schedules until the CMP numbers are supplied.

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Mill deliveries appear somewhat tighter in most products as more high preference tonnage is placed. Large rounds are promised for late May, with small rounds for early April in most cases. Hot-rolled sheets can be promised for early April and cold-rolled mid-April and beyond in most cases, though this can be bettered by some producers. All these deliveries apply to top ratings, some makers giving no promise on lower priorities. Shapes can be obtained in four to five weeks on ratings down to AA-3.

Steel production last week rose ½-point to 99½ per cent of capacity as repaired open hearths were returned to service. Chicago rose 1 point to 101 per cent, eastern Pennsylvania 2 points to 95, Cincinnati 5 points to 95 and Detroit 3 points to 93. Cleveland declined ½-point to 92½ and St. Louis 1 point to 91. Unchanged rates were as follows: Pittsburgh 99, Youngstown 97, Wheeling 80, Birmingham 100, Buffalo 90½ and New England 95.

Pig iron output in January failed to equal that of December, 5,136,543 net tons being made, with 57,702 tons of ferromanganese and spiegel. This compares with 5,143,829 tons of pig iron and 57,594 tons of ferroalloys in December. Operating rate was 100.7 per cent of capacity in January, 101.1 in December.

Tremendous increase in use of alloy steel for war purposes is indicated by statistics of the American Iron and Steel Institute for 1942. Total output of alloy ingots was 11,351,000 tons, 40 per cent above the 1941 peak. The proportion of alloy to total steel through the year was about one in eight tons and at the close of the year it had risen to about one in six, with indications of a larger ratio this year. At the time of the first World War alloy steel represented about one ton in 50 of total production.

Structural fabricators are practically out of their normal line of work and are consuming only light shapes, plates and sheets, in subcontracting work, mainly for shipbuilding. Large use of welding crowds those departments while punching, riveting and other heavy structural operations are restricted. About 10,000 tons of bridgework for the Alcan highway is being bid.

War requirements for wire in many forms are crowding mills and orders are greater than production and shipments, exceeding those of January. Demand for wire normally used in civilian products is notably light. Wire rods are in short supply, with directives necessary in many cases.

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Conditions continue easy in the scrap market, reserves for several weeks having been accumulated by most steelmakers and shortages through the winter thus are averted. Receipts are about equal to current melt and little recourse to stockpiles is necessary. In a few cases allocations are in force to serve mills in areas where supply is below average. Yard stocks are fairly large but preparation is slow on account of labor shortage, though the latter condition may be helped by such workers being put in the essential class. Bad weather recently has slowed shipments from the country. Borings and turnings still exceed demand but considerable tonnages are being prepared in form to be acceptable to melters and are moving more freely.

Composite average prices on steel and iron have undergone no change from the level that has prevailed for some time, ceilings by Office of Price Administration holding steadily. Finished steel composite remains at $56.73, semifinished steel at $36, steelmaking pig iron at $23.05 and steelmaking scrap at $19.17.

COMPOSITE MARKET AVERAGES

	Feb. 20	Feb. 13	Feb. 6	One Month Ago Jan., 1943	Three Months Ago Nov., 1942	One Year Ago Feb., 1942	Five Years Ago Feb., 1938
Finished Steel	$56.73	$56.73	$56.73	$56.73	$56.73	$56.73	$62.05
Semifinished Steel	36.00	36.00	36.00	36.00	36.00	36.00	40.00
Steelmaking Pig Iron	23.05	23.05	23.05	23.05	23.05	23.05	22.92
Steelmaking Scrap	19.17	19.17	19.17	19.17	19.17	19.17	13.70

Finished Steel Composite:—Average of industry-wide prices on sheets, strip, bars, plates, shapes, wire, nails, tin plate, standard and line pipe. Semifinished Steel Composite:—Average of industry-wide prices on billets, slabs, sheet bars, skelp and wire rods. Steelmaking Pig Iron Composite:—Average of basic pig iron prices at Bethlehem, Birmingham, Buffalo, Chicago, Cleveland, Neville Island, Granite City and Youngstown. Steelworks Scrap Composite:—Average of No. 1 heavy melting steel prices at Pittsburgh, Chicago and eastern Pennsylvania.

COMPARISON OF PRICES

Representative Market Figures for Current Week; Average for Last Month, Three Months and One Year Ago

Finished Material

	Feb. 20, 1943	Jan. 1943	Nov. 1942	Feb. 1942
Steel bars, Pittsburgh	2.15c	2.15c	2.15c	2.15c
Steel bars, Chicago	2.15	2.15	2.15	2.15
Steel bars, Philadelphia	2.49	2.49	2.49	2.47
Shapes, Pittsburgh	2.10	2.10	2.10	2.10
Shapes, Philadelphia	2.22	2.22	2.22	2.22
Shapes, Chicago	2.10	2.10	2.10	2.10
Plates, Pittsburgh	2.10	2.10	2.10	2.10
Plates, Philadelphia	2.15	2.15	2.15	2.15
Plates, Chicago	2.10	2.10	2.10	2.10
Sheets, hot-rolled, Pittsburgh	2.10	2.10	2.10	2.10
Sheets, cold-rolled, Pittsburgh	3.05	3.05	3.05	3.05
Sheets, No. 24 galv., Pittsburgh	3.50	3.50	3.50	3.50
Sheets, hot-rolled, Gary	2.10	2.10	2.10	2.10
Sheets, cold-rolled, Gary	3.05	3.05	3.05	3.05
Sheets, No. 24 galv., Gary	3.50	3.50	3.50	3.50
Bright bess., basic wire, Pittsburgh	2.60	2.60	2.60	2.60
Tin plate, per base box, Pittsburgh	$5.00	$5.00	$5.00	$5.00
Wire nails, Pittsburgh	2.55	2.55	2.55	2.55

Semifinished Material

Sheet bars, Pittsburgh, Chicago	$34.00	$34.00	$34.00	$34.00
Slabs, Pittsburgh, Chicago	34.00	34.00	34.00	34.00
Rerolling billets, Pittsburgh	34.00	34.00	34.00	34.00
Wire rods No. 5 to ⅜-inch, Pittsburgh	2.00	2.00	2.00	2.00

Pig Iron

	Feb. 20, 1943	Jan. 1943	Nov. 1942	Feb. 1942
Bessemer, del. Pittsburgh	$25.19	$25.19	$25.19	$25.19
Basic, Valley	23.50	23.50	23.50	23.50
Basic, eastern, del. Philadelphia	25.39	25.39	25.39	25.34
No. 2 fdry., del. Pgh., N.&S. Sides	24.69	24.69	24.69	24.69
No. 2 foundry, Chicago	24.00	24.00	24.00	24.00
Southern No. 2, Birmingham	20.38	20.38	20.38	20.38
Southern No. 2, del. Cincinnati	24.30	24.30	24.30	24.06
No. 2X, del. Phila. (differ. av.)	26.265	26.265	26.265	26.215
Malleable, Valley	24.00	24.00	24.00	24.00
Malleable, Chicago	24.00	24.00	24.00	24.00
Lake Sup., charcoal, del. Chicago	31.54	31.54	31.54	31.34
Gray forge, del. Pittsburgh	24.19	24.19	24.19	24.19
Ferromanganese, del. Pittsburgh	140.65	140.65	140.65	125.33

Scrap

Heavy melting steel, Pitts.	$20.00	$20.00	$20.00	$20.00
Heavy melt. steel, No. 2, E. Pa.	18.75	18.75	18.75	18.75
Heavy melting steel, Chicago	18.75	18.75	18.75	18.75
Rails for rolling, Chicago	22.25	22.25	22.25	22.25
No. 1 cast, Chicago	20.00	20.00	20.00	20.00

Coke

Connellsville, furnace, ovens	$6.50	$6.00	$6.00	$6.00
Connellsville, foundry, ovens	7.25	7.25	7.25	7.25
Chicago, by-product fdry., del.	12.25	12.25	12.25	12.25

STEEL, IRON, RAW MATERIAL, FUEL AND METALS PRICES

Following are maximum prices established by OPA Schedule No. 6 issued April 16, 1941, revised June 20, 1941 and Feb. 4, 1942. The schedule covers all iron or steel ingots, all semifinished iron or steel products, all finished hot-rolled, cold-rolled iron or steel products and any iron or steel product which is further finished by galvanizing, plating, coating, drawing, extruding, etc., although only principal established basing points for selected products are named specifically. All seconds and off-grade products also are covered. Exceptions applying to individual companies are noted in the table. Federal tax on freight charges, effective Dec. 1, 1942, not included in following prices.

Semifinished Steel

Gross ton basis except wire rods, skelp.

Carbon Steel Ingots: F.o.b. mill base, rerolling qual., stand. analysis, $31.00.
(Empire Sheet & Tin Plate Co., Mansfield, O., may quote carbon steel ingots at $33 gross ton, f.o.b. mill.)

Alloy Steel Ingots: Pittsburgh, uncropped, $45.00.

Rerolling Billets, Slabs: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Sparrows Point, Birmingham, Youngstown, $34.00; Detroit, del. $36.25; Duluth (bll.) $36.00.
(Andrews Steel Co., carbon slabs $41; Continental Steel Corp., billets $34, Kokomo, to Acme Steel Co.; Northwestern Steel & Wire Co, $41, Sterling, Ill.; Laclede Steel Co. $34, Alton or Madison, Ill.; Wheeling Steel Corp. $36 base, billets for lend-lease, $34, Portsmouth, O., on slabs on WPB directives.)

Forging Quality Billets: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham, Youngstown, $40.00; Detroit, del. $42.25; Duluth, $42.00.
(Andrews Steel Co. may quote carbon forging billets $50 gross ton at established basing points.)

Open Hearth Shell Steel: Pittsburgh, Chicago, base 1000 tons one size and section: 3-12 in., $52.00; 12-18 in., $54.00; 18 in. and over, $56.00.

Alloy Billets, Slabs, Blooms: Pittsburgh, Chicago, Buffalo, Bethlehem, Canton, Massillon, $54.00.

Sheet Bars: Pittsburgh, Chicago, Cleveland, Buffalo, Canton, Sparrows Point, Youngstown, $34. (Wheeling Steel Corp. $37 on lend-lease sheet bars, $38 Portsmouth, O., on WPB directives; Empire Sheet & Tin Plate Co., Mansfield, O., carbon sheet bars, $39, f.o.b. mill.)

Skelp: Pittsburgh, Chicago, Sparrows Pt., Youngstown, Coatesville, lb., $1.90.

Wire Rods: Pittsburgh, Chicago, Cleveland, Birmingham, No. 5—9/32 in., inclusive, per 100 lbs., $2.00.
Do., over 9/32—47/64-in., incl., $2.15. Worcester add $0.10 Galveston, $0.27. Pacific Coast $0.50 on water shipment.

Bars

Hot-Rolled Carbon Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham, base 20 tons one size, 2.15c; Duluth, base 2.25c; Detroit, del. 2.27c; New York del. 2.51c; Phila. del. 2.49c; Gulf Ports, dock 2.52c, all-rail 2.59c; Pac. ports, dock 2.50c; all rail 3.25c. (Phoenix Iron Co., Phoenixville, Pa., may quote 2.35c at established basing points.) Joslyn Mfg. Co. may quote 2.35c, Chicago base. Calumet Steel Division, Borg Warner Corp., may quote 2.35c, Chicago base, on bars produced in its 8-inch mill.)

Rail Steel Bars: Same prices as for hot-rolled carbon bars except base is 5 tons.
(Sweet's Steel Co., Williamsport, Pa., may quote rail steel merchant bars 2.33c f.o.b. mill.)

Hot-Rolled Alloy Bars: Pittsburgh, Chicago, Canton, Massillon, Buffalo, Bethlehem, base 20 tons one size, 2.70c; Detroit, del., 2.82c.
(Texas Steel Co. may use Chicago base price as maximum f.o.b. Fort Worth, Tex., price on sales outside Texas, Oklahoma.)

AISI Series	(*Basic O-H)	AISI Series	(*Basic O-H)
1300	$0.10	4100 (.15-.25 Mo)	0.55
		(.20-.30 Mo)	0.60
2300	1.70	4340	1.70
2500	2.55	4600	1.20
3000	0.50	4800	2.15
3100	0.70	5100	0.35
3200	1.35	5130 or 5152	0.45
3400	3.20	6120 or 6152	0.95
4000	0.45-0.55	6145 or 6150	1.20

*Add 0.25 for acid open-hearth; 0.50 electric.

Cold-Finished Carbon Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, base 20,000-39,999 lbs., 2.65c; Detroit 2.70.

Cold-Finished Alloy Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, base 3.35c; Detroit, del. 3.47c.

Turned, Ground Shafting: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, base (not including turning, grinding, polishing extras) 2.65c; Detroit 2.72c.

Reinforcing Bars (New Billet): Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Sparrows Point, Buffalo, Youngstown, base 2.15c; Detroit del. 2.27c; Gulf ports, dock 2.52c, all-rail 2.61c; Pacific ports, dock 2.80c, all-rail 3.27c.

Reinforcing Bars (Rail Steel): Pittsburgh, Chicago, Gary, Cleveland, Birmingham, base 2.15c; Detroit, del. 2.27c; Gulf ports, dock 2.52c, all-rail 2.61c; Pacific ports, dock 2.80c, all-rail 3.25c.
(Sweet's Steel Co., Williamsport, Pa., may quote rail steel reinforcing bars 2.33c, f.o.b. mill.)

Iron Bars: Single refined, Pitts. 4.40c, double refined 5.40c; Pittsburgh, staybolt, 5.75c; Terre Haute, common, 2.15c.

Sheets, Strip

Hot-Rolled Sheets: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Buffalo, Youngstown, Sparrows Pt., Middletown, base 2.10c; Granite City, base 2.20c; Detroit del. 2.22c; Phila. del. 2.28c; New York del., 2.35c; Pacific ports 2.65c.
(Andrews Steel Co. may quote hot-rolled sheets for shipment to Detroit and the Detroit area on the Middletown, O. base.)

Cold-Rolled Sheets: Pittsburgh, Chicago, Cleveland, Gary, Buffalo, Youngstown, Middletown, base, 3.05c; Granite City, base 3.15c; Detroit del. 3.17c; New York del. 3.41c; Phila. del. 3.39c; Pacific ports 3.70c.

Galvanized Sheets, No. 24: Pittsburgh, Chicago, Gary, Birmingham, Buffalo, Youngstown, Sparrows Point, Middletown, base 3.50c; Granite City, base 3.60c; New York del. 3.74c; Phila. del. 3.68c; Pacific ports 4.05c.
(Andrews Steel Co. may quote galvanized sheets 3.75c at established basing points.)

Corrugated Galv. Sheets: Pittsburgh, Chicago, Gary, Birmingham, 29 gage, per square 3.31c.

Culvert Sheets: Pittsburgh, Chicago, Gary, Birmingham, 16 gage, not corrugated, copper alloy 3.60c; copper iron 3.90c, pure iron 3.95c; zinc-coated, hot-dipped, heat-treated, No. 24, Pittsburgh 4.25c.

Enameling Sheets: Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Middletown, 10 gage.

base 2.75c; Granite City, base 2.85c; Pacific ports 3.40c.
Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Middletown, 20 gage, base 3.35c; Granite City, base 3.45c; Pacific ports 4.00c.

Electrical Sheets, No. 24:

	Pittsburgh Base	Pacific Ports	Granite City
Field grade	3.20c	3.95c	3.30c
Armature	3.55c	4.30c	3.65c
Electrical	4.05c	4.80c	4.15c
Motor	4.95c	5.70c	5.05c
Dynamo	5.65c	6.40c	5.75c
Transformer			
72	6.15c	6.90c	.....
65	7.15c	7.90c	.....
58	7.65c	8.40c	.....
52	8.45c	9.20c	.....

Hot-Rolled Strip: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Middletown, base, 1 ton and over, 12 inches wide and less 2.10c; Detroit del. 2.22c; Pacific ports 2.75c. (Josiyn Mfg. Co. may quote 2.30c, Chicago base.)
Cold Rolled Strip: Pittsburgh, Cleveland, Youngstown, 0.25 carbon and less 2.80c; Chicago, base 2.90c; Detroit, del. 2.92c; Worcester base 3.00c.
Commodity C. R. Strip: Pittsburgh, Cleveland, Youngstown, base 3 tons and over, 2.95c; Worcester base 3.35c.
Cold-Finished Spring Steel: Pittsburgh, Cleveland bases, add 20c for Worcester; .26-.50 Carb., 2.80c; .51-.75 Carb., 4.30c; .76-1.00 Carb., 6.15c; over 1.00 Carb., 8.35c.

Tin, Terne Plate

Tin Plate: Pittsburgh, Chicago, Gary, 100-lb. base box, $5.00; Granite City $5.10.
Tin Mill Black Plate: Pittsburgh, Chicago, Gary, base 29 gage and lighter, 3.05c; Granite City, 3.15c; Pacific ports, boxed 4.05c.
Long Ternes: Pittsburgh, Chicago, Gary, No. 24 unassorted 3.80c.
Manufacturing Ternes: (Special Coated) Pittsburgh, Chicago, Gary, 100-base box $4.30; Granite City $4.40.
Roofing Ternes: Pittsburgh base per package 112 sheets; 20 x 28 in., coating I.C., 8-lb. $12.00; 15-lb. $14.00; 20-lb. $15.00; 25-lb. $16.00; 30-lb. $17.25; 40-lb. $19.50.

Plates

Carbon Steel Plates: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Sparrows Point, Coatesville, Claymont, 2.10c; New York, del., 2.30-2.55c; Phila., del., 2.15c; St. Louis, 2.34c; Boston, del., 2.42-67c; Pacific ports, 2.65c; Gulf Ports, 2.47c.
(Granite City Steel Co. may quote carbon plates 2.35c, f.o.b. mill. Central Iron & Steel Co. may quote plates at 2.20c, f.o.b. basing points.)
Floor Plates: Pittsburgh, Chicago, 3.35c; Gulf ports, 3.72c; Pacific ports, 4.00c.
Open-Hearth Alloy Plates: Pittsburgh, Chicago, Coatesville, 3.50c.
Wrought Iron Plates: Pittsburgh, 3.80c.

Shapes

Structural shapes: Pittsburgh, Chicago, Gary, Birmingham, Buffalo, Bethlehem, 2.10c; New York, del., 2.28c; Phila., del., 2.22c; Gulf ports, 2.47c; Pacific ports, 2.75c.
(Phoenix Iron Co., Phoenixville, Pa. may quote carbon steel shapes at 2.30c at established basing points and 2.50c, Pheonixville, for export.)
Steel Sheet Piling: Pittsburgh, Chicago, Buffalo, 2.40c.

Wire Products, Nails

Wire: Pittsburgh, Chicago, Cleveland, Birmingham (except spring wire) to manufacturers in carloads (add $2 for Worcester):

Bright basic, bessemer wire	2.60c
Galvanized wire	2.60c
Spring wire	3.20c
Wire Products to the Trade:	
Standard and cement-coated wire nails, polished and staples, 100-lb. keg	$2.55
Annealed fence wire, 100 lb.	3.05
Galvanized fence wire, 100 lb.	3.40
Woven fence, 12½ gage and lighter, per base column	.67
Do., 11 gage and heavier	.70
Barbed wire, 80-rod spool, col.	.70
Twisted barbless wire, col.	.70
Single loop bale ties, col.	.59
Fence posts, carloads, col.	.69
Cut nails, Pittsburgh, carloads	$3.85

Pipe, Tubes

Welded Pipe: Base price in carloads to consumers about $200 per net ton. Base discounts on steel pipe Pittsburgh and Lorain, O.; Gary, Ind. 2 points less on lap weld, 1 point less on butt weld. Pittsburgh base only on wrought iron pipe.

In.	Butt Weld Steel Blk.	Galv.	In.	Iron Blk.	Galv.
⅛	56	33	¼	24	3½
¼ & ⅜	59	40½	⅜	30	10
½	63½	51	1-1¼	34	16
¾	66½	55	1½	38	18½
1-3	68½	57½	2	37½	18

In.	Lap Weld Steel Blk.	Galv.	In.	Iron Blk.	Galv.
2	61	49½	1¼	23	3½
2½-3	64	52½	1½	28½	10
3½-6	66	54½	2	30½	12
7-8	65	52½	2½, 3½	31½	14½
9-10	64½	52	4	33½	18
11-12	63½	51	4½-8	32½	17
			9-12	28½	12

Boiler Tubes: Net base prices per 100 feet, f.o.b. Pittsburgh in carload lots, minimum wall, cut lengths 4 to 24 feet, inclusive.

O. D. Sizes	B.W.G.	—Seamless— Hot Rolled	Cold Drawn	—Lap Weld— Steel	Charcoal Iron
1"	13	$ 7.82	$ 9.01	.....	.....
1¼"	13	9.26	10.67	.....	.....
1½"	13	10.23	11.72	$ 9.72	$23.71
1¾"	13	11.64	13.42	11.06	22.93
2"	13	13.04	15.03	12.38	19.35
2¼"	13	14.54	16.76	13.79	21.63
2¼"	12	16.01	18.45	15.16	.....
2½"	12	17.54	20.21	16.58	26.57
2¾"	12	18.59	21.42	17.54	29.00
3"	12	19.50	22.48	18.35	31.38
3½"	11	24.63	28.37	23.15	39.81
4"	10	30.54	35.20	28.66	49.90
4½"	10	37.35	43.04	35.22	.....
5"	9	46.87	54.01	44.25	73.93
6"	7	71.96	82.93	68.14	.....

Rails, Supplies

Standard rails, over 60-lb., f.o.b. mill, gross ton, $40.00.
Light rails (billet), Pittsburgh, Chicago, Birmingham, gross ton, $40.00.
*Relaying rails, 35 lbs. and over, f.o.b. railroad and basing points, $28-$30.
Supplies: Angle bars, 2.70c; tie plates, 2.15c; track spikes, 3.00c; track bolts, 4.75c; do. heat treated, 5.00c.

*Fixed by OPA Schedule No. 46, Dec. 15, 1941.

Tool Steels

Tool Steels: Pittsburgh, Bethlehem, Syracuse, base, cents per lb.: Reg. carbon 14.00c; extra carbon 18.00c; special carbon 22.00c; oil-hardening 24.00c; high car.-chr. 43.00c.
High Speed Tool Steels:

Tung.	Chr.	Van.	Moly.	Pitts. base. per lb.
18.00	4	1	-	67.00c
1.5	4	1	8.5	54.00c
	4	2	8	54.00c
5.50	4	1.50	4	57.50c
5.50	4.50	4	4.50	70.00c

Stainless Steels

Base, Cents per lb.—f.o.b. Pittsburgh

Type	Bars	Plates	Sheets	H. R. Strip	C. R. Strip
CHROMIUM NICKEL STEEL					
302	24.00c	27.00c	34.00c	21.50c	28.00c
303	26.00	29.00	36.00	27.00	33.00
304	25.00	29.00	36.00	23.50	30.00
308	29.00	34.00	41.00	28.50	35.00
309	36.00	40.00	47.00	37.00	47.00
310	49.00	52.00	53.00	48.75	56.00
311	49.00	52.00	53.00	48.75	56.00
312	36.00	40.00	49.00	...	...
*316	40.00	44.00	48.00	40.00	48.00
*317	50.00	54.00	58.00	50.00	58.00
†321	29.00	34.00	41.00	29.25	38.00
‡347	33.00	38.00	45.00	33.00	42.00
431	19.00	22.00	29.00	17.50	22.50
STRAIGHT CHROMIUM STEEL					
403	21.50	24.50	29.50	21.25	27.00
**410	18.50	21.50	26.50	17.00	22.00
416	19.00	22.00	27.00	18.25	23.50
††420	24.00	28.50	33.50	23.75	36.50
430	19.00	22.00	29.00	17.50	22.50
‡‡430F.	19.50	22.50	29.50	18.75	24.50
442	22.50	25.50	32.50	24.00	32.00
446	27.50	30.50	36.50	35.00	52.00
501	8.00	12.00	15.75	12.00	17.00
502	9.00	13.00	16.75	13.00	18.00
STAINLESS CLAD STEEL (20%)					
304	§§18.00	19.00	.....	.....	

*With 2-3% moly. †With titanium. ‡With columbium. **Plus machining agent. ††High carbon. ‡‡Free machining. §§Includes annealing and pickling.

Basing Point Prices are (1) those announced by U. S. Steel Corp. subsidiaries for first quarter of 1941 or in effect April 16, 1941 at designated basing points or (2) those prices announced or customarily quoted by other producers at the same designated points. Base prices under (2) cannot exceed those under (1) except to the extent prevailing in third quarter of 1940.
Extras mean additions or deductions from base prices in effect April 16, 1941.
Delivered prices applying to Detroit, Eastern Michigan, Gulf and Pacific Coast points are deemed basing points except in the case of the latter two areas when water transportation is not available, in which **case** nearest basing point price, plus all-rail freight may be charged.
Domestic Ceiling prices are the aggregate of (1) governing basing point price, (2) extras and (3) transportation charges to the point of delivery as customarily computed. **Governing basing point** is basing point nearest the consumer providing the lowest delivered price. **Emergency basing point** is the basing point at or near the place of production or origin.
Seconds, maximum prices: flat-rolled rejects 75% of prime prices; wasters 75%, waste-wasters 65%, except plates, which take waster prices; tin plate $2.80 per 100 lbs.; terne plate $2.25; semifinished 85% of primes; other grades limited to new material ceilings.
Export ceiling prices may be either the aggregate of (1) governing basing point or emergency basing point (2) export extras (3) export transportation charges provided they are the f.a.s. seaboard quotations of the U. S. Steel Export Co. on April 16, 1941.

Bolts, Nuts

F.o.b. Pittsburgh, Cleveland, Birmingham, Chicago. Discounts for carloads additional 5%, full containers, add 10%.

Carriage and Machine	
½ x 6 and smaller	65½ off
Do., ⅝ and ⅝ x 6-in. and shorter	63½ off
Do., ¾ to 1 x 6-in. and shorter	61 off
1⅛ and larger, all lengths	59 off
All diameters, over 6-in. long	59 off
Tire bolts	50 off
Step bolts	56 off
Plow bolts	65 off
Stove Bolts	
In packages with nuts separate 71-10 off; with nuts attached 71 off; bulk 80 off on 15,000 of 3-inch and shorter, or 5000 over 3-in.	
Nuts	

Semifinished hex.	U.S.S.	S.A.E.
⅞-inch and less	62	64
½-1-inch	59	60
1⅛-1½-inch	57	58
1⅝ and larger	56	...

Hexagon Cap Screws	
Upset 1-in., smaller	64 off
Milled 1-in., smaller	60 off
Square Head Set Screws	
Upset, 1-in., smaller	71 off
Headless, ¼-in., larger	60 off
No. 10, smaller	70 off

Piling

Pittsburgh, Chicago, Buffalo 2.40c

Rivets, Washers

F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham

Structural	3.75c
⅞-inch and under	65-5 off
Wrought washers, Pittsburgh, Chicago, Philadelphia, to jobbers and large nut, bolt manufacturers l.c.l.	$2.75-3.00 off

Metallurgical Coke

Price Per Net Ton

Beehive Ovens	
Connellsville, furnace	*6.50
Connellsville, foundry	7.50- 8.00
Connellsville prem. fdry.	7.75- 8.10
New River, foundry	8.50- 8.75
Wise county, foundry	8.00
Wise county, furnace	7.00
By-Product Foundry	
Kearny, N. J., ovens	12.15
Chicago, outside delivered	11.50
Chicago, delivered	12.25
Terre Haute, delivered	12.00
Milwaukee, ovens	12.25
New England, delivered	13.75
St. Louis, delivered	†12.25
Birmingham, ovens	8.50
Indianapolis, delivered	12.00
Cincinnati, delivered	11.75
Cleveland, delivered	12.30
Buffalo, delivered	12.50
Detroit, delivered	12.25
Philadelphia, delivered	12.38

*Operators of hand-drawn ovens using trucked coal may charge $7.00, effective Feb. 3, 1943. †$12.75 from other than Ala., Mo., Tenn.

Coke By-Products

Spot, gal., freight allowed east of Omaha

Pure and 90% benzol	15.00c
Toluol, two degree	28.00c
Solvent naphtha	27.00c
Industrial xylol	27.00c
Per lb. f.o.b. works	
Phenol (car lots, returnable drums)	12.50c
Do., less than car lots	13.25c
Do. tank cars	11.50c
Eastern Plants, per lb.	
Naphthalene flakes, balls, bbls., to jobbers	8.00c
Per ton, bulk, f.o.b. port	
Sulphate of ammonia	$29.20

Pig Iron

Prices (in gross tons) are maximums fixed by OPA Price Schedule No. 10, effective June 10, 1941. Exceptions indicated in footnotes. Allocation regulations from WPB Order M-17, expiring Dec. 31, 1942. Base prices bold face, delivered light face. Federal tax on freight charges, effective Dec. 1, 1942, not included in following prices.

	No. 2 Foundry	Basic	Bessemer	Malleable
Bethlehem, Pa., base	$25.00	$24.50	$26.00	$25.50
Newark, N. J., del.	26.62	26.12	27.62	27.12
Brooklyn, N. Y., del.	27.65	.	.	28.15
Birdsboro, Pa., del	25.00	24.50	26.00	25.50
Birmingham, base	‡20.38	‡19.00	. . .	.....
Baltimore, del.	25.67	.....	.....	.....
Boston, del.	25.12	. . .	. . .	.....
Chicago, del.	‡24.47	. . .	. . .	.....
Cincinnati, del.	24.30	22.92	.....	.....
Cleveland, del.	24.12	23.24	.....	.....
Newark, N. J., del.	26.24	.	.....	.....
Philadelphia, del.	25.51	25.01	.....	.....
St. Louis, del.	‡24.12	23.24	.....	.....
Buffalo, base	24.00	23.00	25.00	24.50
Boston, del.	25.50	25.00	26.50	26.00
Rochester, del.	25.53	....	26.53	26.03
Syracuse, del.	26.08	.....	27.08	26.58
Chicago, base	24.00	23.50	24.50	24.00
Milwaukee, del.	25.17	24.67	25.67	25.17
Muskegon, Mich., del.	27.38	.....	.....	27.38
Cleveland, base	24.00	23.50	24.50	24.00
Akron, Canton, O., del.	25.47	24.97	25.97	25.47
Detroit, base	24.00	23.50	24.50	24.00
Saginaw, Mich., del.	26.45	25.95	26.95	26.45
Duluth, base	24.50	24.00	25.00	24.50
St. Paul, del.	26.75	26.26	27.26	26.76
Erie, Pa., base	24.00	23.50	25.00	24.50
Everett, Mass., base	25.00	24.50	26.00	25.50
Boston	25.50	25.00	26.50	26.00
Granite City, Ill., base	24.00	23.50	24.50	24.00
St. Louis, del.	24.50	24.00	.....	24.50
Hamilton, O., base	24.00	23.50	.....	24.00
Cincinnati, del.	24.68	24.68	.	25.35
Neville Island, Pa., base	24.00	23.50	24.50	24.00
§Pittsburgh, del., No. & So. sides	24.69	24.19	25.19	24.69
Provo, Utah, base	22.00	21.50	.	. . .
Sharpsville, Pa., base	24.00	23.50	24.50	24.00
Sparrows Point, Md., base	25.00	24.50	.....	.....
Baltimore, del.	26.05	.	.....	.....
Steelton, Pa., base	.	24.50	.	25.50
Swedeland, Pa., base	25.00	24.50	26.00	25.50
Philadelphia, del.	25.89	25.39	.	26.39
Toledo, O., base	24.00	23.50	24.50	24.00
Mansfield, O., del.	26.06	25.56	26.56	26.06
Youngstown, O., base	24.00	23.50	24.50	24.00

•Basic silicon grade (1.75-2.25%), add 50c for each 0.25%. ‡For phosphorus 0.70 and over deduct 38c. ‡Over 0.70 phos. §For McKees Rocks, Pa., add .55 to Neville Island base; Lawrenceville, Homestead, McKeesport, Ambridge, Monaca, Aliquippa, .84; Monessen, Monongahela City .97 (water); Oakmont, Verona 1.11; Brackenridge 1.24.

High Silicon, Silvery

6.00-6.50 per cent (base)	$29.50		
6.51-7.00	$30.50	9.01- 9.50	$35.50
7.01-7.50	31.50	9.51-10.00	36.50
7.51-8.00	32.50	10.01-10.50	37.50
8.01-8.50	33.50	10.51-11.00	38.50
8.51-9.00	34.50	11.01-11.50	39.50

F.o.b. Jackson county, O., per gross ton, Buffalo base prices are $1.25 higher. Prices subject to additional charge of 50 cents a ton for each 0.50% manganese in excess of 1.00%.

Bessemer Ferrosilicon

Prices same as for high silicon silvery iron, plus $1 per gross ton.

Charcoal Pig Iron

Northern

Lake Superior Furn. $28.00
Chicago, del. 31.54

(For higher silicon irons a differential over and above the price of base grades is charged as well as for the hard chilling irons, Nos. 5 and 6.)

Southern

Semi-cold blast, high phos., f.o.b. furnace, Lyles, Tenn. $28.50
Semi-cold blast, low phos., f.o.b. furnace, Lyles, Tenn. 33.00

Gray Forge

Neville Island, Pa. $23.50
Valley, base 23.50

Low Phosphorus

Basing points: Birdsboro and Steelton, Pa., and Buffalo, N. Y., $29.50 base; $30.81, delivered, Philadelphia.

Switching Charges: Basing point prices are subject to an additional charge for delivery within the switching limits of the respective districts.

Silicon Differentials: Basing point prices are subject to an additional charge not to exceed 50 cents a ton for each 0.25 silicon in excess of base grade (1.75 to 2.25%).

Phosphorous Differential: Basing point prices are subject to a reduction of 38 cents a ton for phosphorous content of 0.70% and over.

Manganese Differentials: Basing point prices subject to an additional charge not to exceed 50 cents a ton for each 0.50% manganese content in excess of 1.0%.

Ceiling Prices are the aggregate of (1) governing basing point (2) differentials (3) transportation charges from governing basing point to point of delivery as customarily computed. Governing basing point is the one resulting in the lowest delivered price for the consumer.

Exceptions to Ceiling Prices: Pittsburgh Coke & Iron Co. (Sharpsville, Pa. furnace only) and Struthers Iron & Steel Co. may charge 50 cents a ton in excess of basing point prices for No. 2 Foundry, Basic, Bessemer and Malleable. Mystic Iron Works, Everett, Mass., may exceed basing point prices by $1 per ton, effective April 20, 1942. Chester, Pa., furnace of Pittsburgh Coke & Iron Co. may exceed basing point prices by $2.25 per ton, effective July 27, 1942.

Refractories

Per 1000 f.o.b. Works, Net Prices

Fire Clay Brick

Super Quality

Pa., Mo., Ky. $64.60

First Quality

Pa., Ill., Md., Mo., Ky.	51.30
Alabama, Georgia	51.30
New Jersey	56.00
Ohio	43.00

Second Quality

Pa., Ill., Md., Mo., Ky.	46.55
Alabama, Georgia	38.00
New Jersey	49.00
Ohio	36.00

Malleable Bung Brick

All bases $59.85

Silica Brick

Pennsylvania	$51.30
Joliet, E. Chicago	58.90
Birmingham, Ala.	51.30

Ladle Brick

(Pa., O., W. Va., Mo.)

Dry press	$31.00
Wire cut	29.00

Magnesite

Domestic dead-burned grains, net ton f.o.b. Chewelah, Wash., net ton, bulk	22.00
net ton, bags	26.00

Basic Brick

Net ton, f.o.b. Baltimore, Plymouth Meeting, Chester, Pa.

Chrome brick	$54.00
Chem. bonded chrome	54.00
Magnesite brick	76.00
Chem. bonded magnesite	65.00

Fluorspar

Washed gravel, f.o.b. Ill., Ky., net ton, carloads, all rail	$25.00-28.00
Do., barge	25.00-28.00
No. 2 lump	25.00-28.00

(Prices effective Nov. 23, 1942)

Ferroalloy Prices

Ferromanganese: 78-82%, carlots, gross ton, duty paid, Atlantic ports, $135; Del. Pittsburgh $140.65; f.o.b. Southern furnaces $135; Add $6 per gross ton for packed carloads $10 for ton, $13.50 for less-ton and $18 for less than 200-lb. lots, packed.

Spiegeleisen: 19-21%, carlots per gross ton. Palmerton, Pa. $36.

Electrolytic manganese: 99.9% plus, less ton lots, per lb. 42.00c. Ton lots 40.00c. Annual contracts 38.00c.

Chromium Metal: Per lb. contained chromium in gross ton lots, contract basis, freight allowed, 98% 80.00c, 88% 79.00c. Spot prices 5 cents per lb. higher.

Ferrocolumbium: 50-60%, per lb. contained columbium in gross ton lots, contract basis, f.o.b. Niagara Falls, N. Y. $2.25; less-ton lots $2.30. Spot prices 10 cents per lb. higher.

Ferrochrome: 66-70%; per lb. contained chromium in carloads, freight allowed, 4-6% carbon 13.00c; ton lots 13.75c; less-ton lots 14.00c; less than 200-lb. lots 14.25c. 66-72%, low carbon grades:

	Car loads	Ton lots	Less ton	Less 200 lbs.
2% C.	19.50c	20.25c	20.75c	21.00c
1% C.	20.50c	21.25c	21.75c	22.00c
0.20% C.	21.50c	22.25c	22.75c	23.00c
0.10% C.	22.50c	23.25c	23.75c	24.00c

Spot is ¼c higher

Chromium briquets: Contract basis in carloads per lb., freight allowed 8.25c; packed 8.50c; gross ton lots 8.75c; less-ton lots 9.00c; less 200-lb. lots 9.25c. Spot prices ¼-cent higher.

Ferromolybdenum: 55-75%, per lb. contained molybdenum, f.o.b. Langeloth and Washington, Pa., furnace, any quantity 95.00c.

Calcium Molybdate (Molyte): 40-45%, per lb. contained molybdenum, contract basis, f.o.b. Langeloth and Washington, Pa., any quantity, 80.00c.

Molybdic Oxide Briquets: 48-52%, per lb. contained molybdenum, f.o.b. Langeloth, Pa., any quantity 80.00c.

Molybdenum Oxide: 53-63%, per lb. contained molybdenum in 5 and 20 lb. molybdenum contained cans, f.o.b. Langeloth and Washington, Pa., any quantity 80.00c.

Molybdenum Powder: 99% per lb. in 200-lb. kegs, f.o.b. York, Pa. $2.60; 100-200 lb. lots $2.75; under 100-lb. lots $3.00.

Ferrophosphorus: 17-19%, based on 18% phosphorus content, with unitage of $3 for each 1% of phosphorus above or below the base; gross tons per carload f.o.b. sellers' works, with freight equalized with Rockdale, Tenn.; contract price $58.50, spot $62.25.

Ferrophosphorus: 23-26%, based on 24% phosphorus content, with unitage of $3 for each 1% of phosphorus above or below the base; gross tons per carload f.o.b. sellers' works, with freight equalized with Mt. Pleasant, Tenn.; contract price $75, spot $80.

Ferrosilicon: Contract basis in gross tons per carload, bulk, freight allowed; unitage applies to each 1% silicon above or below base.

	Carloads	Ton lots
50%	$ 74.50	$ 87.00
Unitage	1.50	1.75
75%	135.00	151.00
Unitage	1.80	2.00
85%	170.00	188.00
Unitage	2.00	2.20
90-95%	10.25c	11.25c

Spot prices ¼-cent higher.

Silicon Metal: Contract basis per lb., f.o.b. producers plants, freight allowed; 1% iron; carlots 14.50c, ton lots 15.00c, less-ton lots 15.25c, less 200 lbs. 15.50c.

Silicon Metal: Contract basis per lb.; 2% iron; carlots 13.00c, ton lots 13.50c, less-ton lots 13.75c, less 200 lbs. 14.00c. Spot prices ¼-cent higher.

Silicon Briquets: Contract basis; in carloads, bulk freight allowed, per ton $74.50; packed $80.50; ton lots $84.50; less-ton lots per lb. 4.00c; less 200-lb. lots per lb. 4.25c. Spot ¼-cent per lb. higher on less-ton lots; $5 per ton higher on ton lots and over.

Silicomanganese: Contract basis freight allowed, 1½% carbon; in carloads per gross ton $135; ton lots $147.50. Spot $5 per ton higher.

Silico-manganese Briquets: Contract basis in carloads per pound, bulk freight allowed 5.80c; packed 6.05c; ton lots 6.30c; less-ton lots 6.55c; less 200-lb. lots 6.80c. Spot prices ¼-cent higher.

Ferrotungsten: Carlots, per lb. contained tungsten, $1.90.

Tungsten Metal Powder: 98-99%, per lb any quantity $2.55-2.65.

Ferrotitanium: 40-45%, f.o.b. Niagara Falls, N. Y., per lb. contained titanium; ton lots $1.23; less-ton lots $1.25. Spot 5 cents per lb. higher.

Ferrotitanium: 20-25%. 0.10 maximum carbon; per lb. contained titanium; ton lots $1.35; less-ton lots $1.40. Spot 5 cents per lb. higher.

High-Carbon Ferrotitanium: 15-20%. Contract basis, per gross ton, f.o.b. Niagara Falls, N. Y., freight allowed to destinations east of Mississippi River and North of Baltimore and St. Louis, 6-8% carbon $142.50; 3-5% carbon $157.50.

Ferrovanadium: 35-40%, contract basis, per lb. contained vanadium, f.o.b. producers plant with usual freight allowances; open-hearth grade $2.70; special grade $2.80; highly-special grade $2.90.

Vanadium Pentoxide: Technical grade, 88-92 per cent V_2O_5; contracts, any quantity, $1.10 per pound V_2O_5 contained; spot 5 cents per pound higher.

Zirconium Alloys: 12-15%, contract basis, carloads bulk, per gross ton $102.50; packed $107.50; ton lots $108; less-ton lots $112.50. Spot $5 per ton higher.

Zirconium alloy: 35-40%, contract basis, carloads in bulk or package, per lb. of alloy 14.00c; gross ton lots 15.00c; less-ton lots 16.00c. Spot ¼-cent higher.

Alsifer: (Approx. 20% aluminum, 40% silicon, 40% iron) Contract basis, f.o.b. Niagara Falls, N. Y., per lb. 7.50c; ton lots 8.00c. Spot ½-cent higher.

Simanal: (Approx. 20% each silicon, manganese, aluminum) Contract basis, freight allowed, per lb. of alloy; carlots 10.50c; ton lots 11.00c, less ton lots, 11.50c.

WAREHOUSE STEEL PRICES

Base Prices in Cents Per Pound, Delivered Locally, Subject to Prevailing Differentials. As of April 16, 1941

	Hot rolled bars	Structural shapes	Plates	Floor plates	Hot rolled sheets (10 gage base)	Hot rolled bands (12 gage and heavier)	Hot rolled hoops (14 gage and lighter)	Galvanized flat sheets (24 gage base)	Cold rolled sheets (17 gage base)	Cold finished bars	Cold-rolled strip	AISI hot bars 2300 series	AISI hot bars 3100 series
Boston	3.98[1]	3.85[1]	3.85[1]	5.66[1]	3.71[1]	4.06[1]	5.06[1]	5.11[14]	4.68[14]	4.13[21]	3.46	7.75[23]	6.05[23]
New York	3.84[1]	3.75[1]	3.76[1]	5.56[1]	3.58[1]	3.96[1]	3.96[1]	5.00[13]	4.60[1]	4.09[21]	3.51	7.60[23]	5.90[23]
Philadelphia	3.85[1]	3.55[1]	3.55[1]	5.25[1]	3.55[1]	3.95[1]	4.45[1]	4.90[16]	4.63[25]	4.06[21]	3.31	7.56[23]	5.86[23]
Baltimore (city)	3.85[1]	3.70[1]	3.70[1]	5.25[1]	3.50[1]	4.00[1]	4.35[1]	5.05[17]	5.00[20]	4.04[21]	....	....	....
Baltimore (country)	3.85[1]	3.70[1]	3.45[1]	5.25[1]	3.25[1]	4.00[1]	4.35[1]	4.75[17]	5.00[20]	4.04[21]	....	....	....
Washington, D. C.	3.95[1]	3.80[1]	3.80[1]	5.35[1]	3.60[1]	4.10[1]	4.45[1]	5.15[17]	5.10[20]	4.03[21]	....	....	....
Norfolk, Va.	4.00[1]	4.05[1]	4.05[1]	5.45[1]	3.85[1]	4.10[1]	4.10[1]	5.40[17]	4.50[24]	4.15[21]	....	....	....
Bethlehem, Pa.°	3.45[1]	....	....	....	....	....	....	....	....	....	....	....	....
Claymont, Del.°	....	....	3.45[1]	....	....	....	....	....	....	....	....	....	....
Contesville, Pa.°	....	....	3.45[1]	....	....	....	....	....	....	....	....	....	....
Buffalo (city)	3.35[1]	3.40[1]	3.62[1]	5.25[1]	3.25[1]	3.82[1]	3.82[1]	4.75[15]	4.30[10]	3.75[21]	3.52	7.35[23]	5.65[23]
Buffalo (country)	3.25[1]	3.30[1]	3.62[1]	5.25[1]	3.15[1]	3.82[1]	3.82[1]	4.65[15]	4.20[10]	3.65[21]	....	....	....
Pittsburgh (city)	3.35[1]	3.40[1]	3.40[1]	5.00[1]	3.35[1]	3.60[1]	3.60[1]	4.75[13]	4.00[24]	3.65[21]	....	7.45[23]	5.75[23]
Pittsburgh (country)	3.25[1]	3.30[1]	3.30[1]	4.90[1]	3.25[1]	3.50[1]	3.50[1]	4.65[13]	4.00[24]	3.65[21]	....	....	....
Cleveland (city)	3.25[1]	3.58[1]	3.40[1]	5.18[1]	3.35[1]	3.50[1]	3.50[1]	4.62[13]	4.05[24]	3.75[21]	3.20	7.55[23]	5.85[23]
Cleveland (country)	3.25[1]	3.58[1]	3.30[1]	5.18[1]	3.25[1]	3.50[1]	3.50[1]	4.62[13]	3.95[24]	3.65[21]	....	....	....
Detroit	3.43[1]	3.65[1]	3.60[1]	5.27[1]	3.43[1]	3.43[1]	3.68[1]	4.84[12]	4.30[24]	3.80[21]	3.40	7.67[23]	5.97[23]
Omaha (city)	4.10[1]	4.15[1]	4.15[1]	5.75[1]	3.85[1]	4.20[1]	4.20[1]	5.52[10]	4.77[24]	4.42[21]	....	....	....
Omaha (country)	4.00[1]	4.05[1]	4.05[1]	5.65[1]	3.75[1]	4.10[1]	4.10[1]	5.52[10]	4.77[24]	4.42[21]	....	....	....
Cincinnati	3.60[1]	3.68[1]	3.65[1]	5.28[1]	3.42[1]	3.67[1]	3.67[1]	4.92[10]	4.37[24]	4.00[21]	3.45	7.69[23]	5.99[23]
Youngstown, O.°	....	....	....	....	....	....	....	4.40[13]	....	....	....	....	....
Middletown, O.°	....	....	....	....	3.25[1]	3.50[1]	3.50[1]	4.40[13]	....	....	....	....	....
Chicago (city)	3.50[1]	3.55[1]	3.55[1]	5.15[1]	3.25[1]	3.60[1]	3.60[1]	4.85[10]	4.10[24]	3.75[21]	3.50	7.35[23]	5.65[23]
Chicago (country)	3.40[1]	3.45[1]	3.45[1]	5.05[1]	3.15[1]	3.50[1]	3.50[1]	4.75[10]	4.00[24]	3.65[21]	....	....	....
Milwaukee	3.63[1]	3.68[1]	3.68[1]	5.28[1]	3.38[1]	3.73[1]	3.73[1]	4.98[10]	4.23[24]	3.88[21]	3.54	7.33[23]	5.88[23]
St. Paul	3.75[2]	3.80[2]	3.80[2]	5.40[2]	3.50[2]	3.85[2]	3.85[2]	5.00[2]	4.35[2]	4.34[21]	3.83	7.70[23]	6.00[23]
St. Louis	3.64[1]	3.69[1]	3.69[1]	5.29[1]	3.39[1]	3.74[1]	3.74[1]	4.99[10]	4.24[24]	4.02[21]	3.61	7.72[23]	6.02[23]
Indianapolis (city)	3.60[1]	3.70[1]	3.70[1]	5.30[1]	3.45[1]	3.75[1]	3.75[1]	5.01[10]	4.25[24]	3.97[21]	....	....	....
Indianapolis (country)	3.35[1]	3.45[1]	3.40[1]	5.05[1]	3.20[1]	3.50[1]	3.50[1]	5.01[10]	4.00[24]	3.97[21]	....	....	....
Memphis, Tenn.	3.90[5]	3.95[5]	3.95[5]	5.71[5]	3.85[5]	4.10[5]	4.10[5]	5.25[11]	4.66[24]	4.31[21]	....	....	....
Birmingham (city)	3.50[5]	3.55[5]	3.55[5]	5.83[5]	3.45[5]	3.70[5]	3.70[5]	4.75[10]	4.78[24]	4.43[21]	....	....	....
Birmingham (country)	3.40[5]	3.45[5]	3.45[5]	5.83[5]	3.35[5]	3.60[5]	3.60[5]	4.75[10]	4.78[24]	4.43[21]	....	....	....
New Orleans (city)	4.10[4]	3.90[4]	3.90[4]	5.85[4]	3.95[4]	4.20[4]	4.20[4]	5.25[26]	4.95[10]	4.60[21]	5.00	....	....
New Orleans (country)	4.00[4]	3.80[4]	3.80[4]	5.75[4]	3.85[4]	4.10[4]	4.10[4]	5.15[26]	4.95[10]	4.60[21]	....	....	....
Houston, Tex.	3.75[2]	4.25[2]	4.25[2]	5.50[2]	3.75[2]	4.30[2]	4.30[2]	5.25[26]	5.43[10]	4.50[22]	....	....	....
Los Angeles	4.35[4]	4.60[4]	4.90[4]	7.15[4]	4.95[4]	4.90[4]	6.70[4]	5.95[18]	7.15[6]	5.70[22]	....	9.55[23]	8.55[23]
San Francisco (city)	3.95[7]	4.35[7]	4.65[7]	6.35[7]	4.55[7]	4.50[7]	4.50[7]	6.60[19]	7.55[19]	5.55[23]	....	9.80[9]	8.80[9]
San Francisco (country)	3.85[1]	4.25[7]	4.55[7]	6.25[7]	4.45[7]	4.40[7]	4.40[7]	6.50[19]	7.45[19]	5.45[22]	....	....	....
Tacoma	4.20[6]	4.45[6]	4.75[6]	6.50[6]	4.65[6]	4.25[6]	5.45[6]	5.70[6]	6.63[24]	5.75[22]	....	....	....
Seattle (city)	4.20[6]	4.45[6]	4.75[6]	6.50[6]	4.65[6]	4.35[6]	5.45[6]	5.70[6]	6.63[24]	5.75[23]	....	....	8.00[3]

°Basing point cities against which warehouses equalized freight as of April 16, 1941, and which must now be used in calculating lowest combination prices.

NOTE—All prices except cold-rolled strip and AISI hot-rolled bars fixed by Office of Price Administration in amendment No. 10 to Revised Price Schedule No. 49.

BASE QUANTITIES

[1]—400 to 1999 pounds; [2]—400 to 14,999 pounds; [3]—any quantity; [4]—300 to 1999 pounds; [5]—400 to 3999 pounds; [6]—300 to 1999 pounds; [7]—400 to 39,999 pounds; [8]—under 2000 pounds; [9]—under 4000 pounds; [10]—500 to 1499 pounds; [11]—one bundle to 39,999 pounds; [12]—150 to 2249 pounds; [13]—150 to 1499 pounds; [14]—three to 24 bundles; [15]—450 to 1499 pounds; [16]—one bundle to 1499 pounds; [17]—one to nine bundles; [18]—one to six bundles; [19]—100 to 749 pounds; [20]—300 to 1999 pounds; [21]—1500 to 39,999 pounds; [22]—1500 to 1999 pounds; [23]—1000 to 39,999 pounds; [24]—400 to 1499 pounds; [25]—1000 to 1999 pounds; [26]—under 25 bundles. Cold-rolled strip, any quantity is base.

Ores

Lake Superior Iron Ore
Gross ton, 51½%
Lower Lake Ports

Old range bessemer	$4.75
Mesabi nonbessemer	4.45
High phosphorus	4.35
Mesabi bessemer	4.60
Old range nonbessemer	4.60

Eastern Local Ore
Cents, unit, del. E. Pa.

Foundry and basic 56-63%, contract	13.00

Foreign Ore
Cents per unit, c.i.f. Atlantic ports

Manganiferous ore, 45-55% Fe., 6-10% Mang.	Nom.
N. African low phos.	Nom.
Spanish, No. African basic, 50 to 60%	Nom.
Brazil iron ore, 68-69% f.o.b. Rio de Janeiro	7.50-8.00c

Tungsten Ore

Chinese wolframite, per short ton unit, duty paid	$24.00

Chrome Ore
(Equivalent OPA schedules):
Gross ton f.o.b. cars, New York, Philadelphia, Baltimore, Charleston, S. C., Portland, Ore., or Tacoma, Wash.
(S/S paying for discharging; dry basis; subject to penalties if guarantees are not met.)

Indian and African	
48% 2.8:1	41.00
48% 3:1	43.50
48% no ratio	31.00
South African (Transvaal)	
44% no ratio	27.40
45% no ratio	28.30
48% no ratio	31.00
50% no ratio	32.80
Brazilian—nominal	
44% 2.5:1 lump	33.65
48% 3:1 lump	43.50
Rhodesian	
45% no ratio	28.30
48% no ratio	31.00
48% 3:1 lump	43.50
Domestic (f.o.b. Columbus, Mont.)	
48% 3:1	43.50
less $7 freight allowance	

Manganese Ore
Including war risk but not duty, cents per gross-ton unit, dry, f.o.b. cars, New Orleans and Mobile; 5 cents higher at Norfolk, Baltimore, Philadelphia, New York; adjustments for analysis variations. (Based on OPA schedules.)

Brazilian, 48%	73.8c
Brazilian, 46%	71.8c
Caucasian, 51%	75.3c
Caucasian, 50%	74.8c
Chilean, 48%	73.8c
Indian, 50%	74.8c
Indian, 48%	73.8c
South African, 48%	73.8c
South African, 46%	71.8c
(Duty Free)	
Cuban, 51%	86.5c
Cuban, 48%	85.0c
Cuban, 45%	82.0c
Philippine, 50%	85.0c
Domestic, 48%, f.o.b. mines	96.0c

Molybdenum

Sulphide conc., lb., Mo. cont., mines	$0.75

NATIONAL EMERGENCY STEELS (Hot Rolled)

Desig-nation	Chemical Composition Limits, Per Cent—Carbon	Mn.	Si.	Cr.	Ni.	Mo.	Basic open-hearth Bars per 100 lb.	Billets per G T	Electric furnace Bars per 100 lb.	Billets per G T
NE 1330	.28-.33	1.60-1.90	.20-.35	.....	.....	.....	$ .10	$2.00	....	.....
NE 8020	.18-.23	1.00-1.30	.20-.35	.....	.....	.10-.20	.45	9.00	$.95	$19.00
NE 8442	.40-.45	1.30-1.60	.20-.35	.....	.....	.30-.40	.90	18.00	1.40	28.00
NE 8613	.12-.17	.70- .90	.20-.35	.40-.60	.40-.70	.15-.25	.75	15.00	1.25	25.00
NE 8720	.18-.18	.70- .90	.20-.35	.40-.60	.40-.70	.20-.30	.80	16.00	1.30	26.00
NE 9255	.50-.60	.75-1.00	1.80-2.20	.....	.....	.....	.40	8.00	....	.....
NE 9262	.55-.65	.75-1.00	1.80-2.20	.20-.40	.....	.....	.65	13.00	....	.....
NE 9415	.13-.18	.80-1.10	.40-.60	.20-.40	.20-.50	.08-.15	.80	16.00	1.30	26.00
NE 9442	.40-.45	1.00-1.30	.40-.60	.20-.40	.20-.50	.08-.15	.85	17.00	1.35	27.00
NE 9587	.35-.40	1.20-1.50	.40-.60	.40-.60	.40-.70	.15-.25	1.20	24.00	1.70	34.00
NE 9630	.28-.33	1.20-1.50	.40-.60	.40-.60	.....	.....	.80	16.00	1.30	26.00
NE 9642	.40-.45	1.30-1.60	.40-.60	.40-.60	.....	.....	.85	17.00	1.35	27.00

Extras are in addition to a base price of 2.70c, per 100 lb., on finished products and $54 per gross ton on semifinished steel major basing points and are in cents per 100 lb. and dollars per gross ton in semifinished. No prices quoted on vanadium alloy.

MAXIMUM PRICES FIXED BY OPA ON IRON AND STEEL SCRAP

Other than railroad grades quoted on the basis of basing point prices from which shipping point prices and consumers' delivered prices are to be computed. Scrap originating from railroads quoted delivered to consumers' plants located on the line of the railroad from which the material originated. All prices in gross tons. A basing point includes its switching district.

PRICES FOR OTHER THAN RAILROAD SCRAP

	ELECTRIC FURNACE, ACID OPEN-HEARTH AND FOUNDRY GRADES													
					Low Phos. Grades									
	OPEN HEARTH GRADES*	Mixed Bor., Turn., Machine Turnings	Cast Iron Borings	Shoveling Turnings	Billet, Bloom Forge Crops	Bar Crops and smaller; Punchings, Plate	Heavy Structural, Plate 3 ft. and less	Heavy Structural, Plate 2 ft. and less	Heavy Structural, Plate 1 ft. and less	Foundry Steel 2 ft. and less	Foundry Steel 1 ft. and less	Alloy-Free Low Phos. & Sulphur Turnings	First Cut Heavy Axle & Forge Turnings	Electric Furnace Bundles
Pittsburgh, Brackenridge, Butler, Johnstown, Midland, Monessen, Sharon, Steubenville, Weirton, Canton, Youngstown, Warren	$20.00	$15.00	$16.00	$17.00	$25.00	$22.50	$21.50	$22.00	$22.50	$21.50	$22.00	$18.00	$19.50	$21.00
Claymont, Coatesville, Harrisburg, Conshohocken, Phoenixville	18.75	13.75	14.75	15.75	23.75	21.25	20.25	20.75	21.25	20.25	20.75	16.75	18.25	19.75
Bethlehem	18.25	13.25	14.25	15.25	23.25	20.75	19.75	20.25	20.75	19.75	20.25	16.25	17.75	19.25
Buffalo	19.25	14.25	15.25	16.25	24.25	21.75	20.75	21.25	21.75	20.75	21.25	17.25	18.75	20.25
Cleveland, Middletown, Cincinnati, Portsmouth, Ashland	19.50	14.50	15.50	16.50	24.50	22.00	21.00	21.50	22.00	21.00	21.50	17.50	19.00	20.50
Detroit	17.85	12.85	13.85	14.85	22.85	20.35	19.35	19.85	20.35	19.35	19.85	15.85	17.35	18.85
Toledo	†15.35	12.85	13.85	14.85	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
Chicago	18.75	13.75	14.75	15.75	23.75	21.25	20.25	20.75	21.25	20.25	20.75	16.75	18.25	19.75
Kokomo	18.25	13.25	14.25	15.25	23.25	20.75	19.75	20.25	20.75	19.75	20.25	16.25	17.75	19.25
Duluth	18.00	13.00	14.00	15.00	23.00	20.50	19.50	20.00	20.50	19.50	20.00	16.00	17.50	19.00
St. Louis	17.50	12.50	13.50	14.50	22.50	20.00	19.00	19.50	20.00	19.00	19.50	15.50	17.00	18.50
Birmingham, Atlanta, Alabama City, Los Angeles, San Francisco, Pittsburg, Calif.	17.00	12.00	13.00	14.00	22.00	19.50	18.50	19.00	19.50	18.50	19.00	15.00	16.50	18.00
Minnequa, Colo.	16.50	11.50	12.50	13.50	21.50	19.00	18.00	18.50	19.00	18.00	18.50	14.50	16.00	17.50
Seattle	14.50	9.50	10.50	11.50	19.50	17.00	16.00	16.50	17.00	16.00	16.50	12.50	14.00	15.50

RAILROAD SCRAP

	Heavy Melting Steel	Scrap Rails	Rails for Rolling	Scrap Rails 3 ft. and under	Scrap Rails 2 ft. and under	Scrap Rails 18 in. and under
Pittsburgh, Wheeling, Steubenville, Sharon, Youngstown, Canton	$21.00	$22.00	$23.50	$24.00	$24.25	$24.50
Philadelphia, Wilmington, Sparrows Point	19.75	20.75	22.25	22.75	23.00	23.25
Cleveland, Cincinnati, Middletown, Ashland, Portsmouth	20.50	21.50	23.00	23.50	23.75	24.00
Chicago	19.75	20.75	22.25	22.75	23.00	23.25
Buffalo	20.25	21.25	22.75	23.25	23.50	23.75
Detroit	18.85	19.85	21.35	21.85	22.10	22.35
Kokomo	19.25	20.25	21.75	22.25	22.50	22.75
Duluth	19.00	20.00	21.50	22.00	22.25	22.50
Kansas City, Mo.	17.00	18.00	19.50	20.00	20.25	20.50
St. Louis	18.50	19.50	21.00	21.50	21.75	22.00
Birmingham	18.00	19.00	20.50	21.00	21.25	21.50
Los Angeles, San Francisco	18.00	19.00	20.50	21.00	21.25	21.50
Seattle	15.50	16.50	18.00	18.50	18.75	19.00

CAST IRON SCRAP OTHER THAN RAILROAD

(Shipping point prices in gross tons)

	Group A	Group B	Group C
No. 1 Cupola Cast	$18.00	$19.00	$20.00
No. 1 Machinery Cast, Drop Broken, 150 lbs. & Under	18.00	19.00	20.00
Clean Auto Cast	18.00	19.00	20.00
Stove Plate	17.00	18.00	19.00
Unstripped Motor Blocks	15.50	16.50	17.50
Heavy Breakable Cast	15.50	16.50	17.50
Charging Box Size Cast	17.00	18.00	19.00
Miscellaneous Malleable	20.00	21.00	22.00

Group A includes the states of Montana, Idaho, Wyoming, Nevada, Utah, Arizona and New Mexico.

Group B includes the states of North Dakota, South Dakota, Nebraska, Colorado, Kansas, Oklahoma, Texas and Florida.

Group C includes states not named in groups A and B, plus Kansas City, Kans.-Mo.

*Open Hearth Grades refer to No. 1 heavy melting steel, No. 1 hydraulic compressed black sheet scrap, No. 2 heavy melting steel, dealers' No. 1 bundles, dealers' No. 2 bundles and No. 1 busheling. No. 1 chem. borings, 1 per cent oil, $1 under, No. 2, 1.5 per cent oil, $2 under heavy melting steel. No. 3 bundles, $2 under No. 1 heavy melting; cast steel, $2.50 over, No. 2 busheling, $2.50 under No. 1 heavy melting steel, auto springs, crankshafts, $1 over No. 1 heavy melting. †Toledo open-hearth grades cover only No. 2 busheling.

A basing point includes the switching district of the city named. The Pittsburgh basing point includes the switching districts of Bessemer, Homestead, Duquesne, Munhall and McKeesport, Pa. Cincinnati basing point includes the switching district of Newport, Ky. St. Louis basing point includes the switching districts of Granite City, East St. Louis and Madison, Ill. San Francisco basing point includes the switching districts of South San Francisco, Niles and Oakland, Calif.

Inferior Grades: Maximum prices of inferior grades shall continue to bear the same differential below the corresponding listed grades as existed from Sept. 1, 1940, to Jan. 31, 1941. No premium allowed on grades considered superior, unless approved by OPA. Addition of special preparation charges prohibited. Purchase of electric furnace or foundry grades for open hearth or blast furnace use permitted only at no more than price for corresponding open hearth grade. Exceptions: Low phos. billet, bloom and forge crops and electric furnace bundles may exceed open hearth price, and electric furnace bundles may exceed blast furnace price, if material is delivered to the consumer direct from the original industrial producer.

Commissions: No commission is payable except by a consumer to a broker for services rendered, the commission not to exceed 50 cents per gross ton. No commission is payable unless: The broker guarantees the quality and delivery of an agreed tonnage the scrap is purchased at a price no higher than the maximum allowed; the broker sells the scrap to the consumer at the same price at which he purchased it; the broker does not split the commission with the seller of the scrap, with another broker or sub-broker, or with the consumer. Commissions must be shown as separate item on invoice.

Maximum Shipping Point Price: Where shipment to consumer is by rail, vessel or combination of both, scrap is at its shipping point when it has been placed f.o.b. railroad car or f.a.s. vessel. In such cases, maximum shipping point prices are: (1) For shipping points located within a basing point, the price listed in the above table for scrap at the basing point in which the shipping point is located, minus the lowest established switching charge for scrap within the basing point; and (2) for shipping points located outside a basing point, the price in the above table for scrap at the most favorable basing point, minus the lowest transportation charge by rail, water or combination thereof. When vessel movement is involved, dock charges shall be 50 cents at Memphis, $1 at Great Lakes ports, $1.25 at New England ports, 75 cents elsewhere. New England shipping point prices computed on most favorable basing point prices; maximum transportation charge on scrap from New England, $6.65 per ton.

Scrap shipped by motor vehicle is at its shipping point when loaded. For shipping points within basing points, maximum is price listed in table minus lowest switching charge. When outside basing point, maximum is price at most favorable basing point minus lowest established charge when hauled by common carrier. When hauled by seller charges are based on carload rate for rail shipment, minimum $1.00 per ton.

Maximum Delivered Prices: Determined by adding established transportation charges to shipping point price, not to exceed by more than $1 (plus freight rate increase March 18, 1942) the prices listed in the table for the nearest basing point. Certain exceptions specified in Revised Price Schedule No. 4 (Amendment 1) apply to St. Louis district consumers, to WPB allocations, to water shipments from Duluth or Superior, Wis., to shipments of billets, blooms and forge crops from Pittsburgh and to shipments of electric and foundry grades from Michigan; to shipments of turnings to ferroalloy producers and of borings to chemical users. Delivered prices of scrap shipped under WPB allocations may exceed prices at nearest basing point by more than $1, if most economical transportation is used.

Unprepared Scrap: Above prices are for prepared scrap. Maximum prices for unprepared scrap are $3.50 less; (material from which Nos. 1, 2 and 3 bundles made is $4 less) than for the corresponding grades of prepared scrap, except for heavy breakable cast. In no case shall electric furnace and foundry grades be used as the 'corresponding grades of prepared scrap."

Remote Scrap: Consists of all grades, except railroad scrap, in Florida, Montana, Idaho, Wyoming, Nevada, Arizona, New Mexico, Texas, Oklahoma, Oregon, Washington, Louisiana, Utah. Delivered price may exceed by not more than $5 the price at the basing point nearest consumer's plant, provided sworn details furnished OPA. Permission required to exceed by more than $5 the nearest basing point price. Colorado scrap is remote scrap for Colorado consumers only.

Plates . . .

Plate Prices, Page 123

Heavier demand for plates by shipyards and their sub-contractors reflects reshuffling of construction schedules and contracts at existing yards with only slight increase in the number of ways. More efficiency in yard operations at some plants is apparent and the peak in fabrication and assembly has yet to be attained, with subcontracting extending steadily.

Heavier demand through allocations is being met with a minimum of confusion, plate and wide strip mills having scheduled and anticipated the upturn. Some sheared material is included in delinquent tonnage each month. Flamecutters are getting substantial deliveries on heavier material, while semifabricated flanged and dished work and heads are active, with deliveries extended; shops are making little headway in reducing backlogs in most cases. Suppliers of fire box steel are also taxed.

Contracts to build 32 Liberty ships at Providence, R. I., have been transferred to the Kaiser Co. from the Rheem Mfg. Co. This will be the first east coast contract for the Pacific coast shipbuilder, who takes over a new yard and organization built by the Rheem company, the latter having delivered one ship. Several are now on the ways in various stages of completion and another construction mark may be set by Kaiser, given a running start by the original contractors. The Maritime Commission transfer of the contracts was "to expedite the delivery of ships in 1943 to meet the 18,890,000-ton building program."

The final week in February is expected to bring a spurt in bookings of plates as consumers apply for tonnage for April rolling. Production is at a virtual peak and were it not for the fewer days in February some producers probably would establish a new monthly record.

Sheets, Strip . . .

Sheet & Strip Prices, Page 122

Hot and cold-rolled sheet buying is slightly heavier with deliveries unchanged with most producers. Demand for galvanized is light, but with tonnage increasingly concentrated among fewer mills, deliveries in spots are slightly improved. Heavier demand for cold-rolled has not filled the available capacity, with some sellers still seeking tonnage. Part of the upturn is due to orders for practice bombs, fabricators in some cases having contracts through the year against which specifications are more substantial. Releases for insecticide containers are also a factor in the total.

Prospects for jobbers are somewhat enhanced by allowing warehouses to make up tonnage against quotas due and second quarter sales of sheets will influence deliveries in the third, as distributors will be allowed to replace tonnage during that period only to the extent of what they sell in the second.

Among the few definite CMP allotment numbers to come through in the East for a prime contractor is one covering landing matters. Contracts have been placed for part of a large inquiry, various finishes, for the navy, opened several weeks back, four mills sharing in the awards, most going to Wheeling Steel Co. and Apollo Steel Co.

Galvanized sheet production has been

stopped in the Chicago district by WPB order. This makes official a condition already in effect. One producer suspended galvanizing operations in December and the other in January. Some warehouses have asked permission to transfer their quotas for galvanized sheets to mills outside the district.

Light-gage electrical sheets and strip are in stronger demand, mainly for small aircraft motors and transformers where weight and space are large factors.

Fabricators of narrow cold strip expect heavier requirements. Volume of new orders thus far in February is ahead of the last two months. Most buying is for second quarter delivery, tied in with CMP and PRP forms, although few of the former are accompanied by allotment numbers, which are expected to follow. Under the CMP, tonnage to consumers will approximate that of first quarter. On this basis directives for hot strip are in for March and even beyond.

Rerollers are getting all hot strip allowed under directives, although deliveries tend to be late each month. Fabrication of cartridge clips is being concentrated among fewer shops and suppliers of strip to others are getting some hold-ups on shipments. Production quotas are unchanged with most rerollers, allowing operations at 70 to 75 per cent of capacity. Annealing departments, however, are at capacity. Excepted from quotas are wire for flattening, material from frozen stocks or material from inventories, the latter being low in most cases. Moderate increase in demand for stainless is noted by some producers, despite substantial tonnages of this grade in frozen stock lists.

Bars . . .

Bar Prices, Page 122

Including bars, most bessemer steel deliveries are becoming somewhat more extended. While dependent on sizes and use, producers for the moment are more bessemer-minded, frequently following through on new orders and specifications with the object of switching to that grade where possible. Encouraged by WPB, this mild advisory pressure is bearing some results, notably with prospects of slightly better deliveries; however, with gradually broadening orders deliveries are consequently more extended, but on numerous finished products, including some bar sizes, are still ahead of open-hearth and electric furnace material.

In this connection, improvement in numerous grades of bessemer through better production controls, aids in convincing fabricators but revisions in specifications are often hampered by individual application for approval. Nevertheless, while resulting in some delays, approvals are frequent. Another factor is the reduction in ingot hot-topping, becoming a serious semifinished problem with some producers of open-hearth steel.

Meanwhile demand for hot carbon and cold-finished bars in the larger sizes, both rounds and flats, is heavy, with deliveries extended and showing no improvement. Small sizes are available in five to six weeks and there is little pressure from consumers or jobbers, most of whom are now well covered. Alloys and forging stock are extended into third quarter on new volume, with specifica-

tions against old contracts heavy for all alloy grades.

An outstanding war contract for flats includes an order for files and rasps for the Navy totaling $1,042,058.06, the contract going to a Providence, R. I., manufacturer.

Wire

Wire Prices, Page 123

With emphasis on wire tonnage entering into war requirements, including aircraft, rope, barrage cable, signal wire, nails and barbed wire, new orders are in excess of shipments. Demand and production schedules are uneven, some departments operating at capacity while others are down, creating bottlenecks in annealing, some drafting operations and priority revisions. Buying continues concentrated heavily on fine wire specialties and some heavier wires, with the slack largely in the group between, material normally fabricated into formed articles for the civilian trade. In the aggregate, incoming volume is ahead of last month. Mild improvement is apparent in demand for bessemer, screw stock included, although bessemer is frequently substituted for fabricated work where forming operations are not too difficult.

While jobbers in some areas experience a slackening in nails, total requirements are maintained, also production at approximately 60,000 tons a month. Barbed wire machinery is fully engaged on the restricted number of types now manufactured, most going to the services. While some flexibility is noted in production and rod quotas, depending on peaks in demand, changes are centered largely in rod schedules. Rods, notably in small sizes, are tight with directives applying on much production.

Rails, Cars . . .

Track Material Prices, Page 123

All domestic freight cars scheduled for production in first half under the 20,000-car program have been released by WPB, the last list within the past few days. Some cars up for inclusion in the program will remain frozen and probably will not come up for consideration until third quarter. Probably there will be no further action on domestic awards or releases until last half.

Cars for export may be another matter, although it is understood that those now on schedule, with domestic awards, will keep most carbuilders busy through first half. It is believed steel for the domestic cars will be entirely rolled in second quarter.

Structural Shapes . . .

Structural Shape Prices, Page 123

Structural fabricating shops with subcontracts and miscellaneous work are consuming plates, and in some cases sheets, two or three times heavier than shapes. Nature of much fabrication calls for the use of lighter shapes, angles and channels; current demand for heavy sections is almost absent. Welding equipment is well engaged at most shops. One shop in the East building pontoons and tank bodies under subcontract, plans to go on a three eight-hour welding schedule. Riveting, punching and other heavier

equipment schedules are restricted, reflecting the dearth of normal structural requirements, construction backlogs with most shops scraping bottom.

Demand for shapes by shipyards accounts for most inquiry, substantial part of the volume being allocated. Warehouses are well covered with structurals and are not adding to inventories in most instances; demand for structurals with jobbers has also dropped. Free supply is also enhanced by numerous small lots included in lists offered by the steel recovery section, WPB.

On the limited volume of building and engineering projects figured, prices on fabricated work are somewhat easier, at least lower than during the period of heavy demand. Buyers are also unwilling to pay premiums on plain material, allowed one producer by OPA when demand was heavier. U. S. Steel Export Co. is reported low on bridges for the Alcan (Alaska-Canadian) highway, approximately 10,000 tons, one of the few active bridge inquiries.

Structural mills in the Chicago area are experiencing a substantial increase in orders, arresting the rapid decline in backlogs. The new tonnage is for shipbuilding and barge construction. Fabricators in that district are faced by continued decline in backlogs and almost no new orders since the restriction on building construction. Many have been unable to obtain sufficient subcontract work to keep their facilities engaged.

Pennsylvania department of highways has taken bids on dismantling and removal of seven bridges on the abandoned West Penn railway right of way near Strafford, Pa. The department will use the steel for bridges in various parts of the state, part having been assigned for replacement of bridges lost in recent floods. About 365 tons of structural steel is involved.

Scrap . . .

Scrap Prices, Page 126

An easy situation continues in the scrap market, melters having accumulated enough material to remove all fear of shortage for several weeks in most instances. Unfavorable weather over most areas at the moment has reached movement to yards but under labor conditions no more could be handled. Some yards are preparing only half their normal tonnage because of lack of workers. Classifying scrap workers as essential may help the situation as to labor.

Pittsburgh melters are well supplied and not all scrap offered is being accepted. A few minor allocations still are in force. Good condition of mill stocks is indicated by lack of demand for turnings, which is general. Material reaching scrap yards for processing is light and this condition is expected to continue for some time. Industrial scrap tonnage is fairly large. Miscellaneous collections are yielding comparatively little.

Cincinnati consumers are well situated and are more discriminating in accepting shipments. Less scrap is reaching yards, attributed to weather and lack of labor. Dealers are shipping excess borings and turnings to other districts, holding their prices sufficiently low to absorb the added freight charges.

Demand for steel scrap has firmed in eastern Pennsylvania, following a lull of several weeks. January shipments are

estimated to have been about 30 per cent less than in December with a further decline this month. Mill backlogs have been reduced sufficiently to make larger shipments necessary. Greater interest is being shown in turnings, which have been a drug on the market recently.

Scrap flow into the St. Louis district is barely holding its own and melters generally are using some material from reserves. Industrial and railroad scrap make up most current supply but movement from the country is slow and little improvement is expected. Lack of labor for collection and preparation is a bar to a large movement and drives during the past year have cleared out much of the dormant material. Some yard operations have been reduced 50 per cent from lack of labor.

Cleveland consumers have accumulated sufficient reserves for the remainder of the winter and receipts are close to current needs. Normally about 35 per cent of scrap used in the Cleveland-Youngstown area is shipped from Michigan. At present only about 5 per cent comes from that source. Directives from the Southwest and East make up the difference.

War Manpower Commission has advised the WPB Salvage Division that employes of the scrap metal industry are regarded as in an essential employment. As a result the Salvage Division is advising employes in automobile wrecking and scrap yards to remain at work unless specifically instructed to the contrary by the local employment offices of WMC.

Director general for operations, WPB, has issued an order requiring increased use of scrap and chrome ore in production of stainless steel, because of limited supplies of ferrochrome. The order provides that at least 30 to 40 per cent of the chromium content of stainless steel must come from scrap and ore, the exact percentage being governed by carbon content.

Pig Iron . . .

Pig Iron Prices, Page 124

Pig iron consumers are not pressing for deliveries and demand has eased materially in some areas. Gray iron

Tool Steel Scrap

Cents per pound, to consumers f.o.b. shipping point

Tungsten Types

(For each 1% tungsten contained)

Solid scrap containing over 12%	1.80c
Solid scrap containing 5 to 12%	1.60
Turnings, millings containing over 12%	1.60
Do., 5 to 12%	1.40
Turnings, millings, solids under 5%	1.25

Molybdenum Types

Solid scrap, not less than 7% molybdenum, 0.50 vanadium	12.50
Turnings, millings, same basis	10.50
Solid scrap, not less than 3% molybdenum, 4% tungsten, 1% vanadium	13.50
Turnings, millings, same basis	11.50

Mixed Scrap

(Molybdenum and Tungsten Types)

Solid scrap, each 1% contained tungsten	1.60
Solid scrap, each 1% molybdenum	.80
Millings, turnings each 1% tungsten	1.40
Millings, turnings, each 1% molybdenum	.70

foundries appear to be in less need and in some instances have asked suppliers to defer shipment until the end of the month. Distribution under the allocation system has been so well linked with essential requirements that little difficulty has been encountered in satisfying all needs.

Demand for foundry grades is easier in New England, while basic requirements seem stabilized at capacity and malleable needs are little changed. Several foundries serving the machine tool industry are asking less iron. Large consumers whose normal practice is to buy heavily under favorable conditions are unable to do so under inventory control. More iron will be available from the district furnace in March, some reserve stock having been built up. With the $1 per ton differential in favor of the furnace, and smaller demand, the higher price is apparently a factor in buyer requisitions on suppliers, increasingly so as pressure for iron eases with some buyers.

Warehouse . . .

Warehouse Prices, Page 125

Recent WPB orders affecting warehouses define how, and for the most part what, to sell, but details are still lacking as to how much they may buy. Indications are, pending clarification, more hot-rolled steel will be available to jobbers during second quarter with third quarter quotas based materially on tonnage distributed during April, May and June.

Slower items include structurals, small diameter carbon bars and hot sheets, including heavier gages, although the latter on the whole are more active than lighter gages. Indicating the decline in sheet demand, some heavier gage tonnage delivered in December in volume has not yet moved. While offsize plates are selling slowly, unless sheared to size for certain specific needs, standard material continues to move briskly. Tightening restrictions on butt-weld pipe for maintenance and repairs, largely plumbing and heating outlets, are slowing demand, while lap-weld inventories are low and unbalanced.

Idle and excessive inventories of steel warehouses are to be reported on a new basis set up under steel recovery programs now being released. A letter to warehouses by Thornton E. Stokes, chief of Steel Recovery Section, Materials Branch, Redistribution Division, WPB, explains the new provisions.

Government does not plan to purchase primary forms of steel for remelting to war uses except in special cases and since warehouses are the normal channels for distribution of steel in its existing primary forms they will not at this time be required to report any items of steel which they believe can be disposed of through their normal trade channels.

Steel Recovery Corp. offers its facilities to find buyers for slow-moving warehouse items. Slow absorption of these items tends to increase warehouse inventory limitations on items for which there is heavier demand. Warehouses having no slow-moving items to report are not required to return the Steel Recovery Corp. report forms.

Subsequent changes in requirements for steel may make it necessary to obtain more complete information about idle and excessive warehouse stocks at a later date, the letter states.

Iron Ore . . .

Iron Ore Prices, Page 125

Exemption from price control has been ordered by Office of Price Administration on sales of domestic metallurgical manganese ore to dealers for resale and to users or processors using the ore directly in steel production, or to substandard ferromanganese users. The order will affect less than 1 per cent of United States consumption. The order is amendment No. 2 to price regulation No. 248.

Metallurgical Coke . . .

Coke Prices, Page 123

Beehive coke contracts are being altered to conform to the recent change in prices and all shipments now are moving at the revised level. Operators of hand-drawn ovens, using trucked coal, find the additional price of much assistance in obtaining better grade coal to improve quality of their product.

Production in the Connellsville field has changed little, active ovens numbering slightly over 10,000 and about 1000 are idle. This is close to the situation through last half of 1942.

Canada . . .

Toronto, Ont.—New buying in the Canadian iron and steel markets has returned to a more normal basis. Orders now are in steady volume, with further additions reported to backlogs. Under direction of the steel controller, urgently needed steel supplies are available on short notice for the war industry, but for less essential consumers delivery is uncertain. Some orders placed around the middle of last year are being filled now, while on others deliveries are still deferred.

Some important war industries are being forced to suspend operations temporarily, due to lack of steel directly due to closing of steel mills at Sault Ste. Marie and Sydney for the two weeks in January when workers were on strike. In this connection it was reported that Cockshutt Plow Co., Bradford, Ont., had to close its steel department, which will remain closed until steel mills again reach full production and can resume scheduled deliveries. Also as a result of steel shortage the gear division of McKinnon Industries Ltd., St. Catherines, Ont., suffered interruption and there is a strong possibility of a series of other shutdowns.

Steel mills again are nearing capacity production, but with heavy withdrawals from inventory by most war industries during the strike period, it will be some time before new stocks can be built up and in the meantime serious shortage of some special grades of steel has developed. During the past few days there has been talk in government circles indicating early changes in the war production program. In this connection special attention may be given to producing fighting ships, with some slowing in production of tanks and other motorized vehicles. It now appears that special attention is to be given to production of war supplies that are most urgently needed at the moment and to this end supply of steel and labor will be concentrated.

Under the new shipbuilding program demand for plates, sheets, and other steel is becoming more active, and while large orders already have been placed on this account, it is expected that there may be some changes in specifications in plate rolling. It also is stated that efforts will be made to obtain larger quantities of plates from the United States to meet growing demand here. Canadian plate mills are at maximum production, but under the enlarged shipbuilding program, can supply less than 50 per cent of requirements.

Efforts are being made to increase scrap iron and steel collections, but so far results have been limited. Dealers' yard stocks have been mostly cleared and there has been some slowing in deliveries to consumers in the past few days. The used goods administrator is making a new appeal to holders of idle machinery to make it available for scrap.

Steel in Europe

London—(*By Radio*)—Bookings of heavy steel in Great Britain are sufficient to cover all first-half production. Output of alloy steels is increasing, to meet demands of war industries. Hematite pig iron is scarce and difficult to obtain. Special activity is apparent in light-section bars. Sufficient scrap for steelmakers' needs is being provided.

Nonferrous Metal Prices

Feb.	Copper: Electro, del. Conn.	Copper: Lake, del. Midwest	Copper: Casting, refinery	Straits Tin, New York: Spot	Straits Tin, New York: Futures	Lead N. Y.	Lead East St. L.	Zinc St. L.	Aluminum 99%	Antimony Amer. Spot, N.Y.	Nickel Cathodes
1-18	12.00	12.12½	11.75	52.00	52.00	6.50	6.35	8.25	15.00	14.50	35.00

F.o.b. mill base, cents per lb. except as specified. Copper and brass products based on 12.00c Conn. copper

Sheets

Yellow brass (high)	19.48
Copper, hot rolled	20.87
Lead, cut to jobbers	9.75
Zinc, l.c.l.	13.15

Tubes

High yellow brass	22.23
Seamless copper	21.37

Rods

High yellow brass	15.01
Copper, hot rolled	17.37

Anodes

Copper, untrimmed	18.12

Wire

Yellow brass (high)	19.73

OLD METALS

Dealers' Buying Prices
(In cents per pound, carlots)

Copper

No. 1 heavy	9.25-10.00
Light	7.25- 8.00

Brass

No. 1 composition	8.50- 9.00
Yellow brass castings	5.50- 6.00
Auto radiators	6.12½-6.62½
Red brass, borings & turnings	8.00- 8.50

Zinc

Old	4.75- 5.00
New clippings	6.00- 6.50

Aluminum

Clippings	9.75-10.25
Cast	8.75- 9.25
Pistons	8.50- 8.75
Sheet	8.75- 9.25

Lead

Heavy	4.75- 5.25
Mixed babbitt	5.35- 5.50
Electrotype shells	5.00- 5.50
Stereotype, Linotype	6.00- 6.75

Tin and Alloys

Block tin pipe	44.00-46.00
No. 1 pewter	32.00-36.00
Solder joints	7.75- 8.50

SECONDARY METALS

Brass ingot, 85-5-5-5, l.c.l.	12.50
Standard No. 12 aluminum	14.50

MAGNESIUM

(12 pound rod, 4 in. diam.)

99.8% ingot, carlots	22.50
100 lb. to carlots	24.50
Extruded sticks, ¼ to 2 lb.	
Carlots	32.00
100 lb. to carlots	34.00

Jobs, Environment for Women's Qualifications

(*Concluded from Page 66*)

ale, performance on the job, idleness, use of women, physically handicapped, etc.

"2. Analyzing personnel methods as to what methods you are using, the balance of emphasis upon each method in relation to the others, their management and labor support, timing, etc.

"3. Setting up overall plant program for manpower utilization based on the studies just outlined.

"4. Suggesting other WMC services available to you, such as placement and training and establishing contacts for you.

"As their tools for rendering this service, they have occupational analyses, worker analyses, manning table, replacement schedules and common sense."

Mr. McNutt admitted that such a program might run into opposition, but "if the subject is approached sincerely, in the true light of the situation, with the attitude that 'we are here to learn from you what problems you have in manpower utilization, so that WMC may assist in their solution' the possibilities for constructive service and assistance are unlimited."

He emphasized that the "utilization consultants" would concern themselves with answering one question "How effectively are the people on the job performing with the tools and equipment at hand under the processes of operation at their disposal?"

"I am confident," he continued, "that a utilization consultant willing to confine himself to this legitimate sphere of activity would not only be readily acceptable to labor and management, but would be welcomed by them for the constructive assistance which he could offer."

NEW BUSINESS

Plant Expansion, Construction and Enterprise, Government Inquiries, Sub-Contract Opportunities, Contracts Placed and Pending

SUB-CONTRACT OPPORTUNITIES

Data on subcontract work are issued by regional offices of the War Production Board. Contact either the office issuing the data or your nearest field office. Write, don't telephone, and mention key letters and numbers appearing before each item to assure prompt attention and avoid delay.

Philadelphia Office, Contract Distribution Branch, Production Division, WPB, Broad Street Station building, reports the following subcontract opportunities:

Buescher-4-1: A government agency requires facilities for fabricating the following items on ship construction: Vertical and inclined ladders, grab rungs, escape ladders from cargo holds, fabricated from steel bar and plate stock; feed and fitter tanks, complete assembly, coke baskets, filter cartridges and handles, cartridge ferrules and rods, isolating valve rods and float yokes; uptakes fabricated from ⅛ and $\frac{3}{16}$-inch steel plate with examination doors and fittines; ladders and gratings for engine and boiler rooms; fuel oil burner work benches; valve label plates, 2¾-inch diameter etching, 233 per ship; hose racks; stowage racks for fixed ammunition and small arms; service boxes for 4-inch fixed ammunition, medium galvanized steel, ⅛-inch plates; wire dish racks; fire-room sand box; miscellaneous oil tanks 50 to 180 gallons; masts and mast fittings for 30 and 50-ton booms, rigging details, flounders plates, links, turnbuckles, pads and eyes, hoist and runner, link and shackles, topping lift chain plates.

Buescher-5-1: A western corporation requires facilities for diesel engine crankshafts, three per month for the duration. Equipment required, crankshaft lathe and grinder, milling machine, drill press. Overall dimensions, length, 14 feet, 9¾ inches, throw, 9½ inches; main bearing, 9.250 inches; crank bearings 9 inches. Tolerance, .002. Material, SAE 1035 steel. Prime contractor has small quantity of forgings and others must be furnished by subcontractor.

Buescher-5-2: A western corporation requires 18 diesel engine cylinders per month for the duration. Equipment required, 3-foot radial drill press; vertical boring mill, 46-inch swing, three feet 9 inches under head; planer, bed 4 feet wide. Overall dimensions, 24 x 34 3/16 x 40 inches. Material, cast iron, to be furnished by contractor, prime contractor having small supply at present. Also, cylinder liner for above cylinders. Overall length, three feet 8½ inches x 17.616 inches diameter. Equipment required, boring mill, 46-inch swing, rough bore. Finish, bore 14-inch at plus .003 tolerance after insertion in cylinder. Engine lathe, 24-inch swing, four feet between centers; 10-ton arbor press. Material Nickel-chrome iron, to be furnished by contractor. Prints and specifications at Philadelphia office.

Buescher-6-1: Pennsylvania concern requires subcontracting facilities for machining reciprocating steam engine cylinders. Equipment, six-foot radial drill; vertical boring mill, 146-inch swing, 73½ inches under bar; planer, 104 inches wide, with side and top heads. Overall dimensions, 93.5 x 104 x 73½ inches high. Cylinder bore 70 inches, depth, 52¾ inches. Material, semisteel. Castings will be furnished.

Buescher-6-2: A government agency requires two types of guide valve tappets. Total quantity, 15,500 pieces. Delivery, 800 to 1000 of each per month. Equipment, automatic or hand screw machine, 1.250-inch spindle; No. 1 milling machine; drill press; cylindrical, surface and internal grinders; cylindrical hones or laps; case hardening. Dimensions, O.D. 1.125-inch; length 3.5-inch; bore, type A, .6876-inch plus or minus .0005; type B, .6863 plus or minus .0005; other tolerances .001. Material, type A steel, SAE 4615, which will be supplied. Prints and specifications at Philadelphia office.

Boston office, Contract Distribution Branch of WPB, 17 Court street, is seeking contractors for the following:

SC-68: Multiple-spindle automatic screw machine work for machines having 1½ and 2-inch diameter bar capacity. Three items. Material, two items of steel and one of phosphor bronze, supplied by prime contractor. Quantities, 24,000 of each item. Weekly requirements, 600 of one item, 1800 of the other two. Reference, 1-H-195.

SC-69: Multiple or single-spindle automatic screw machine work for machines having 7.16-inch diameter bar capacity. Secondary operation of centerless grinding. Material, tungsten-chromium steel WD-7-4100 of manganese-molybdenum FXS-318, supplied by prime contractor if cannot be otherwise procured. Very large quantities required, to limit of available facilities. Reference, 1-H-196.

New York office, Contract Distribution Branch of WPB, 122 East Forty-Second street, New York, reports the following subcontract opportunities:

S-6-8823: A Buffalo prime contractor is seeking subcontracting facilities on ¾-inch automatic screw machines. Will require 75,000 parts per month for the duration. All parts are for aircraft, tolerances are close and inspection is exact. All parts must be finished all over except hex and must be smooth and uniform. Prints furnished on request.

S-6-9669: A Long Island manufacturer seeks subcontracting facilities to make snap fasteners (bird cage type). Machinery needed, presses. Quantity, 3700 gross of small size and 240 gross of large size.

S-6-9807: A Brooklyn corporation seeks a subcontractor to make gear blanks, finished, turned and bored. Quantities up to 200. Sizes from 1-inch diameter to 4½-inch diameter. Equipment required, turret lathes with turret attachments. Material, steel and brass, to be furnished by prime. Delivery as soon as possible. Tolerances, plus .000, minus .0003 in I.D.; plus or minus .001 on O.D.

S-5-8849: Long Island manufacturer is seeking subcontracting facilities as follows: Twelve-inch double-spindle grinder, Gardner or Blanchard, to make aluminum alloy die casting No. 85, finished both sides. Quantity large.

S-5-7907: An aircraft company is looking for subcontracting facilities for the following bearings for 30 shipments of 960 KS4 bearings, self-centering, 390KS3 and 240KS31.

S-5-8900: A New York state procurement agency is seeking facilities on a hydraulic press with furnace adjacent, 300 to 1800 tons, minimum bolster area, 4 x 8 to 4 x 12 feet. Material to be furnished.

Minneapolis office, Contract Distribution Branch of WPB, 334 Midland Bank building, is seeking contractors for the following:

S.O. No. 317: Large number of parts $\frac{3}{16}$ to 1¼-inch. Equipment, small turret lathes with or without hex collets and small automatic or hand screw machines. Quantities, 7000 to 8000 of each item. Material, steel and brass, furnished by prime. Deliveries, urgent, to start at once. Prices, open. Drawings at Minneapolis office.

S.O. No. 319: Part, instruments. Engraving or etching flat calibrations on instruments, 3-inch scale 1/64-inch. Flat .001 calibrations on verniers. Quantity, 50,000, with deliveries of 1000 per day. Samples available.

S.O. No. 320: Part, collets—5C rivets. Operations, cutting tempering, grinding. Quantity, 15,000, deliveries to start at once. Material, subcontractor to supply. No drawings available as this is a standard commercial product in general use.

S.O. No. 325: Miscellaneous machine operations. Equipment, automatic and hand screw machines; gear hobbers, Barber-Colman or equal; turret lathes. Quantities 100 to 1000. Materials furnished by prime. Prices, negotiated; prime will pay setup cash and hourly rate. Drawings and specifications furnished by prime.

S. O. No. 326: Components for winches, 13½ x 8¼-inch. Facilities, duplex or heavy-duty miller. Operations, three milling and one drilling. Large quantities. Delivery to start immediately. Materials furnished. Fixtures and jigs furnished. Drawings supplied by prime contractor.

S.O. No. 330: Tow bar, 79 inches long. Forging and welding U bar with wood filler. Quantity, 16,000. Deliveries to start at once. Materials, steel and wood. High priority. Prime contractor will supply drawings.

S.O. No. 323: Miscellaneous parts. Equipment, single or multiple automatic screw machines, up to 1 inch. Quantities large, deliveries to start at once. Prime contractor will supply drawings.

Detroit office, Contract Distribution Branch, Production Division, WPB, Boulevard building, is seeking contractors for the following:

Job No. 4460: Connecting rod and bolt, 200,000 per month, upset forging 25/32-inch O.D. Equipment, screw machine, heat treat, centerless grinder. Size, 2 10/16-inch long. Tolerance, plus or minus .00025.

Job No. 4520: Worm adjuster. 100,000 pieces. Material, steel, furnished. Equipment automatic screw machine, hand screw machine 1-inch, hand mill, lathe. Tolerance, plus .000, minus .002.

Job No. 4617: Retaining ring. 100,000 pieces. Material, steel, furnished. Equipment, sensitive drill, punch press 11 gage, H.D. drill, surface grinder. Tolerance, plus .002, minus .003.

Job No. 4618: Nut, 10,000 pieces. Material, steel, 399952. Equipment, automatic screw

machine hand mill. Tolerance, plus .0006, minus .000.

Job No. 4692: Gun mount trunnion, 50,000 pieces. Material, steel, furnished. Equipment, automatic screw machine, chucker, centerless grinder, sensitive drill, cadmium plate. Dimensions, ¾-inch hex x 3¾-inch long. Tolerance, plus .000, minus .003.

Job No. 4693: Top fitting, 5000 per month. Material, steel. Equipment, hand screw machine, tapper. Dimensions, 1¾-inch O.D. x 1⅛-inch long. Tolerance, plus or minus. .002.

Job No. 4694: Flat point headless screw, 20,000 to 40,000 per month. Material, corrosion-resisting steel. Equipment, automatic screw machine, hand mill. Dimensions, .071-inch O.D. x 1/16-inch long.

Job No. 4765: End connection, 150,000 per month. Material, steel forging, furnished. Equipment, horizontal mill, H.D. drill, vertical mill.

Job No. 4816: Rear main bearing. Quantity, 500 per week. Material, steel, furnished. Equipment, hand screw machine, lathe. Dimnsions, 5⅜-inch O.D. x 3¼-inch. Tolerance, plus or minus .0025.

Job No. 4817: Connecting rod bearing. Quantity, 500 per week. Steel furnished. Equipment, hand screw machine. Dimensions, 3⅞-inch O.D. x 4 7/16-inch long. Tolerance, plus or minus .001.

Job No. 4807: Front drive pulley hub. Quantity, 15—. Forgings furnished. Equipment, turret lathe, lathe, sensitive drill. Dimensions, 5¾-inch O.D. x 1 55/64-inch. Tolerance, plus or minus .0005.

Job No. 4766: Anchor pin. Quantity, 10,000. Material, steel. Equipment, automatic screw machine, heat treat, centerless grinder, zinc plate. Dimensions, 9/16-inch O.D. x 1¾ inch.

Job No. 4711: Pinion. Quantity, 2000. Material, steel forging. Equipment, turret lathe, lathe, sensitive drill, bevel gear shaper, horizontal mill, heat treat, magnaflux. Dimensions, 9 inches O.D.

Job No. 4643: Cylinder assembly. Quantity, 300 per month. Steel furnished. Equipment, magnaflux, turret lathe, external grinder, internal hone, horizontal boring mill, vertical mill, horizontal mill, heavy-duty drill, sensitive drill, external and internal grinder, thread grinder. Dimensions, 4⅞-inch O.D. x 38 7/16 inches long.

Job No. 4519: High-speed shaft. Quantity, 500. Material, SAE 4615, furnished. Equipment, hand screw machine, internal grinder, thread hobber, gear shaper, heat treat, external grinder. 1 17/32-inch O.D. x 1 7/16-inch long. Tolerance, plus or minus .0002.

Job No. 4504: Stator yoke. Quantity, 5000. Material, tubing, furnished. Equipment, hand screw machine, sensitive drill, external grinder. Dimensions, 3 1/16-inch O.D. x 2 3/32-inch long.

Chicago office, Contract Distribution Branch of WPB, 226 West Jackson Boulevard, is seeking contractors for the following:

A B Equipment Mfg. Co., 223 West Erie street, Chicago, attention Alfred H. Noyes. Priority, AA-1. Small tubular parts to be ground internally. Contractor supplies material. Quantity, 1000. Dimensions, 1 x 2½ inches. Material KW steel. Equipment required, plain internal grinder, 3 x 8¾ inches. Tolerance, .001.

Arens Controls Inc., 2253 South Halsted street, Chicago, attention H. J. Lach. Priority, AA-1. Job covers regrinding to specification high-speed counterbore drills, varying in size. Contractor supplies standard drills. Quantity, 18. Size, 4 x ½-inch. Equipment, plain cylinder grinder, 3 x 12 inches; universal and tool grinder, 8 x 24 inches. Tolerance, .002.

Budd Wheel Co., 12141 Charlevoix, Detroit, attention A. W. Patterson. Priority, AA-1. Two items, hook and U-strap shackle. Production requirements, 10,000 per month, beginning March 15. Subcontractor does entire job, including furnishing of steel forgings. Hook is 7½ x 11 inches, shackle 3 x 20 inches. Equipment 4000-pound board drop hammer. Tolerance, .060.

Clearing Machine Co., 6499 West Sixty-fifth street, Chicago, attention C. E. Novinger. Priority, AA-1. Two each of three large fabricated steel beds. Machining must be done on same machine as three pieces form part of complete unit. Contractor furnishes fabricated parts. Equipment, 8-inch-spindle horizontal boring mill. Tolerance, .013.

West Holds Important Vanadium Deposits

(*Concluded from Page* 43)

entered the field with the new data in hand to test the conception that had been slowly forming in his mind, namely, that a single obscure bed of workable thickness carried vanadium in commercial quantities and that the bed had wide extent. He established a field laboratory for rapid analyses on the ground. More trenches were dug, more samples taken and analyzed. The Bureau of Mines assigned engineers to the project. The bed proved to be vanadium bearing nearly everywhere and its position and attitude were mapped. When all of these facts were established and the mapping had been completed, the data were turned over to the Bureau of Mines, the War Production Board, and the Metals Reserve Co."

Reports, checks, and double-checks followed, and the results were fed into the country's newly-created war ma-

chine to answer the mounting demands for vanadium. To forestall speculative claim-staking that would jeopardize a large-scale program of rigorous testing and proper public control of the resource, Secretary Ickes withdrew the more promising public lands from mineral entry. The project was reviewed by the WPB which certified it to the Metals Reserve Co. and a development contract was writen with the Homestake Mining Co. With the assistance of the Bureau of Mines and the Metals Reserve Co. development tunnels are being driven from the canyon walls into the heart of the Sublette ridge and vanadium is expected shortly to flow from the "strike."

CONSTRUCTION AND ENTERPRISE

OHIO

BARBERTON, O.—Pfahl Gauge & Mfg. Co., 85 East Voris, has acquired land on East Voris for expansion. Fred L. Pfahl is president.

CLEVELAND — Wellman Engineering Co., 7000 Central avenue, has received increase of $70,000 for additional equipment in plant. Total Defense Plant Corp. commitment is $530,000.

CLEVELAND—Unit Building Products Co., care of William Bingham, engineer, Chillicothe road, Kirtland township, Chesterland, will build factory and experimental research laboratory. Cost $40,000.

CLEVELAND—Sam W. Emerson Co., 1836 Euclid avenue, has been awarded contract by industrial company for five-story shop and storage building. Cost estimated at $400,000.

CLEVELAND—Eaton Mfg. Co., 739 East 140th street, has received an increase of its commitments with Defense Plant Corp. by $190,000, making an overall of $1,700,000, which funds are to be used in equipping a plant in Ohio.

CLEVELAND—Parker Appliance Co., 17325 Euclid avenue, F. A. Boller, secretary-treasurer, has purchased four-story building of 85,000 square feet at East Seventy-second street and St. Clair avenue which it will occupy soon.

MICHIGAN

BLOOMFIELD HILLS, MICH.—R. F. Tillotson, 300 Hickory Grove, has contract for addition to factory at 9640 Grinnell, Detroit, for Multi-Hydromatic Welding & Mfg. Co.

DETROIT—Autometric Corp., 17111 West Six Mile road, has been organized to deal in tools, gages, dies, etc.; Frank J. Jankiewicz, 8205 Georgia.

DETROIT—Campbell Construction Co., 3253 Goldner, has been awarded contract for alterations to factory at 5440 West Jefferson, for Detroit Harvester Co.

DETROIT—Industrial Construction Co., 5315 Seminole, has contract for addition to manufacturing plant at 14401 West Eleven Mile road, Oak Park, for H. S. Becker Mfg. Co.

DETROIT—Reisdorf & Brewe Co., 805 Donovan building, has been awarded general contract for engineering and assembly building for Continental Aviation & Engineering Corp. to be located at Kercheval and Algonquin avenues.

FERNDALE, MICH.—Wesson Tool Co., 1220 Woodward Heights boulevard, has been or-

ganized to deal in tools and machinery; R. Crucknell, 521 Surf street, Chicago.

PONTIAC, MICH.—H. E. Beyster Corp., 3-135 General Motors building, Detroit, engineer, will soon let contract for factory addition for Die Typing Corp. Cost over $40,000.

MASSACHUSETTS

WALTHAM, MASS.—Waltham Screw Co., 77 Rumford avenue, has let contract for two-story factory addition to William H. Porter Co. Inc., 84 Arsenal street, Watertown, Mass.

CONNECTICUT

MIDDLETOWN, CONN.—Wilcox Crittenden & Co. Inc., 284 South Main street, has let contract for one-story plant addition and alterations to Denis O'Brien & Sons Inc., Ridgewood road. Estimated cost $40,000.

NEW HAVEN, CONN.—New Haven Buick Co., F. E. Loesser, 320 Whalley avenue, is altering and remodeling plant on Whalley avenue for New Haven Tube Bending Co. Inc., 5 Lawrence street, lessee.

PENNSYLVANIA

ALTOONA, PA.—Sylvania Electric Products Inc., E. J. Bohensky, purchasing agent, Emporium, has let contract for two-story plant to J. C. Orr & Son. Cost $80,000. C. Wagner, 133 West Fourth street, Williamsport, Pa., architect.

ILLINOIS

CHICAGO—Tinen Forging, Die & Tool Co. Inc., 4417 West Rice street, has purchased the 123 x 125-foot southeast corner of Rice street and North Kilburn avenue, and will build a plant costing $35,000.

LOCKPORT, ILL.—Texas Co., 332 South Michigan avenue, Chicago, has let general contract to Foster-Wheeler Corp., 105 West Adams street, Chicago, for additions to its plant here to cost over $2,000,000, with equipment.

ROCKFORD, ILL.—J. I. Case Co., 700 State street, Racine, Wis., has let contract to Austin Co., 510 North Dearborn street, Chicago, for alterations and improvements to its factory here to cost about $40,000, with equipment.

MARYLAND

BALTIMORE—L. & S. Welding Co., 2226 Kirk avenue, is adding new equipment and began production about two months ago.

BALTIMORE—Rustless Iron & Steel Corp. is erecting second story addition to its production laboratory to provide 5000 square feet of floor space.

BALTIMORE—Standard Oil Co. of New Jersey has awarded contract for new facilities at its Canton refinery here, for production of aviation gasoline.

BALTIMORE—Jenkins Aircraft Products Co., 3369 Frederick avenue, engaged in precision machinery and tool work, plans to double output through utilization of additional space at its present location, where it began production about two months ago.

TENNESSEE

MILLINGTON, TENN.—City's application for water and sewer project costing $105,000 has been approved. FWA project.

FLORIDA

MIAMI, FLA.—Defense Plant Corp. has authorized an increase in its contract with Intercontinent Aircraft Corp., Miami, to provide plant facilities in Florida. Overall commitment $2,047,000.

MISSOURI

ST. LOUIS—L. M. Persons Corp., 6319 Manchester avenue, has let contract for one and two-story factory additions to Robert N. Hunkson, 1310 North Geyer road, Kirkwood.

ST. LOUIS—Alco Valve Co., 2628 Big Bend

boulevard, Maplewood, St. Louis, has let contract for altering three story factory to E. A. Brunson Construction Co., 4052 Forest Park boulevard, St. Louis.

SIKESTON, MO.—E. P. Coleman Co. will rebuild its mill at cost of over $40,000, with equipment.

ARKANSAS

WILSON, ARK.—R. E. L. Wilson Co., Wilson, has let contract for plant addition to McGregor's Inc., 1071 Union avenue, Memphis, Tenn.

IOWA

ALBERT CITY, IOWA—Super Mfg. Co. plans to rebuild its plant at estimated cost of $50,000, including equipment.

BURLINGTON, IOWA—J. I. Case Co., 700 State street, Racine, Wis., has awarded general contract to Austin Co., 510 North Dearborn [illegible] and e- construction of its local factory here. Improvements estimated to cost about $160,000.

DAVENPORT, IOWA — Uehtorff Co., 211 North Howell street, has awarded contract to John Soller Construction Co., 717 Harrison street, for one-story plant addition to cost over $40,000, with equipment.

CALIFORNIA

LOS ANGELES—Heat Treated Materials Inc. has been organized with capital of $25,000, by C. F. Degele, Long Beach, Calif., and R. H. Gordon and Thomas J. Kelley, of Los Angeles. Representative, Thomas J. Kelley, 639 South Spring street, Los Angeles.

SAN BRUNO, CALIF.—United Air Transport Corp., Mills field, has given contract for new shop building and altering present shop building to Cahill Bros., 206 Sansome street, San Francisco. Estimated cost $150,000. W. D. Peugh, 333 Montgomery street, San Francisco, architect.

CANADA

ESSEX, ONT.—Masco Valve Seat Co., John Wass, manager, is having plans prepared for plant here estimated to cost $25,000, with equipment.

FORT WILLIAM, ONT.—Canadian Car & Foundry Co. Ltd., 621 Craig street West, Montreal, has given general contract to Claydon Co. Ltd., Graham Horne building, and work has been started on plant addition here to cost $68,000.

ST. THOMAS, ONT.—British American Foundry Co., Centre street, plans plant addition here, estimated to cost about $30,000, with equipment.

THOROLD, ONT.—Exolon Co., Tramus street, has plans and will let contracts soon for further plant addition here to cost, with equipment, about $35,000.

WINDSOR, ONT.—Kelsey Wheel Co. Ltd., 309 Ellis avenue, has had plans prepared and is calling bids for plant addition to cost about $90,000, with equipment.

CAP DE LA MADELEINE, QUE.—Dominion Rubber Co. Ltd., 550 Papineau avenue, Montreal, has given general contract to Richard & B. A. Ryan Ltd., 1880 William street, Montreal, for addition to plant here, to cost about $40,000.

LACHINE, QUE.—Dominion Bridge Co. Ltd., Notre Dame street, is having plans prepared for repair shop to cost about $25,000, with equipment.

LONGUEUIL, QUE.—Dominion Engineering Works Ltd., First avenue, Lachine, has received bids for plant addition to cost about $60,000. J. P. Tripp, engineer.

MONTREAL, QUE.—C. A. Cayouette & Cie Ltee., 3650 Jolicoeur street, is considering plans for woodworking factory here to cost about $50,000, including equipment.

MONTREAL, QUE.—Dominion Tar & Chemical Co. Ltd., 423 Canada Cement building, is having plans prepared for plant addition to cost $25,000, with equipment.

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⅞" x 105	⅞" x 120	¾" x 135
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12,000 lbs.	#4	temper — .035	x	7.156
5,500 lbs.	#4	temper — .0375	x	7.000
5,000 lbs.	#4	temper — .0375	x	6.218
19,000 lbs.	#4	temper — .035	x	5.25
13,500 lbs.	#4	temper — .035	x	6.25
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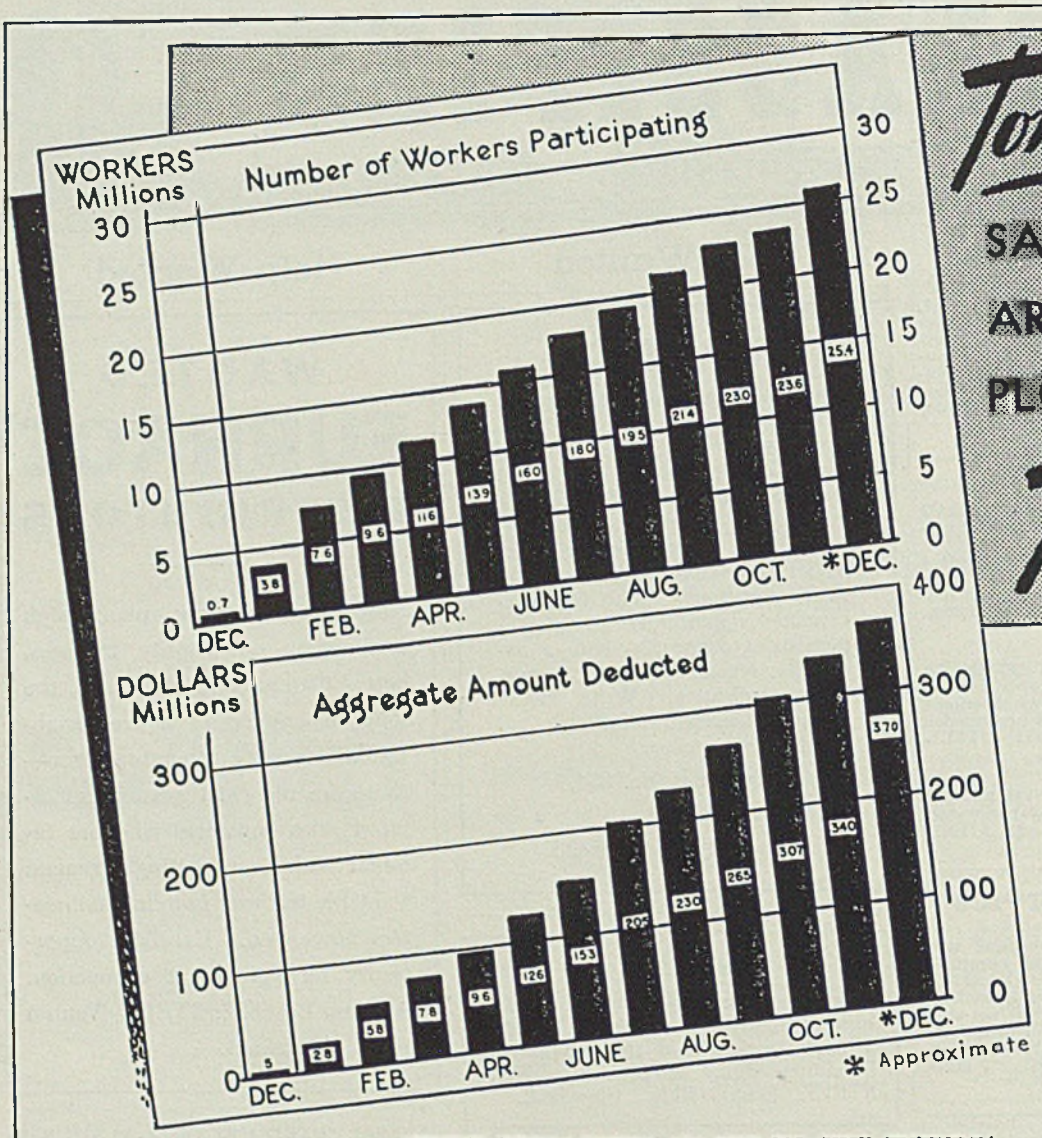

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(Continued on next page)

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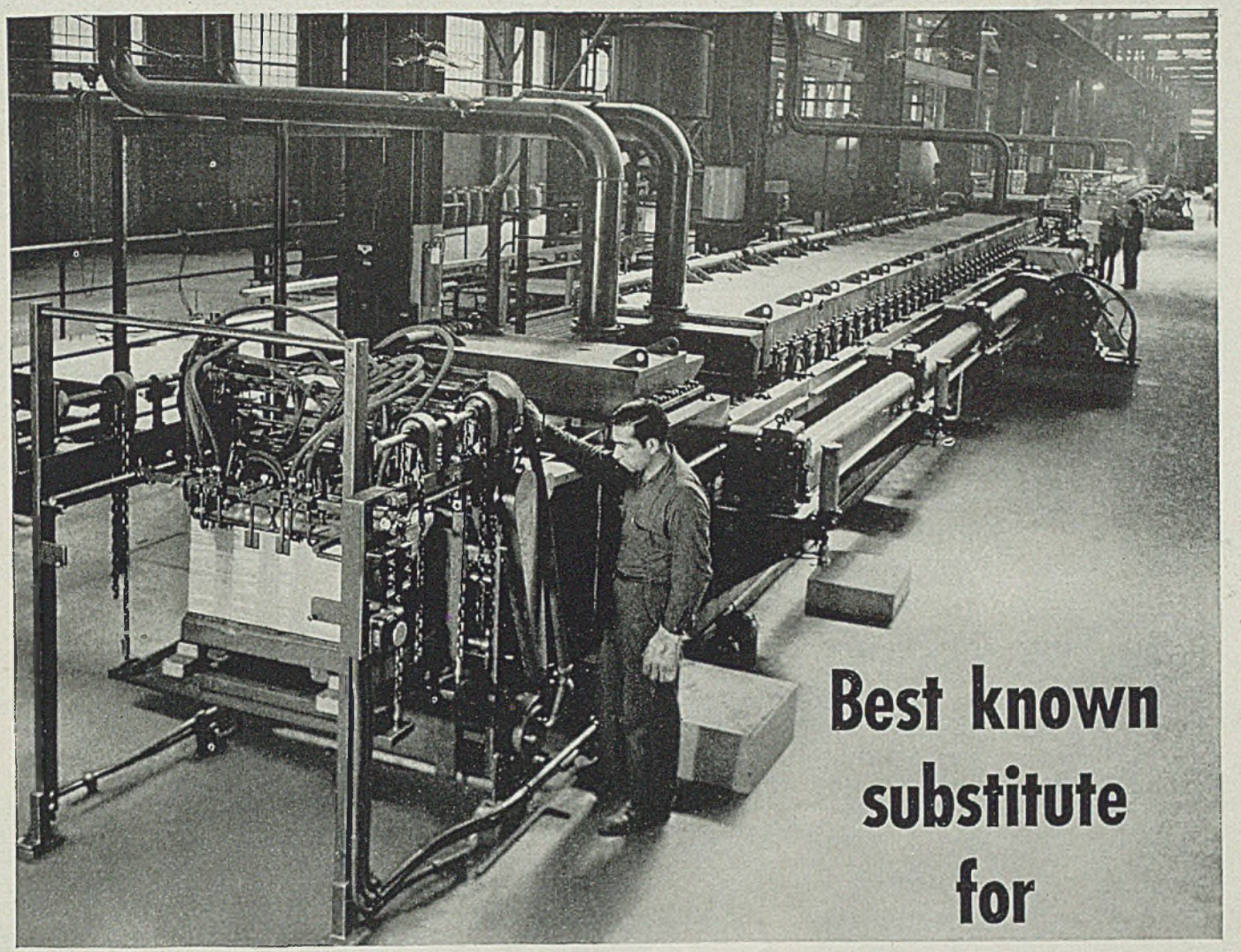
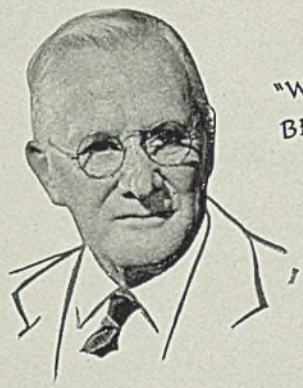


Best known substitute for tinplate



"WE'RE CONSERVING TIN WITH BETHLEHEM'S NEW BONDERIZED BLACK PLATE"

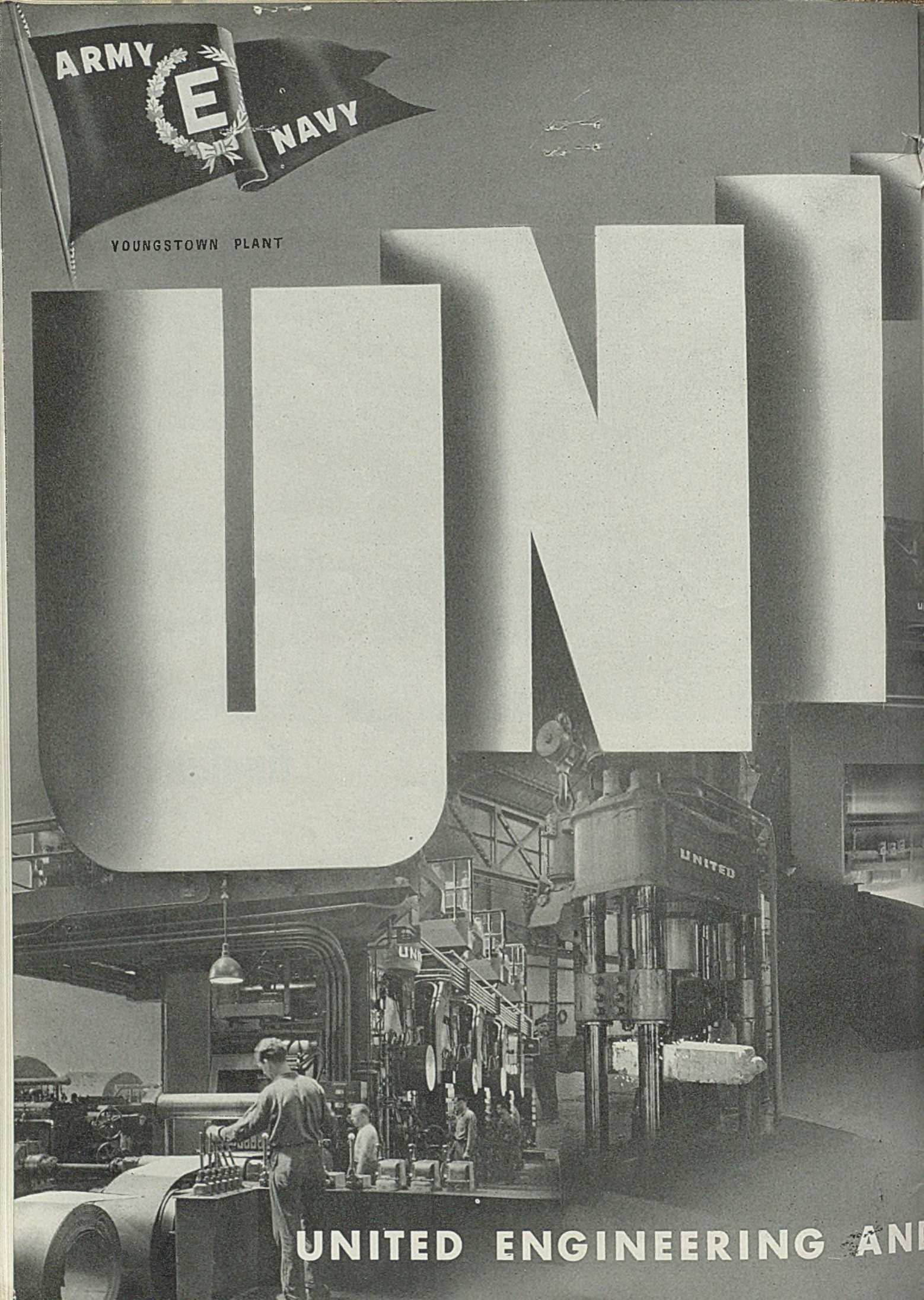
Manufacturers of containers have made exhaustive tests to find a substitute for tinplate. They have tried many materials. The results of these tests are that they have approved Bonderized tin mill black plate for use largely for ends of general-line cans, and of some sanitary cans.

Black plate has been found suitable for these uses when Bonderized and given a coating of lacquer or enamel because the new process of Bonderizing definitely retards under-film corrosion and provides for better adhesion of the paint coating to the surface of the metal.

It may be to your advantage to learn all the facts about Bethlehem's new Bonderized black plate, including the results of tests that have been made. It is now available in quantity for early delivery. Get in touch with your nearest Bethlehem representative, or write direct to Bethlehem Steel Company, Bethlehem, Pa.

BETHLEHEM STEEL

BETHLEHEM'S NEW BONDERIZED BLACK PLATE


ARMY
E
NAVY
YOUNGSTOWN PLANT
UNITED
UNITED ENGINEERING AN

Complete Rolling Mill Equipment

FOUNDRY COMPANY *Pittsburgh, Pa.*

BEHIND THE SCENES

Obstacle Golf

■ We had completely given up the idea of indulging in our favorite pastime of playing golf this year what with restrictions on gasoline, shortage of golf balls, etc., but now we see in *Printers' Ink* where Britain's ardent duffers are carrying on despite much greater difficulties. Here are the Richmond Golf Club's wartime rules as posted in the clubhouse near London:

1. Players are asked to collect bomb and shrapnel splinters to save these causing damage to the mowing machines.
2. In competitions, during gunfire or while bombs are falling, players may take cover without penalty for ceasing play.
3. The positions of known, delayed action bombs are marked by red flags at a reasonably, but not guaranteed, safe distance therefrom.
4. Shrapnel and/or bomb splinters on the Fairways, or in Bunkers within a club's length of the ball, may be moved without penalty.
5. A ball moved by enemy action may be replaced, or if lost or destroyed, a ball may be dropped not nearer the hole without penalty.
6. A ball lying in a crater may be lifted and dropped without penalty.
7. A player whose stroke is affected by the simultaneous explosion of a bomb may play another ball from the same place. Penalty one stroke.

And, we suppose, if a long brassie shot clonks the pilot of a passing Messerschmitt, the player automatically wins the hole with a *birdie*.

One Way To Lick Absenteeism

■ It may not sound logical, but the experience of Jack & Heintz, the Cleveland aircraft equipment maker which raised Congressional eyebrows last summer with its wage and salary disclosures, would seem to indicate that if high wages and long hours cause worker absenteeism, then still higher wages and still longer hours will cure it. The company's 6000 employes work 12 hours a day 7 days a week and still receive big pay but unauthorized absences have been cut to only one-fifth of one second per man hour. Aiming at perfection, $7500 in war bonds has been offered for a spotless record in February, the bonds to be divided by lottery. The slate was still clean as this is being written.

The Tool Grinder—By Jessie Morris

■ There's something so nice and wistful about this little verse Jessie Morris of Mentor, Ohio sends us that we just can't resist running it. Some of the tool grinders we know will probably break into a ballet dance when they read it but here goes:

He grinds with skillful pressure.
He does not grind too much.
His senses gage the angle.
He checks with gentle touch.

He uses mathematics
To such a fine degree
That all his finished tool bits
Are balanced poetry.

Straight from Headquarters

■ The Springfield (Mass.) Ordnance District writes:

Your fine magazine contains many interesting and useful articles and a great deal of valuable information which the inspectors from this office use to good advantage in furthering the war effort.

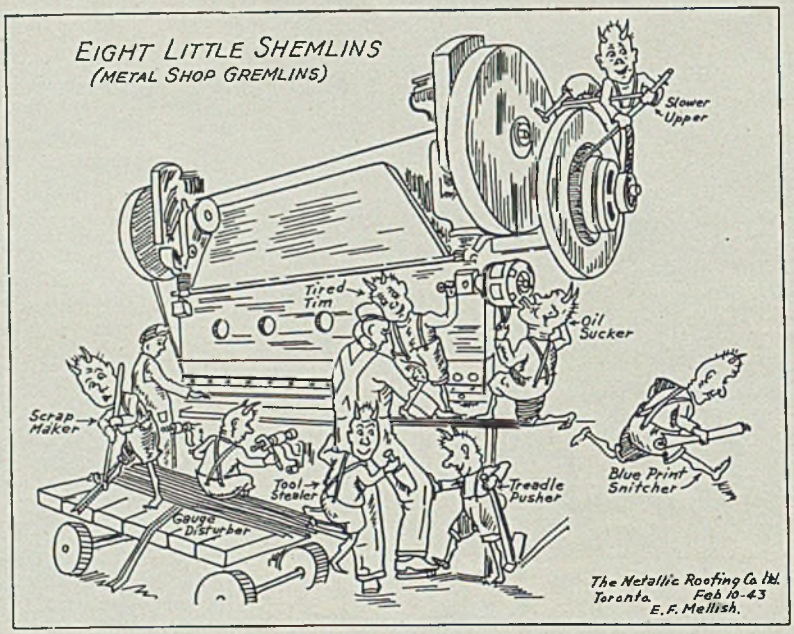
And We Need Every Pound of It

■ Today the United States can make as much steel in three hours as the entire tonnage of iron produced in the thirteen colonies during 1775.

Introducing . . . The Shemlins

■ *By far the most intriguing thing to come out of World War II is the story of the gremlins, those mischievous little imps of Satan who have the uncanny faculty of gumming the works at the most inopportune time. As everyone must know by now they were first discovered by the boys in the RAF and in our own air force in their flights over Europe. They raise havoc with their bag of tricks, guzzling gasoline, jamming guns, tampering with the compass, ripping holes in wings and generally causing all sorts of trouble. But even so, the rogues are welcome companions for the pilots and despite their antics they've come to be a tremendous help on those bright moonlight nights high over enemy territory.*

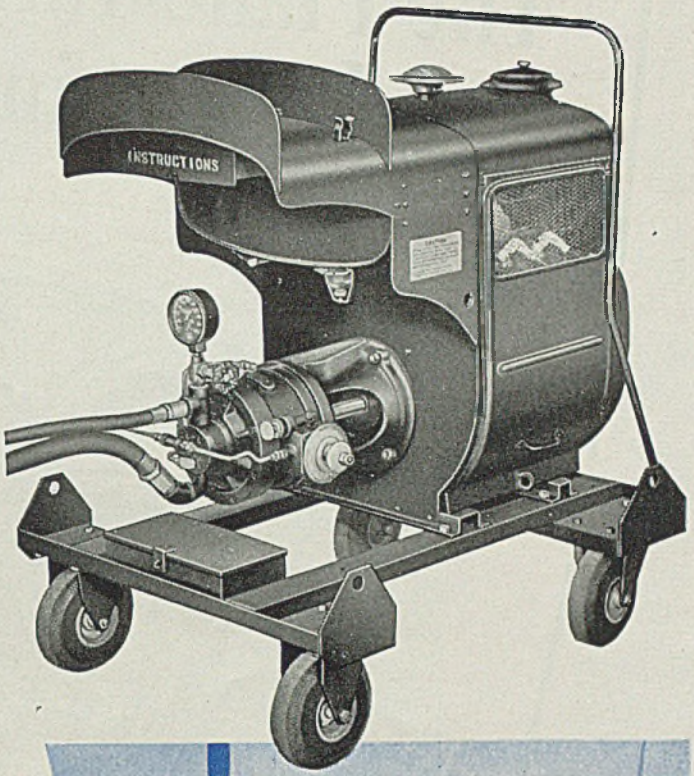
Now it looks like they've invaded the home front, although according to E. F. Mellish of The Metallic Roofing Co., Ltd., Toronto, these little rascals are really cousins and are called shemlins. Eight of them are shown here doing their very best to slow down production and we strongly urge you to do everything possible to keep them out of your shop, because once they get feeling at home it's just too bad.



Vol. 112, No. 9, March 1, 1943, issue of STEEL, published every Monday at Cleveland, Ohio. Entered as second class matter at the post office, Cleveland, O., under act of March 3, 1879. U. S. and possessions, Canada, Mexico, Cuba, Central and South America, 1 year $6; 2 years $10; all other countries, 1 year $12. Current issues, 25c. Yearbook of Industry issue, $2.00.

TESTED "IN ACTION" ON THE GROUND

for safer action in the air!



Not so long ago the only dependable way to check the operation of many parts of an airplane was to test them in action. And if tests had to be made in actual flight at the risk of a pilot's neck—well, in those days, what were test pilots for, anyway?

But HydrOILics has changed that.

For example, the gasoline-powered HydrOILic Test Stand shown at right checks the whole hydraulic system of an airplane in a few short minutes—*while the plane is safe on solid ground.* It's a mighty important test because ailerons, rudders, brakes, bomb bay doors, landing gear, and even the propeller pitch of modern planes depend on the hydraulic system for safe, smooth, accurate operation.

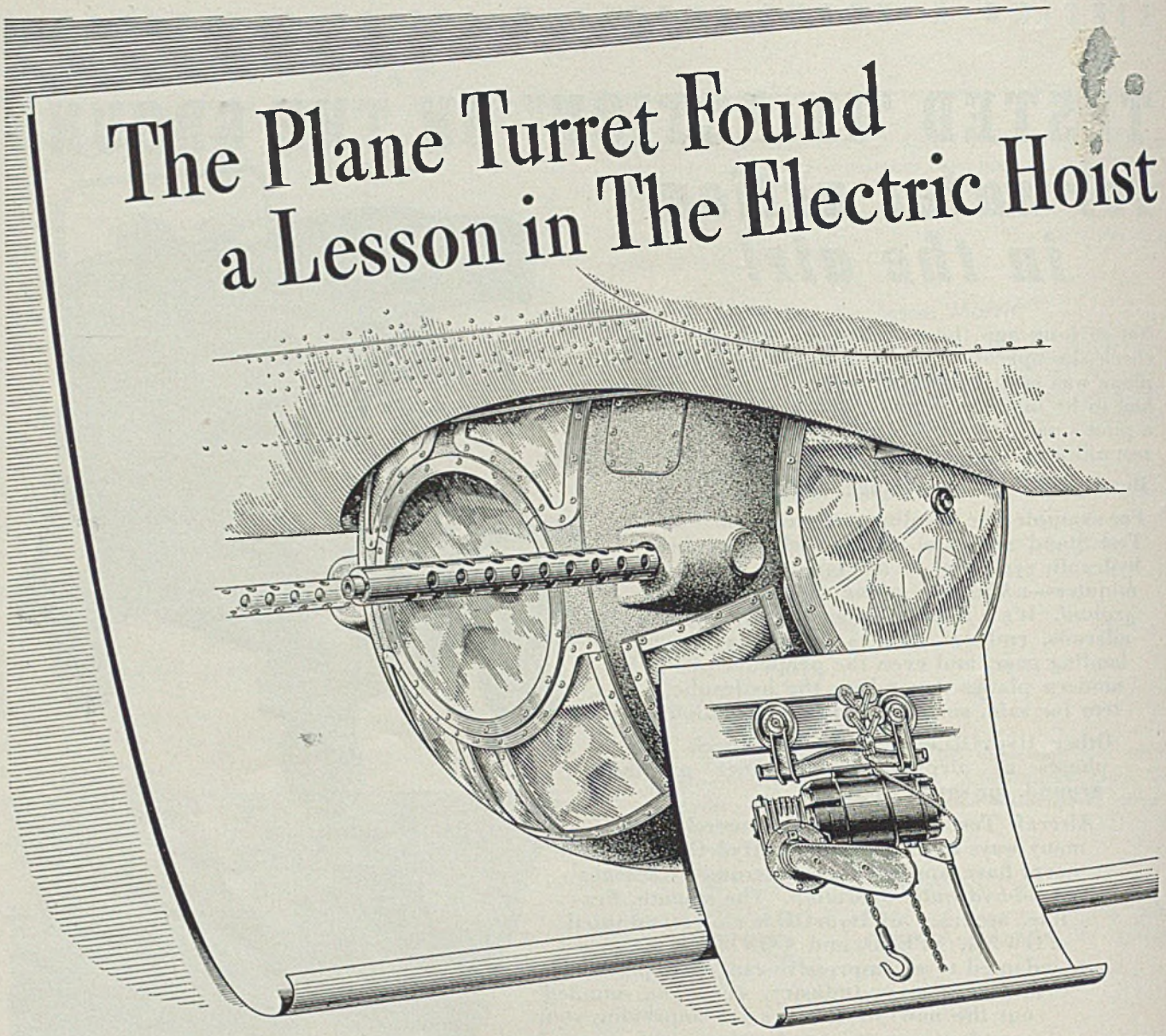
Other HydrOILic Test Stands check other phases of airplane performance on the ground, for safety in the air.

Aircraft Testing Equipment is merely one of many ways in which Denison HydrOILic engineers have applied the numerous advantages of *oil-hydraulic operation.* The smooth, flexible, accuracy of HydrOILic's oil-transmitted POWER, SPEED and CONTROL has been adapted to an impressive range of operations in almost every industry. Have *you* sounded out the new possibilities for improving your product, or its production, with Denison HydrOILic engineering or equipment? For information, call your Denison representative, or write to Denison engineers.

The **DENISON ENGINEERING CO.**
1163 DUBLIN ROAD, COLUMBUS, OHIO

INDUSTRY'S NEW RIGHT HAND

The Plane Turret Found a Lesson in The Electric Hoist



THERE'S not much in common, perhaps, between a hoist and a bomber turret. The hoist works day and night—constantly starting and stopping, frequently overloaded, seldom lubricated. That's why hoist manufacturers turned to the Torrington Needle Bearing to make product performance more dependable.

The plane turret, on the other hand, performs its task in a single, short, action-crowded interval, followed by thorough overhauling. But in those few swift moments of aerial combat, there's no leeway for the failure of *any* part. So turret designers, too, selected the Needle Bearing, to give reliable performance—and many other needed features as well. Quick response, for example, as the gunner pivots and somersaults to keep an enemy fighter in his sights—that comes from the Needle Bearing's low starting friction. A few more inches of space in the turret's cramped quarters, made possible by the bearing's small size. More rounds of ammunition or more gallons of fuel on board—result of the bearing's weight-saving features. And faster turret production because of the bearing's ready availability.

WHEN YOU DESIGN YOUR POST-WAR PRODUCTS, there may be a hint for you in a bearing as versatile as this. Long life, high load capacity, faster speeds, compact design, less need of attention—aren't these just the features your customers will be looking for? Torrington engineers will show you how you can give your product these advantages with the Needle Bearing. For preliminary information on sizes and ratings, and for a list of many typical applications, write for Catalog No. 110.

THE TORRINGTON COMPANY

Established 1866 • Torrington, Connecticut, U. S. A.

Makers of Needle and Ball Bearings

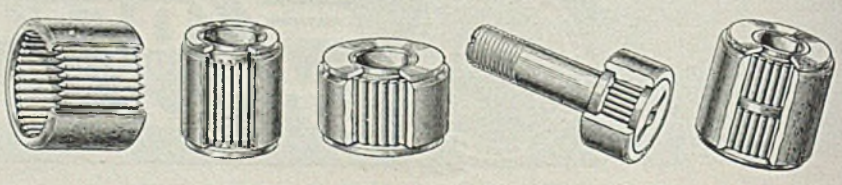
New York Boston Philadelphia Detroit
Cleveland Seattle Chicago San Francisco
Los Angeles Toronto London, England

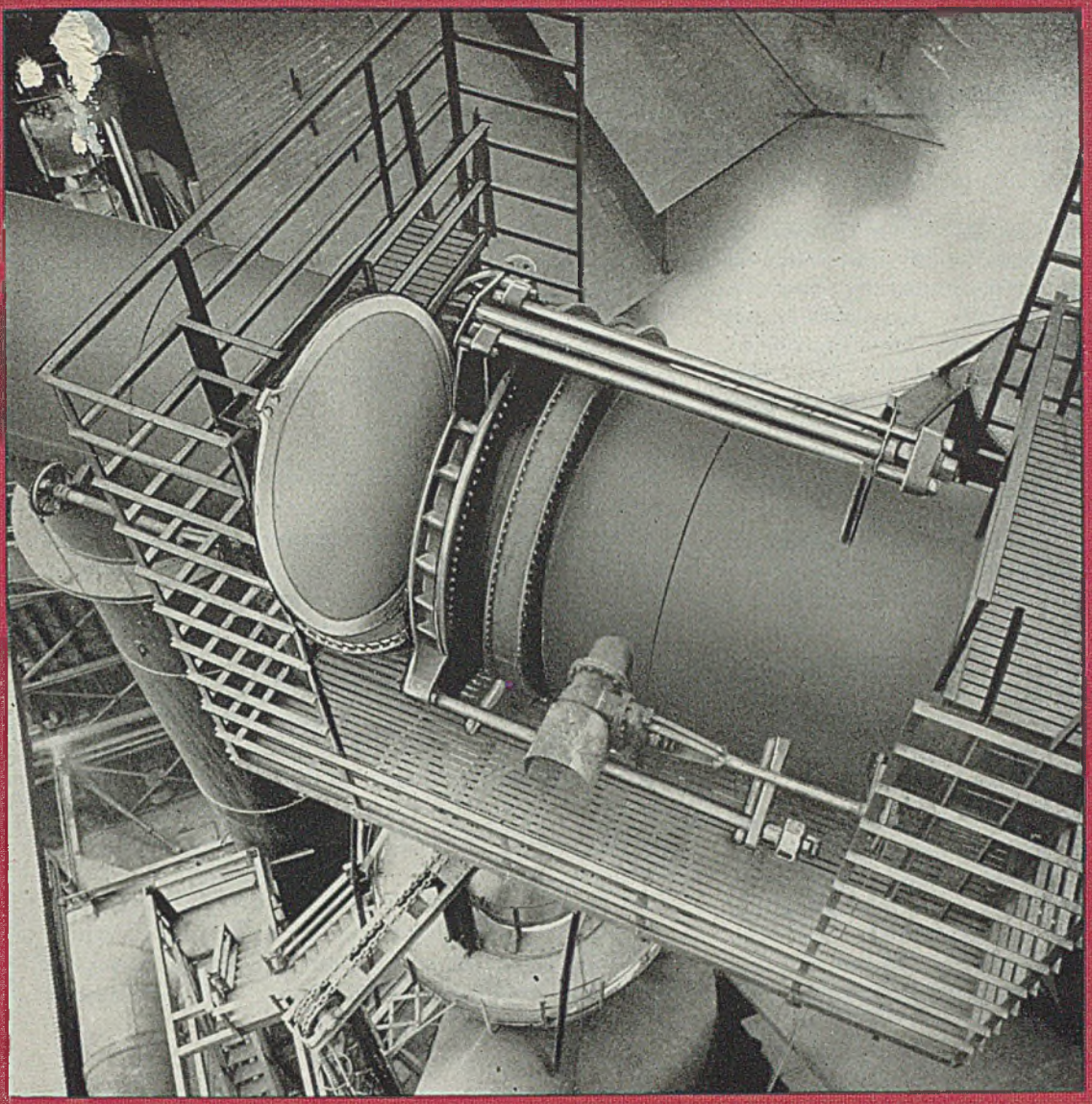
LET'S GO! U.S.A. KEEP 'EM FLYING!

TORRINGTON NEEDLE BEARINGS

KEYED TO TODAY'S NEEDS

AND TOMORROW'S TRENDS





Leadership through Quality

108" VALVE
IN
HOT GAS MAIN
BETWEEN
BLAST FURNACE
AND
DUST CATCHER

the Bailey

THERMAL EXPANSION GOGGLE VALVE

PATENTED

NATURE'S PHYSICAL LAWS NEVER FAIL!

Thermal Expansion and Contraction is the Physical Law by which the Bailey Thermal Valve is operated.

The Seal at the Goggle Plate is locked gas-tight by contraction of the Thermal Valve and released by their expansion. This positive, powerful action is assured,—facilitated by practical construction, with built-in quality and durability proved by exacting service under the most severe operating conditions.

See Following Pages for Complete Details

WILLIAM M. BAILEY COMPANY *Engineers* PITTSBURGH, PENNSYLVANIA

THE THERMAL EXPANSION VALVE

PATENTED

The Thermal Expansion Goggle Valve is operated by means of thermal expansion or contraction of metal tubes, thereby opening or closing flanges to free or clamp the goggle plate. Expansion tubes have been used for many purposes, but in this design three tubes, equally spaced around the valve, produce a definite, positive, powerful force when steam or gas is admitted, the expansion of the tubes separating the valve flanges to allow easy swinging of the goggle plate. After the plate is swung, the heating element is turned off and the tubes allowed to cool normally or more rapidly by the admission of cold water, when the contraction of the tubes moves the flanges together to clamp the plate and close the valve.

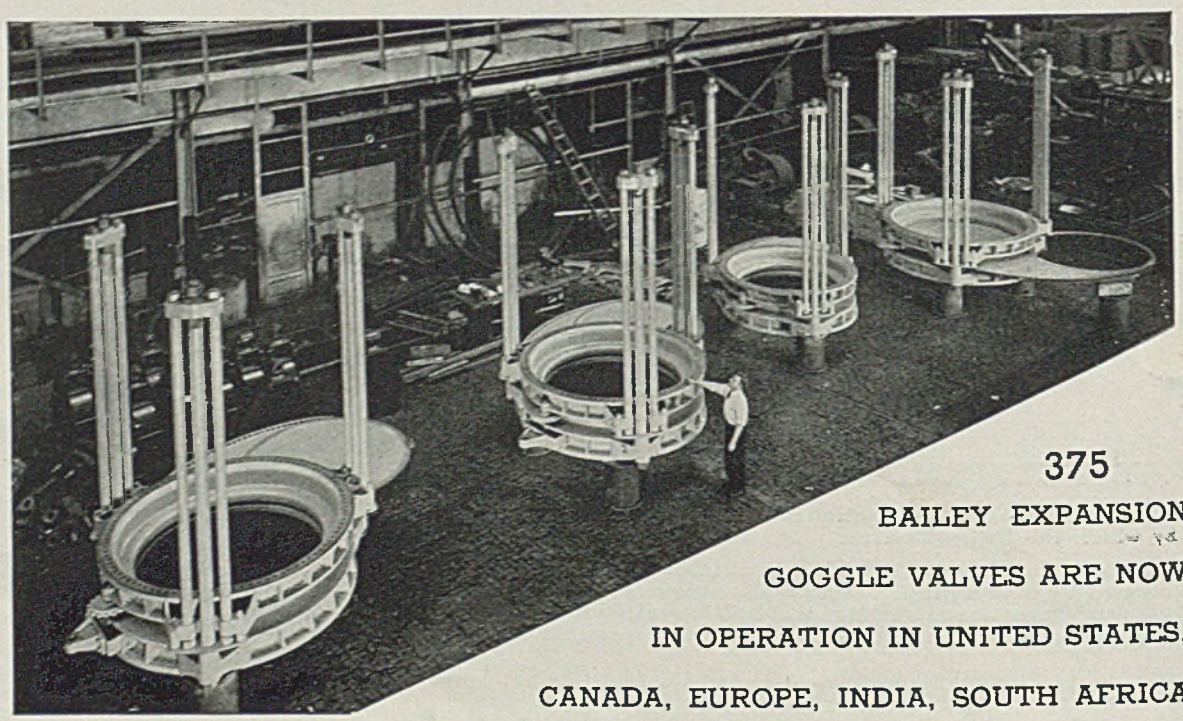
The valve flanges are of powerful design, made of open hearth steel annealed, and the expansion elements are ruggedly built; so that when the tubes expand or contract, the valve must open or close uniformly around the seat of the valve.

Expansion tubes have been used successfully to control a number of the most vital and delicate operations in the steel industry for years and the forces at command are definite, positive and powerful. A certain difference in temperature must result in a certain expansion or contraction, and when the thermal unit is physically tied to something movable, that something must move—so far.

With the flange castings and expansion element properly designed, of sufficient weight and strength, the resistless force resulting from admitting a flow of steam into the expansion tubes and changing to a flow of cold water assures positive uniform releasing and clamping of the goggle plate. An absolutely gas-tight valve is the result.

The flange movement is accomplished by the mere turning of a small valve to admit the steam or water (which valves may be conveniently located near the ground level), and then the opening and closing of the large goggle valve can be quickly done by a pull on the operating chain provided for swinging the plate. The operating chain is direct-connected to a bronze worm gear unit, which is oil and dust-tight and is suspended directly underneath the goggle valve. This unit assures quick and easy swinging of the goggle plate and reduces the man power required to a minimum. The average time required to operate a 90" valve from the ground level is 3 minutes.

The Bailey patented fabricated goggle plate, with machined seats on both sides, is used on these valves, operated either by hand chain through a worm gear reduction unit, by a motor driven reduction unit or by emergency hand chain.



375

BAILEY EXPANSION

GOGGLE VALVES ARE NOW

IN OPERATION IN UNITED STATES,

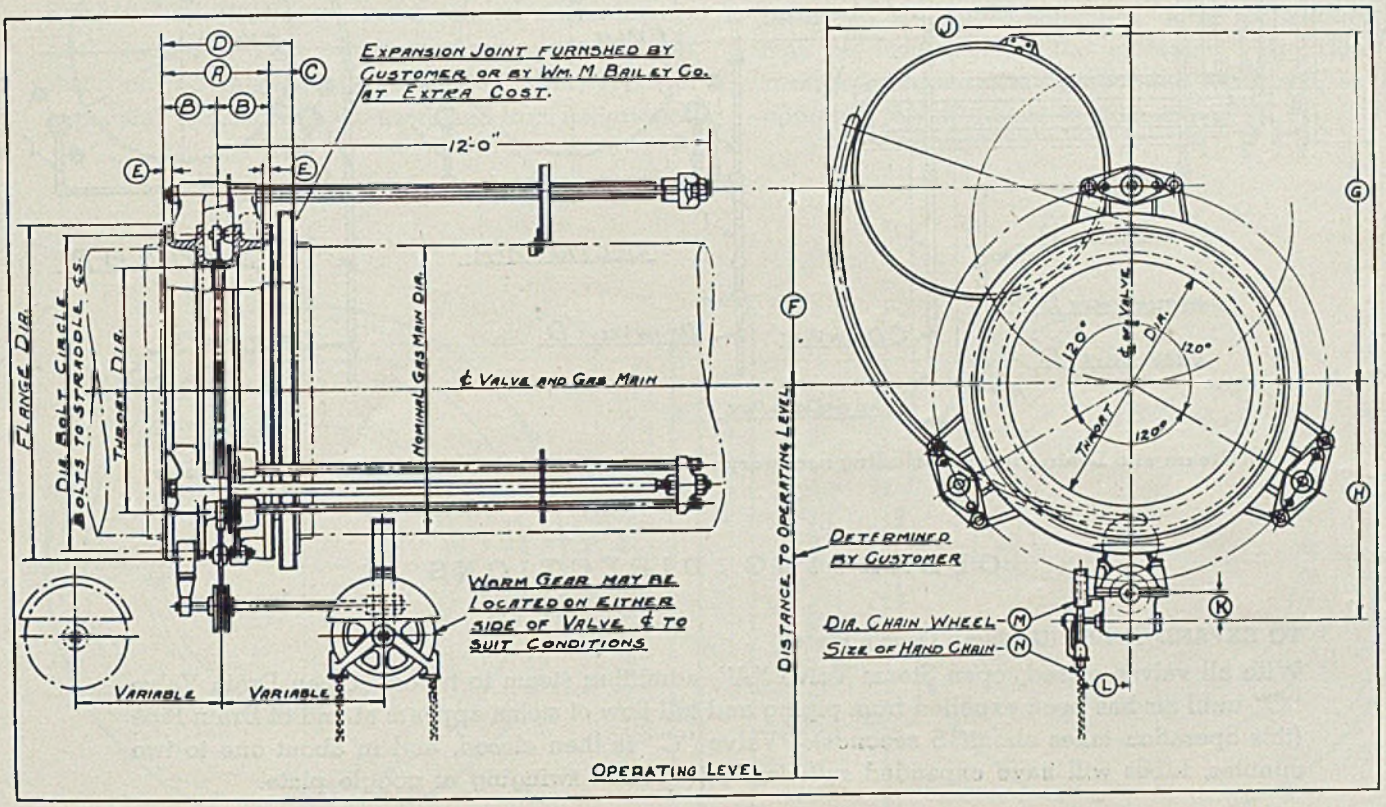
CANADA, EUROPE, INDIA, SOUTH AFRICA

These cuts show the design and dimensions of all standard sizes of Thermal Expansion Valves.

The plan view of the lower expansion element shows the pull rods are fastened securely to the rod anchor flange while the expansion tube in the center is fastened to the tube anchor flange. At the opposite end both pull rods and the expansion tube are held by means of a cross-head with adjusting nut by which valve may be operated in emergency.

The Alignment Plate, through which the expansion tube passes is fastened at each end to lugs on the rod anchor flange, thus preventing the separated gas main from sagging.

This alignment plate is fitted tight against a shoulder provided on the expansion tube and moves with the expansion or contraction of the tube, thereby not interfering with successful operation of valve.



Size of Valve	Nom. Gas Main Dia.	Throat Dia.	Flange Dia.	Bolts			A	B	C	D	E	F	G	H	J	Worm Gear			M	N	Weight of Valve
				Dia. B. C.	No. Reqd.	Dia.										No.	K	L			
48"x 36"	4'-0"	3'-0"	4'-11"	4'-6"	48	⅞"	2'-2"	13"	9 15/16"	2'-11 15/16"	1⅜"	2'-9½"	4'-3½"	3'-8 25/32"	4'-0½"	21-A	6 5/16"	10¼"	20½"	¼"	6,600
54"x 42"	4'-6"	3'-6"	5'-6½"	5'-2"	60	⅞"	2'-3½"	13¾"	9 15/16"	3'-1 7/16"	1½"	3'-2"	5'-0"	3'-11 25/32"	4'-7"	21-A	6 5/16"	10¼"	20½"	¼"	7,800
60"x 48"	5'-0"	4'-0"	6'-1"	5'-9"	60	⅞"	2'-3½"	13¾"	9 15/16"	3'-1 7/16"	1¾"	3'-6¼"	5'-7½"	4'-6 11/32"	5'-2"	21-A	6 5/16"	10¼"	20½"	¼"	10,400
66"x 54"	5'-6"	4'-6"	6'-8"	6'-3"	72	1"	2'-5"	14½"	9 15/16"	3'-2 15/16"	1¾"	3'-10"	6'-6"	4'-9 11/32"	5'-9"	21-A	6 5/16"	10¼"	20½"	¼"	12,100
72"x 60"	6'-0"	5'-0"	7'-3"	6'-8½"	72	1"	2'-5"	14½"	9 15/16"	3'-2 15/16"	2"	4'-2"	7'-1"	5'-1 25/32"	6'-3"	2	7¾"	14⅛"	24"	5/16"	13,200
78"x 66"	6'-6"	5'-6"	7'-9"	7'-3"	84	1"	2'-5"	14½"	9 15/16"	3'-2 13/16"	2"	4'-5½"	7'-9"	5'-5 11/32"	6'-9 5/8"	2	7¾"	14⅛"	24"	5/16"	14,200
84"x 72"	7'-0"	6'-0"	8'-4"	7'-8½"	84	1"	2'-7"	15½"	9 15/16"	3'-4 15/16"	2"	4'-10"	8'-5"	5'-8 11/32"	7'-2¾"	2	7¾"	14⅛"	24"	5/16"	17,800
90"x 78"	7'-6"	6'-6"	8'-10"	8'-2½"	96	1"	2'-7"	15½"	9 15/16"	3'-4 15/16"	2¼"	5'-1¼"	9'-2"	5'-11 11/32"	7'-9¾"	2	7¾"	14⅛"	24"	5/16"	21,000
96"x 84"	8'-0"	7'-0"	9'-3½"	8'-8½"	96	1"	2'-7"	15½"	9 15/16"	3'-4 15/16"	2¼"	5'-7"	10'-1"	6'-4¾"	8'-4"	2	7¾"	14⅛"	24"	5/16"	22,800
102"x 90"	8'-6"	7'-6"	9'-10"	9'-3"	108	1"	2'-9"	16½"	9 15/16"	3'-6 15/16"	2¼"	5'-11"	10'-10"	6'-7½"	9'-0"	2	7¾"	14⅛"	24"	5/16"	25,800
108"x 94"	9'-0"	7'-10"	10'-6"	9'-9"	108	1"	2'-9"	16½"	9 15/16"	3'-6 13/16"	2¼"	6'-1"	11'-4"	6'-9½"	9'-4"	2	7¾"	14⅛"	24"	3/16"	29,000
114"x100"	9'-6"	8'-4"	11'-3"	10'-3"	108	1"	2'-11"	17½"	9 15/16"	3'-8 15/16"	2¼"	6'-7"	12'-0"	7'-0¾"	9'-11"	2	7¾"	14⅛"	24"	5/16"	31,500
120"x104"	10'-0"	8'-7¾"	11'-8"	10'-11"	108	1"	3'-1"	18½"	9 15/16"	3'-10 15/16"	2¼"	6'-10½"	12'-3½"	7'-3¼"	10'-4⅛"	2	7¾"	14⅛"	24"	5/16"	34,000

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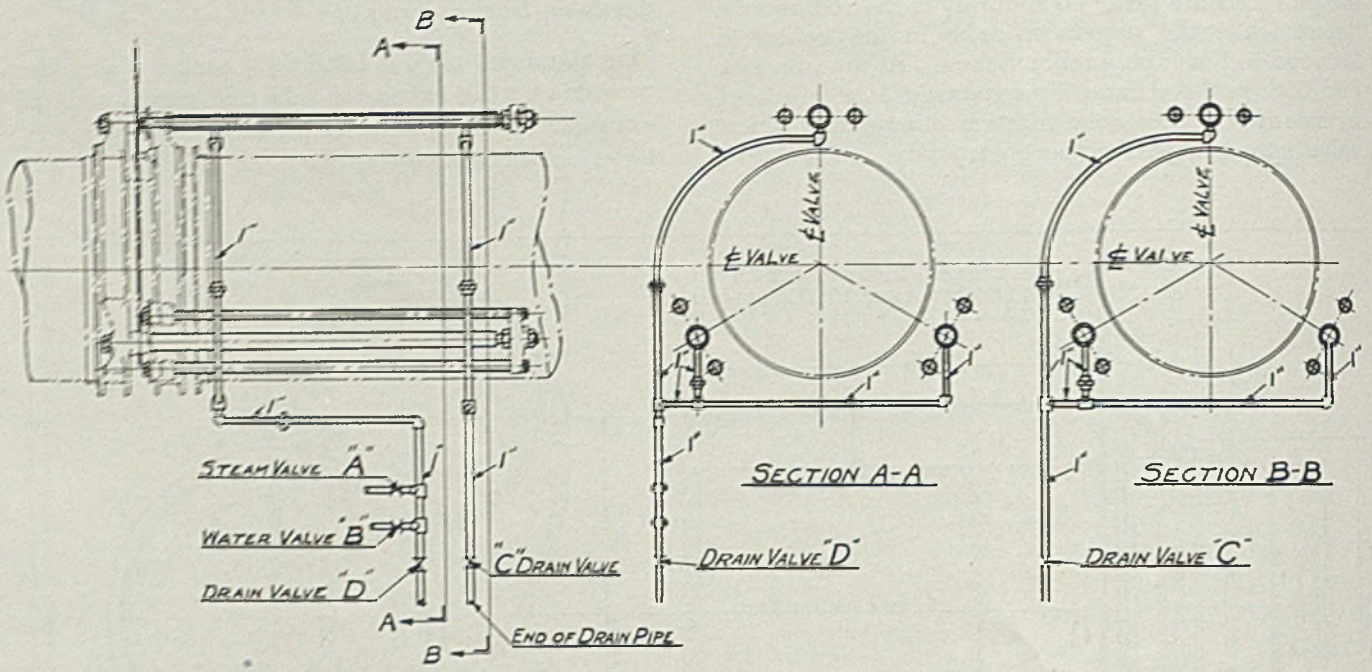
STEAM PIPING REQUIREMENTS FOR EACH VALVE



All Steam and Drain Piping, including necessary valves and fittings, are furnished by the Purchaser.

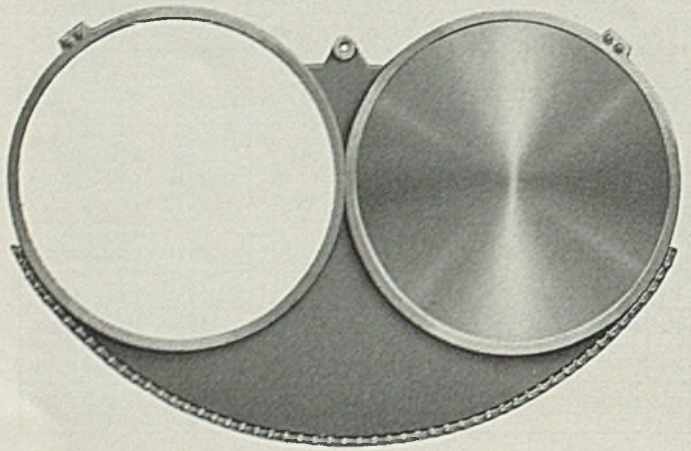
OPERATING DIRECTIONS

TO EXPAND TUBES (Unclamp Goggle Plate)

With all valves closed, open Steam Valve "A", admitting steam to tubes. Open Drain Valve "C" until air has been expelled from piping and full flow of steam appears at end of Drain Pipe (this operation takes about 15 seconds). Valve "C" is then closed, and in about one to two minutes, tubes will have expanded sufficiently to permit swinging of goggle plate.

TO CONTRACT TUBES (Clamp Goggle Plate)

Close Valve "A", then open Valves "B" and "C" allowing water to pass through tubes until they have contracted sufficiently to seal goggle plate. After cooling water is turned off, open Drain Valves "C" and "D" to drain piping.



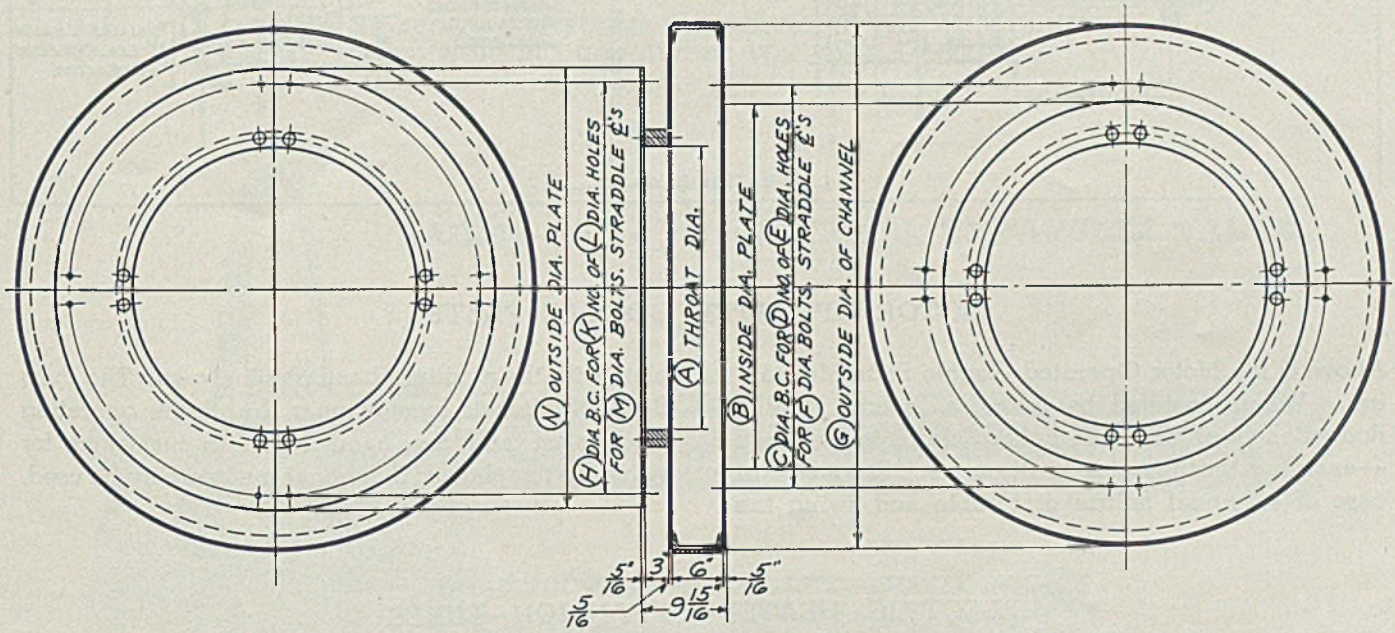
The Goggle Plate is the Bailey patented fabricated design with seats on both sides machined to within .002 of an inch to conform to the machined edges of the flanges. The plate is pivoted on one of the expansion tubes and operated by a hand chain through a sprocket wheel which in turn meshes in the chain welded at each link to the plate.

The simplicity and ruggedness of this design guarantee years of satisfactory operation.

THE EXPANSION JOINT

All gas mains expand and contract in accordance with their change in temperature. Gas mains also get out of alignment due to settling and twisting of the foundations of the furnace, dust catcher, gas washers or main supports, so the installation of an EXPANSION JOINT is recommended adjoining or near each valve to eliminate undue pressure or strain on the valve flanges or plate. Many types of expansion joints have been used, and from experience in installing 375 valves, the design illustrated is recommended as the one to meet the most adverse conditions affecting gas mains and allow the valve to operate freely under all conditions.

The Expansion Joint or a more simple type will be furnished if thought sufficient, or in some cases, it may be furnished by the customer. The right is reserved, however, to approve the type used, as the operation of all valves is guaranteed.



Size of Valve	Nom. Gas Main Dia.	A	B	C	D	E	F	G	H	K	L	M	N	Weight in Pounds	Detail Dwg. No.
48"x 36"	4'-0"	3'-0"	3'-6"	4'-4¾"	48	⅜"	¾"	4'-11"	4'-6"	48	⅞"	¾"	4'-10"	630	CV-1548
54"x 42"	4'-6"	3'-6"	4'-0"	4'-10¾"	60	⅜"	¾"	5'-8"	5'-2"	60	⅞"	¾"	5'-6"	980	CV-1549
60"x 48"	5'-0"	4'-0"	4'-8"	5'-4¾"	60	⅜"	¾"	6'-4½"	5'-9"	60	1"	⅞"	6'-1"	1110	CV-1310
66"x 54"	5'-6"	4'-6"	5'-2"	5'-10¾"	72	⅜"	¾"	6'-11½"	6'-3"	72	1⅛"	1"	6'-7"	1235	CV-1547
72"x 60"	6'-0"	5'-0"	5'-8"	6'-4¾"	72	⅜"	¾"	7'-7½"	6'-8½"	72	1⅛"	1"	7'-0½"	1400	CV-1317
78"x 66"	6'-6"	5'-6"	6'-3"	6'-11¾"	84	⅜"	¾"	8'-2½"	7'-3"	84	1⅛"	1"	7'-7"	1550	CV-1366
84"x 72"	7'-0"	6'-0"	6'-8"	7'-5¾"	84	⅜"	¾"	8'-11"	7'-8½"	84	1⅛"	1"	8'-0½"	1745	CV-1311
90"x 78"	7'-6"	6'-6"	7'-2"	7'-11¾"	96	⅜"	¾"	9'-5½"	8'-2½"	96	1⅛"	1"	8'-6½"	1875	CV-1466
96"x 84"	8'-0"	7'-0"	7'-8"	8'-5¾"	96	⅜"	¾"	10'-5"	8'-8½"	96	1⅛"	1"	9'-0"	2180	CV-1387
102"x 90"	8'-6"	7'-6"	8'-0"	8'-11¾"	108	⅜"	¾"	11'-0½"	9'-3"	108	1⅛"	1"	9'-7"	2415	CV-1550
108"x 94"	9'-0"	7'-10"	8'-6"	9'-5¾"	108	⅜"	¾"	11'-4½"	9'-9"	108	1⅛"	1"	10'-1"	2510	CV-1551
114"x100"	9'-6"	8'-4"	9'-0"	9'-10¾"	108	⅜"	¾"	12'-4½"	10'-3"	108	1⅛"	1"	10'-7"	2895	CV-1350
120"x104"	10'-0"	8'-7¾"	9'-6"	10'-5¾"	108	⅜"	¾"	12'-11½"	10'-11"	108	1⅛"	1"	11'-3"	3095	CV-1552

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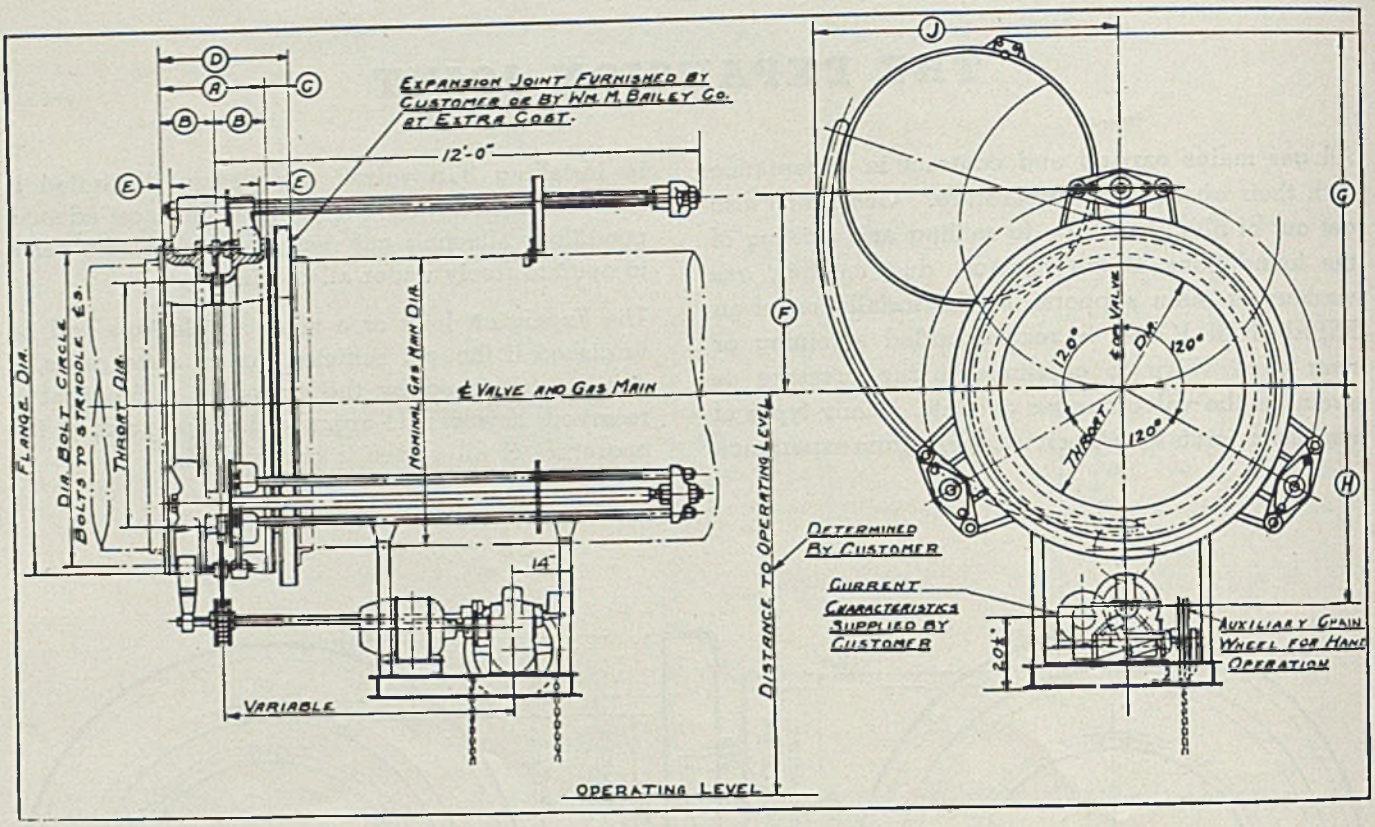
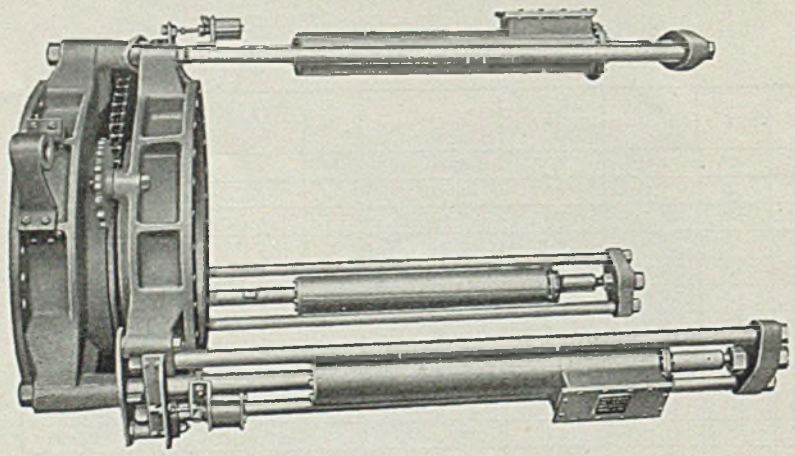


MOTOR OPERATED GOGGLE PLATE

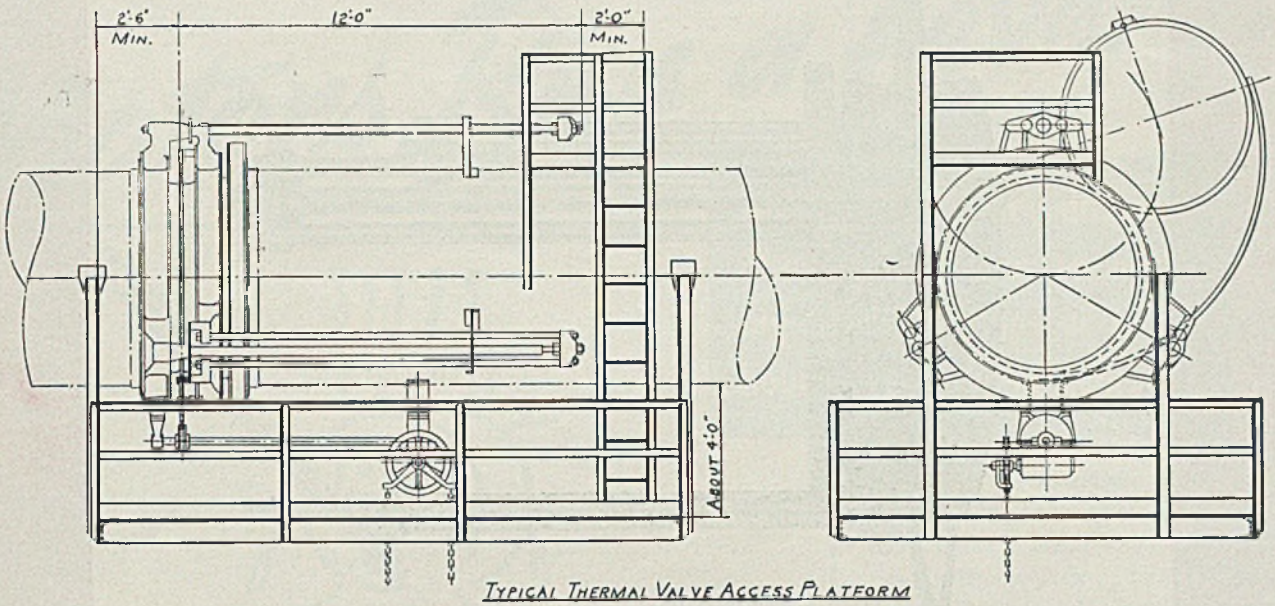
Above is the Motor Operated Goggle Plate Mechanism. When operated by motor, a Special Double Reduction Gear Unit with built-in clutch is furnished —enabling the operator to disconnect the motor in case of electrical failure or trouble and swing the plate with the auxiliary hand chain shown. The Push Button Station is located near the clutch operating mechanism and the hand chain is furnished for swinging the plate so that either method may be used.

ELECTRIC HEATED EXPANSION TUBES



Standard 90" Thermal Valve with Electric Heaters on Thermal Expansion Tubes. Three Methods of Operation Possible, so that any emergency can be met.

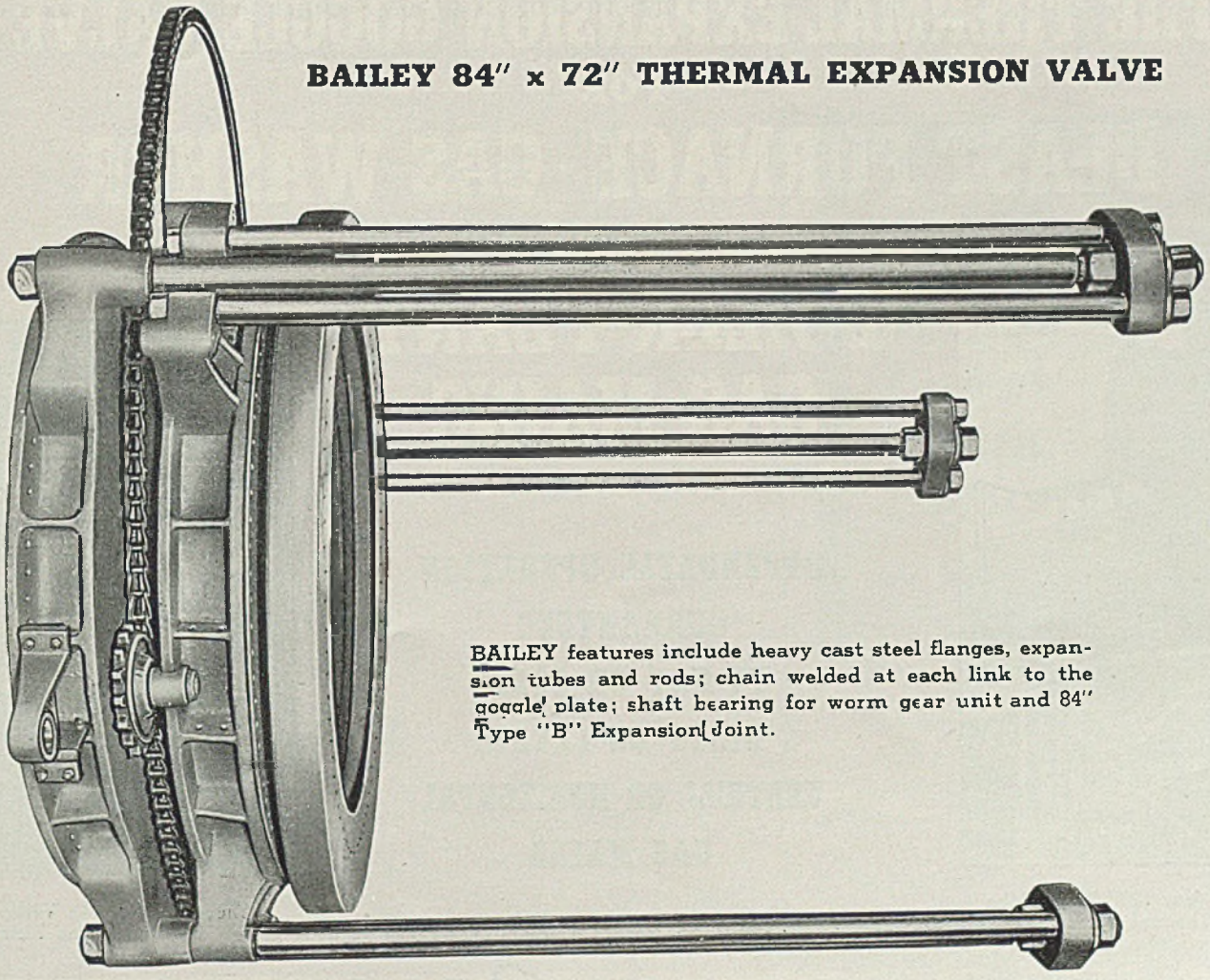
These Valves may be built for operation by means of Electrically Heated Expansion Tubes. The heater is fitted around the outside of the expansion tubes so that the tubes may be cooled by water. Should the electric current fail, the valve may be operated as a steam operated valve or may be operated by applying a wrench to the adjustment nuts. The two or three methods of operation guarantee against failure in an emergency.



TYPICAL THERMAL VALVE ACCESS PLATFORM

SIMILAR ACCESS PLATFORMS FOR SERVICING THE VALVES INSURE SAFE WORKING CONDITIONS FOR YOUR EMPLOYEES

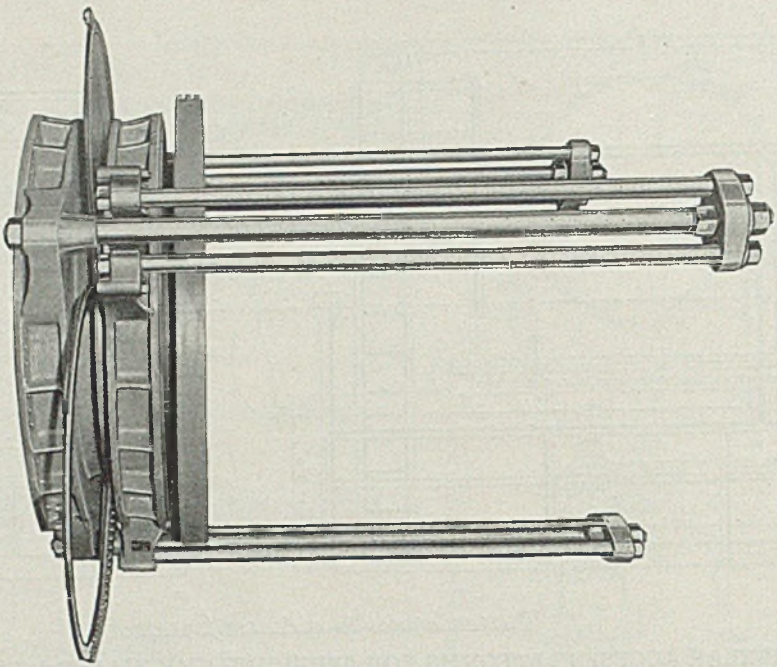
BAILEY 84" x 72" THERMAL EXPANSION VALVE



BAILEY features include heavy cast steel flanges, expansion tubes and rods; chain welded at each link to the goggle plate; shaft bearing for worm gear unit and 84" Type "B" Expansion Joint.

(Turn Page)

WMBCo.



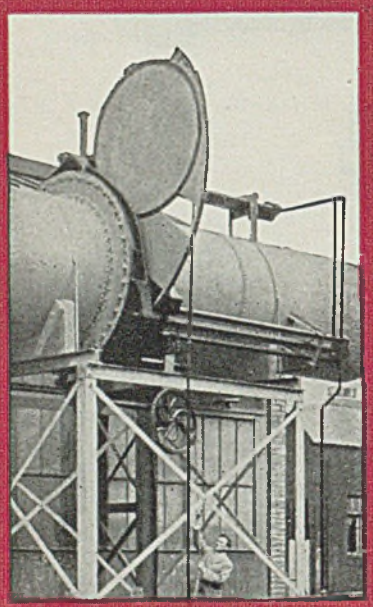
THE THERMAL EXPANSION GOGGLE VALVE

FOR

BLAST FURNACE · GAS WASHER

AND

BOILER PLANT GAS MAINS



One of four 120" Three Tube Thermal Valves

DEPENDABLE OPERATION

GUARANTEED

IN HOT OR COLD,

DIRTY OR CLEAN,

VERTICAL OR HORIZONTAL

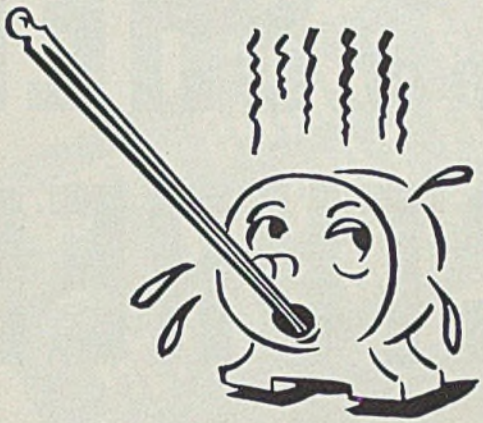
GAS MAINS

Thermal Valves in Vertical and Horizontal Gas Mains

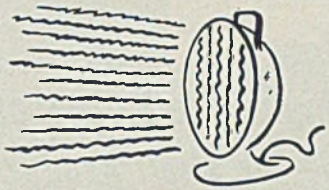
WILLIAM M. BAILEY COMPANY *Engineers* PITTSBURGH, PENNSYLVANIA

Motors Run a Fever?

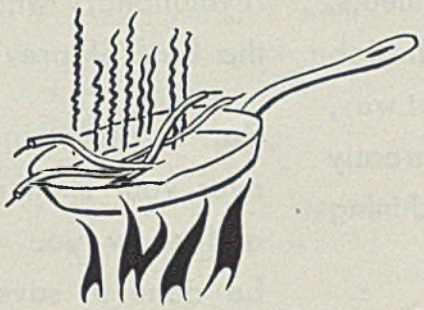
No wonder if they do more often today. They're working 3 and 4 times as many hours a year as in peace!



When a motor runs hot in your plant, do your men have explicit directions for locating the cause? If not, send in for your free copy of "Guide to Wartime Care of Electric Motors". Its QUICK DIAGNOSIS OF MOTOR AILMENTS is invaluable!



Friction makes heat — and so does electrical resistance. Pages 8 and 9 of Allis-Chalmers' new book tell how wartime preventive maintenance should fight friction . . . pages 16 and 17 outline strategy for preventing overload. Recommendations are simple, practical, *geared to wartime* — ideal for training.

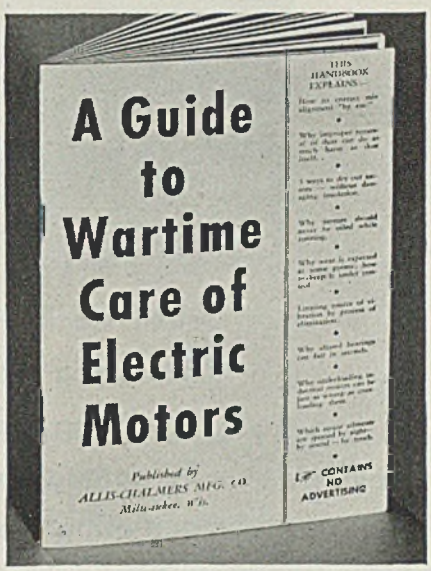


Insulation is "fried" by excessive heat — bearings burned out — soldered connections melted. Play safe . . . put Allis-Chalmers' new motor maintenance guide to work protecting *your* motors!

HERE'S the arithmetic of the wartime motor maintenance problem: motors that worked 1800 hours in a peace year now work up to *8700 hours!*

A killing schedule—yet motors now must last *longer* than ever before — and wishing won't make it so.

One thing will: the new *wartime* standard of motor care set forth in Allis-Chalmers' new motor maintenance guide. Already, 70,000 copies are in use in plants all over the U. S.!



Contents of this valuable new publication include the 9 main enemies of electric motors and how to fight them . . . dust, stray oil, moisture, friction, misalignment, vibration, uneven wear, overload and underload. Send in today for *your* free copy to ALLIS-CHALMERS, MILWAUKEE, WIS. A 1591

ALLIS-CHALMERS

WE WORK FOR VICTORY — WE PLAN FOR PEACE

ATKINS

always at the service of SHELL MANUFACTURERS

who want to speed up shell stock cut-off

Find out how new high speed saws plus new cutting techniques are boosting output for shell producers . . . . . .

● Vastly increased output on shell stock and shell band cut-off has been achieved in many shell producing plants by Atkins engineers. By getting the *right saw* on the job and using that saw in the *right way*, cutting speeds have been greatly increased and subsequent machining operations reduced.

Basis of the new cutting speeds are Atkins Curled-Chip Saws. These modern metal cutting saws, as adapted to specific cutting jobs, permit stepped-up rates — rates nothing less than revolutionary when compared with the best of previous performance.

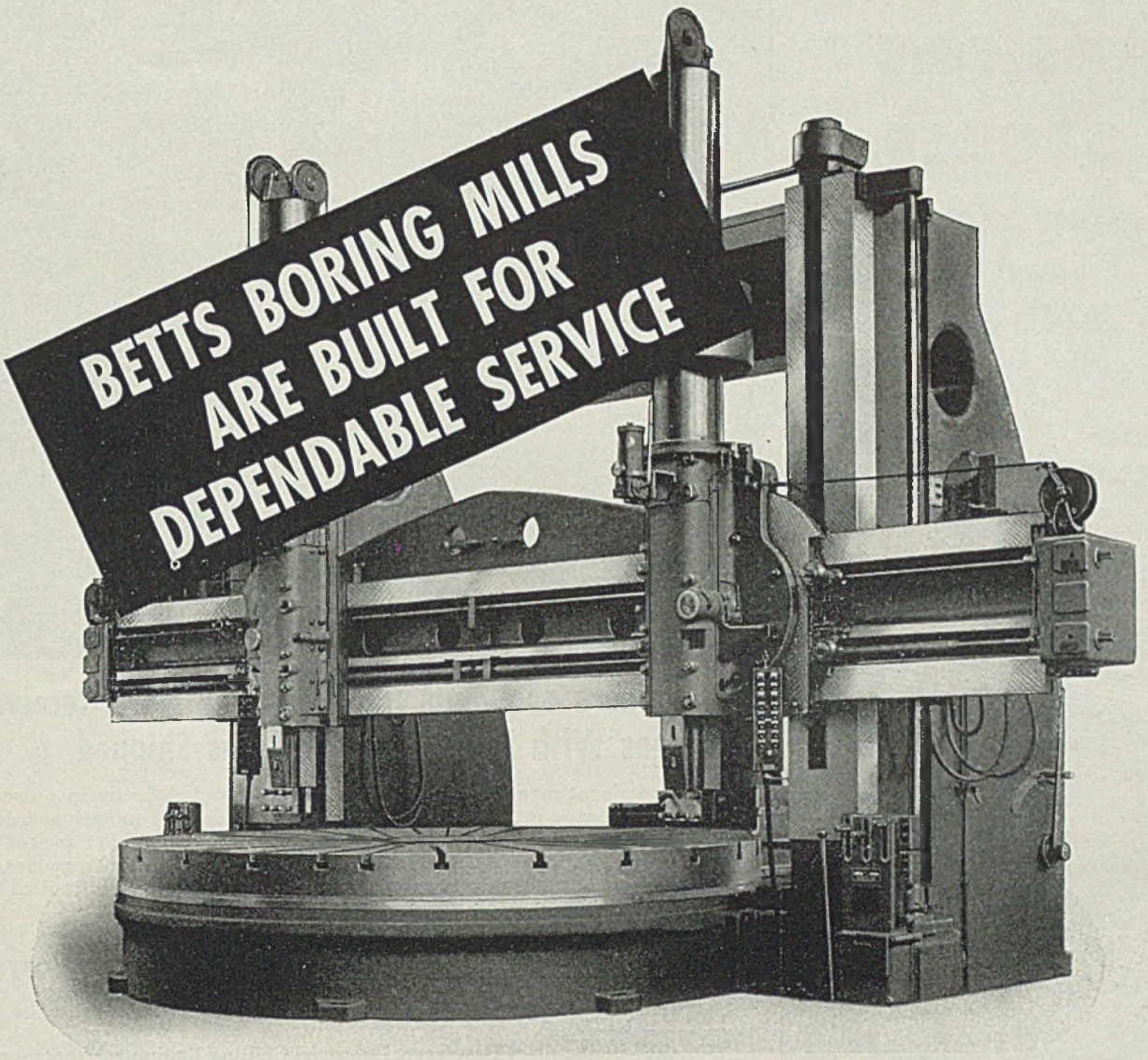
Call in an Atkins engineer to go over your shell cutting operations and show you exactly what can be done to save time and labor and reduce machine downtime on this vital work.

Write or Wire for Full Details

E. C. ATKINS AND COMPANY • INDIANAPOLIS, INDIANA

INCREASE YOUR CAPACITY WITH

CONSOLIDATED MACHINE TOOLS



These large Betts Mills are meeting today's requirements for machines that will stand up on heavy schedules—24 hours a day—frequently with inexperienced operators. They are heavy duty machines, built for exacting service . . . . their continuous accuracy is a result of the modern rigid design and the many years experience building good machine tools.

In addition to the Betts 14' Vertical Boring and Turning Mill illustrated, other Betts Mills are built in sizes to swing work up to practically any requirement. All the modern features contributing to convenience and safety of operation, accuracy and increased production are incorporated in their design.

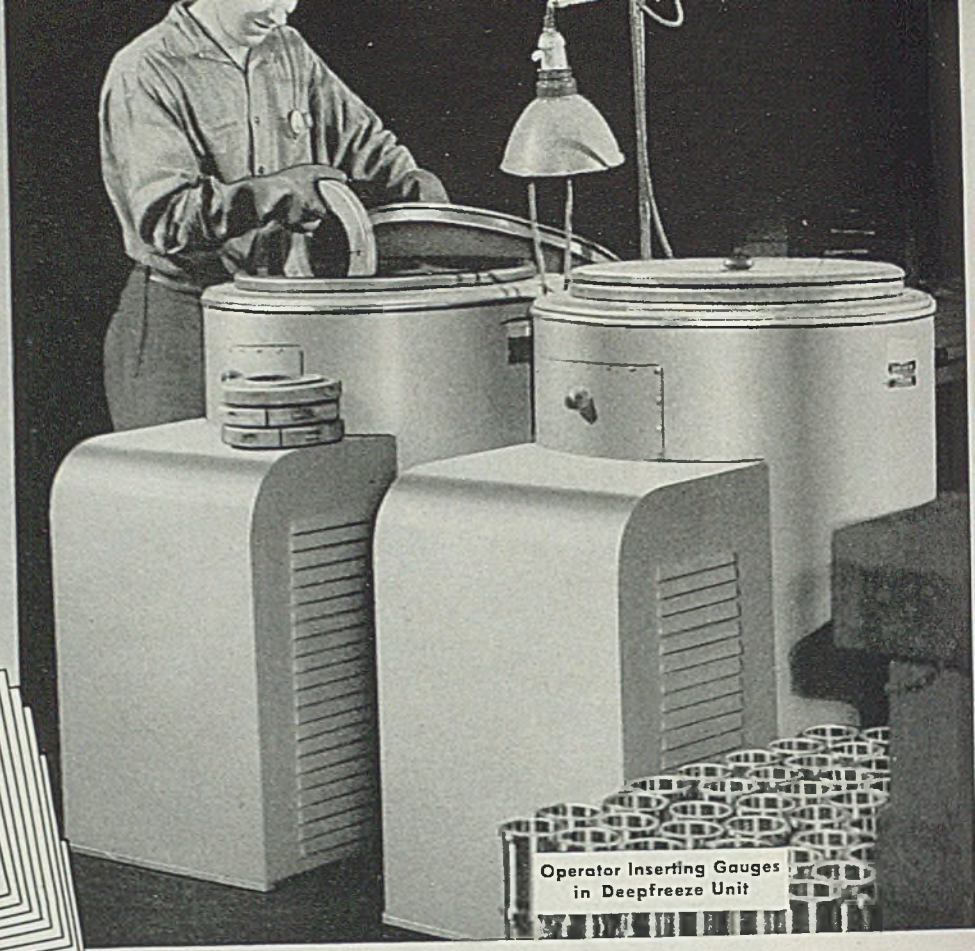
Complete information on any of the machines in the Consolidated line will be sent on request.

BETTS • BETTS-BRIDGEFORD • NEWTON • COLBURN • HILLES & JONES • MODERN

CONSOLIDATED MACHINE TOOL CORPORATION

ROCHESTER, NEW YORK

HOW TO "Freeze" DIMENSIONS ON GAUGES AND PRECISION PARTS



Operator Inserting Gauges in Deepfreeze Unit

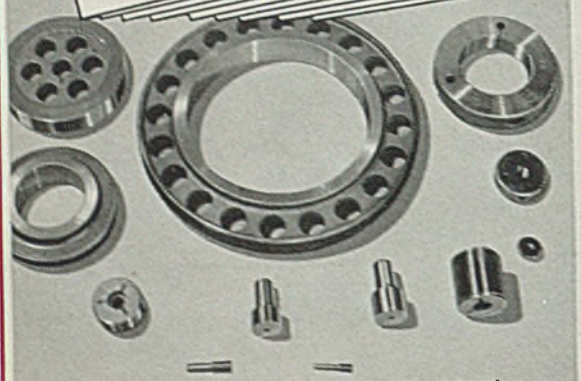
COMPANY NAMES STARTING WITH P*

increased production

Case Study from the Files of Deepfreeze

The Sub-Zero Method of Shrinking, Testing and Treating of Metals

*Name on request to bona-fide inquiries



ypical gauges subjected to alternate cold and heat treating

DATA AND PART INFORMATION

Season gauges to prevent change in finished size.

Thread gauge treated as follows: 2 hours Deepfreeze—2 hours boiling water—2 hours Deepfreeze.

Other gauges treated according to gauge and steel. Some are heat treated one or more times or normalized between machining operations. Size determines number of Deepfreeze applications—larger gauges chilled more than once.

Sequence of Operations on Thread Gauge:

1. Machined, heat treated and rough ground.
2. Deepfreeze and heat treat.
3. Finish by lapping.

RESULTS: Gauges hold size in transit to customer's plant—no rejects.

SAVINGS: All time previously lost in correcting or replacing gauges whose size was distorted due to temperature changes and jarring.

FREE ADDITIONAL DATA . . . and proof of the outstanding success of the Deepfreeze method for chilling metals are included in this booklet. Write for your copy.

Customers of Gauge Manufacturer Now Receive Gauges With Exact Dimensions as Shipped

This prominent manufacturer of gauges experienced difficulty in preventing growth or change in size of gauges during shipment to customers, and during later use in customers' plants. Jarring and temperature changes in transit affected finished gauge size and hours of careful work were wasted. When gauges were not distorted in transit, future metal growth and warp resulted in spoiled work in the customer's plant.

Alternate Cold and Heat Treating Assures Correct, Permanent Size

With the installation of Deepfreeze Industrial Chilling Equipment, together with usual heat treating, the gauges are now properly treated to hold finished size under all normal temperature changes and handling.

Gauges are stored 2 hours in Deepfreeze unit, then in boiling water, oil, or salt bath depending upon steel used, and then back to Deepfreeze storage for 2 additional hours.

The Uses of DEEPFREEZE in Your Plant

In addition to preventing growth or warp in gauges and precision parts, Deepfreeze metal chilling can help you in:

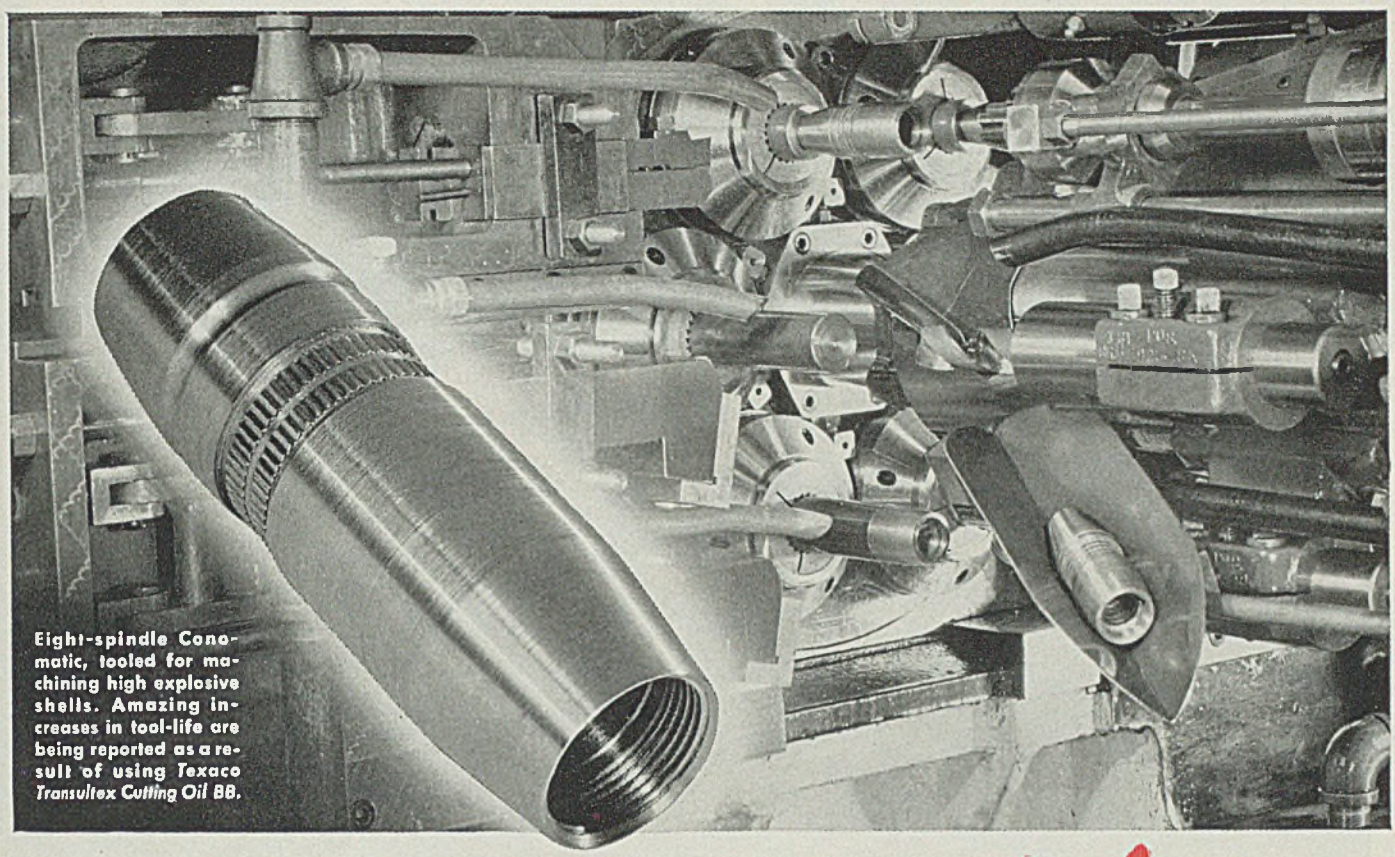
1—Shrinking of metals for ease of bearing assembly, etc.

2—Testing of metals for reaction of sub-zero temperatures to aircraft instruments, etc.

Investigate the full possibilities and application of Deepfreeze to your manufacturing . . . write for the booklet offered at the left.

Deepfreeze
DIVISION

MOTOR PRODUCTS CORPORATION
2309 DAVIS ST., NORTH CHICAGO, ILLINOIS



Eight-spindle Conomatic, tooled for machining high explosive shells. Amazing increases in tool-life are being reported as a result of using Texaco *Transultex Cutting Oil BB.*

Output Quadrupled between tool grinds . . .

THEY PREFER TEXACO

★ More revenue airline miles in the U. S. are flown with Texaco than with any other brand.

★ More buses, more bus lines and more bus-miles are lubricated with Texaco than with any other brand.

★ More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.

★ More Diesel horsepower on streamlined trains in the U. S. is lubricated with Texaco than with all other brands combined.

★ More locomotives and railroad cars in the U. S. are lubricated with Texaco than with any other brand.

WHEN MACHINING 37-mm high-explosive projectiles, involving drills, reamers, taps and form-tools, 50 to 150 pieces was top output between tool grinds.

Then the cutting coolant was changed, and output not only was quadrupled, but feeds were also increased. The cutting coolant that permitted this tremendous increase is *Texaco Transultex Cutting Oil BB.*

Texaco Transultex is transparent, permits operator to *see* what's going on, it permits freer cutting, carries away more heat, produces better finish.

The outstanding performance that has made Texaco preferred in the fields listed in the panel has made it preferred by prominent users in the metal-cutting field.

Texaco users enjoy many benefits that can also be yours. A Texaco Engineer specializing in cutting coolants will gladly cooperate in the selection of the most suitable products for your operations. Just phone the nearest of more than 2300 Texaco distributing points in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York, N. Y.

TUNE IN FRED ALLEN EVERY SUNDAY NIGHT—CBS ★ HELP WIN THE WAR BY RETURNING EMPTY DRUMS PROMPTLY

TEXACO REG. T. M.

TEXACO Cutting and Soluble Oils

FOR FASTER MACHINING

Until recently, cutting hatchway openings out of heavy deck plating was a bottleneck in the construction of certain types of ships. It was a slow, costly job requiring many laborious machining operations.

Could the oxyacetylene flame eliminate this bottleneck? This was the problem presented to Airco's research engineers by one of its customers. The problem was solved by an entirely new gas cutting machine, designed and constructed specifically to handle this job.

With this machine it is possible to cut beveled openings, rounded at the corners, out of thick steel plate—all in a single continuous operation! The finished cut is smooth and clean, and more important, the openings are cut in *1/120th* the time required by the former method. Today this machine—the Airco Polygraph—has become standard equipment in shipyards and many other war production plants throughout the country.

This development is typical of the achievements resulting from the teamwork of Airco engineers and its customers—each contributing their specialized knowledge towards one common objective.

Every Airco customer, besides being assured of oxygen guaranteed 99.5% pure, also has at his disposal the services of Airco's applied engineering personnel and of a research staff with specialized experience in the application of oxyacetylene and electric arc processes. If you have any problems involving the use of these processes, communicate with your nearest Airco office.

Air Reduction

General Offices: 60 EAST 42nd ST., NEW YORK, N. Y.

IN TEXAS

MAGNOLIA-AIRCO GAS PRODUCTS CO.

General Offices: HOUSTON, TEXAS

OFFICES IN ALL PRINCIPAL CITIES

AIRCO

WILSON

IDLE CYLINDERS ARE PRODUCTION SLACKERS: *Keep 'em rolling for victory!*

HAGAN

NINE SIZES *with heating capacities ranging from 600 to 20,000 pounds per hour.*

ROTARY

OIL OR GAS FUEL,—*single or double motor operated doors. Manual or automatic control of hearth movement.*

FORGING

HEAT, CARBON, ALLOY AND STAINLESS STEEL BILLETS *from one to nine inches square,—or from a few pounds to 500 pounds each.*

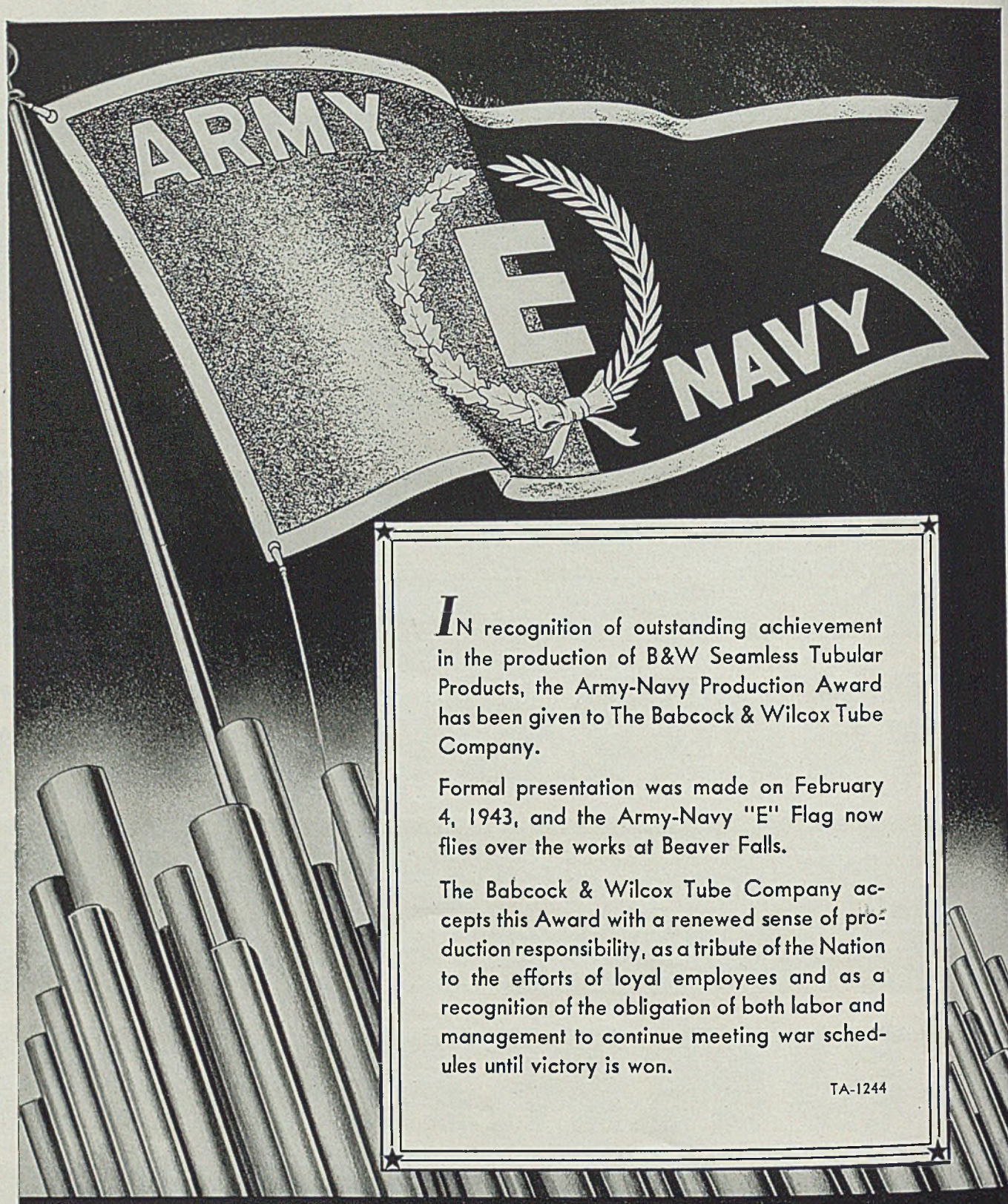
FURNACES

OVER 160 DIFFERENT UNITS—*all sizes—now serve many of America's leading forge plants with a dependable, continuous flow of uniformly heated* **BILLETS** *vitally needed in our war program.*

GEORGE J. HAGAN CO.

PITTSBURGH, PA.

DETROIT · CHICAGO · LOS ANGELES · SAN FRANCISCO



IN recognition of outstanding achievement in the production of B&W Seamless Tubular Products, the Army-Navy Production Award has been given to The Babcock & Wilcox Tube Company.

Formal presentation was made on February 4, 1943, and the Army-Navy "E" Flag now flies over the works at Beaver Falls.

The Babcock & Wilcox Tube Company accepts this Award with a renewed sense of production responsibility, as a tribute of the Nation to the efforts of loyal employees and as a recognition of the obligation of both labor and management to continue meeting war schedules until victory is won.

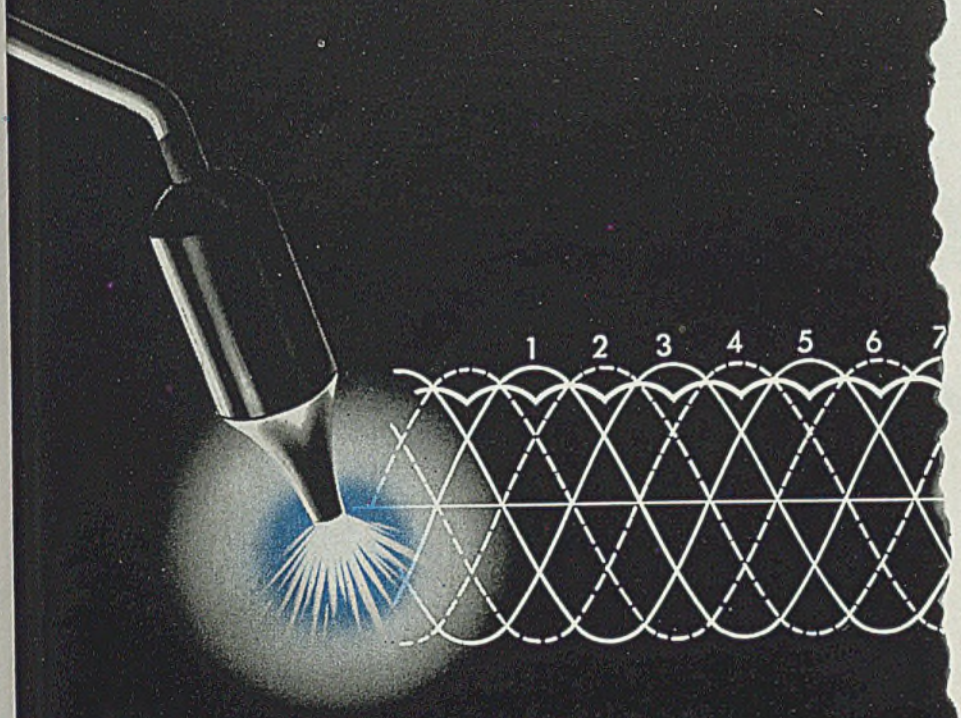
TA-1244

BABCOCK & WILCOX TUBES

BOILER TUBES • CONDENSER TUBES • HEAT EXCHANGER TUBES
MECHANICAL TUBES • PIPE • STEEL TUBES
SEAMLESS STEEL TUBES AND PIPE
HOT FINISHED • COLD DRAWN • CARBON STEELS • ALLOY STEELS

THE BABCOCK & WILCOX TUBE CO., BEAVER FALLS, PA.

more than 2,000,000 kw serving war industries



ignitron power conversion proved in war production

Early in the peaceful 1930's Westinghouse introduced the Ignitron Rectifier—the new power conversion unit with no moving parts. Today, more than 2,000,000 kw installed in the electrochemical, steel, mining, transportation and other industries is serving to speed war production. No other method of power conversion has ever enjoyed an expansion as rapid as this electronic equipment. And there are good reasons why.

The Ignitron delivers high efficiency over the entire load range—high short-time overloads, constant 24-hour loads, or light loads.

Its operating costs are low. Operation is simple and automatic. There's no high starting demand.

Maintenance, too, is at a minimum. There are no major moving parts that require periodic replacement.

Costs are further reduced through ease of installation. No special foundations are required. Lightweight construction and vibrationless operation permit installation on any concrete floor of reasonable strength.

If you need d-c power conversion, investigate these and other advantages of the Ignitron Rectifier. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

in the steel industry

The inherent advantages of the Ignitron Rectifier make it ideally suited for steel mill service. With its high short-time overload capacity, circuit breakers can be set to trip out less frequently without fear of damage to equipment. Also, since there are no major moving parts to be affected by dirt and grit, the Ignitron requires less maintenance. Operation can be made completely automatic to provide unattended service.

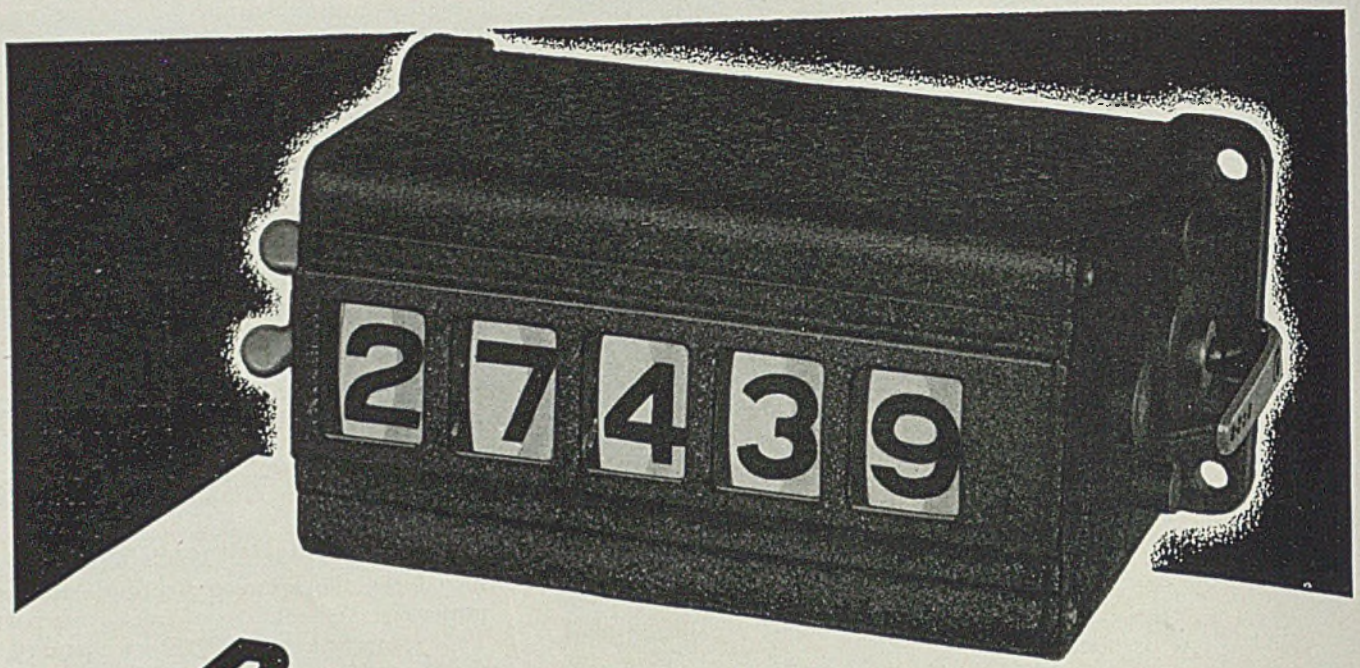
For further information about the Ignitron Rectifier, write Dept. 7-N for your copy of Book B-3024.

J-10242-1

Westinghouse IGNITRON RECTIFIERS

Electronics at Work

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE



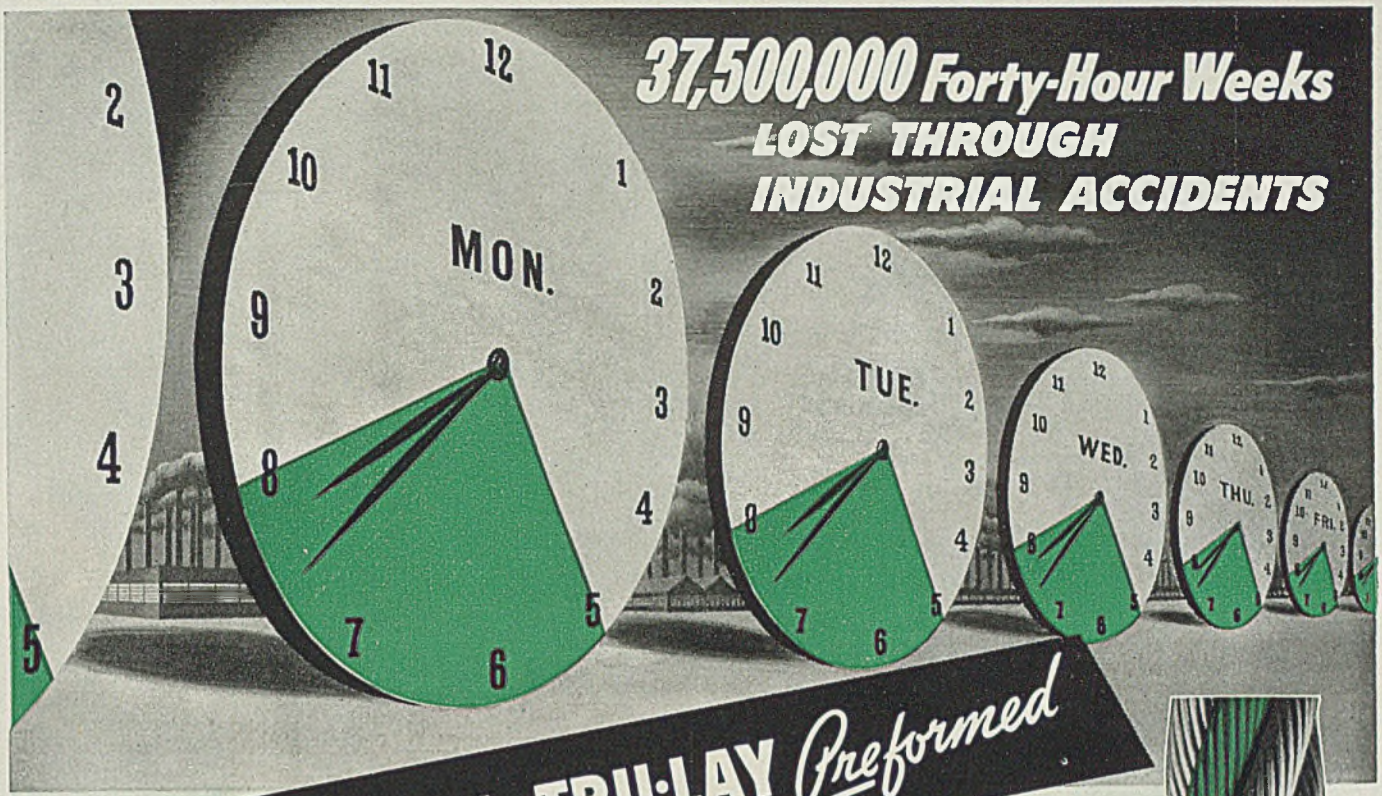
Read the WAR NEWS before it happens

Tomorrow's battle headlines are being written in today's production records. And wherever Veeder-Root Counting Devices are installed, these records are being published continuously, in bold black-and-white figures. So any bad news can be corrected long before it gets into serious trouble . . . trouble that so often develops where there is no constant, accurate Control-by-Count.

For all types of war-production machines, you can get Veeder-Root Counting Devices . . . mechanically or electrically operated . . . to count in any terms or units of performance required. And any of these counters can be installed quickly and easily, without disrupting production. If your work counts in war production today, then help to make the war news good tomorrow. *Count on Veeder-Root.*

Keep War-Production Machines in Step... equip them with VEEDER-ROOT COUNTERS

VEEDER-ROOT INC., HARTFORD, CONNECTICUT, U. S. A.



American Cable TRU-LAY *Preformed*

...is a SAFER ROPE TO HANDLE

Believe it or not, industrial accidents cost the United States (last year) 37,500,000 forty-hour *weeks* of productive time. The interest of our national welfare demands that nothing be left undone to reduce this terrific toll. Look: that amount of productive time is enough to build 8 more battleships, plus 40 more destroyers, plus 3600 more bombers, plus 16,000 more tanks. It is your patriotic duty to do everything possible to protect yourself and others from accidents—that we may produce more weapons of victory.

One way many operators have reduced time-out accidents is through the adoption of American Cable TRU-LAY PREFORMED WIRE ROPE. American Cable TRU-LAY is a *safer* rope to handle because it is preformed. Being preformed, TRU-LAY is flexible, tractable, willing to do what is required of it without crankiness. It resists kinking and snarling and possesses remarkable fatigue-resistance. More than this, broken crown wires in TRU-LAY PREFORMED do not wicker out to jab and tear workmen's hands. That is one of the big reasons why TRU-LAY PREFORMED is a safer rope. For your next line, specify American Cable TRU-LAY PREFORMED. All American Cable ropes identified by the Emerald Strand are made of Improved Plow Steel.

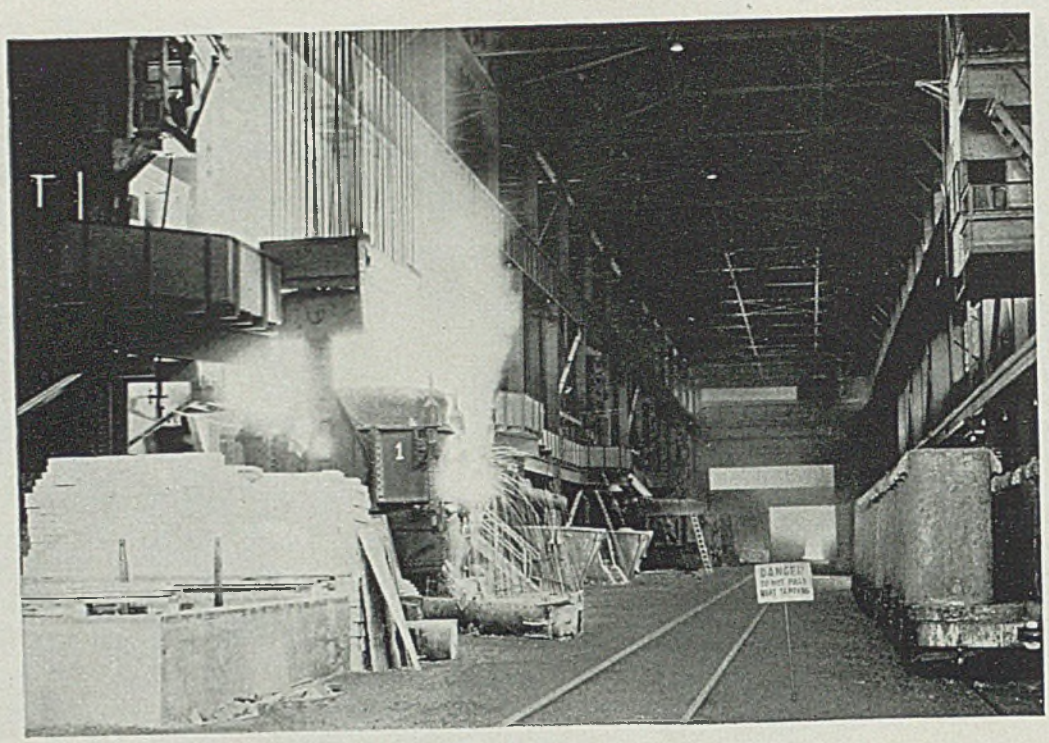
AMERICAN CABLE DIVISION

Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Tacoma

AMERICAN CHAIN & CABLE COMPANY, Inc.

BRIDGEPORT, CONNECTICUT

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, Yacht Rigging, MANLEY Auto Service Equipment, OWEN Springs, PAGE Fence, Shaped Wire, Welding Wire, READING-PRATT & CADY Valves, READING Electric Steel Castings, WRIGHT Hoists, Cranes, Presses . . . *In Business for Your Safety*



to speed victory

skilled men . . .

modern equipment

make possible Weirton's

"DOUBLE CONTROL" of quality

At each step in the steel-making process—from iron ore to the last detail of shipping—the combination of control by men and by machines gives "double control" to the quality of Weirton steel . . . steel so vitally needed to build tanks, trucks, ships, shells, guns and all the other tools required by our Armed Forces.

To make possible the "double control" of quality here at Weirton, men of experience—only those especially trained in the art and science of steel-making—are employed. Then, these skilled craftsmen make machines of the very latest designs do their bidding. That's what is meant by Weirton's "double control" of quality.

At Weirton, men and women are bending every effort to see that the Army, the Navy, the Maritime Commission and our regular customers working on War Production get the steel needed to produce Victory equipment.

WEIRTON STEEL COMPANY

Weirton, West Virginia

Sales Offices in Principal Cities

Division of

NATIONAL STEEL CORPORATION

Executive Offices · Pittsburgh, Pa.

What big ears you have!

Long before the first faint hum of a plane can be heard, these giant ears have detected it and the anti-aircraft guns swing into menacing position.

Inch by inch, foot by foot, they turn, following every movement of the approaching craft; and as they turn, the synchronized guns turn, too. Woe to an enemy who chances within their range!

The delicate mechanism that points these guns owes its accuracy in no small measure to the reducers that control the micromatic movement through the arc and bring the guns to bear exactly on their objective.

And Foote Bros. speed reducers are on this job at listening posts with the Army and the Navy throughout our possessions and on our far-flung fronts doing their part in protecting our forces against air-borne aggression.

The lessons learned in the school of war are already assuring our Armed Forces of better speed reducers—sturdier and more compact speed reducers. These same lessons applied to post-war manufacturing promise a new conception of the transmission of power to American manufacturers after the war.

FOOTE BROS. GEAR AND MACHINE CORPORATION
5301 S. Western Boulevard
CHICAGO

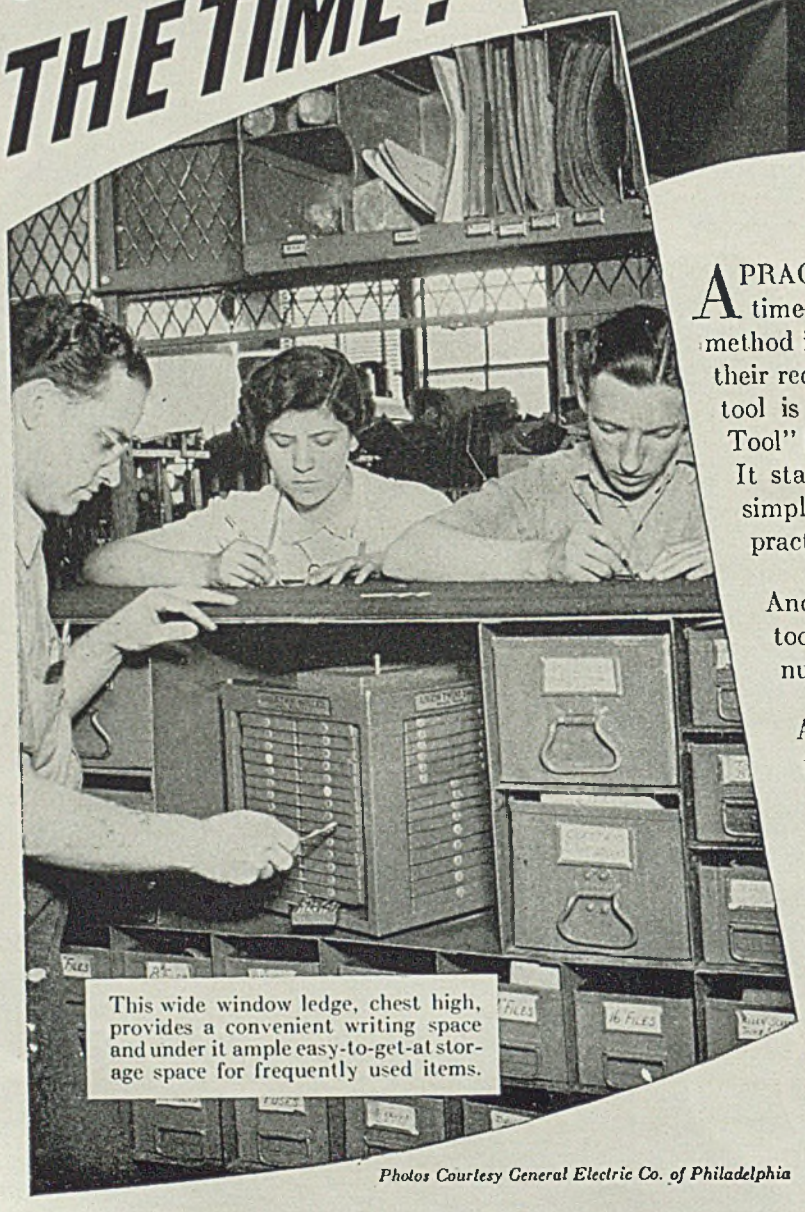
FOOTE BROS

Better Power Transmission Through Better Gears

Tool Conservation begins in the Tool Crib

Know Where ALL YOUR TOOLS are ALL THE TIME!

No time is lost accounting for this reamer. The attendant hands it over to the operator in exchange for a requisition.



This wide window ledge, chest high, provides a convenient writing space and under it ample easy-to-get-at storage space for frequently used items.

Photos Courtesy General Electric Co. of Philadelphia

A PRACTICAL tool accounting system saves tools, time and money. One simple but highly effective method is illustrated here. Machine operators make out their requisitions on wide ledges or counters. When the tool is issued the requisition is hung on the "Out-Tool" board under the operator's own special number. It stays there until the tool is returned. This is a simple system, but highly efficient and speedy in practice.

Another proven practical plan is to exchange the tool for a metal tool check with the operator's number on it.

After all, the exact system used is less important than knowing where tools are and being able to issue them quickly. Wasting time at the tool crib window means lost time at the machine. These days America can not afford wasted time!

GREENFIELD TAP AND DIE CORPORATION

GREENFIELD, MASSACHUSETTS

DETROIT PLANT: 5850 Second Boulevard

WAREHOUSES in New York, Chicago and Los Angeles

In Canada: GREENFIELD TAP AND DIE CORP. OF CANADA, LTD., GALT, ONT.

ARMY E NAVY

GTD GREENFIELD

TAPS · DIES · GAGES · TWIST DRILLS · SCREW PLATES

BORON ALLOYS

for greater hardenability in low-alloy and engineering steels

"SILVAZ" ALLOY 3	"SILCAZ" ALLOY 3	"ELECTROMET" FERROBORON
BORON 0.5%	BORON 0.5%	BORON . . 15-20%
SILICON 35-40%	SILICON 35-40%	SILICON . . 1.50% max.
ALUMINUM 6%	ALUMINUM 7%	ALUMINUM 1.00% max.
TITANIUM 10.0%	TITANIUM 10.0%	CARBON . . 0.50% max.
ZIRCONIUM 6%	ZIRCONIUM 4%	
VANADIUM 10%	CALCIUM 10%	

SMALL AMOUNTS of Boron (0.001% to 0.003%) added to low-alloy and engineering steels produce an increase in hardenability comparable to that produced by much larger additions of the other common alloying elements. Like them, it lowers the rate of cooling necessary to harden a steel and widens the zone that cools rapidly enough to harden.

The procedure for making alloy steel must be followed to insure good results from the use of Boron. Boron is readily oxidized and must be added only to a completely deoxidized steel bath, or the Boron must be protected by strong deoxidizers until it is dissolved. Because of the extremely small amounts added (less than an ounce per ton), a diluted form is highly desirable to insure uniform results.

When Boron is added as "Silvaz" Alloy 3 or "Silcaz" Alloy 3, the other elements protect the Boron from oxidation and also have their own effect on the steel. The Boron is sufficiently dilute to insure even distribution.

These Boron-bearing alloys are available in commercial quantities for immediate shipment; however, "Silvaz" Alloy 3 is restricted to use in war production.

ELECTRO METALLURGICAL COMPANY
Unit of Union Carbide and Carbon Corporation
30 East 42nd Street New York, N. Y.

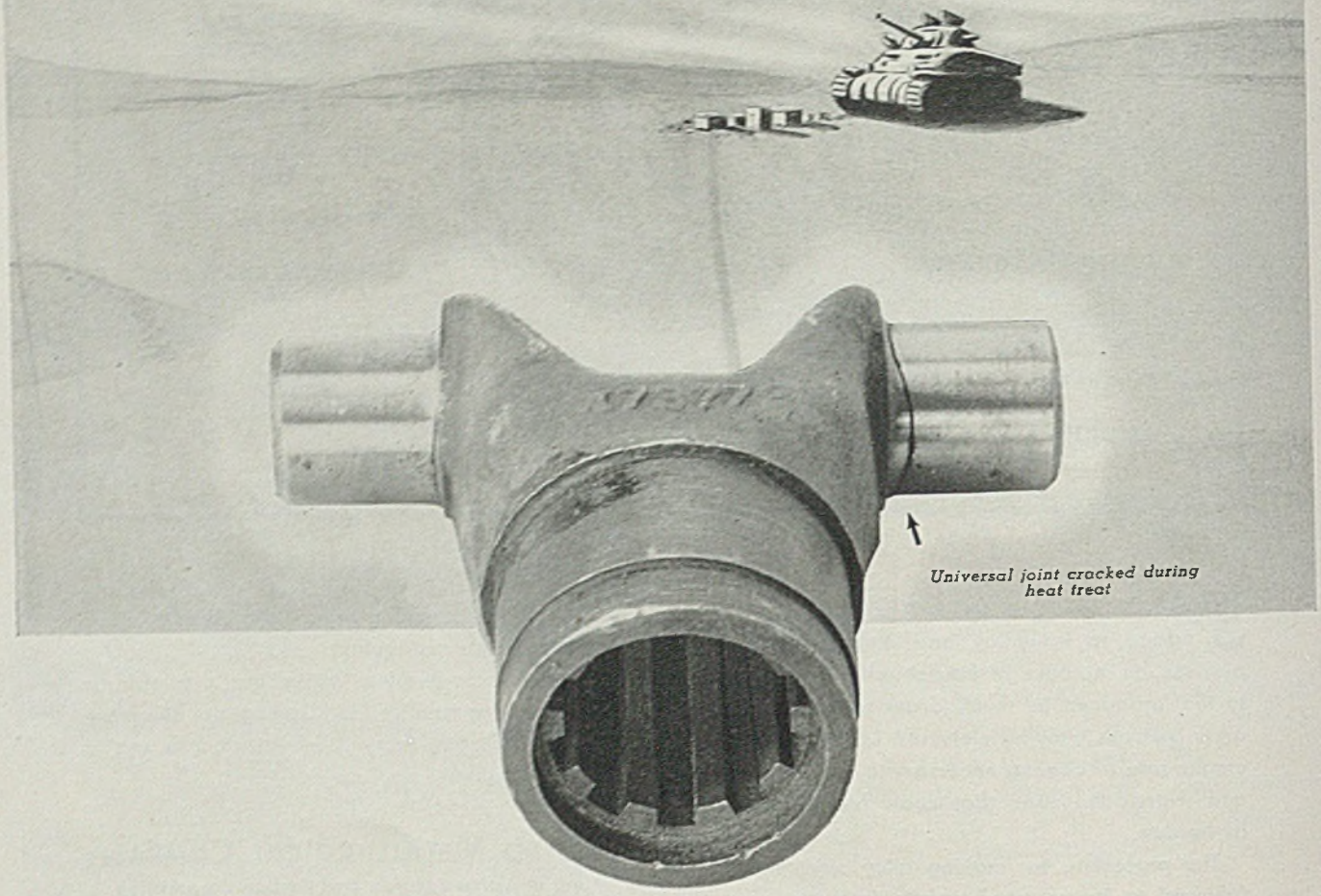
Electromet
Trade-Mark
Ferro-Alloys & Metals

Distributed through offices of Electro Metallurgical Sales Corporation in Birmingham, Chicago, Cleveland, Detroit, New York, Pittsburgh, and San Francisco. In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario.

"Electromet," "Silcaz," and "Silvaz" are trade-marks of Electro Metallurgical Company.

NEWS BULLETIN FROM MAGNAFLUX CORPORATION—

Sub-Contractor Inspections Prevent Battlefront Breakdowns



Universal joint cracked during heat treat

Magnaflux Service

As originators and pioneers of the Magnaflux Methods, Magnaflux Corporation and its engineering staff have accumulated an unequalled fund of specialized knowledge and experience on this subject. This is placed at the disposal of industry in the service which is extended to Magnaflux users. Included are: training for operators, all necessary text books, regular contacts by field engineers, laboratory services, etc.

MAGNAFLUX CORPORATION

● As the war stimulated sub-contracting, *parts inspection* became more important than ever—even more a matter of life and death when parts were likely to fail under battle conditions.

The Magnaflux Corporation, as pioneer in non-destructive testing methods for every metal part on the production line, witnessed two developments among manufacturers:

(1) Prime Contractors not already benefiting from Magnaflux Service turned to the Magnaflux Corporation for fast practical inspection methods *as a check on sub-contracted parts;*

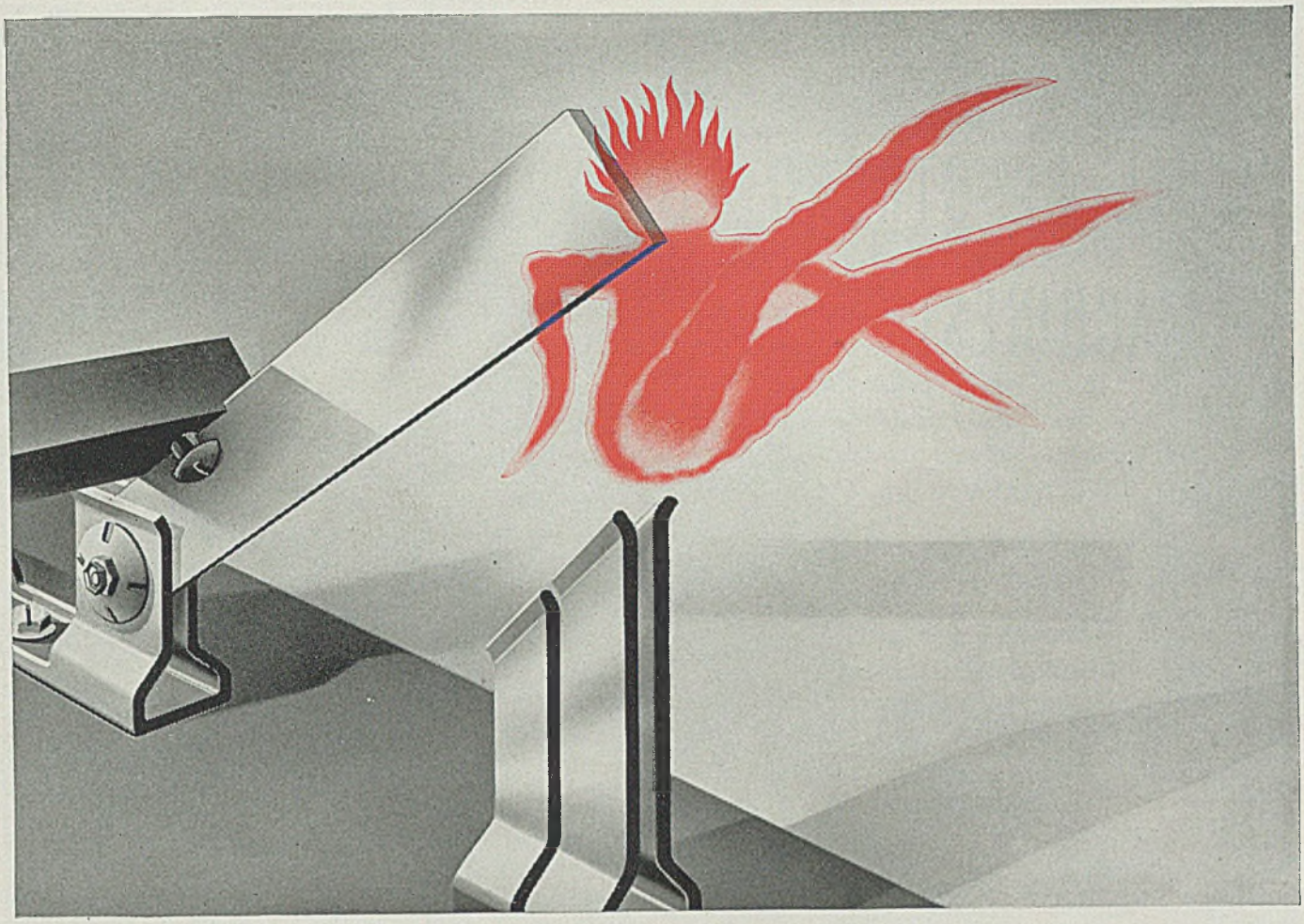
(2) Sub-contractors for companies without Magnaflux Service did the same with their own parts *to prevent later claims by the Prime Contractor.*

In many cases the question was taken out of their hands by Government specification of Magnaflux Methods.

This all points to one conclusion: Industry will settle on *inspection of all parts* prior to shipment or assembly as standard practice. Let the Magnaflux Corporation make quick positive inspection a routine step in your production. Time and money saved easily offset the expense. The right method can be recommended for you by a Magnaflux engineer. Write us for Bulletin B-415.

MAGNAFLUX CORPORATION

5912 Northwest Highway, Chicago, Illinois



hot arcs get the point Quick!

Arcs burn with terrific heat when they leap between opening contacts. The heavier the load . . . the hotter they burn. Switch contacts get badly pitted and burnt, unless the arc is both controlled and extinguished, *quick*.

Westinghouse Safety Switches eliminate this source of trouble. The diamond-pointed jaw carries the arc outside the contact area assuring long contact life.

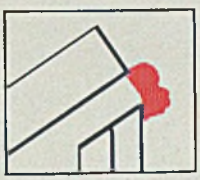
On Safety Switches, 575 and 600 volts, Westinghouse adds another protective plus—the "De-ion" arc quencher. This exclusive feature draws the arc up into the grids—divides and extinguishes it in the blink of an eye.

These advantages mean better, more dependable protection. Contacts stay clean, last longer. Time-outs for maintenance and inspection reduced.

Protect your important circuits with Westinghouse Safety Switches. Ratings up to 1200 amps, 600 volts. Call your Westinghouse representative today. Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa., Dept. 7-N.

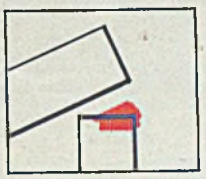
J-21166

LIKE THIS



Diamond-pointed break jaws confine arcing to the point . . . force the arc to break outside the current carrying areas. Contact surfaces stay clean, don't pit and burn.

NOT LIKE THIS



When ordinary safety switches are opened, the arc leaps across the contact areas . . . along the jaw and blade. It hangs on longer, burns and pits the contact surfaces.

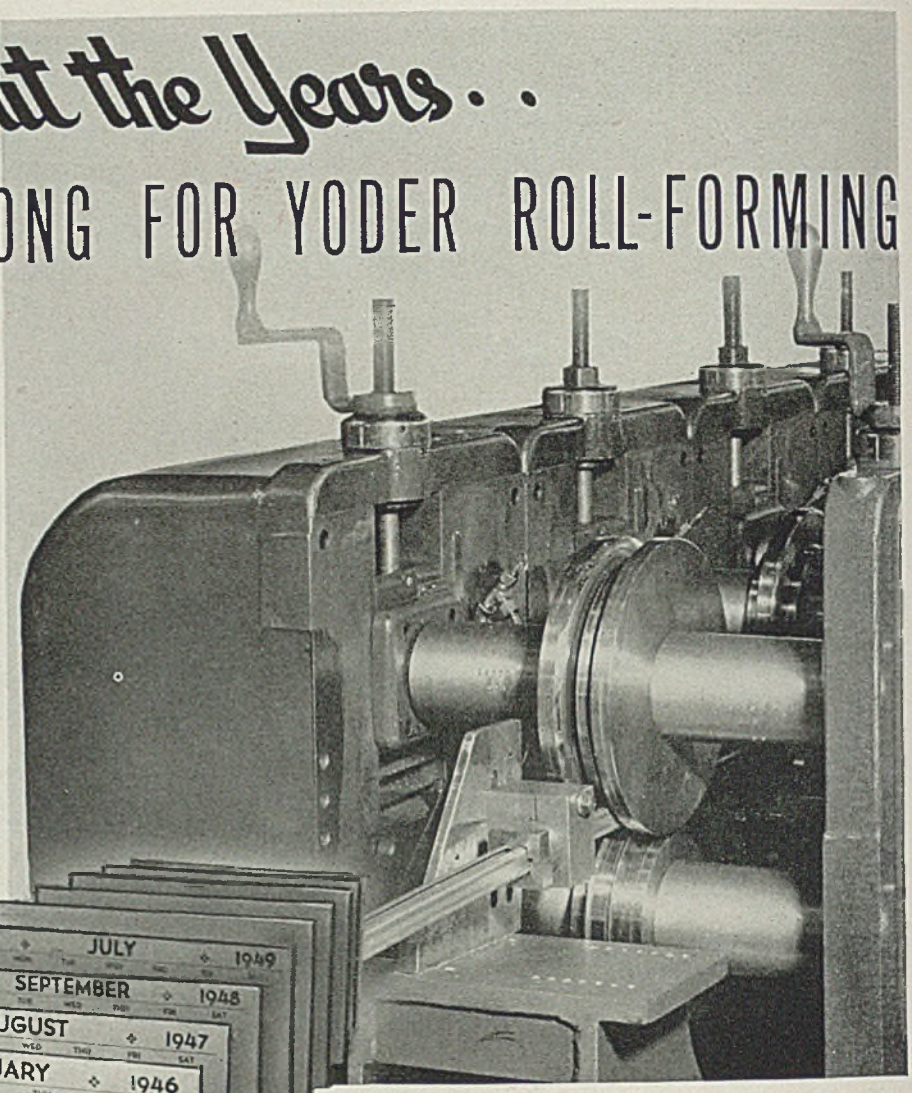
Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

SAFETY SWITCHES

Throughout the Years . .

YOU'LL BE STRONG FOR YODER ROLL-FORMING MACHINES!



BECAUSE of the speed with which it rolls out tough metals into intricate shapes.

BECAUSE of the ease with which rolls can be quickly changed. The Micrometer Adjustment, a patented Yoder feature, is of primary importance in the smooth functioning of this operation

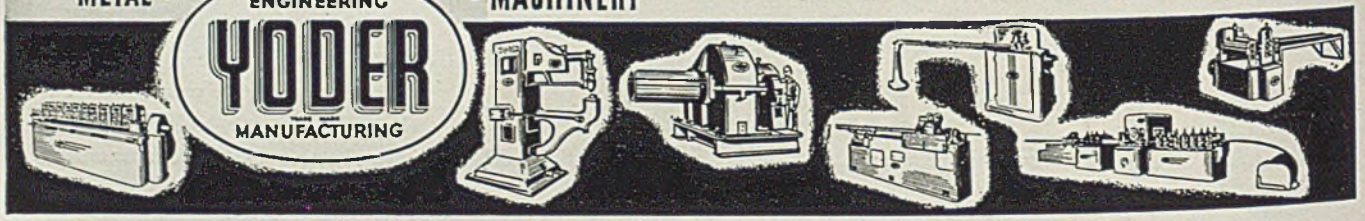
BECAUSE of its simplicity of operation, which fits into the war program with its scarcity of skilled help. This feature will also help in peacetime in meeting "low cost" competition.

BECAUSE Yoder Roll-forming Machines *keep going strong*, since they are well-built from the best of materials by the organization that has pioneered, for over thirty years, in this "roller-die" field. Write for our representative or a bulletin.

THE YODER COMPANY • CLEVELAND, OHIO, U.S.A.

METAL • FORMING • PRODUCTION • MACHINERY

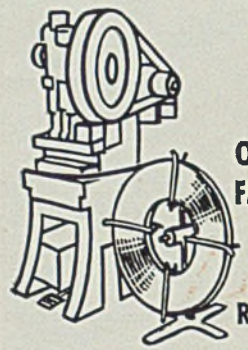
ENGINEERING **YODER** MANUFACTURING




FIGHT RUST
AND CORROSION
with L-M Copper Tubing. It is immune to rust and highly resistant to corrosion. Many of our fighting machines—army trucks, tanks, warships, cargo vessels, airplanes—are equipped with
LEWIN-MATHES
SEAMLESS TUBING
L-M Rotating Shell Bands of
Pure Copper or Gilding Metal
LEWIN
MATHES
LEWIN-MATHES COMPANY • • SAINT LOUIS, MISSOURI

HOW TO Come Out of a Production Huddle

WITH THE RIGHT ANSWER FOR METAL



ONE MINUTE FACTS ABOUT *CMP* Precision Cold Rolled Strip Steel

MORE FEET PER POUND—Rolling to exceptionally close tolerances whether specified or not assures maximum feet per pound and thus more finished parts per ton—a CMP extra.

CONTROLLED UNIFORMITY—CMP assures consistent accuracy and uniformity by precise control methods—provides duplication of all desired properties in coil after coil.

LONG COILS—Normally CMP can supply strip in coils up to 300 lbs. per inch of width—a real help for high speed production where automatic machines are utilized.

THE COLD METAL PRODUCTS COMPANY

SUBSIDIARY OF THE COLD METAL PROCESS CO.

YOUNGSTOWN, OHIO

WARTIME OR PEACETIME CMP Speeds Your Production and Lowers Finished Product Cost

Manufacturers who are helping to win the war are also helping to shape the vital post-war markets. Out of the many victorious battles of production have come new ideas, new methods and new products—real aids to quicken our victory and essential to our peacetime economy.

Typical examples of this great ingenuity are the results of many "production huddles" where decisions specified CMP Precision Strip even for non-ferrous metal replacement. Every requirement for precision, production economy and desired service characteristics was successfully fulfilled. More proof of the wide adaptability of CMP Precision Cold Rolled Strip Steel—not just steel but a material of versatility.

Your investigation for after-victory applications of CMP Precision Strip will reveal all the facts and perhaps give you a head start for those markets of tomorrow.

CMP STRIP STEEL

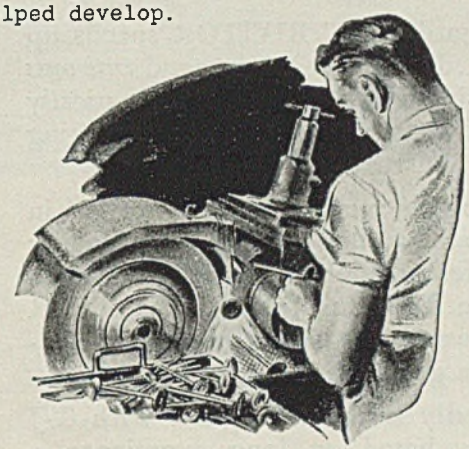
PRECISION COLD ROLLED

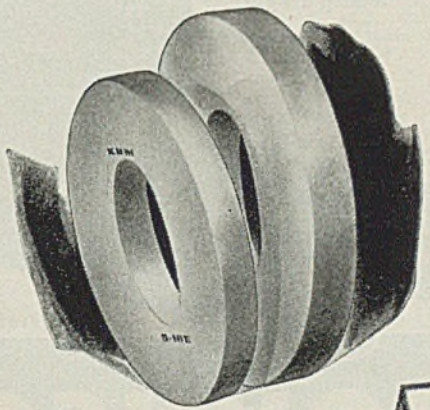
GIVES MAXIMUM PRODUCTION PER TON

What's the hottest spot in a Dog Fight ?

A pilot may keep cool in a "dog fight"—but not his engine! And to function smoothly at high engine temperatures all moving parts must be ground and finished with split hair precision. And that's where Carborundum comes in. For instance, the valve stems are ground to the required accuracy by a centerless grinding process which Carborundum helped develop.

The centerless grinder grinds the valve stems to an accuracy of five ten-thousandths of an inch. Does it, too, in half the time other finishing methods would require. Carborundum has led in the development of centerless grinding wheels to speed the output of valves, pistons, shafts and other such parts that go into a plane.





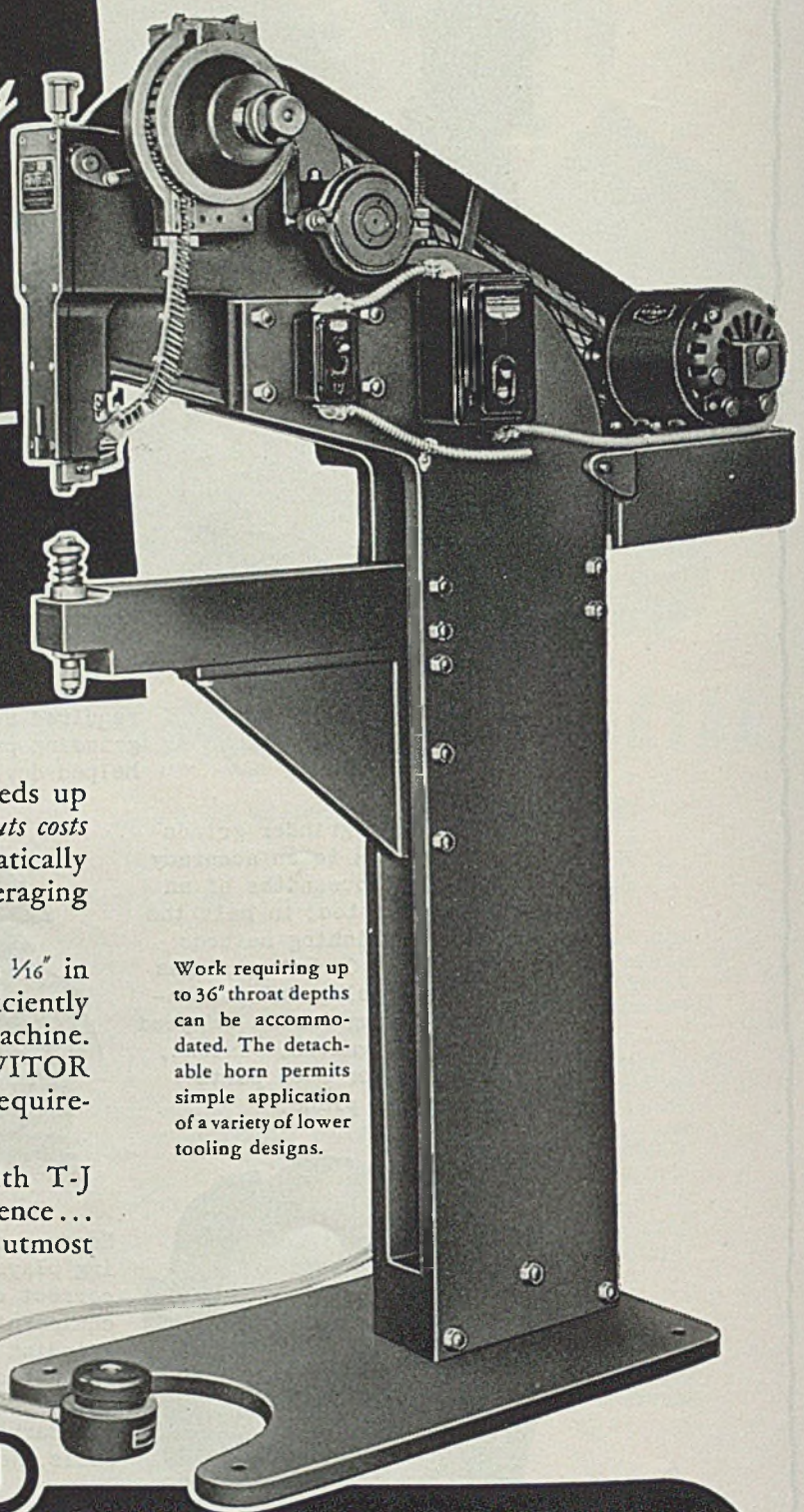
Because of the vital part grinding plays in war production, correct care and use of grinding equipment is a wartime must. Every grinding wheel is a "Weapon for Production" and should be properly used for maximum effectiveness. The Carborundum Company, Niagara Falls, New York.

CARBORUNDUM
REG. U.S. PAT. OFF.
ABRASIVE PRODUCTS

Carborundum is a registered trade-mark of and indicates manufacture by The Carborundum Company.

1600 PER HOUR

Automatically
FEEDS AND SETS
1/4" DIAMETER
SOLID STEEL
RIVETS



THIS versatile "RS" RIVITOR speeds up riveting...does a better job...and *cuts costs* for many industries today! It automatically feeds and sets rivets at rates averaging 1600 per hour!

Solid rivets ranging from ¼" to 1/16" in diameter are handled rapidly and efficiently (with different tooling) by this machine. Thus, the Tomkins-Johnson RIVITOR offers greater capacity...meets requirements of a greater number of jobs.

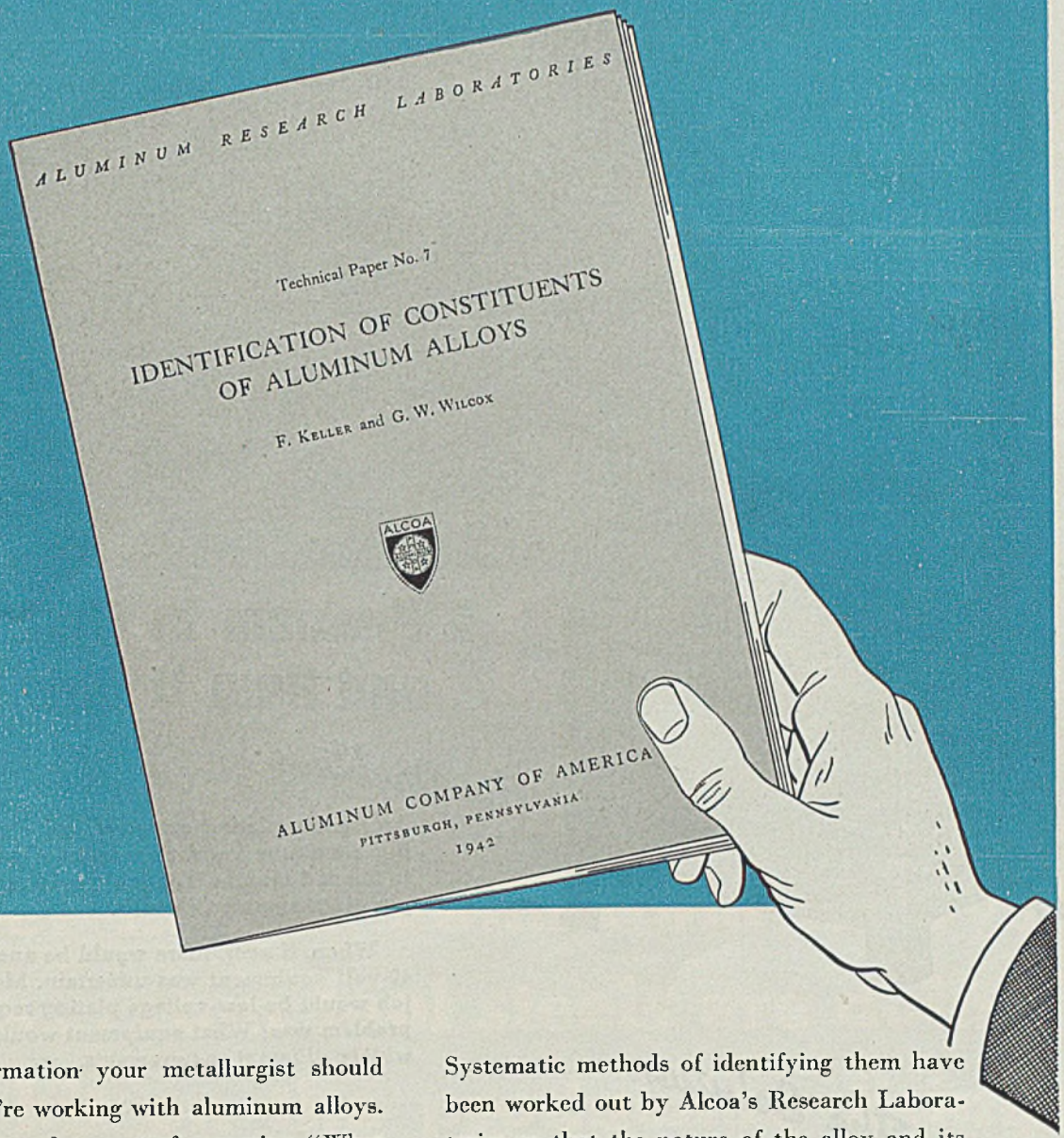
Ruggedly built...designed with T-J know-how based on long experience... this RIVITOR meets demands for utmost dependability and long life. Write today for bulletin R-4. The Tomkins-Johnson Co., Jackson, Michigan.

Work requiring up to 36" throat depths can be accommodated. The detachable horn permits simple application of a variety of lower tooling designs.

FOR TOUGH JOBS...SPECIFY T-J

TOMKINS-JOHNSON
RIVITORS

To help your metallurgist tell "What's in it?"



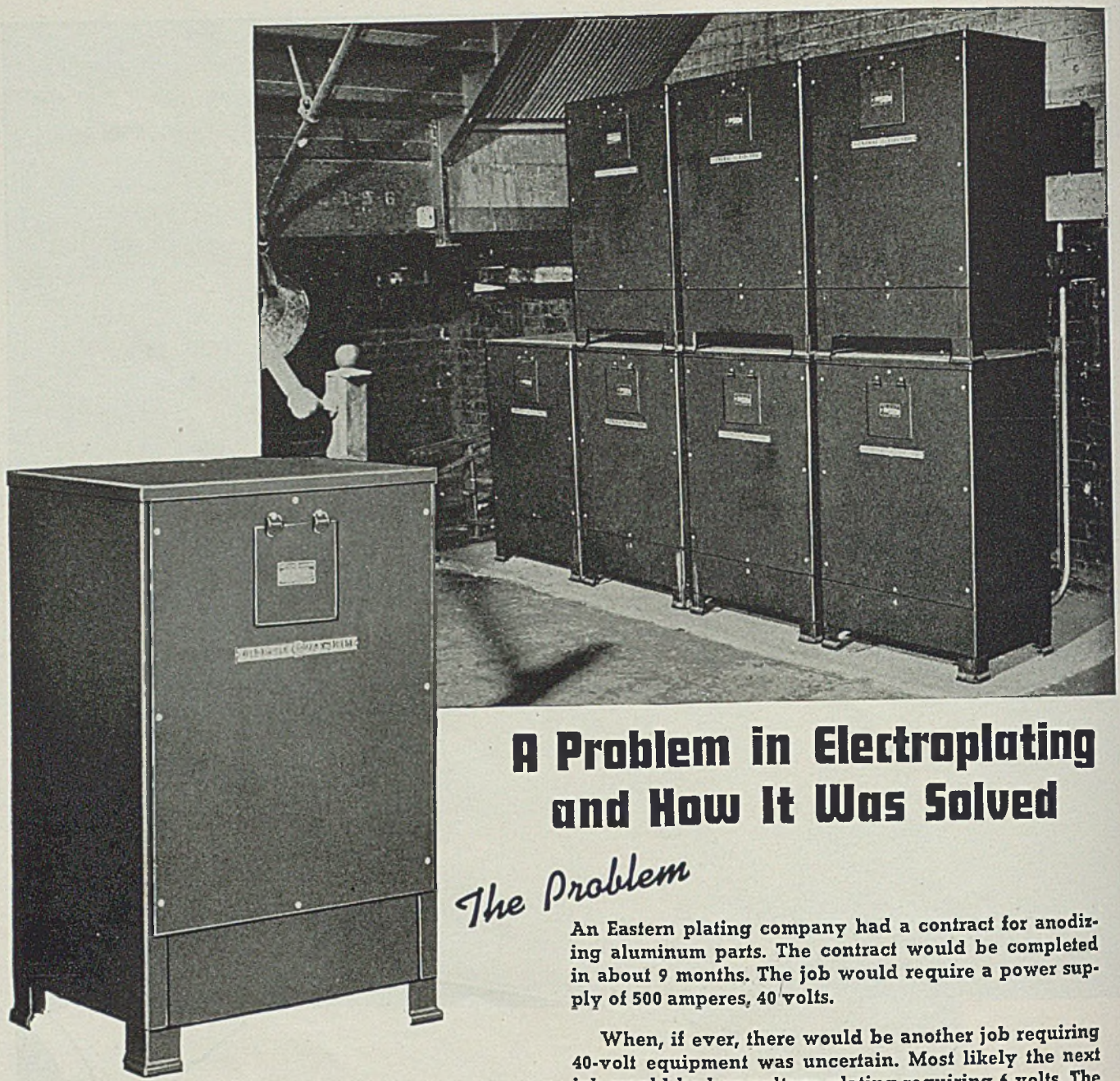
Here's information your metallurgist should have, if you're working with aluminum alloys. It provides a ready means of answering, "What type of aluminum alloy is it?"

Technical Paper No. 7 presents metallographic methods for examining aluminum alloys. How to prepare a specimen is told in detail; cutting the sample, mounting, polishing and etching.

Metals alloyed with aluminum form a variety of constituents of microscopic size. Systematic methods of identifying them have been worked out by Alcoa's Research Laboratories so that the nature of the alloy and its metallurgical treatment are revealed by the microscope. Chemical etching treatments color the constituents and reveal their form so that they can be identified by the systematic pictorial guide provided in this technical paper.

Your metallurgist may want a copy of Technical Paper No. 7. Write ALUMINUM COMPANY OF AMERICA, 2112 Gulf Bldg., Pittsburgh, Pa.

ALCOA ALUMINUM



A Problem in Electroplating and How It Was Solved

The Problem

An Eastern plating company had a contract for anodizing aluminum parts. The contract would be completed in about 9 months. The job would require a power supply of 500 amperes, 40 volts.

When, if ever, there would be another job requiring 40-volt equipment was uncertain. Most likely the next job would be low-voltage plating requiring 6 volts. The problem was: What equipment would serve both these widely different requirements.

The Solution

Here's how the needed flexibility was obtained: Seven standard 500 ampere, 6-volt G-E Copper Oxide Rectifiers were purchased. By a series connection and regulator control, this equipment was adapted to operate over a range from 1 to 40 volts at 500 amperes. When the contract was completed, the same equipment was relocated at two different points in such a way that 4 units were used for a plating job requiring 12 volts, 1000 amperes, while the other 3 units were set up on a job requiring 6 volts, 1500 amperes.

This illustrates only one of the many electroplating power supply problems that can be solved through flexible G-E Copper Oxide Rectifiers. Whatever your problem, General Electric Metallic Rectifier Engineers will be glad to consult with you. For additional information, write to Section A333-90 Appliance and Merchandise Dept., General Electric Co., Bridgeport, Conn.

GENERAL ELECTRIC

"Keep 'Em Cutting"

This is the Victory slogan of every worker in the Vanadium-Alloys Plants . . . our tool steels are doing their bit on the production firing lines of America . . . cutting, forming and stamping weapons of Victory for the United Nations.

Vanadium-Alloys
STEEL CO., LATROBE, PA.

OWI PHOTO

TIME IS VITAL TODAY!

One sure way to save time in the making of your product is to use

Washburn Wire

CARE in basic material
CARE in manufacture
CARE in inspection

mean saving of many hours by saving "seconds"

And no "second" can go to War

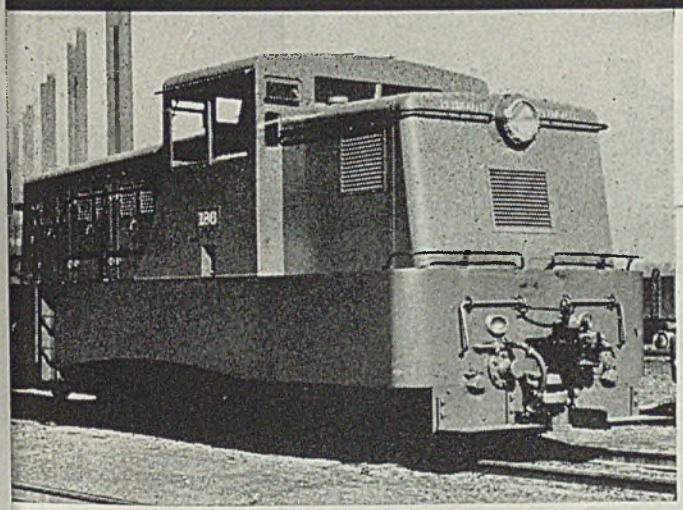
WASHBURN WIRE COMPANY, NEW YORK CITY

CLEAN, UNIFORM BILLETS – STRIP – RECTANGULAR, ROUND, FLAT RODS
TEMPERED AND UNTEMPERED FLAT AND ROUND HIGH CARBON WIRES

This canopy part is quickly formed with simple dies.

PLYMOUTH LOCOMOTIVE PARTS FORMED QUICKLY...

Forming an exhaust housing with curvature of 8-inch radius.



All light metal hood and cab parts for this 65 ton Plymouth Flexomotive were formed on the press above

A Steelweld Bending Press has proven very advantageous in the forming of various metal parts required for the hood and cab of Plymouth Industrial Locomotives built by The Plymouth Locomotive Works, division of The Fate-Root-Heath Company, Plymouth, O. Since installed in 1936 the press has performed all such work required for the hundreds of locomotives produced.

Sharp bends or sweeping curves are easily and quickly formed by the operator who previously had no experience in press work. It is a simple matter for him to change dies and set up for the different work. The metal formed is for the most part of 12 gauge steel.

Although the press is in operation every day, in the many years it has been in service, it has required only the replacing of one small rubber belt for the automatic lubricator. Beyond that not one cent has been spent for repairs. The operator lubricates all grease fittings with the pressure gun once a week and checks on clutch and brake adjustment three times a year. Original brake and clutch linings are still in use.

The plant executives are highly pleased with the machine and declare it to be one of their most useful tools.

THE CLEVELAND CRANE & ENGINEERING CO.
STEELWELD MACHINERY DIVISION
1125 EAST 283RD STREET • WICKLIFFE, OHIO.

MANUFACTURERS OF • CLEVELAND CRANES • CLEVELAND TRAMRAIL • STEELWELD BENDING PRESSES

GET THIS BOOK!

CATALOG No. 2002 gives complete construction and engineering details. Mail request for free copy on your company letterhead.

STEELWELD
BENDING PRESSES

GENERAL SALES AGENTS: CYRIL BATH & CO., E. 70TH & MACHINERY AVE., CLEVELAND

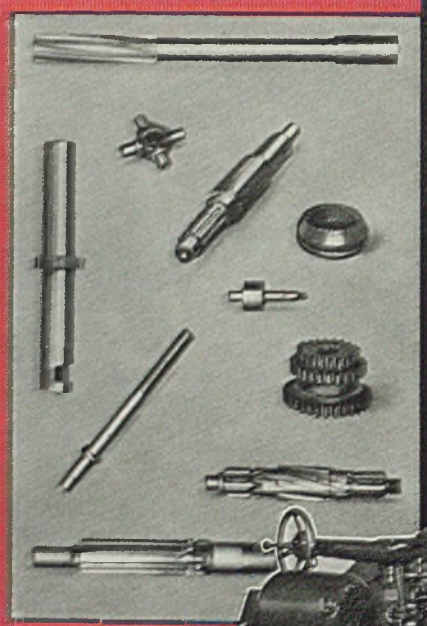
THE FITCHBURG METHOD OFFERS . . . SPECIAL MACHINES FROM STANDARD UNITS

Fitchburg automatic multiple precision grinding offers the same profit possibilities that up-to-date shops now earn with multiple tooling and combined cutting on machined work.

Special machines mounting Standard Bowgage Head Grinding Wheel units, like the one illustrated, enable the precision grinding of two or more dimensions at a single handling. Grinding is completed within the time required for the longest single operation. On mass production work these Fitchburg grinders rapidly repay their cost.

On hundreds of parts like those shown, for machine, automotive or ordinance work, Fitchburg engineers can help you to make sure your orders are filled on time, and at the lowest possible cost. It will not obligate you to mail in your blueprints for study. Catalog shows wide range of other successful applications. Write for a copy today on your business letterhead.

When installing special grinding equipment it is important to remember that the Fitchburg Bowgage Grinding Wheelhead is a self-contained standard unit. It can be remounted on standard machines, or on new special bases, for operations other than the one originally specified. This feature protects your investment.



FITCHBURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U.S.A.

Manufacturers of—Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Both Full Universal Grinders and Special Purpose Grinders.

Since fire protection is the business of Cardox, this organization frequently sees the disastrous results of fire . . . the apallingly needless waste, the breakdown of production schedules. These things follow often when adequate thought is not given to the planned elimination of fire hazards.

For this reason war industries are offered the experienced counsel of Cardox, as part of its obligation to see that fire does not unnecessarily delay—by one day or one hour—the continuous flow of war materials on which this Nation's Victory depends.

Approach FIRE Realistically

Fire was once thought of as a haphazard calamity that struck without warning or reason. It was put in the unpredictable class—the same as lightning. As you know, that approach to the problem of fire is outmoded. Even lightning itself can be planned for.

The way to prevent fire damage is to anticipate it. Thousands of small fires never become catastrophies, thanks to the dependable operation of today's adequate fire extinguishing systems—soundly planned and soundly *engineered.*

Reminder to Plant Men

So, to executives who may soon become too busy to give extensive consideration to their own fire hazards, this reminder is extended:

Fire *may* destroy equipment on which many other operations depend . . . may knock out one machine or department which *blocks production from an entire plant.* Who can measure the cost of such a failure? What price for planes, guns, shells or ships that got there too late?

As a contribution to the war effort Cardox offers this friendly suggestion to executive engineers: Keep your fire protection up to the new high speed of industry. Make your hazard surveys more thorough and more frequent. Keep posted on progress in protection developed by wartime fire problems.

Write, on your letterhead, for Bulletin 833.

How Cardox Systems Protect War Industries

- *Timed discharges, as needed, through built-in piping systems . . . supplied instantly from a single storage unit holding tons (if required) of liquid Cardox CO_2.*
- *Mass discharge of Cardox CO_2 "knocks out" fire, by . . .*
- *Reducing oxygen content of the atmosphere below the concentration necessary for combustion, and . . .*
- *Cooling combustibles and fire zone below ignition temperature . . .*
- *Extinguishing fire quickly and completely* without *damage from extinguishing medium.*

CARDOX—CO_2 Systems with Enhanced Fire Extinguishing Performance

A. *Uniformity of CO_2 characteristics.*
B. *Extinguishing medium with uniformly greater cooling effect.*
C. *Accurate projection of CO_2 through greater distances.*
D. *Timed discharges, as needed, through built-in piping systems . . . supplied quickly from a single tank holding tons of liquid Cardox CO_2.*

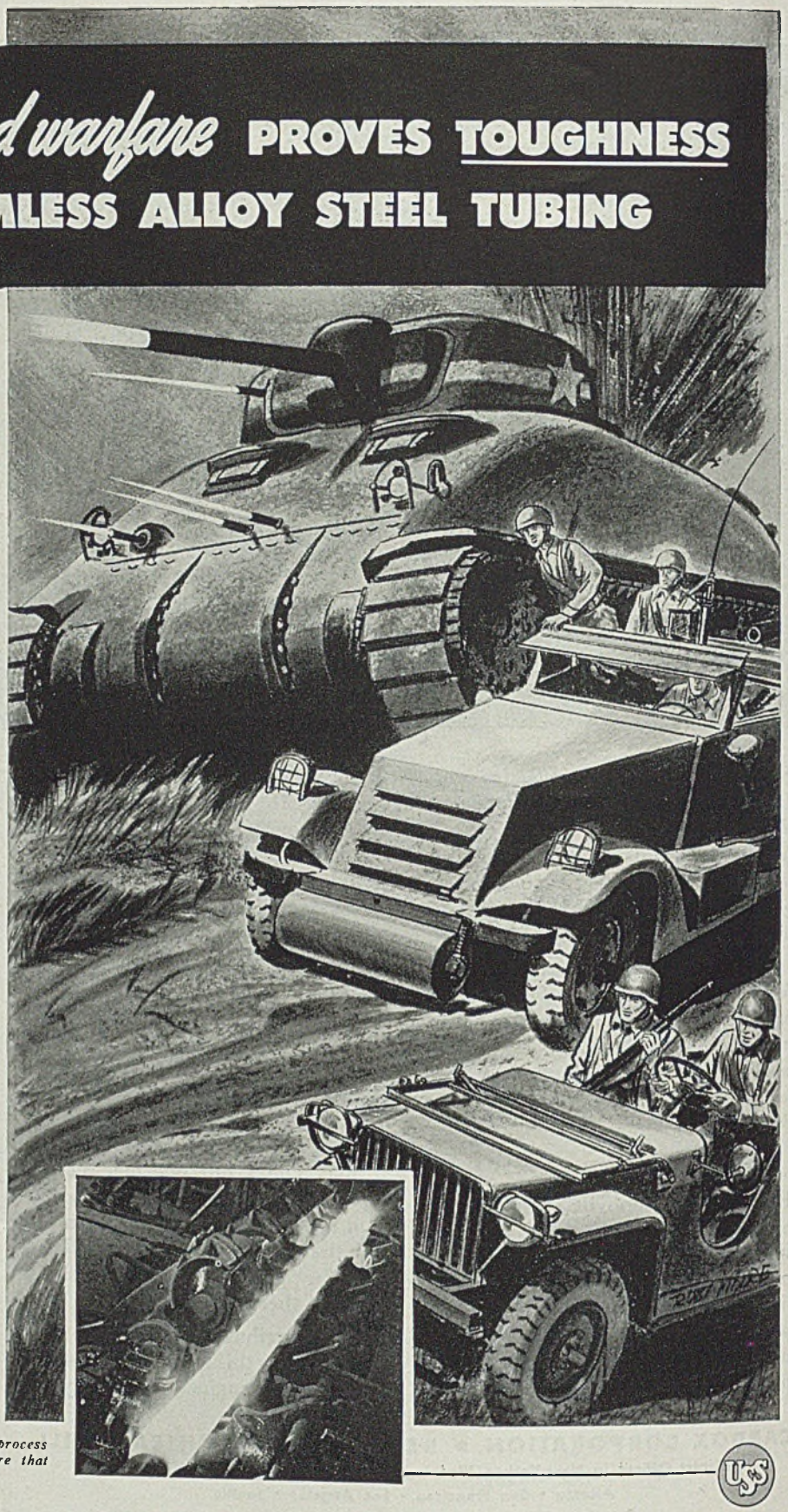
CARDOX CORPORATION • BELL BUILDING, CHICAGO, ILL.

District Offices in New York • Washington • Detroit • Pittsburgh • Cleveland
Atlanta • San Francisco • Los Angeles • Seattle

CARDOX

NON-DAMAGING FIRE EXTINGUISHING SYSTEMS

Mechanized warfare PROVES TOUGHNESS OF SEAMLESS ALLOY STEEL TUBING



TANKS, trucks, jeeps and other military equipment must take a pounding many times as severe as anything encountered in peaceful service. To give American equipment the ability to take punishment, designers used considerable amounts of seamless alloy steel tubing.

This type of construction gives maximum strength with less weight. It reduces breakdowns from shock, abrasion and fatigue. It prevents corrosion in vital parts. For many uses, seamless alloy steel tubes, pierced from solid billets of steel, are unsurpassed.

To the task of their manufacture, Tubular Alloy Steel Corporation brings the accumulation of fifty years of technical experience and resources in facts and figures which could only come from extensive laboratory investigations and tests of alloy tubes under every conceivable condition of service. Tubular Alloy Steel Corporation products rest on this foundation.

To speed the victory program is our single aim and purpose today. Our contribution is centered on the sole task of producing the finest seamless alloy steel tubing advanced research and the most up-to-the-minute refinements in processes and materials make possible.

Tubes are available in the current range of alloys in sizes from ¼ inch to 8⅝ inches in the customary wall thicknesses for properly authorized "Production for Victory" uses. Write for complete information.

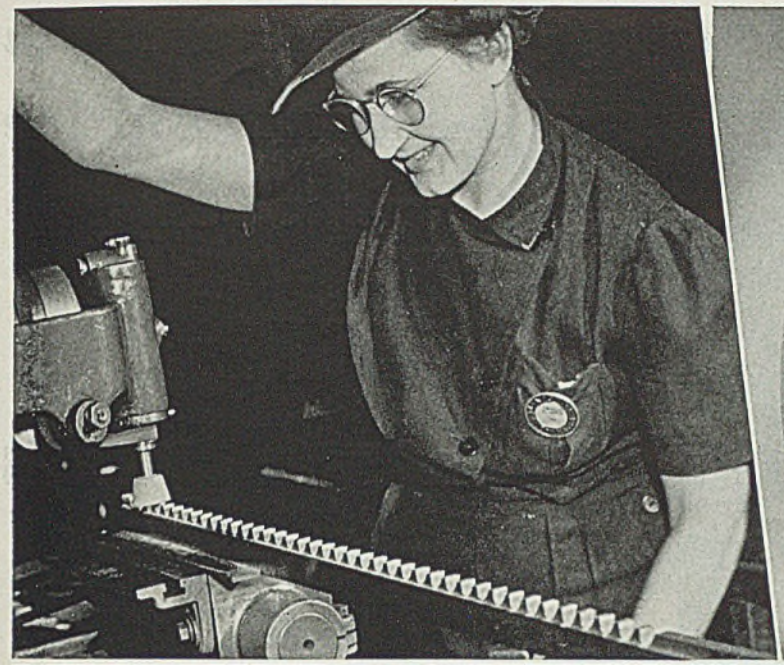
PIERCING *a billet of steel by the seamless process . . . the only method of tube manufacture that assures uniform wall strength throughout.*

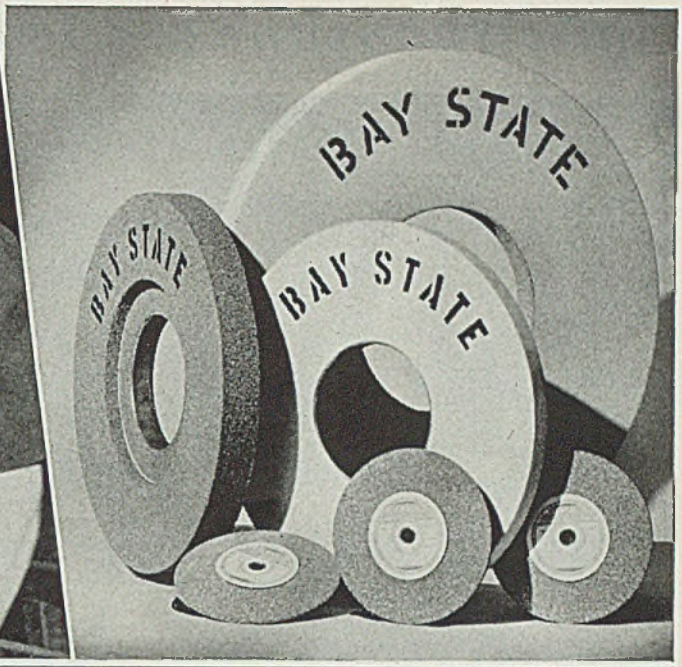
The newest name in alloy tubing

TUBULAR ALLOY STEEL CORPORATION

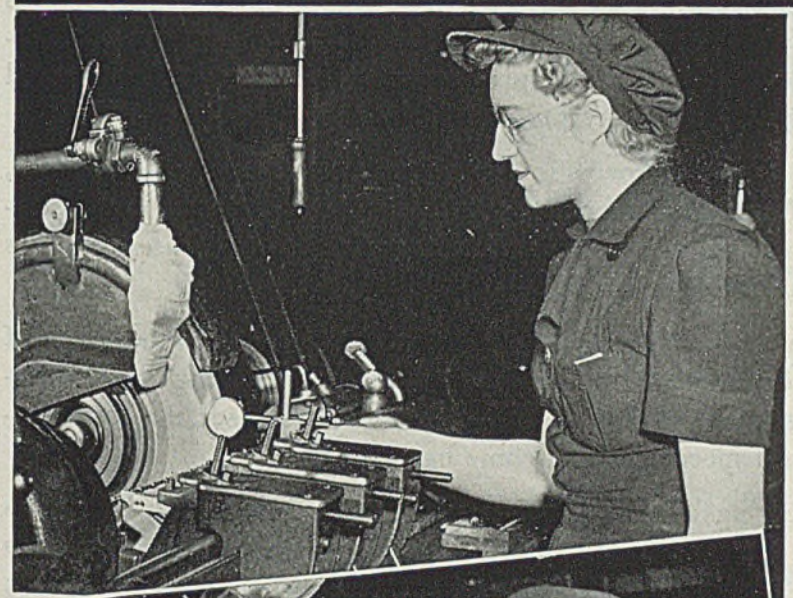
Gary, Indiana

UNITED STATES STEEL





THEY'RE DOING A "SWELL" JOB!



. . . and "hats off" to women operators like these and thousands of others who have stepped into industry to help fight this war!

Our superior allied battle-front action is dependent to no little degree on the skill and courage of our women on the production line. Long will we remember their great contribution.

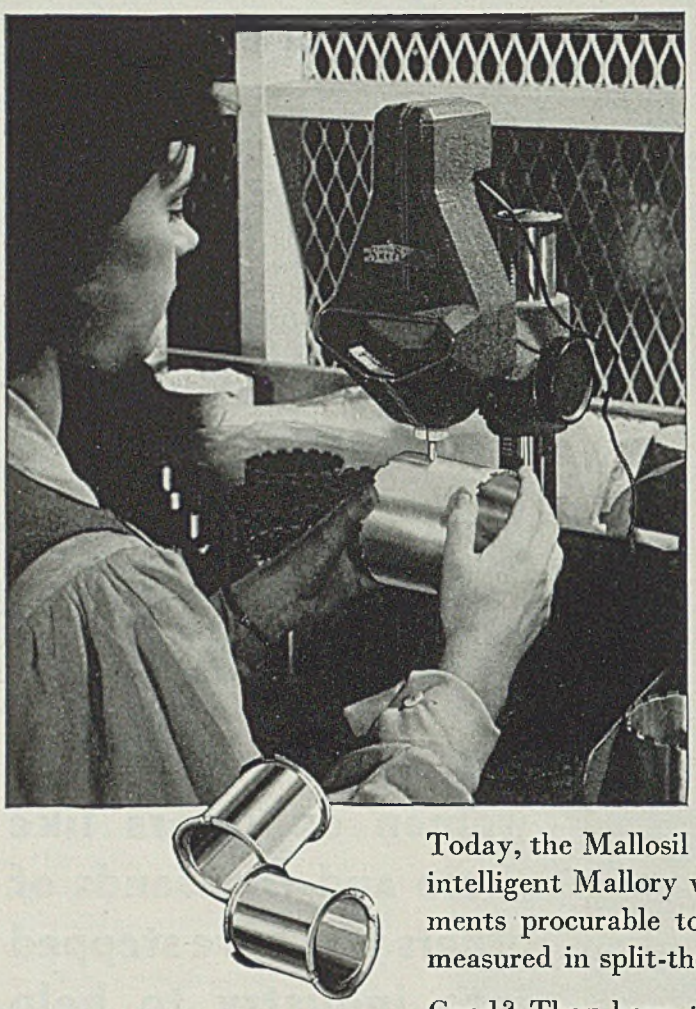
BROACH GRINDING

Photos courtesy of LaPointe Machine Tool Co.

BAY STATE

ABRASIVE PRODUCTS CO., WESTBORO, MASS. U.S.A.

Split-thousandth Bearing Tolerances Mean Split-second Engine Performance Aloft—



Mallory Precision Bearings Provide Them!

Precision keeps pace with production in the output of Mallory Bearings through the Mallosil Process. Top-quality performance is insured by the newest and most accurate high-speed production machinery and specialized testing equipment.

Today, the Mallosil Process is applied to Mallory Bearings by skilled, intelligent Mallory workers, busy guiding the finest tools and instruments procurable to produce uniformity in bearings with tolerances measured in split-thousandths.

Good? They have to be good! Whether they carry engine loads of huge bombers or hard-hitting fighters, Mallory bearings must withstand the terrific poundings and fatigue stresses set up by seven-mile-a-minute speeds . . . and come back for more.

Mallory Bearings . . . made by Mallory's precision Mallosil Process of bonding silver to base metal backings . . . are an important step forward in bearing technique. They are indispensable in war effort; they give promise for a far-reaching future in many directions—in commercial aviation, trucks, buses, machine tools, Diesel-powered equipment, to mention a few.

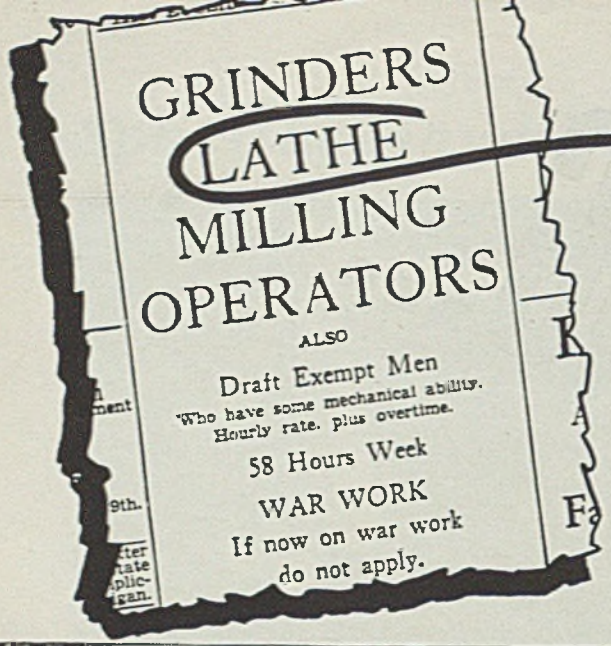
Constant experimental designing and testing are solving many problems arising from the quest for better performance and the demands of changed requirements. We shall be glad to discuss the possibilities of the Mallosil Process with you.

P. R. MALLORY & CO., Inc., INDIANAPOLIS, INDIANA • *Cable Address*—PELMALLO

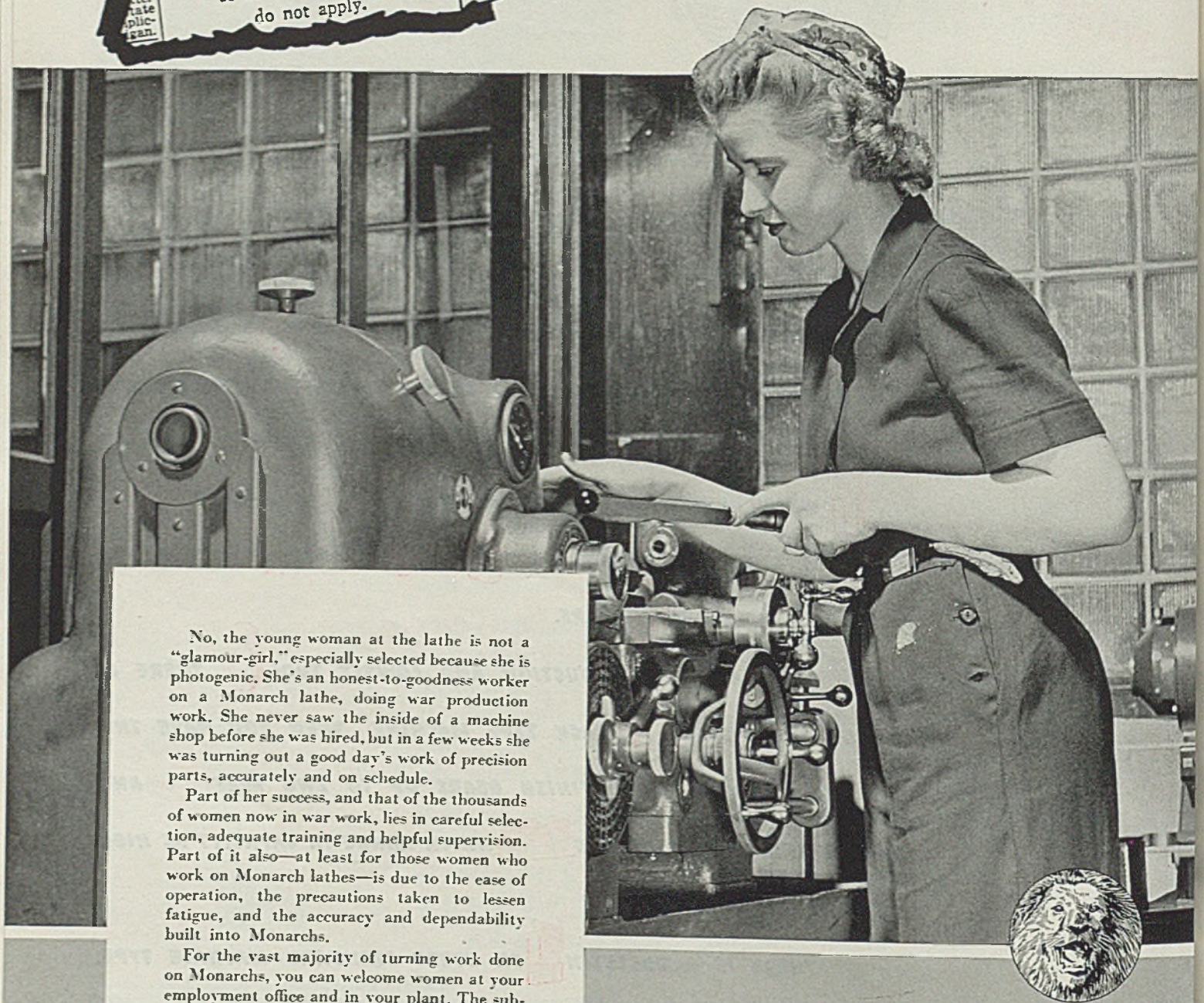
Trademarks Reg. U. S. Pat. Off.—Mallosil, Rectostarter, Vibrapack

P.R. MALLORY & CO. Inc.
MALLORY

SERVES THE AVIATION, THE AVIATION-INSTRUMENT AND THE AVIATION-COMMUNICATION FIELD WITH WELDING TIPS, THE MALLOSIL PROCESS—BEARINGS, SPECIAL ALLOYS, ELECTRICAL CONTACTS, VIBRATORS, VIBRAPACKS, CONDENSERS, ROTARY AND PUSH BUTTON SWITCHES, ELECTRONIC EQUIPMENT, COMMUNICATIONS HARDWARE, RECTOSTARTERS



Women Welcomed!



No, the young woman at the lathe is not a "glamour-girl," especially selected because she is photogenic. She's an honest-to-goodness worker on a Monarch lathe, doing war production work. She never saw the inside of a machine shop before she was hired, but in a few weeks she was turning out a good day's work of precision parts, accurately and on schedule.

Part of her success, and that of the thousands of women now in war work, lies in careful selection, adequate training and helpful supervision. Part of it also—at least for those women who work on Monarch lathes—is due to the ease of operation, the precautions taken to lessen fatigue, and the accuracy and dependability built into Monarchs.

For the vast majority of turning work done on Monarchs, you can welcome women at your employment office and in your plant. The substitution of "woman-hours" for man-hours will effectively help give you more machine-hours. If you'd like some firsthand information on the subject, send for the booklet "Women in Production Work." It's yours for the asking.

THE MONARCH MACHINE TOOL COMPANY
SIDNEY • • • OHIO

MONARCH LATHES

Cover the Turning Field