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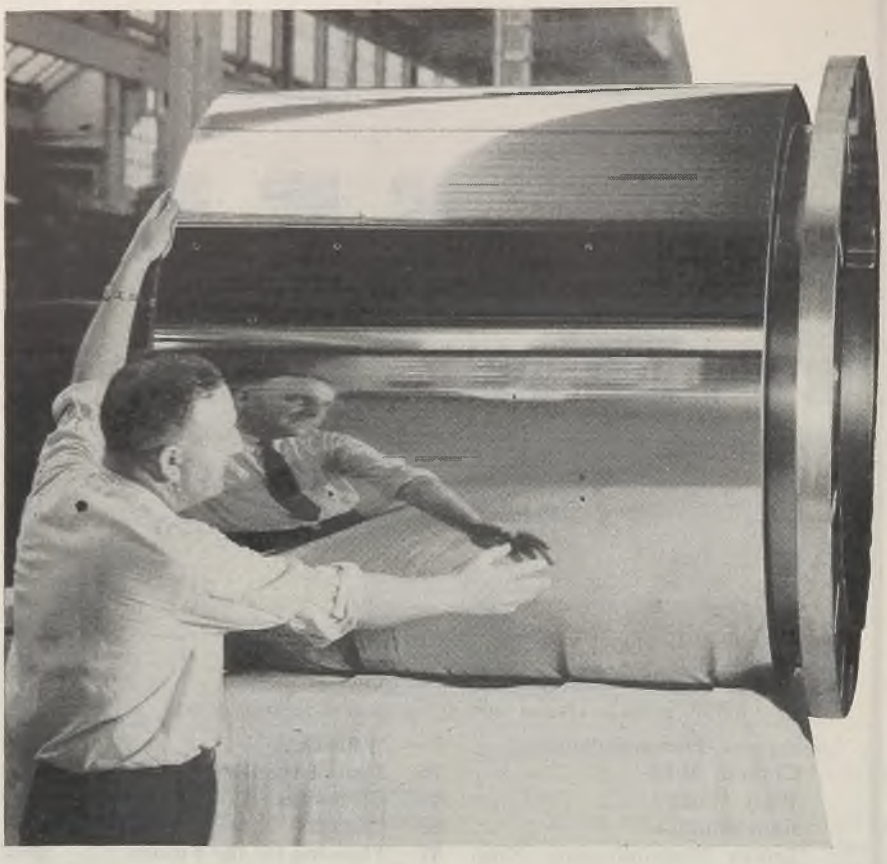
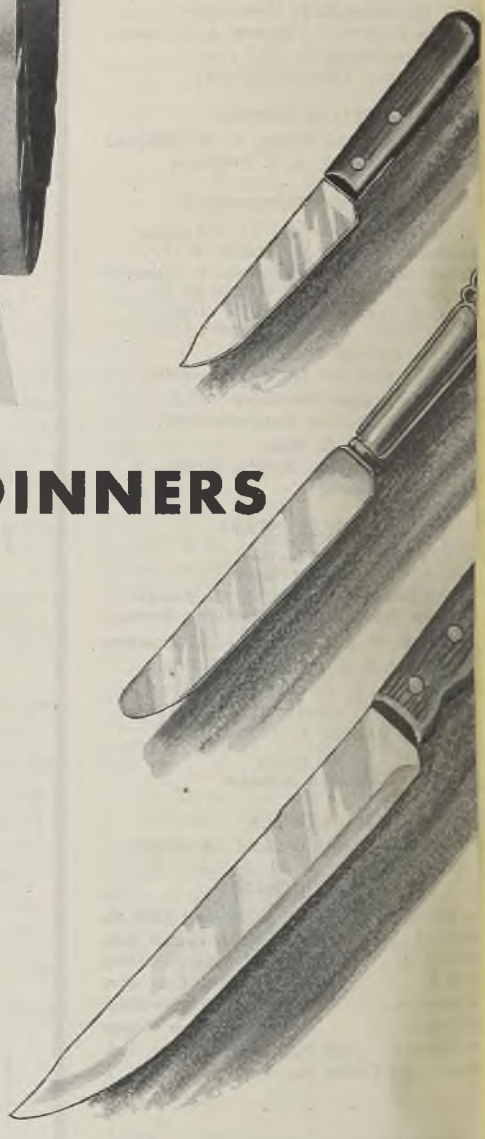
NEWS

TECHNICAL

FEATURES

MARKETS





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STEEL
November 13, 1944

Mandate for Unity

A rare bit of Americana, in the form of an unusual presidential election, has given the troubled world a glimpse of democracy at work under pressure. Although the nation is engaged in a war of unprecedented magnitude, its hold upon democratic principles has been strong enough to permit it to go through with the constitutional luxury of a national election. The mere fact that it could do this has been a revelation and an inspiration to freedom-loving people all over the world.

The outcome of the election is subject to various interpretations. Perhaps the most clear-cut lesson to be learned from the vote is that the people are more internationally-minded than ever before. The vote in certain regions shows conclusively that the public has turned definitely away from the extreme isolationism of Nye and Fish.

As for the presidential vote itself, it seems important that electors and elected alike be careful to interpret the result correctly. On the basis of votes in the electoral college, President Roosevelt has been re-elected by an overwhelming majority. On the basis of popular vote, the race was close. With ballots from over 90 per cent of the voting units counted, the President has 23,610,587 votes to Mr. Dewey's 20,-743,268.

This margin of 2,867,319 does not represent an "overwhelming" majority. On the contrary, if one considers the "frozen" vote of the Solid South and the wartime excess of votes influenced by patronage and favor, it is possible to argue that perhaps Mr. Dewey actually received a majority of the "free" popular vote.

However, this is not written to detract from President Roosevelt's victory. He won by the established rules. It is the duty of all of us to accept the will of the majority and to co-operate to the utmost with the elected.

It is also the duty of the elected to be guided by the mandate of the electors as expressed by their votes. In view of the closeness of the vote, under the circumstances noted above, the mandate of the people was not an overwhelming vote of confidence in our government. Instead it was a mixture of confidence and protest—a mixture so evenly divided that the leaders of the fourth term may well decide that the people's mandate of Nov. 7, 1944, calls for a government which pays no favors to any class.

The evenness of the vote presents a priceless opportunity for national unity.

MISSION TO CHINA: On their way to China are Donald M. Nelson, Howard Coonley and a hand-picked group of experts consisting of five executives from the iron and steel industry and an authority on alcohol. The immediate objective is to set up a Chinese WPB to stimulate the production of iron, steel and motor fuel for war. The long range purpose is to assist China in postwar industrial development.

Both tasks have almost unlimited possibilities. It will be interesting to see the extent to which American assistance can augment the output of the little shops which the Chinese have been able to build from odds and ends moved from the path of the enemy. Also, Americans will be curious to note the progress that can be made toward meeting the desire of the Chinese to establish a steel industry of 5,000,000 tons capacity to be completed within five years after the war.

The importance of the mission cannot be over-

(OVER)

estimated. China needs encouragement, not only to keep in the war on a more effective basis, but also to plan for postwar reconstruction. Its large population cannot go far toward economic stability without a substantial degree of industrialization. The Nelson mission is a challenging assignment.

—p. 78

* * *

PUTS UP $4.69 TO $1: WPB has prepared a report on government wartime investments in the seven western states of Arizona, California, Idaho, Nevada, Oregon, Utah and Washington. During the past four years the federal government has spent more than five billion dollars for war production facilities in this area.

Of this amount, $2,767,000,000 has gone into war housing and army and navy facilities. The remainder, $2,333,000,000, has been invested in manufacturing plants and equipment. This is in addition to $497,000,000 invested by private interests in manufacturing establishments and equipment.

This 4.69 to 1 ratio of government investment to private investment probably is higher than will be found in most industrial sections in the nation. It is a factor in Senator Murray's drive for the "decentralization" of industry. Also it will tend to make the problem of government plant disposal more complicated in the Far West than in other sections of the country. —pp. 80, 81

* * *

RAPID HEAT TREATING: There seems to be no end to the parade of new developments in induction heat treating. An eastern company has introduced a method of high speed continuous heat treating, using high frequency energy, by which finished bearing pins, 2½ inches long by ½-inch diameter, are case hardened to a depth of 0.025 inch while passing through a heating coil at the rate of 75 pins per minute.

The pins are of chromium molybdenum steel, NE-9442. The surface hardness after heat treating is Rockwell C-60, above file-hardness. The heating coil is a single layer about 1 inch long by ¾ inch in diameter, has five turns of small copper tubing, and is exposed to the water used in quenching. With 5-megacycle energy, the coil heats the surfaces of the pins above the critical temperature in less than 1 second.

This is another application of automatic induction heating—a development which has made rapid strides during the past decade. —p. 120

TO RETAIN SERVICE: In the months ahead, decisions must be made as to which of the various wartime government and private agencies shall be scrapped and which shall be retained for service during the reconversion period.

One decision of this kind already has been made. The tooling information service of the Automotive Council for War Production will be continued in the reconversion period in order to assure maximum speed in acquiring tools, dies, jigs, fixtures and gages needed in the production of automobiles. This service, which has been made possible by the voluntary co-operation of about 200 tool, die and fixture shops, provides manufacturers with an accurate list of the available tooling capacities of these companies. It has demonstrated its value time and time again during the war.

Numerous other services have been instituted by co-operating companies to facilitate war production. It might be well for their sponsors to be thinking about whether or not they will be useful in the transition from war to peace. —p. 91

* * *

LOAN LOSSES ARE LOW: Maury Maverick, chairman of SWPC and ardent champion of small business, has issued a progress report on the activities of his agency. In it he outlines accomplishments to date and suggests that on the basis of its record, the Smaller War Plants Corp. should be permitted to function throughout the reconversion period.

An interesting feature of Mr. Maverick's report is his account of federal loans to small business houses. He emphasizes the fact that SWPC has tried not to compete with private lending institutions. It has loaned federal funds to small producers only when they could not get funds from private sources.

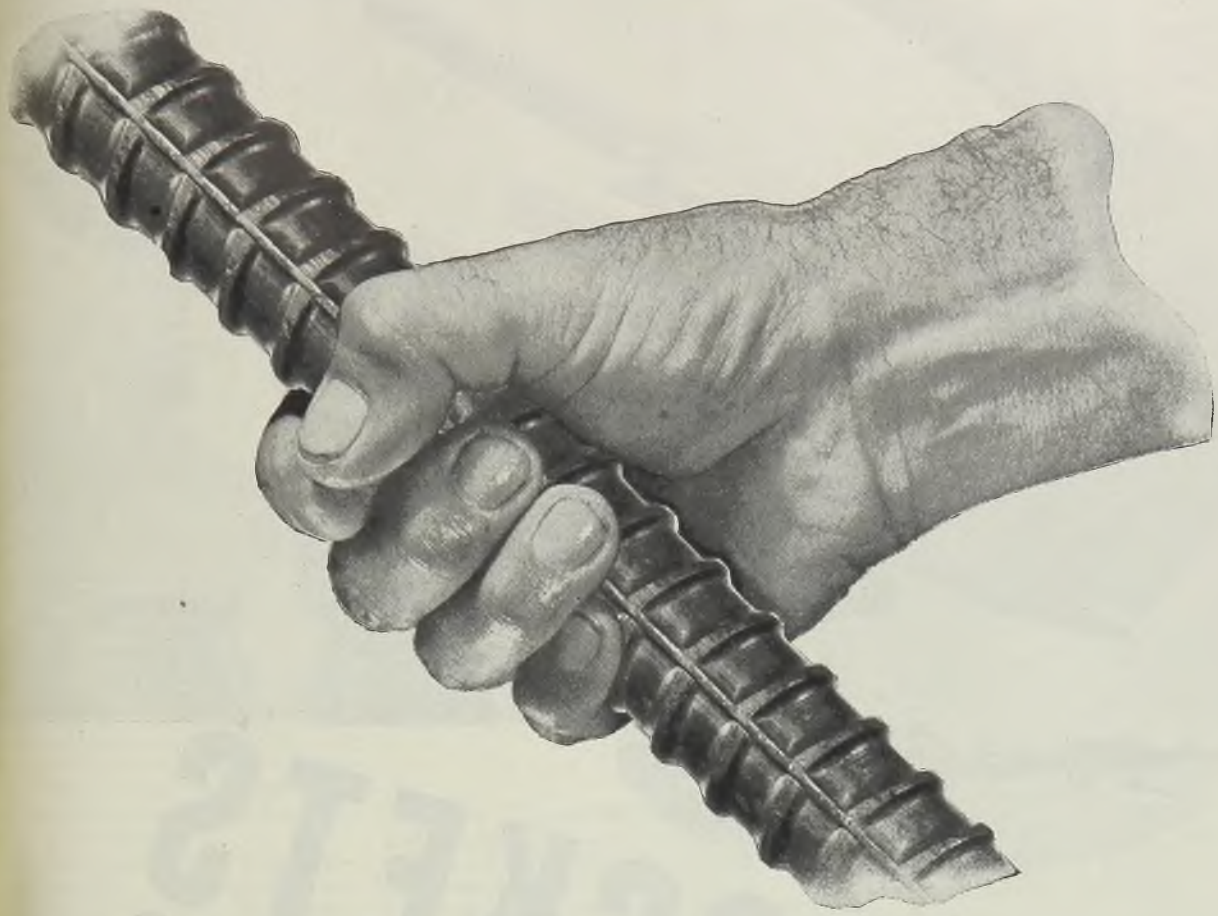
Experience over a 2-year period indicates that the net loss from government loans to small business may not exceed 1 per cent. In view of this low rate, Mr. Maverick concludes that banks are refusing loans to applicants who really are good risks.

Doubtless there are two sides to this question, but we wonder whether bankers generally are as sympathetic and as co-operative as they should be to the financial problems of small manufacturers.

—p. 75

E. L. Shaner

EDITOR-IN-CHIEF



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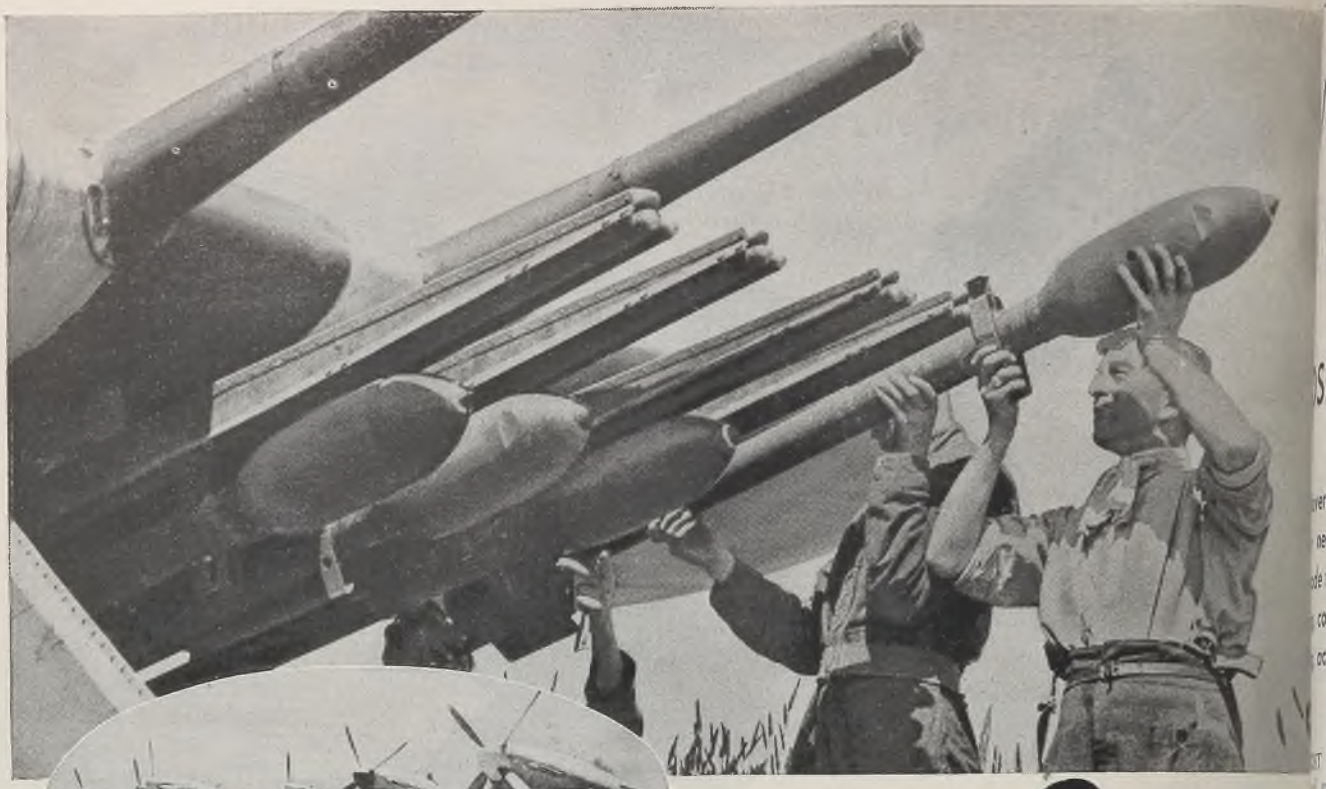

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SWPC Assistance To Continue After Hostilities End

Maverick believes service offered by bureau will be necessary during reconversion period. Plans made to expand agency's work. Will aid in financing, contract termination and settlement, engineering, acquisition of surplus property and machinery

MAURY MAVERICK . . . . . *"Not only a war job"*

BROUGHT into sharp focus during the political campaign just closed, the plight of small business, not only during the war but also in the reconversion period, appears destined for the continued attention of Washington.

During 1942-43, due largely to limitations on materials and manpower and other government-imposed restrictions, an estimated 500,000 small businesses were forced to close their doors.

The government in the past two years has made considerable headway in the management and supervision of small business, and expectations in Washington are that this supervision will continue and expand after hostilities end. This expectation was enhanced by the outcome of last week's election.

The various reconversion bills passed during the past few months have enhanced the powers of the Smaller War Plants Corp., established about two years ago. This agency now has so many services to offer small business during reconversion that its officials believe few small industrialists can afford to ignore it. The services include financing, providing engineering and technical assistance, help in the complexities of termination procedure, help in acquisition of surplus plants and machinery, and many others.

While the agency currently is running low on funds, most Washington observers believe Congress will supply additional funds in the amounts needed.

A progress report, submitted by SWPC Chairman Maury Maverick to War Production Board Chairman J. A. Krug, outlines the accomplishments of the agency and suggests the role it may play in the future. The report bluntly states that companies registered with SWPC are in better position to weather the reconversion storm than companies which prefer to stay on their own.

In his letter of transmission, Mr. Maverick says: "It must therefore be plain that I regard this agency as here not only to do a war job, but to preserve our accomplishments for the future. . .

"In the past several months many new responsibilities have been placed on us which we must discharge to aid free enterprise and little business.

"One thing is certain. The Smaller War Plants Corp. welcomes the important new responsibilities that have been placed on it under the Contract Settlement act, the Surplus Property act, and the Demobilization and Reconversion act. . .

Funds Nearly Exhausted

"I cannot help but point out that the additional powers conferred on the corporation, and the increased applications for financial assistance, placed the corporation in a position where more funds are needed. As brought out in different parts of the report, the funds of the corporation will shortly be exhausted. The Senate unanimously raised the capital of the corporation from $150 million to $350 million. This would make $200 million more available, since the original $150 million is practically exhausted."

The agency when it was established in September, 1942, had only a small group of employes, all in Washington. At present it has 1653 full-time employes, 1226 of whom are in field offices and 427 in Washington.

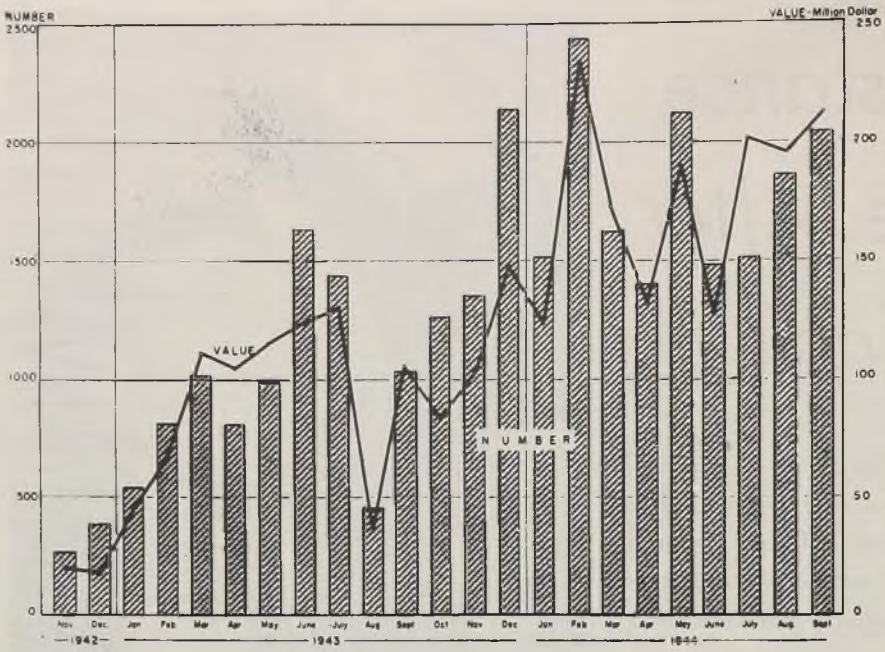
One of its first jobs was to gather basic information concerning small plants. It found there were 165,000 small independent producers with 500 employes or fewer. To gain information of the potential war production capacity of these plants, SWPC directly contacted 52,500 companies whose annual sales volume ranged from $50,000 to $2,500,000. More than 33,000 of these were registered, with inventories of equipment of each, types of possible production, capacity, manpower, financial condition, and other facts. Figures concerning the machinery and capacity of some 65,000 plants also were compiled in a survey made jointly with WPB.

To represent the small plants effectively in the matter of obtaining war work, the agency, Mr. Maverick says: "Planned its organization to conform with the setup of various military and other government procurement offices. Liaison officers have been established with each of the major contracting agencies, both in Washington and elsewhere.

"Although this function, as it now exists, cannot and should not be carried out in time of peace, some machinery should be made available to see that little business gets a fair chance to obtain government orders in peacetime, and in the economy in general.

"There is much loose, careless talk about the 'inefficiency' of small business. It is argued that mere bigness brings efficiency. The experience of the Smaller War Plants Corp. indicates that this is not necessarily true.

"In the early stages of the efforts to mobilize small plants, this corporation paid considerable attention to the question of possible price differentials. It was thought that small plants would not be able to supply goods at prices as low as those charged by larger concerns. And Congress even made provision in the act to meet this possibility. But experience has shown, that small and large plants take about the same steps in fixing prices on new war products. Small plants which are properly equipped to produce



Number and value of prime contracts awarded with the assistance of the Smaller War Plants Corp., November, 1942, through September, 1944 are charted

an item usually are not seriously handicapped in meeting price competition."

From November, 1943, through September, 1944, a total of 30,167 prime contracts, valued at more than $2.8 million were awarded to small plants with the assistance of SWPC. In the same period 30,375 subcontracts, totaling $640 million, were awarded with the agency's aid. The volume of these contract awards by months is shown in accompanying charts.

The SWPC took on its own account 11 prime contracts for subcontracting to small plants, under which it placed 170 subcontracts.

Formation of manufacturers' pools was encouraged by the agency. From May, 1943, to August this year, 31 pools had been cleared and certified as war production agencies. Some 200 pools previously had been created by the Division for Contract Distribution. After allowing for dissolutions, 149 pools were still in existence on Aug. 31. Up to that time, more than $300 million contracts had been placed in more than 2000 member plants.

In addition to its procurement, contracting and financing activities, the SWPC performs several other services. For example, it serves as "Washington representative" for a number of small concerns which cannot afford their own representative there. It represents many companies in appeals from restriction and limitation orders, from rulings of the War Manpower Commission, and War Labor Board and other directive bureaus.

In making loans, the SWPC attempts not to compete with private lending institutions. It is a source of loans for small producers who cannot get financial assistance elsewhere, and it assumes financial risks no one else would accept.

Despite this, Mr. Maverick believes the agency's loan losses have been "quite low."

"Up to June 1, 1944, after about two years of operation, an analysis of loans reveals that only 32 borrowers had defaulted on loans of $1.2 million against which $296,000 was repaid. However, these losses have not been written off, since it is estimated there will be additional recoveries of more than $389,000, leaving the net loss less than $515,000. On the basis of all loans made up to that date, this would represent a loss rate of less than 1 per cent."

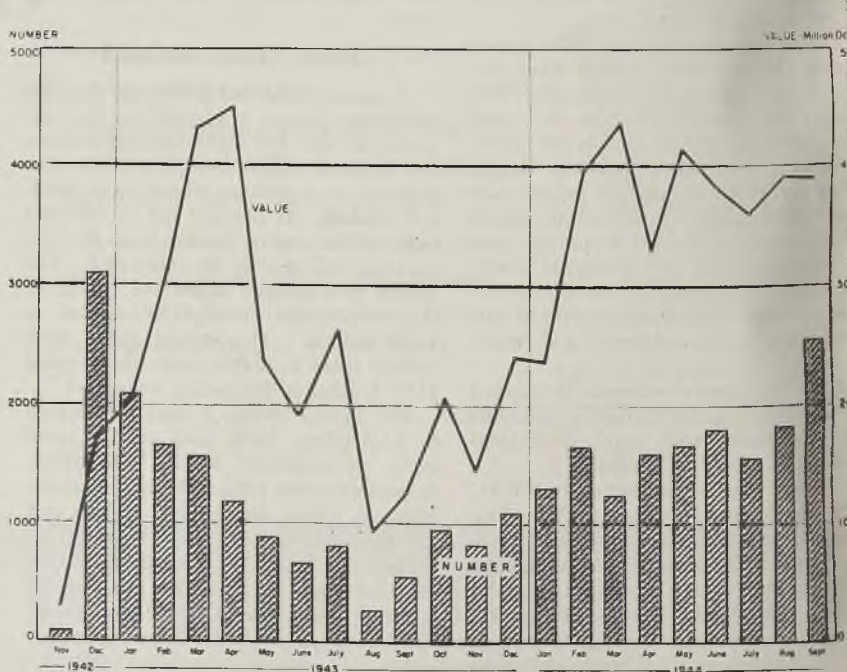
Mr. Maverick's report is mildly critical of the conservatism of private banks in granting loans to small business. "Although every effort is made by the SWPC to place loans with banks before undertaking them itself, the greater portion of the corporation's loans have been made without bank participation. This points to a very important conclusion. The relatively favorable loss experience of the corporation shows that many loans which were refused by the banks actually turned out to be excellent risks."

Mr. Maverick continues: "If we are to have a free enterprise economy, little business must have ready access to adequate sources of financing. Not even the most efficient small business can compete with big business if it cannot obtain funds or has to pay three times as much for them as was the case before the war.

"We can only conclude and emphasize that the corporation's experience in financing small companies during the war can be of great value in establishing proper and adequate financing facilities for small enterprise in the coming years of reconversion and peace."

In regard to resumption of civilian goods, Mr. Maverick said that war production always was the first goal of the SWPC. However, he added, when small plants are let out of war production and no further contracts can be obtained for them, then these small plants should be permitted to produce civilian goods, provided that such production would not interfere with the war effort.

The SWPC chairman pointed out that the reconversion act specifically negates three ideas hindering reconversion. One is the "industrial grandfather clause," the principle of which is that no plant should be permitted to make a civilian product unless it made that product before the war. Similarly it outlaws the



Number and value of subcontracts awarded with the assistance of the Smaller War Plants Corp., November, 1942, through September, 1944, are shown above

"Cherokee strip" principle that all producers of a civilian product should start at the same time, which would hold up some small producers until the large companies had completed their war contracts. The third permits the resumption of civilian production on a restricted basis, under certain conditions.

The SWPC will help the WPB allocate certain materials to assist small plants to get back into civilian production. Already a considerable tonnage of steel has been set aside under the spot authorization plan.

Another function of the SWPC during coming months will be to assist small plants in the termination and settlement of their war contracts.

"Clearly," says Mr. Maverick, "both prime and subcontractors can get prompt settlement only if they are properly trained in preparing and submitting correct claims. Insofar as contractors are properly 'educated' the government's task of rendering assistance will be made easier."

The agency has set up meetings throughout the country at which contractors are given instructions in preparing and submitting claims. More than 4800 persons, representing 2464 companies, attended such meetings up to Sept. 30. Special training has been given regional officers that they may more effectively assist subcontractors.

Helps Obtain Interim Financing

Still another function of the SWPC will be to help the small contractors obtain interim financing. In the opinion of the SWPC chairman many companies which do not now realize it will be in need of such aid.

Wherever possible, such interim financing will be handled through local banks. Many difficulties are anticipated in obtaining such assistance through the private lending institutions, and in these cases the SWPC probably will extend its own lending facilities directly.

Plants which are registered with SWPC are doing about twice as much to prepare for contract terminations as those which are not, the chairman believes on the basis of a survey made in New England.

"It is a first essential for these small plants that their termination claims be settled quickly. Money tied up in a termination claim is needed to convert to peacetime production. Experience in terminations to date proves conclusively that unless plants have prepared adequately for terminations, their claims are not settled for many months.

"In its survey, SWPC inquired into the probable financing requirements of each small plant. Although a very large proportion felt they would not need financing during the reconversion period it is our distinct impression that these small plants did not adequately appraise the difficulty which they will encounter. They are now doing a much larger volume of business than in normal times. Impressed by the dollar values of goods and contracts which they are handling and fully occupied with their operating activities, many of them failed to give adequate consideration to such factors as the impact of the wartime tax rates, the effect to renegotiation, and the fact that their working capital is almost completely tied up in the time and complexities involved in getting back to civilian production. A very short lag between termination and resumption of normal production will cause these small plants to dissipate their cash resources in trying to hold a skeleton labor force and keeping their plant open and operating.

"The role SWPC must play in the pre-termination, termination, and immediate reconversion periods thus becomes clear. In the pre-termination period, the corporation must redouble its efforts to help the small manufacturer understand and prepare for the complexities which will confront him when he presents his claim. The corporation must continue to emphasize the need for adequate accounting records. In the termination period, the corporation must see that the small manufacturer obtains fair and expeditious settlement."

Present, Past and Pending

■ BOEING PLANTS TO OPERATE AT CAPACITY IN 1945

SEATTLE—Boeing Aircraft Co. has received an order for 1000 additional B-29 Superfortresses from the War Department, bringing total backlog to over $1.1 billion, calling for capacity operations at Seattle and Renton, Wash., plants well into 1946.

■ HOLLAND PLACES ORDERS FOR PUMPS AND DIESEL ENGINES

NEW YORK—Holland has placed an order with Worthington Pump & Machinery Corp., Harrison, N. J., for 200 pumps and orders with General Motors Corp. and other companies for diesel engines to supply power for driving these pumps, involving an expenditure of about $3 million. An additional $6 million will be spent for other power plants and $3 million for pipe materials and such tools as draglines, bulldozers, tractors and pile-driving equipment.

■ GENERAL ELECTRIC MAY BUILD PLANT IN ASHTABULA, O.

ASHTABULA, O.—Construction of a plant here for General Electric Co. is being planned, according to local reports, which will employ up to 3000 workers.

■ WAR DEPARTMENT ENDS CONTROL OVER STRUCK PLANTS

TOLEDO, O.—Possession and operation of eight war plants here by the War Department ceased Nov. 6 and of the Cleveland Graphite Bronze Co. plant in Cleveland Nov. 8. The government had assumed control of the plants in strikes by the Mechanics Educational Society of America, an independent union.

■ MORE PRODUCTS TO BE PUT UNDER SPOT AUTHORIZATION

WASHINGTON—Civilian goods production allowed under the "spot authorization" plan may be broadened soon to include motor cars, nonmilitary planes, electric and gas refrigerators, motorcycles, farm machinery and several other products.

■ INGALLS SHIPBUILDING REPORTS NEW LAUNCHING

PASCAGOULA, MISS.—Ingalls Shipbuilding Corp. launched recently its fifty-eighth 18,000-ton all-welded ship in the past 53 months.

■ STEEL INDUSTRY ADVISORY COMMITTEE MEETING POSTPONED

WASHINGTON—A meeting of the overall Steel Industry Advisory Committee, War Production Board, originally scheduled for Nov. 16 has been postponed until an unannounced date.

■ U. S. OPERATING STEEL MILL CLOSE TO FIGHTING FRONT

WASHINGTON—Several hundred tons of steel per day are being produced in a huge, modern mill located close to the fighting front in Europe, according to the War Department. The mill is producing priority bridging material for the U. S. engineer troops. Production of pig iron began Oct. 12 and the first I-beam rolled out of the mill on Oct. 14.

■ ARMY HALTS SHIPMENTS OF BATTLEFIELD FERROUS SCRAP

WASHINGTON—The Army is no longer returning battlefield scrap to this country, it was revealed here last week. Area commanders have been instructed to assemble and store ferrous scrap for shipment or disposal as required.

■ CARNEGIE-ILLINOIS AWARDS CONTRACT FOR COKE OVENS

PITTSBURGH—Carnegie-Illinois Steel Corp. has awarded a contract to the Koppers Co., this city, for 174 Koppers-Becker underjet by-product coke ovens at the Clairton works, consisting of two batteries of 87 ovens which will replace No. 21 and No. 22 ovens of the old style.

Little WPB To Be Set Up To Spur War Production

American group, headed by Donald M. Nelson and including five steel executives, will aid country in increasing steel and alcohol production. May lay plans for postwar industrialization

DONALD M. NELSON . . . . . *To head Chinese WPB*

AN AMERICAN mission is on its way to China to organize a War Production Board in that country and to increase the production of steel and other war materials from the limited facilities available there.

The group is headed by Donald M. Nelson, former WPB chairman, who recently completed an investigative mission to China. Included in the second mission are five top-ranking American steel men: Herbert W. Graham, director of metallurgy and research, Jones & Laughlin Steel Corp., Pittsburgh, who will head the steel group; Carl Albert Bell, foundry superintendent, United Engineering & Foundry Co., New Castle, Pa.; Henrik Ovesen, consulting engineer, Lukens Steel Co., Coatesville, Pa.; Harry A. Strain, director of raw materials, fuel and tar, United States Steel Corp., Pittsburgh; E. K. Waldschmidt, formerly of Jones & Laughlin Steel Corp. and more recently chief of the shell steel section, Steel Division, WPB.

Howard Coonley, WPB executive and chairman of Walworth Co., New York, will be deputy to Mr. Nelson. Eugene M. Stallings, technical expert in alcohol production, also is a member of the mission.

The mission was sent to the Orient at the request of Generalissimo Chiang Kai-Shek and its purpose will be to stimulate China's war production, particularly in metals and alcohol. The latter was regarded as significant by WPB officials here who point out that the fuel situation in the Orient is critical and that alcohol could be used as fuel for land vehicles. At present, gasoline is being flown into China over the Himalayan "hump" by airplane, a hazardous and costly process.

Probably more important than the immediate need for alcohol is the development of China's infant steel industry. That country is planning the development of a steel industry of 5,000,000 tons annually within five years after the end of the war, according to Chinese authorities now in this country.

For this longer term program, China probably will have to start from scratch, inasmuch as there is very little modern equipment in the country at present and there is little likelihood that any great quantities of equipment can be shipped there now.

The immediate task of the steel mission, it is understood, will be to rearrange the limited facilities available, introduce American methods, and apply American ingenuity to obtain the largest production possible.

The five men in the mission are recognized for their ability to get things done under difficulties and have played an important part in making possible the steel production records in this country.

In announcing their selection, Mr. Nelson said: "All of these men are hand picked for their long, practical experience in iron and steel production. Their knowledge extends from the mining of the raw materials through the coke ovens, blast furnaces, open hearths, bessemers, electric furnaces and cupolas and on through the steel mills and foundries to the finished products. Among them they could design and operate a complete steel mill, and have the resourcefulness to meet the difficult conditions which exist in China. I know that the Chinese managers and workers will have the greatest respect for these American production men, who among them can do virtually any job in iron and steel production with their own hands and brains. Several of them already have a deep insight into the problems of iron and steel production in China. Mr. Bell, for example, actually designed many of the heavy castings which now equip Chinese steel mills.

HOWARD COONLEY

"The fact that it was possible to obtain the services of these men from their companies," Mr. Nelson continued, "is splendid proof of the sustained close co-operation of industrial management with the government in the all-out prosecution of the war. Each of the companies concerned had to make a sacrifice in releasing these outstanding men for the Chinese mission, but the heads of all of the companies took a most constructive and helpful attitude."

The mission's long-range task is expected to be lending assistance to China's postwar industrial development.

Although information on China's industry and resources is limited, it is known her industry is primitive and her

H. W. GRAHAM

HARRY A. STRAIN

HENRIK OVESEN

resources considerable. Seven years of war, however, have forced this country to take its first faltering steps toward modern industrialization. In this, China has been handicapped by a lack of machinery and a lack of credit with which to buy equipment.

At the outset of the war, most of China's factories were located on the east coast, first to be occupied by the Japanese. As the Chinese fell back before the invaders, these factories, mostly small, were moved inland wherever possible. Today, many of them are operating in caves for protection from Nipponese bombing raids.

The munitions factories generally are outmoded by our standards today, and in many cases resemble plants in this country in the years before the first World War. Here and there a modern touch, the innovation probably of a Chinese student trained in America or Europe, offers an incongruous note.

Has Sufficient Raw Materials

As to resources, China has enough iron ore and coal to support a considerable steel industry, taking into account the deposits in Manchukuo, which may be returned to China after the war.

American engineers who have explored the possibility of erecting blast furnaces and steel plants in the country report much of the ore is of high quality.

China has tungsten far in excess of her needs. In fact, the country is reported in a League of Nations survey as producing 45 per cent of the world's output. Antimony is plentiful and a fair amount of tin is available. Other alloying elements needed could be obtained within reasonable distance. Chrome, for example, would be available in the Philippines.

China is anxious to industrialize as rapidly as possible when war conditions permit. Chiang Kai-Shek's request for the American mission is the most recent evidence of this. However, the country has a long way to go and will be handicapped by a lack of credit to buy foreign machinery and equipment.

A small start toward postwar industrialization has been made by Chinese in this country. For example, the seed of a Chinese aircraft industry has been planted in San Francisco where Chinese Aircraft Corp., manned by specially trained Chinese workmen directed by American management, is assembling fuselages for Douglas Aircraft Co. The company was started with Chinese capital raised in this country and aided by the Defense Plant Corp. After the war it is expected the plant, complete with equipment and trained personnel, will be transported to China.

OPA Ceiling Price Schedule on Iron and Steel Scrap Revised

TO PROVIDE a wider market for sellers of superior iron and steel scrap grades, Office of Price Administration has revised price regulation No. 4, removing price restrictions applying to basic open hearth and blast furnace consumers in buying superior grades of electric furnace or foundry scrap.

In the case of such grades as bar crops and plate scrap—grade 14—the basic open hearth consumer was required to pay $2.50 per ton less than the electric furnace consumer, in spite of superior grade.

A wider market for all sellers of scrap is provided by removal of restrictions upon the amount of freight the consumer can pay. Previously the seller of scrap located at a basing point generally could not ship scrap away from that basing point without reducing prices in direct proportion to the freight he absorbed, or selling to the buyer under allocation.

OPA also modified the provision with regard to mixed shipments. Hereafter when a shipper invoices different grades of scrap in one car, settlement may be made on the basis of the actual grades shipped. Previously settlement for all mixed shipments had to be made at the price of the lowest-priced grade in the shipment. Where the seller invoices only one grade, the consumer is permitted to settle on the basis of the actual grade removed from the car if the balance of the car is returned. If the buyer and seller agree that no part of the car is to be returned, then settlement may be made on the basis of the lowest-priced grade in the car.

Other revisions in the order include: Brokerage fees of 50 cents per gross ton for brokerage services hereafter may be charged only where the scrap is bought and sold at ceiling prices. Ceiling prices have been reinstated to cover the grade of cut rails, two feet and under. The ceiling price for this grade is fixed at $3 over No. 1 heavy railroad melting steel price. Machine shops and forge shops hereafter will not be classified as consumers of steel scrap, and may purchase scrap axles and other items for machining and reworking at ceiling prices provided they are for a resale product.

Gain in Steel Employment Now Is Expected

Now that plate rolling schedules are due to decline over the next few months with a corresponding increase in sheet rolling schedules, a reversal in the recently declining trend in steel mill employment is expected. Steel plant workers in June totaled about 455,000 and declined to about 450,000 at the end of August.

Despite this decline requests for steel mill labor have continued, particularly in such tight labor areas as Cleveland. These requests now are expected to become more numerous and urgent. Steelworkers continue to work 47.2 hours weekly on the average with 39.8 hours in October, 1942.

Government War Plant Investment Tops $5 Billion in Western States

In addition private industry has invested $497 million in war production facilities. Bulk of government and private expenditures has been in California. More than fourth of federal spending for shipbuilding and repair facilities

SAN FRANCISCO

THE federal government during the past four years has channeled more than $5,100,000,000 into war production facilities in the seven far western states. In addition private industry has invested another $497,000,000 in plants to produce war materiel.

These comprehensive facts are disclosed in a detailed report prepared by the Industries and Facilities Division, War Production Board.

Covering the period June, 1940, to June 30, 1944, this report shows expenditures on new plants broken down by industries, ranging from shipbuilding to machinery and tools. It reveals relative standings of these industries considerably at variance with previous ideas of their position. For example, the West Coast aircraft industry, which has been far and away at the top of the list in value of war goods produced, ranks fifth in standing of industries in the tabulation of government expenditure on producing facilities. It has cost the government less than half as much to build new wartime aircraft plants than it has to construct new shipyards in the West Coast area.

Of the $5,100,000,000 federal plant investment in the seven western states, $2,333,000,000 was for manufacturing establishments and equipment. The remainder was divided: $1,159,000,000 for Army facilities; $1,019,000,000 for Navy facilities; and $595,000,000 for war housing. Bulk of the expenditures have been in California, the report shows, this state alone accounting for 57 per cent of the $5,100,000,000 total and 60 per cent of the $2,333,000,000 manufacturing investment. Of the private investment in plants, totaling $497,000,000, California's share was $409,000,000.

Up to the end of last June, $614,000,000 of government funds had been poured into West Coast shipyards, or slightly more than one-fourth of total U. S. spending for this purpose. Another $443,000,000 went for nonferrous metal installations, principally aluminum and magnesium refineries in the seven western states. Iron and steel plants ranked third with $379,000,000, not including the RFC loan to construct the Kaiser steel mill at Fontana. Of the expenditure on steel plants, the Geneva Steel Works in Utah accounted for $216,000,000 and another $150,000,000 was spent on various projects in California. Investment in chemical plants and petroleum refineries, including the synthetic rubber installations in Southern California, took $350,000,000 of government money, but private operators at the same time put $169,000,000 of their funds into new plants.

Classified by states, the total investment in western war plants, the record shows (000,000 omitted):

	—Manufacturing—		———Military———		
	Govt.	Private	Army	Navy	War Housing
Arizona	$99	$34	$131		$23
California	1,361	409	563	$696	292
Idaho	25	3	34	67	6
Nevada	144	1	35	45	14
Oregon	112	20	114	43	66
Utah	286	5	113	37	29
Washington	306	25	169	131	165
Total	$2,333	$497	$1,159	$1,019	$595
Per cent of U.S.	9.1	6.5	12.8	23.0	28.2

Analysis of the state totals shows that of the aggregate government shipyard investment, $433,000,000 has gone to California, $121,000,000 to Washington state and $60,000,000 in Oregon. Federally financed aircraft plants total $229,000,000 in California, while the investment in Washington is $41,000,000. The nonferrous metal funds are divided: $112,000,000 in Washington (mostly aluminum); $134,000,000 in Nevada (largely for the Basic Magnesium, Inc. plant, now virtually shut down); $97,000,000 in California; $77,000,000 in Arizona, and $21,000,000 in the state of Oregon.

An important phase of these statistics is that they indicate the huge postwar problem to be faced by the western area —that is, disposal of surplus war facilities. Surplus disposal of plants will exceed $2,000,000,000 in the western area.

NEW TRANSPORT: One of the first of the Navy's fast new transports is shown above during sea trials. The ship was built at the Wilmington, Calif., yard of the Consolidated Steel Corp.

California Employment Declines

Drop of 16,000 from factory payrolls reported in area during September, largest monthly decline since downtrend started last January

LOS ANGELES

DECLINE of 16,000 industrial workers employed in this area was recorded in September by the State Bureau of Labor Statistics. This is the largest drop for any one month since falling off in employment began in January of this year.

Contraction in aircraft plants was chiefly responsible for the September decline. Total factory labor force was down to 393,700, compared with 459,600 in September last year.

The month-to-month decline in employment is being studied by a newly organized committee of industrial leaders which will attempt to discover where these workers go and why, and whether others are entering the area to take their places.

In still another attempt to solve the labor situation, the personnel committee of the Chamber of Commerce has started a postwar labor stabilization plan in which hundreds of factories are cooperating. An inventory of skills is being made as the basis for a proposed interchange of workers between plants as the need arises. Attempts will be made to so time work-force releases as war work ends, that freed employes can step immediately into other plants beginning the production of peacetime goods.

It is hoped that employes when they know they will find other jobs as soon as war production stops will not be shopping about for other kinds of work, and that the war effort can go on unhampered by labor turnover. The proposed plan is also expected to prevent to a large degree lags in postwar employment of workers.

Claim Steel Expansion in West Vital to Area's Postwar Economy

EXPANSION of the West's steel industry is vital to that area's postwar economy, the Senate Committee on Small Business, chairman, James E. Murray (Dem., Mont.), was informed recently by representatives of western industrial and civic groups.

Highlights of these representatives' recommendations are: (1) Removal of the so-called "Pittsburgh plus" base for raw steel prices now in effect at the Geneva and Fontana plants; (2) a permanent adjustment in the overland freight rates from Provo, Utah, to the West Coast, and eastward to the Middle West states.

Rex L. Nicholson, director of one of the civic groups, said a survey of the steel industry and the possibilities of the postwar market, show that there will be a market in the 11 Western states sufficient to absorb the present steel capacity in the West.

"In general there is plenty of good iron ore in the western states to serve an expanding iron and steel industry," one survey found, according to the report to the Senate committee. "The present capacity of steel plants in the 11 western states is sufficient to provide more steel than will be used in those states for the immediate postwar period. Present plants can be easily expanded to meet any demand from the Middle West and Pacific export.

"A base price for pig iron and steel that is independent from the eastern base must be established in the west according to western costs of production. Because of natural advantages, the West can produce iron and steel cheaper than the East with the possible exception of Birmingham, Ala.

"Before there is any need for expansion of iron and steel plants, however, it is necessary that secondary plants be put in operation to convert steel into sheet metal products, appliances, machinery, etc."

Expansion Opportunities For Chemicals Studied

LOS ANGELES

Questionnaires are being sent chemical producing firms in this area by the local chamber of commerce with a view to ascertaining what chemicals are now being produced here, and in what quantities and to what extent southern California minerals are being utilized and to what purposes the chemicals are put.

War demands have stimulated these industries to a marked degree. Whether this expansion can be maintained in postwar years is a question yet unanswered.

Studies made in recent months indicate opportunities for expansion exist in nearly all groups of chemical production. Government statistics for 1939 indicate a wide disparity between consumption and production in the western market.

The 11 chemical industry groups offering greatest possibilities for expansion are drugs and medicines, fertilizers, insecticides and fungicides, adhesives, coal tar products, colors and pigments, grease (except lubricating), toilet preparations, plastic materials, rayons, essential oils.

In 1939, the 11 western states purchased 13.5 per cent of all the radios sold in the country, but produced only 1.5 per cent of them. The West purchased 15 per cent of all electrical appliances sold in the country and made 2.9 per cent. Stoves, ranges, heaters were purchased in the West to a total of 15 per cent of national sales; 8.2 per cent of these articles were made here.

Scarce Labor and Supplies Limit Coast Reconversion

SAN FRANCISCO

Spot authorizations for nine additional San Francisco area companies to manufacture civilian goods have been approved by the War Production Board. Annual value of the nine companies' authorized output is $993,240. Products include electric air heaters, innerspring mattresses, brass faucets, floor and wall furnaces, flower holders, gutters, downspouts and stove pipe, agricultural equipment, steel venetian blinds and farm trucks.

Although since the start of the civilian production program, 79 authorizations have been granted to northern California firms for an annual output of $10,401,010, it appears actual production will not come anywhere near that figure. There are two stumbling blocks in the reconversion path here—materials and manpower, both of which continue extremely scarce in many lines.

Of these, the materials shortage is by far the most pronounced, especially in metal products. For example, approximately 15 of the 79 authorizations thus far are for production of box springs and mattresses containing metal springs. However, steel springs for this purpose virtually are nonexistent here and manufacturers fear they are likely to remain scarce for a long time to come.

Another company which received approval for production of portable irrigation pipe is unable to obtain the necessary material.

This same situation runs like a thread through most of the authorizations. In several instances where material is available for at least a part of production, scarcities of components is blocking reconversion.

Probably the best situated companies are those which can use scrap materials for production of small household gadgets —garden rakes and dust pans are examples. Several companies also have been able to obtain authorizations for producing civilian goods by sandwiching such output between war orders. These companies have been able to avoid manpower troubles, as a result.

Another trouble which has cropped up for reconverting firms is the relationship between wartime manufacturing costs and OPA price ceilings.

Roosevelt Expected To Extend Renegotiation Act for 6 Months

War procurement agencies suggest extension holding view they are unable to price contracts fairly because of continued uncertainties in war production. Various price adjustment boards reported well up to schedule

AS A RESULT of recommendations by the heads of the war procurement agencies, President Roosevelt is expected to announce a six-month extension of the Contract Renegotiation act beyond its present expiration date, Dec. 31, 1944.

This recommendation results from the conclusion of procurement officers that they still are unable to price contracts fairly because of two contingencies.

The first is the uncertainty as to how long the war in Europe will last and, accordingly, what dollar-value of goods contractors will be able to deliver prior to the V-E day flood of contract terminations and cutbacks. The other is uncertainty as to whether costs will be increased by the institution of higher wages, possibly, as a result of such action as the White House may order in settlement of demands that the Little Steel formula be broken.

In view of their inability to discount these factors, procurement officers feel, a continuation of the price renegotiation process will be necessary to protect the government against excessive prices on war materiel.

Another reason, procurement officers feel, why price renegotiation should be continued, is the continuing large volume of business involving new weapons of war, as in rocket planes, the field of radar, etc. While new weapons are called for in fewer contracts than a year or two ago, the volume of such business, on which prices cannot be fixed fairly in advance, continues large, with a continued need for renegotiation to reduce unduly large profits.

Still another reason why renegotiation should be extended, procurement officers believe, is that the renegotiation process offers the most effective means of controlling prices paid to subcontractors.

In addition to recommending that the President extend the operation of the law by six months, it is expected that the heads of the war agencies will recommend to Congress that the law be revised so as to permit extension of renegotiation to the end of 1945.

In the first place, most contractors operate on a calendar-year basis, which would necessitate extra bookkeeping to provide data that would be required in renegotiating first half business. In the second place, renegotiation of first half income, and not that for the entire year might prove unfair to contractors; should the war end, say, in April or May, they well might show substantial profits in the first half.

The various price adjustment boards are well up to schedule; about 75 per cent of contracts have been renegotiated on 1943 income.

Steel Ingot Output Gains Noticeably in October

Steel ingot production in October totaled 7,578,304 net tons, representing 95.1 per cent of rated capacity, according to the American Iron and Steel Institute. This compares with September output of 7,193,496 tons, 93.4 per cent of capacity. In October, 1943, production was 7,814,117 tons, representing 101.2 per cent of capacity as existing at that time.

For ten months ingot production totaled 74,777,771 tons, compared with 74,209,247 tons in the comparable period in 1943.

Plate, Bar and Sheet Production Declines

Production of sheared and universal plate, hot bars and hot-rolled sheets declined slightly in September, according to the American Iron and Steel Institute.

Sheared and universal plate output was 1,011,247 net tons, compared with 1,047,554 tons in the preceding month. Shipments amounted to 990,773, against 1,003,342 tons.

Hot-rolled bar production for September was 1,003,940 tons, against 1,058,383 tons in the preceding month. Shipments were 831,316 tons, against 832,471 tons.

Hot-rolled sheet output was 1,080,938 net tons, against 1,139,406 tons in August. Shipments amounted to 555,324 tons, against 574,176 tons in the month before. Cold-rolled sheet production and shipments were up slightly.

Structural shape production was 311,898 tons, compared with 324,318 the month before.

Steel Construction Group Elects New Officers

Paul Coddington, Lakeside Bridge & Steel Co., Milwaukee, recently was elected president of the American Institute of Steel Construction at the closing session of the Institute's 1944 annual convention at Atlantic City, N. J. He succeeds Clyde G. Conley, president, Mt. Vernon Bridge Co., Mt. Vernon, O.

Other officers included T. R. Mullen Lehigh Structural Steel Co., Allentown Pa., first vice president; P. F. Gillespie, Judson-Pacific Co., San Francisco, second vice president, and J. G. Shryock, Belmont Iron Works, Philadelphia, treasurer.

Carl Blim, Utica Structural Steel Co., Utica, N. Y., was named to the board of directors. Re-elected to the board were Walter C. Conger, Truscon Steel Co., Youngstown, O.; C. A. Ballentine, Decatur Iron & Steel Co., Decatur, Ala.; R. P. Hutchinson, Bethlehem Fabricators Inc., Bethlehem, Pa.; C. A. Johnson, Bethlehem Steel Co., Bethlehem, Pa.; N. G. Lilley, Kansas City Structural

STEEL INGOT PRODUCTION STATISTICS

	Estimated Production—All Companies								Calculated weekly production, all companies Net tons	Number of weeks in mo.
	Open Hearth—		Bessemer—		Electric—		Total—			
	Net tons	Per cent of capac.	Net tons	Per cent of capac.	Net tons	Per cent of capac.	Net tons	Per cent of capac.		
Based on reports by companies which in 1943 made 98.3% of the open hearth, 100% of the bessemer and 87.9% of the electric ingot and steel for castings production										
1944										
Jan.	6,769,438	97.2	439,551	85.4	377,751	83.3	7,586,740	95.6	1,712,582	4.43
Feb.	6,410,338	98.5	409,781	85.2	368,555	87.0	7,188,674	96.9	1,736,395	4.14
March	6,976,450	100.1	455,368	88.5	388,408	85.7	7,820,226	98.5	1,765,288	4.43
1st qtr.	20,156,226	98.6	1,304,700	86.4	1,134,714	85.3	22,595,640	97.0	1,738,126	13.00
April	6,768,895	100.3	437,517	87.8	362,118	82.5	7,568,530	98.5	1,764,226	4.29
May	6,860,532	98.5	438,980	85.3	380,960	84.0	7,680,472	96.8	1,733,741	4.43
June	6,452,087	95.6	418,117	83.9	347,028	79.0	7,217,232	93.9	1,682,338	4.29
2nd qtr.	20,081,514	98.1	1,294,614	85.6	1,090,106	81.9	22,466,234	96.4	1,726,844	13.01
1st hlf.	40,237,740	98.4	2,599,314	86.0	2,224,820	83.6	45,061,874	96.7	1,732,483	26.01
July	6,723,994	96.3	415,593	80.9	334,710	73.7	7,474,297	94.0	1,691,017	4.42
Aug.	6,691,262	95.6	429,637	83.5	348,901	76.6	7,469,800	93.7	1,686,185	4.43
Sept.	6,464,631	95.6	398,028	80.0	330,837	75.2	7,193,496	93.4	1,680,723	4.28
3rd qtr.	19,879,887	95.8	1,243,258	81.5	1,014,448	75.2	22,137,593	93.7	1,686,031	13.13
9 mos.	60,117,627	95.7	3,842,572	84.5	3,239,268	80.8	67,199,467	95.7	1,716,900	39.14
Oct.	6,822,670	97.5	420,108	81.6	335,126	73.7	7,578,304	95.1	1,710,678	4.43

Percentages of capacity operated in 1944 are calculated on weekly capacities of 1,572,758 net tons open-hearth, 116,182 tons bessemer and 102,350 tons electric ingots and steel for castings, total 1,791,287 net tons; based on annual capacities as of Jan. 1, 1944, as follows: Open-hearth 82,223,610 net tons, bessemer 6,074,000 tons, electric 5,350,880 tons. Beginning July 1, 1944, the percentages of capacity operated are calculated on weekly capacities of 1,580,042 net tons open hearth, 116,182 net tons Bessemer and 102,757 net tons electric ingots and steel for castings, total 1,798,981 net tons; based on annual capacities as follows: Open hearth 82,604,600 net tons, Bessemer 6,074,000 net tons, Electric 5,372,150 net tons.

Steel Co., Kansas City, Kans.; N. R. Patterson, Patterson Steel Co., Tulsa, Okla., and Mr. Mullen and Mr. Shryock.

Voters Approve Laboratory

By a margin of nine votes, citizens of Brecksville, O., last week approved the proposed building in the municipality of a research laboratory by the B. F. Goodrich Co., Akron, O. Final recount of the vote showed 488 in favor of the project and 479 opposed. A majority was needed.

Warehouse Association To Meet in Pittsburgh Dec. 1

Third annual war conference of the Steel Products Warehouse Association Inc. will be held in Hotel William Penn, Pittsburgh, Dec. 1, W. E. Thoresen, Great Western Steel Co., Chicago, president of the association, announced last week. Program plans bear strongly on the discussion of subjects of special interest and importance to steel distributors and mill sales executives in the reconversion and postwar period.

Following a morning session devoted to association business, subjects scheduled for afternoon presentation by outstanding authorities from the steel industry and concerned government agencies will cover warehouse operations under war controls; price ceilings; steel controls in the reconversion period.

Closed Shop Ban Approved In Florida, Arkansas

Proposal to ban the closed union shop in Florida received approval of voters in that state in the election last week. Similar proposal in Arkansas was expected to be approved although the vote count had not been completed late in the week. A like proposal in California was voted down.

In Florida the vote of the state's 1480 precincts was 116,723 for the amendment, and 103,383 against. In Arkansas the proposal was ahead by 10,000 votes with about 60 per cent of the state's precincts reported.

Amendments in all three states provided that no person can be denied employment because he is or is not affiliated with a labor organization.

OPA Expects To Move Promptly When War Ends

Questions manufacturers of refrigerators and washing machines on costs during reconversion period.

OFFICE of Price Administration continues to believe it will be able to act promptly on reconversion pricing when the war in Europe ends. In view of the Army's attitude that the war will not end soon, OPA is striving to improve its approach on this problem in the meantime.

The agency now has two major moves in process. Supplementing discussions recently at industry advisory committee meetings, it has directed questionnaires to manufacturers of certain household goods, such as refrigerators and washing machines. To fill in these questionnaires, these manufacturers will have to get best estimates of manufacturing costs during the reconversion period from the makers of components.

This inquiry may be extended later to other household goods manufacturers, such as vacuum cleaners and clocks, and also to automobile builders.

OPA also is working on a plan whereby the task of reconversion pricing on all sorts of miscellaneous goods will be decentralized to the 93 OPA offices throughout the country.

Price Schedule Covering Government Sales Revised

Several changes in the order establishing price ceilings for federal government sales of all commodities except food were announced last week by the Office of Price Administration. A standard adjustable pricing provision has been added, permitting government agencies entering into long-term contracts to specify that prices may be increased up to the levels existing at time of delivery.

Expenses already incurred by the government for the installation of new and used commodities may be added to existing ceilings for these commodities when they are sold "in place."

CMP Limit on Minor Capital Additions Raised to $500

Governmental agencies and institutions will be able to obtain minor capital additions costing up to $500 under the provisions of Controlled Materials Plan regulation 5A as amended last week by the War Production Board. The limit previously had been $100.

POSTWAR PREVIEWS

SMALL BUSINESS—Government will continue to offer special services for small companies, including financing, engineering service, contract termination and settlement, and acquisition of surplus property, after the war. See page 75.

MISSION TO CHINA—American industrialists on way to Orient to aid China bolster war production of metals and alcohol. May lay foundation for postwar industrialization. See page 78.

RENEGOTIATION—Act will be extended for six months beyond present expiration date of Dec. 31, 1944. See page 82.

RECONVERSION PRICING—OPA questions household durable goods manufacturers on costs during reconversion period. See page 83.

SURPLUS PROPERTY— Easy terms of financing to be offered potential purchasers of excess property. Surplus tools, plants listed. See pages 84, 86.

BRITISH DEMOBILIZATION—White paper reveals plans for releasing servicemen after war with Germany ends. See page 87.

POSTWAR EMPLOYMENT— Development of new products holds promise for jobs for many. Research authority suggests special concessions be allowed for development work. See page 102.

FORGING TOOLS— Continuous retooling and development in forging necessitated by innovations in shell. Many beneficial changes in design of tools for pierce-bottom-and-draw method tend to prolong its usefulness. See page 108.

CUTTING FLUIDS— Necessary adjunct to full performance of metal-cutting tools in any program for peak output, cutting fluids will be selected with greater care by those who know their origin and development. See page 122.

STEELMAKING—AIME group finds basic brick for open-hearth steel furnaces key to future economies through easier slag removal, less expensive replacement, and consistent reduction in down time. See page 134.

Liberal Financing Terms To Be Offered Surplus Property Buyers

Lack of ready cash will not be barrier to purchases. Reconstruction Finance Corp. and Smaller War Plants Corp. will extend loans. Government orders prefabricated portable steel buildings to store equipment until it can be sold

LACK of ready cash is not seen in Washington as a barrier to the acquisition of surplus government-owned machine tools and other industrial equipment. A primary objective in the surplus property disposal program is making this property available to bolster the economy during the immediate reconversion and postwar periods.

Among the objectives listed by Congress in a preamble to the recently enacted Surplus Property Disposal act were these: "To facilitate the transition of enterprises from wartime to peacetime production and of individuals from wartime to peacetime employment," "to effect broad and equitable distribution of surplus property," "to foster the development of new independent enterprise," and "to promote production, employment of labor, and utilization of the productive capacity."

The matter of income to be derived from the sale of surplus property is confined to the very last of the 20 objectives listed and is conservatively worded: "To obtain for the government, as nearly as possible, the fair value of surplus property upon its disposition."

All government agencies having to do with surplus property disposal understand fully the wish of Congress that this property be disposed of primarily to create economic well-being. All of them understand that in event of an economic breakdown during the reconversion and postwar periods they will be investigated to determine to what extent they may have failed to carry out the will of Congress.

As far as manufacturers are concerned the matter boils down substantially as follows: If a manufacturer wants surplus government-owned equipment, and can give assurance that he will use it for productive purposes, involving employment of labor, the chances are all in favor of his obtaining it on pretty much his own terms. The fact that he does not have much cash should not deter him from making his needs known.

He can go direct to the nearest regional office of the Defense Plant Corp., the agency which handles the disposition of surplus industrial equipment, or he can go to the Smaller War Plants Corp.

If he goes to the Defense Plant Corp., he can finance his purchase on liberal terms, preferably with a private bank but, failing that, with the Reconstruction Finance Corp. regional office, usually in the same building with the Defense Plant Corp. regional office.

Reconstruction Finance Corp. recently authorized its regional representatives to arrange easy-payment terms on Defense Plant Corp. sales as follows: Down payment of not less than 15 per cent, and payment of the balance over not more than five years, with 4 per cent interest charged on unpaid balances. Regional representatives are authorized to exercise their discretion in fixing terms within these limits on sales involving up to $100,000.

RFC May Grant Easier Terms

But the RFC has authority to grant still easier terms if in its judgment they are warranted. In those cases where buyers need special consideration, the regional representatives have instructions to refer particulars to headquarters in Washington. The chances are that if the terms of payment offered are at all reasonable, the deal will be speedily concluded and the prospective buyer will get his equipment.

Should the prospective buyer strike a snag in his dealings with the Reconstruction Finance Corp., which appears quite unlikely, he should be able to get any necessary financial assistance from the Smaller War Plants Corp., which also has regional offices in cities all over the country.

"The Smaller War Plants Corp.," reads the act, "is hereby authorized to make or guarantee loans to small business enterprises in connection with the acquisition, conversion, and operation of plants and facilities which have been determined to be surplus property, and, in co-operation with the disposal agencies, to arrange for sales of surplus property to small business concerns on credit or time bases."

The term "small business," as viewed in the light of current policies of the Smaller War Plants Corp., with the approval of Congress, may be defined to include all companies smaller than the largest companies in their respective industries. As has been stated on numerous occasions, the term "small business" would include substantially all companies in the electrical field outside of General Electric and Westinghouse, most of the steel companies, etc. Therefore, the vast majority of all companies are warranted in bringing their financial and other problems to the Smaller War Plants Corp.

In the belief, widely prevalent in Washington, that prosperity in the reconversion period will depend to a large extent on utilization of government-owned surplus tools, the Defense Plant Corp. is taking steps to make it easy for prospective buyers to pick out the tools and equipment they will need. In a double-barrelled move to facilitate plant clearance upon contract termination, and at the same time allow prospective buyers to inspect surplus equipment, the Defense Plant Corp. has placed contracts for 600 prefabricated portable steel buildings,

Excess construction implements, owned by the Defense Plant Corp., are offered to buyers at a public auction in Waukesha, Wis. The excess material was sold for DPC by the Agricultural Adjustment Administration, and reportedly was the first public auction conducted by that agency. NEA photo

with galvanized, removable, sheet steel end and side panels, 100 with American Rolling Mill Co. and 500 with Great Lakes Steel Corp. These will be 20 x 100 feet and will contain about 6½ tons of steel each. They will have a total of 1,200,000 square feet of floor space.

The plan is to locate these buildings on parking lots, paved streets, driveways, etc., adjacent to plants with terminated war contracts, placing in them the surplus idle equipment removed from those plants. There the prospective buyers can look it over, and the Defense Plant Corp. will have experienced equipment men on hand to answer questions, make demonstrations and handle sales and shipping details.

Some of these plants will be located in and around Detroit. Indianapolis, Cleveland, Buffalo, New York and Dayton at present are immediate tentative locations. The Defense Plant Corp. contemplates placing contracts for more buildings of this type to contain an additional 8,000,000 square feet of floor space.

These buildings are intended for storing and showing of standard machine tools and other heavy equipment of the types that can stand handling; the buildings will be equipped with cranes and other necessary apparatus. For delicate precision equipment, fully enclosed, heated buildings will be provided.

Altogether the Defense Plant Corp. expects to have some 500,000 machine tools and other heavy equipment items for disposal. This total includes not only a large number of units already rendered surplus and idle, but large numbers of tools still engaged on war work but which will be available for delivery to buyers immediately after they are no longer needed in the war effort.

Price Levels Established

Whereas terms of payment, as outlined above, are flexible and subject to discussion, prices are not subject to variation. Prices on machine tools, for example, may not deviate from the terms of the regulation issued by the Surplus War Property Administration on July 13, 1944 (see STEEL July 24, p. 60).

Under this regulation standard machine tools that have been in the government's possession less than one month may be had at 90 per cent of the original cost to the government. Additional depreciation when the tools have been in the government's possession one month or more is charged off at the rate of 2½ per cent per month for the first six months, 1 per cent per month for the next four months, and 0.8 per cent per month for the next 26 months.

This is the price schedule on tools sold to a purchaser or lessee who has the tools in his own plant and thus has the advantage of being fully acquainted with them. Other buyers are allowed an additional deduction of 5 per cent in compensation for their trouble in locating the tools that they want.

The price schedule cited above applies to basic standard machine tools only.

RFC Lists Surplus Tools for Sale

Regional offices also prepared to answer questions and con negotiations for disposal of complete plants which are or become surplus property

RECONSTRUCTION Finance Corp., Surplus War Property Division, has issued a catalog listing 804 surplus machine tools now offered for sale by that agency. Copies may be obtained from the 23 regional offices of RFC located in 23 principal cities. Each listing sets forth a brief description of the machine or machines offered and indicates the particular RFC regional office where full particulars may be obtained.

To simplify matters for prospective buyers, the latter may make inquiry of the nearest RFC office which, in turn, will obtain full details from the particular regional offices holding the machines in which buyers are interested. The catalog also contains complete details as to the formula by which prices on these surplus machine tools may be computed.

Operations Highly Decentralized

"It is extremely important to emphasize that disposal operations are highly decentralized, and that all inquiries concerning RFC surplus war property should be directed to the appropriate RFC Loan Agency office, rather than writing to Washington," Hans A. Klagsbrunn, deputy director of surplus war property for RFC, has stated to STEEL.

"The catalog of surplus machine tools contains brief information as to the size and make of the machinery which is for sale. The appropriate regional offices have much more detailed information about these tools and are in a position to obtain further detailed information on request. In addition to the information on the surplus tools, these regional offices have lists of machine tools which are idle in various plants, but which have not yet been declared surplus by the service sponsoring their use. Detailed information about each of these so-called 'available' tools can be obtained by a regional office on request, and an endeavor will be made to obtain from the sponsoring service a release of any specific tools which any person may wish to acquire."

Mr. Klagsbrunn also emphasizes that the RFC regional offices are in a position to answer questions and to conduct negotiations relative to the disposal of complete plants now offered for sale. These plants are listed in a 153-page catalog; the list includes both plants that are idle now and those which still are used for war production and will become available for other uses at a later date. The purpose in publishing all of these listings at this time is to enable prospective buyers to begin making arrangements at the earliest possible time so as to make full use of these plants in the approaching reconversion peri

Copies of this catalog may be ob by interested parties from the RF gional offices.

"Many of these plants," says Klagsbrunn, "are in full war produ and current operations in them c be disturbed until the war work is pleted. But we are willing to u take negotiations now with the in possession, and with other inte persons, relative to disposal of plants, subject to their continuing i production.

"We are also currently disposi some of our machine tools to lesse possession while they are still being in war production, subject to the dition that the tools be kept on work as long as may be necessary."

The RFC regional offices to whic quiries for surplus machine tool plants may be addressed are locate Atlanta, Ga.; Boston; Charlotte, N Chicago; Cleveland; Dallas, Tex.; ver; Detroit; Houston, Tex.; Kansas Mo.; Los Angeles; Minneapolis; Orleans; New York; Omaha, N Philadelphia; Portland, Oreg.; Richm Va.; St. Louis; Salt Lake City, U San Antonio, Tex.; San Francisco; Seattle.

Shift in Television Range Would Delay Availability

If the proposal to shift television f its present channels to a higher ra in the frequency spectrum is adopted would take five years or more to engi the necessary equipment and to that tent delay progress in the reconvers and postwar era, Dr. C. B. Jolliffe, Ra Corp. of America, has advised the F eral Communications Commission.

If television is conducted at a posit below 300 megacycles in the wave-leng band, he said, sight-and-sound broadca ing for the public will become a real immediately after the war. RCA n has in the design stage all the equipme that is necessary to provide televisi broadcasting service and good televisi service in the home, he added.

The frequency area above approximat ly 450 megacycles, he recommende should be assigned to experimental deve opment of television, including col broadcasting. In the meantime, whi this experimental work goes on, the pre ent limited system, operating in Ne York, Philadelphia, Schenectady, Chicag and Hollywood, can be expanded an improved greatly if the commission wi reaffirm standards and allocate adequat channels.

Britain Plans Reallocation of Manpower After Germany's Defeat

No general demobilization of the armed forces or of war industry proposed. Release of men from services planned in step with requirements of changed situation. Two methods to be employed for effecting change in setup

COPIES of a British white paper which have reached this country reveal that whereas there will be no general demobilization of the armed forces or of war industry in Great Britain after the fall of Germany and up to and including the defeat of Japan, there will be a "reallocation of manpower between the forces and industry in order best to provide for the requirements of the changed situation."

"It will be necessary to continue compulsory recruitment of men for the forces in order to bring relief to the men who have served for long periods, and enable some of them to return to their homes," says the white paper. "It will also be necessary to maintain the requisite control over industry and labor during the interim period in which there will continue to be heavy and over-riding demands for munitions of war and other essential production."

Until the requirements for continuing the war against Japan and for garrisoning occupied countries are finally known, it will be impossible to determine on final figures, says the report, but it is clear that reallocation of manpower will be possible on a substantial scale. Two methods will be employed in selecting men for return from the forces. Those selected according to age and length of service will be in one group known as class A. Those selected because of their qualifications for urgent reconstruction work will form a second group identified as class B.

Class A Formula

In making selections for class A, the combination of age and length of war service will be on the basis that two months of service is equivalent to one additional year of age. Thus, a man 22 years old with four years of service would be in the same release group as a man 40 years old with one year's service; and a man 24 years old with four years of service would be in the same group as a man 30 years old with three years of service. Exception is made of men of 50 years and over who will be treated as a priority class to be released before other men.

Men in class A will begin to be released as soon as practicable after Germany's defeat.

AVIATION CONFERENCE: Here is the British delegation to the international civil aviation conference at Chicago. They are, left to right: G. G. Fitzmaurice, W. C. G. Cribbett, Sir Arthur Street, Lord Swinton, chairman of the delegation, Sir George London, J. H. Magowan, and A. J. Walsh

Men in class B to be transferred from the forces will be those belonging to particular occupational groups specified as urgently needed for reconstruction employments.

"It is essential to the scheme," says the white paper, "that there should be a clearly marked difference in the treatment of men released in class A in their turn, and of men transferred to class B out of their turn. Accordingly, the terms applying to the two classes will be sharply differentiated as follows:

"CLASS A

"(1) On release they will be given eight weeks' leave with full pay, ration allowances and, where applicable, family allowance, dependents allowance and war service grant. Payment will be made on the day of release, the remainder being paid at regular intervals. These payments will be given to assist in resettlement. In addition to the period of eight weeks, men qualified will be given a further period of leave and payments as set forth respecting foreign service.

"(2) At the expiration of leave as in (1) above, they will be placed in a special class of reserve from which they would be recalled only in extreme emergency.

"(3) They will be permitted to exercise their reinstatement rights and go back to their former employment. If they have no jobs to which to return, employment exchanges will give them every assistance in finding employment and will not, during the period in which they are receiving the regular service payments, regard them as subject to any powers of direction which are otherwise generally operative.

"CLASS B

"(1) On transfer, they will be given three weeks' leave with full pay, ration allowance and, where applicable, family allowance, dependents allowance and war service grant, and will then be placed to reserve. Payments due on account of foreign service will be held in suspense until the end of the war.

"(2) They will be directed to their reconstruction employments.

"(3) They will be liable to be recalled individually to the forces if they discontinue their reconstruction employment.

"(4) Men selected for transfer in Class B will not be transferred against their wish, but it will be open to them, if they so desire, to wait their normal turn for release in Class A. Once, however, a man has been transferred in Class B, he will not subsequently be eligible to apply for inclusion in Class A."

Agreement Reached on Procedure For Surplus Property Disposal

Government agencies declare all procedures prescribed by them and which were in effect on Oct. 3, 1944, remain in full force until superseded by self-operative provisions of Surplus Property act or by rules issued by Surplus Property Board

A UNIFORM decision has been reached by government agencies regarding the proper procedure to be followed in the disposal of surplus property. This largely dispels the confusion which had existed following enactment of the Surplus Property Disposal Act on Oct. 3, 1944.

Officials had been uncertain as to how surplus property operations were to be conducted pending appointment of the Surplus Property Board, which will supersede the Surplus War Property Administration and will have general supervision and direction over surplus property.

To avoid the interruption of these operations, Congress has recognized the necessity for the continued effectiveness, until superseded by regulations of the board, of all policies and procedures relating to surplus property prescribed by the SWPA and the owning and disposal agencies which were in effect when the act was signed on Oct. 3, 1944, and which were not inconsistent with the act.

General Policy Statement

The joint statement issued by the government agencies and approved by W. L. Clayton, surplus war property administrator, lists the provisions of the act which are considered to be self operative and which, therefore, became effective as soon as the act was signed. It also lists those provisions of the act which will not become effective until the issuance of regulations by the board and which, therefore, are not inconsistent with existing policies and procedures of the SWPA and the respective owning and disposal agencies in effect on Oct. 3, 1944.

Among the provisions of the act which are considered to be effective now and under which operations are being conducted, pending appointment of and issuance of regulations by the Surplus Property Board, are the following:

No disposal will be consummated of any harbor or port terminal, any airport, or any power transmission line.

The plants and facilities (not including any plant which cost the government less than $5 million) in the following categories will not be disposed of until the board has made a report to Congress, except as to materials or equipment (including machine tools) if such properties are not necessary for the operation of the plant in the manner for which it is designed and except as to government-owned structures or other property operated as an integral part of a privately owned plant and not capable of economic operation as a separate and independent unit: Iron and steel, aluminum, magnesium, synthetic rubber, chemical, aviation gasoline, pipe lines and facilities used for transporting oil, and patents, processes, techniques and inventions, except such as are necessary to the operation of the plants and facilities listed above.

Machine Tools Provision

It was noted that machine tools, comprised in surplus plants, will not be sold under Surplus War Property Administration Regulation No. 3 if the plants in which they are located are in the abovementioned categories, unless the tools are "not necessary for the operation of the plant in the manner for which it is designed," or unless the property is exempted because it is "an integral part of a privately owned plant and not capable of economic operation as a separate and independent unit."

Property listed in the following categories may continue to be disposed of under authority contained in existing regulations of the SWPA, inasmuch as such regulations are not inconsistent with the authority conferred by the act upon the board to dispose of such property without qualification: Aircraft plants and facilities and aircraft and aircraft parts, shipyards and facilities, transportation facilities, and radio and electrical equipment.

Whenever any disposal agency shall begin negotiations for the disposition to private interests of a plant or other property, which cost the government $1 million or more, or of patents, processes, techniques or inventions, irrespective of cost, the disposal agency must notify the attorney general of the proposed disposition and the probable terms or conditions thereof. This provision is for the purpose of determining whether the proposed disposition will violate the antitrust laws.

Another section of the act which is considered to be presently effective requires certain strategic minerals and metals, not required for war production, to move directly from the owning agencies to the Treasury Procurement Division for addition to the stockpile authorized by the Act of June 7, 1939, as amended, after the War Production Board has taken prescribed action.

As summarized in the statement, all policies and procedures relating to su plus property prescribed by the SWP or by any of the agencies joining in th statement (War, Navy and Treasury d partments, Maritime Commission, R construction Finance Corp., Foreign Ec nomic Administration, and the War Fo Administration), which were in effect Oct. 3, 1944, and the authority of t respective owning and disposal agenci prescribed thereunder, remain in f force and effect unless and until supe seded by regulations prescribed unc the act except to the extent specifica described in the statement.

Krug Asks Steel Warehous To Maintain Ample Stocks

General steel warehouse industry h been asked by J. A. Krug, chairman the War Production Board, to see th their warehouses are sufficiently stock to allow the smaller manufacturer obtain his share of steel during the r conversion period. WPB is studying t best procedure to follow under CM regulations to enlarge warehouse stock

Mr. Krug stressed at a recent meeti of the industry's advisory committee t responsibility of the general steel wa house industry to the smaller manufa turers, who will have an important ro in the transition from war to peacetim production. Industry representatives r ported that they were unable to bui stocks under present provisions of ord M-21-b-1, which provides that distribu tors can order only enough steel to re place sales made from stock. If stock are to be increased, distributors shou be permitted to order for delivery durin the first and second quarters of 194 some tonnage in excess of what they ar currently selling, the committee said.

At the present time, the industry selling 1,100,000 tons of general stee products per quarter, compared wit 780,000 tons sold per quarter during th first half of 1942.

OCR Organization Given Official Status by WPB

An order, outlining the organizatio and functions of the Office of Civilian Requirements, has been issued by th War Production Board. Only the posi tion and duties of the vice chairman fo civilian requirements had been estab lished.

Functions of the vice chairman are set forth in part as: Participation in the re view of plans for cutbacks in war pro grams and recommendations of the fa cilities most suitable to release in order to resume or expand production of goods and services for which he acts as claimant; specifications of the kinds and amounts of goods and services which should be provided first as resources become avail able. The order changes the status of the government division from a separate

unit under the Vice Chairman for Civilian Requirements to an OCR bureau.

Essential civilian supplies will continue to receive OCR's protection until it is clear that demand and supply are coming into balance, J. A. Krug, WPB chairman, said in outlining the functions that he believes OCR will have to perform in the public interest.

OCR will continue to see to it that sufficient supplies are maintained to meet essential civilian requirements; see to it that the products in short supply are fairly distributed to all parts of the country in accordance with essential needs; certify to the Office of Price Administration, after consultation with industry divisions, those cases in which production is being held up by need for suitable price action; watch the claims for the export of any short supplies, so as to protect the essential supplies for the United States civilian consumers.

Mica-Graphite Division, WPB, To Be Abolished

Mica-Graphite Division, War Production Board, will be abolished and its functions consolidated with the Miscellaneous Minerals Division in the Office of the Vice Chairman of Metals and Minerals, effective Dec. 2, 1944, WPB has announced.

James S. McGregor will continue as director of the Miscellaneous Minerals Division and Fred G. Rockwell will continue as a deputy director. Frank F. Watts, present deputy director of the Mica-Graphite Division, will become a deputy director of the Miscellaneous Minerals Division, and Harry D. Sharpe, assistant to the director of the Mica-Graphite Division, will become assistant to the director of Miscellaneous Minerals. M. H. Billings, director of the Mica-Graphite Division, has resigned to return to private industry. He will be associated with the Union Carbide & Carbon Co., a division of the National Carbon Co., at Niagara Falls, N. Y.

Production of Additional Electric Ranges Authorized

Additional authorizations for the production of 12,400 domestic electric ranges in the fourth quarter of this year have been issued to the following manufacturers who are able to make them without interfering with war production: A. B. Stoves Inc., Battle Creek, Mich., 3500; Frigidaire Division, General Motors Corp., Dayton, O., 6000; Newark Stove Co., Newark, O., 1000; Roberts & Mander Stove Co., Hatboro, Pa., 900; and Rutenber Electric Co., Marion, Ind., 1000. War Production Board hopes to authorize the production of a total of 88,000 domestic electric ranges this year, about 16 per cent as many as were made in the year ended June 30, 1941. Total authorizations to date aggregate 73,525 units.

PRIORITIES–ALLOCATIONS–PRICES

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

INSTRUCTIONS

STEEL DRUMS: New steel drums of more than 12-gallon capacity may be accepted by shippers until Jan. 29, 1945, for packing certain bulk foods for which the use of this type of container has been forbidden. Acceptance of the drums is subject to the 60-day inventory restriction of L-97. Foods affected are: Certain solid and semisolid compounds used in cooking, such as lard; dairy products; cold pack and frozen food products; certain hydrogenated oils, such as shortenings; jellies, jams and preserves; molasses; and syrups. Total weight of new drums used for the foregoing products for industrial orders must not exceed 25 per cent of the weight of the new steel drums used for the same purposes in 1941. Packers of the products specified above who have entered the field since the base year may apply to WPB for a quota.

INDEX OF ORDER REVISIONS

CMP REGULATIONS

CONSTRUCTION: Construction limitations applicable to certain authorized building projects have been modified in schedule A to Controlled Materials Plan regulation No. 6. The revised restrictions are applicable to all construction authorized on form GA-1456 whenever issued. The changes also apply to certain utility construction controlled by order U-1 but they do not apply to housing construction authorized by the National Housing Agency.

The amended order permits builders to use the following materials or products formerly prohibited or restricted: Steel plate; aluminum; metal lath; certain building components, such as hardware, plumbing and heating items; and certain other items manufactured from steel sheet or strip, or from copper.

Requirements that structural steel and reinforced concrete buildings be designed in accordance with WPB directives 8 and 9 has been eliminated. Former restrictions on electrical installations have been changed to a single prohibition against installation of wire and conduit of larger than the minimum required by the 1940 National Electric code. Further changes reduce the number of items of equipment required to be listed in the application form WPB-617. (CMP No. 6)

L ORDERS

PLUMBING TRAPS: Bodies of low pressure thermostatic radiator and drip traps, combination float and thermostatic traps, and boiler return traps now may be made of copper. Previously only cast iron could be used. (L-42)

CIVILIAN DEFENSE PRODUCTS: Orders L-57, 105 and 115, controlling, respectively, the manufacture and sale of gas masks and anti-gas devices for protection against enemy attack, civilian defense helmets and incendiary bomb demonstration units, have been revoked. (L-57, 105, 115)

OIL BURNERS: None of the material recently authorized for production of 30,000 domestic type oil burners during the fourth quarter of 1944 can be allocated for pot type or sleeve type vaporizing oil burners. These burners were inadvertently included in the definition of domestic type burners in order L-74, under which the 30,000 burners will be produced. The definition has been clarified by an amendment. Production of pot and sleeve type burners, although not included among the domestic type burners, is permitted under the order. (L-74)

MARINE CLEATS AND CHOCKS: Marine cleats and chocks have been removed from schedule III of the hardware simplification order, L-236, thus permitting manufacture of these items without restrictions on types and sizes. Schedule III still restricts manufacture of five kinds of marine fittings hardware to the types and sizes specified in table I through V as follows: Forged, fabricated and pipe turnbuckles; forged shackles; rope thimbles; rope sockets; and forged hoist, grab and slip hooks. (L-236)

M ORDERS

COLLAPSIBLE TUBES: Collapsible tubes now are controlled only in their use of tin. Under the amended order, tubes for purposes other than those specified are limited to no more than a 0.5 per cent content of reclaimed tin. Tubes for dental cleansing preparations may use new tin but not in excess of 3 per cent by tube weight. New tin up to 7½ per cent of tube weight is permitted for medicinal and pharmaceutical ointments and preparations, such as nasal jelly, for introduction into body orifices. New tin, per tube, is unlimited for eye ointments and other eye preparations for medical type, sulfa ointments and jellies, diagnostic extracts, morphine or hypodermic injections. A purchaser of tubes containing more than 0.5 per cent tin must certify to the manufacturer that he is familiar with the provisions of M-115. (M-115)

COATED ABRASIVE PRODUCTS: Purchasers of coated abrasive products are no longer required to file form WPB-3478 and purchasers of certain types of mechanics' hand service tools are no longer required to file form WPB-1319 to obtain specific authorization from the War Production Board. Purchases of mechanics' hand service tools are still controlled by order E-6, which requires a rating of AA-5 or better for all orders placed with tools producers, and order L-216, schedules 2 and 3, which limits production to specified patterns, types, finishes, etc., and limits use of alloy steels in production of wrenches and pliers. (M-293)

WHITE PIGMENTS: All ratings on nonmilitary orders for white pigments, which include both titanium dioxide and zinc sulphide pigments, have been canceled. Only those orders accompanied by a military certification are valid rated orders. (M-353)

PRICE REGULATIONS

SCRAP: Definition of scrap, contained in the regulation covering special sales of industrial materials, has been changed to include all material defined as "scrap" by any other OPA regulation. (No. 204)

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In other words, the Bullard "MAN-AU-TROL", for the first time in machine-tool history, adds the high-speed, low-cost production of special-purpose automatic machines to the versatility of multi-purpose, manually operated machines. In addition, the machine can be shifted to manual operation by moving a single lever.

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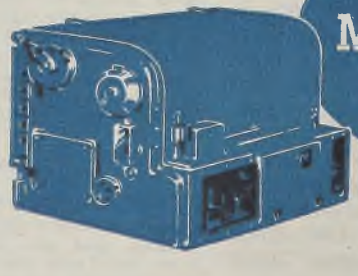

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MIRRORS of MOTORDOM

By A. H. ALLEN Detroit Editor, STEEL

Machinery moving into Detroit from upstate plants. Many new orders being placed, with deliveries of those entered more than 60 days ago going ahead. Automotive Council for War Production to continue tooling information service after the war

MACHINERY movers are doing a rush business these days in eastern Michigan, although it is still a vague matter as to just what they are moving, where from and where to. Nevertheless the most casual observer cannot fail to note the frequent passage of large trucks loaded with machine tools and other plant equipment, some of it covered with tarpaulins and some open to the weather. Particularly on North Woodward avenue is this traffic readily spotted, and most of it inbound, suggesting that some of the automotive plants upstate in the Flint, Saginaw and Bay City areas are being cleared for a changeover to civilian production. Some of the incoming equipment may be going to plants in the Detroit area, other units may be going to storage areas set up by ordnance and other procurement agencies, although little has been released officially about the establishments of such depots.

There have been extensive layoffs in at least two upstate plants, one automotive and the other not, and it is likely some equipment rearrangment is under way. Such instances should multiply rapidly over the coming months, and if anyone has a few large trucks for which he can obtain tires and gasoline, plus a crew of strong backs, he could stand to make himself a nice bit of change by going into the machinery moving business, for when the real changeover starts the demand for such service is going to be intense.

The new machinery and machine tool business currently is brisk, and scores of orders are being entered for both large and small shops. Virtually all of these orders are of the so-called "unrated" variety, that is, carrying no priority, but since there are almost no war orders for equipment being placed these days, beyond an occasional emergency machine, the fact an order is unrated is of little consequence, and deliveries currently being quoted in standard machines range from February to June. All new orders carry the customary 60-day "freeze" required by the WPB, so the earliest delivery which could be quoted would be early in January. However, deliveries are going forward on tools ordered prior to 60 days ago, which indicates that some of the motor companies' "key" requirements are slowly being filled.

Despite these few signs of reconversion activity, progress generally is painfully slow. Only a limited number of engineers are available and they are continually in danger of suddenly being pulled off a reconversion job and switched to a rush war job, making the problem of supervising and planning their activity doubly difficult. At the same time the military services are exerting extra pressure to discourage talk of industrial reconversion, and to concentrate on things like the shortages of forgings and castings reputed to be delaying the production of heavy military trucks. To reinforce their position, the services have dumped large new orders into plants producing such items as heavy guns, radar, rockets, shells, combat tanks, etc., and where a few weeks ago producers thought they could see ahead to the gradual completion of these schedules, it is not the case now.

This much can be said: Every day that passes brings the resumption of automobile production that much closer, even with the limited amount of preparatory work now possible. Sometimes the industry can furnish surprises with what it can do in the face of restrictions on time and personnel. Developments of the next couple of months will bear close watching, for the trickle of parts orders and specifications now dribbling into the trade is the forerunner of a tidal wave which will develop when the time is ripe.

General Motors lists its bill of materials covering requirements for the first lot of 500,000 cars as the following: 800,000 tons of steel, 174,000 tons of cast iron, 43,000 tons of rubber compound, 26,500 tons of glass, 43,000,000 pounds of upholstery material and 40,000,000 pounds of paint and thinner. Orders are now being readied and, particularly in the case of Fisher Body, have started to move. No release dates for initial schedules are being set, nor are finalized price arrangements concluded.

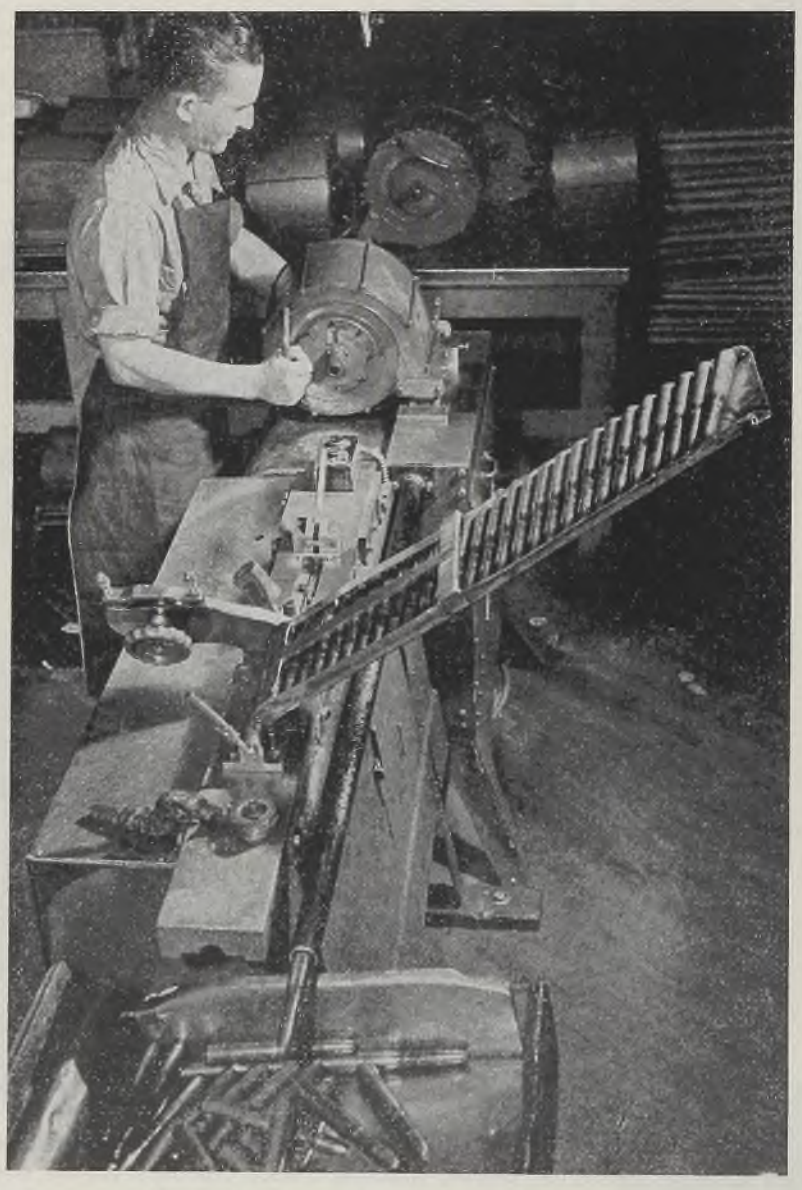
These are truly becoming busier days for layout engineers, production control, purchasing and material control experts,

TREMENDOUS TRIFLES: Col. Emerson L. Cummings, chief engineer, Office of Chief of Ordnance, Detroit, speaking before ordnance officers and employes in Detroit recently, showed four small malleable iron castings which he said have a total of 2280 uses in parts for heavy ordnance trucks (4 tons and over). He displayed the castings as examples of the "tremendous trifles", shortage of which can impede truck output

all of whom must get in their licks before the assembly lines can move.

A wartime activity of the Automotive Council for War Production—its tooling information service—will be continued in the reconversion period to assure maximum speed in acquiring tools, dies, jigs, fixtures and gages needed in passenger car production. The service is made possible by the voluntary co-operation of about 200 tool, die and fixture shops, and involves the weekly compilation of available tooling capacity of these companies. Throughout the war, the tool shops have helped out neighboring plants which have become loaded with tooling assignments or have lacked specialized equipment to complete a job. Toolmakers experiencing breakdowns of their equipment also have been given ready assistance from other shops in the group. So successful has the nationwide service proved that weeks often have been cut from tooling schedules.

Recent example of the wartime functioning of the service was a hurry-up call from Atlanta, Ga., shellmaking plant which needed 37 dies for the production of a lot of 400,000 shell carriers. The dies had to be designed and produced in six weeks and a thorough canvass of all facilities in the south proved unproductive. The tooling information service of the ACWP was able to provide the necessary source for the dies.



FIRING LINE: This Oerlikon gun feed is given its first test at the Electric Auto-Lite Co., Cincinnati. The gun feed here is loaded with steel cartridges which are fired by a spring mechanism. Note the shell emerging from the pipe in the foreground. As the last shell is fired the gun feed automatically cocks the gun so it is ready for the next magazine

Postwar expansion of Studebaker Corp. will be financed out of current cash, and efforts have been made to insure advance engineering planning being sufficiently flexible to conform with the uncertainty of the time and manner of the war's end, according to information recently disclosed at South Bend, Ind., by company officials.

R. E. Cole, vice president in charge of engineering, explains, "We don't have just one postwar plan, we have many. Why? Because we don't know when Germany will quit. If, for example, Germany should fall tomorrow, we'll resume manufacture on the same models we were turning out before the war. Suppose the war with Germany is still prolonged the resumption of production on a brand new model can be accomplished as quickly as on 1942 models. We've planned for that too."

R. A. Vail, vice president in charge of manufacturing, observed that reconversion problems are not too different from those faced in the conversion to war production since the three principal factors to be dealt with are familiar ones—facilities, materials, men.

Hydraulic Equipment Pioneer

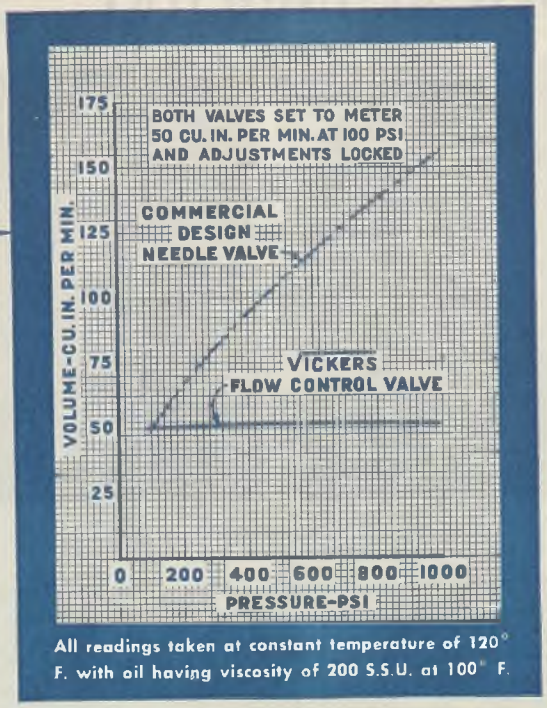
For over a quarter of a century one of the pioneers in the field of hydraulic equipment for automobiles and later railroad equipment has been the Monroe Auto Equipment Co., Monroe, Mich. The company has probably one of the youngest executive families now of any in the parts field, the three McIntyre brothers respectively 39, 37 and 32. Wartime demands have boosted the company's business from a level of around $4,500,000 in 1941 to $10,000,000 in 1943 and probably $15,000,000 this year. Employment concurrently has lifted from a prewar level of around 900 to the present 1500, of which 600 are women.

Shock absorbers built by Monroe have been adapted to jeeps, scout cars, armored vehicles and tanks, while one of its latest designs, a vertical triple-action type, is being used on a new type of heavy truck. Development work on shock absorbers led to the design of a special type of seat for tanks and trucks, cushioned by a hydraulic cylinder, which is now being tested by most of the leading truck builders.

Another new Monroe product now undergoing tests is a new type of oil pump for automotive engines which the company thinks it can supply at a 20 per cent saving over former types of pumps. The design makes use of a cast iron body with a compressed and sintered rotor of powdered metal of the oilite type.

In 1936 the company installed the first hydraulic shock absorber ever used on railroad cars, equipping the streamlined Hiawatha of the Milwaukee road. Since then most of the new streamlined passenger cars have been similarly equipped, and work is now in progress on adapting them to freight cars. Large postwar market is seen for them.

CONSTANT FLOW RATE REGARDLESS OF VARIATIONS IN FLUID PRESSURE



All readings taken at constant temperature of 120° F. with oil having viscosity of 200 S.S.U. at 100° F.

Automatic Pressure Compensation

Adjustable Overload Pressure Protection

VICKERS
FLOW CONTROL AND OVERLOAD RELIEF VALVES

In hydraulic control systems, this valve combines the functions of a flow control valve with an automatic relief valve to save space and simplify installation. It maintains a constant "metering-in" flow rate (for a given setting of the control adjustment) regardless of any variation in imposed fluid pressure resulting from changes in work resistance. Pump operates only at pressure required to do the work at hand; relief valve is independently adjustable and limits the maximum system pressure to any desired value.

This valve combines in one unit the means for accomplishing three independent functions: (1) adjustable control of flow rate in the hydraulic circuit, (2) adjustable overload pressure protection in the hydraulic system, and (3) remote "Start and Stop" control when used with suitable pilot valve. See Bulletin 40-22 for complete information. Vickers Application Engineers will gladly discuss with you how "hydraulics" can be used to your advantage.

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

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CONSTANT DELIVERY PUMPS | FLUID MOTORS | DIRECTIONAL CONTROLS | VOLUME CONTROLS | PRESSURE CONTROLS | CONTROL ASSEMBLIES | VARIABLE DELIVERY PUMPS

MEN of INDUSTRY

PAUL JAMES

LYLE E. HILL

FRANK H. STOHR

GUY W. DAVIS

Paul James has been named district manager of the Syracuse, N. Y., office of Lincoln Electric Co., Cleveland, and **E. L. Smith** has been made manager of the company's Rochester, N. Y., office, succeeding Mr. James. **George S. Stevens** has been transferred from the factory at Cleveland to Charlotte, N. C., as field representative and engineer.

—o—

E. Bowers Ayres Jr. and **P. Kay Schwartz** have been elected vice presidents, Proctor & Schwartz Inc., Philadelphia, and **Walter S. Corson** has been elected treasurer. Both vice presidents have been directors of the company for some time; Mr. Corson has been named a director.

—o—

Arch A. Warner, formerly works manager, Mechanics Universal Joint division of Borg-Warner Corp., Chicago, has been elected president and general manager of the corporation's Rockford Drilling Machine division, succeeding **E. C. Traner,** who has retired from active direction after 25 years of service.

—o—

John D'Agostino, until recently a member of the Brazilian Military Commission purchasing staff in Washington, has been appointed South American representative of Simmons Machine Tool Corp., Albany, N. Y. Mr. D'Agostino will make his headquarters at offices of Simmons' South American agent, Mesbla S. A., Rua de Passeio No. 48, Rio de Janeiro, Brazil.

—o—

Porter R. Wray, who has been associated with United States Steel Corp. subsidiaries since 1934, and for the past year assistant to the chief metallurgist of the Duquesne plant, Carnegie-Illinois Steel Corp., has been appointed manager of the Carnegie-Illinois alloy bureau, metallurgical division, Pittsburgh district.

—o—

Sterling Alloys Inc., Boston, has announced appointment of the following field engineers: **John Sonnenfeld,** 206 North Seventh street, Keokuk, Iowa, to handle Missouri, western Iowa, southern Illinois, Kansas and Nebraska; **A. C. Woolley,** Terminal Sales building, Portland, Oreg., to cover Oregon and Washington, and **G. Dell,** 314 West Bloom street, Louisville, Ky., for Kentucky and southern Indiana, including Evansville.

—o—

Lyle E. Hill, who for two years has served Caterpillar Tractor Co., Peoria, Ill., as a priorities supervisor and special traveling representative of the purchasing department, has returned to the company's engine sales department as head of the railroad power division.

—o—

Omer L. Woodson, for the past five years vice president of Bell Aircraft Corp., Buffalo, and since 1942 general manager of its Marietta, Ga., bomber plant, has been appointed vice president and general manager, Ryan Aeronautical Co., San Diego, Calif. He has a background of 27 years in aviation, in 1936 being named assistant chief engineer for Curtiss-Wright Corp., New York.

—o—

William J. Kelly, president, Kelly O'Leary Steel Works Inc., Chicago, has been elected president of the Consumers Co., Chicago, effective Dec. 1. He will retain his interests in the former company. Mr. Kelly is also president of the Machinery and Allied Products Institute.

—o—

David Van Alstyne Jr., senior partner of the investment firm of Van Alstyne Noel & Co., New York, and **A. D. Armitage,** president, J. H. Williams Co., Buffalo, have been elected directors of Buffalo Bolt Co., North Tonawanda, N. Y.

—o—

Herman F. Zorn has been elected president, The V & O Press Co. Inc., Hudson, N. Y., succeeding **Thomas I. Shriver,** who resigned to become chairman of the board.

—o—

Arthur P. Emmert, former vice president in charge of manufacturing, Warner Gear division, Borg-Warner Corp., Chicago, has been named president of the division, succeeding **C. S. Davis,** who has retired to devote his entire time to the parent corporation. **E. S. Russey** has been named vice president of Warner Gear division, and **J. O. Moore** become works manager.

—o—

Joseph B. Elliott, general sales manager, Schick Inc., has been appointed vice president in charge of sales and advertising. **L. H. Simmonds** has been named vice president and general manager, Schick Service Inc.

—o—

R. W. Owens, who joined Elliott Co., Jeannette, Pa., last February as assistant to the president, has been elected vice president in charge of manufacturing. **Frank H. Stohr,** previously manager of the industry sales department, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., succeeds Mr. Owens as assistant to the president of Elliott Co.

—o—

Guy W. Davis has been appointed to make a survey of Latin American markets for Addressograph-Multigraph Corp., Cleveland, as special representative of **D. E. White,** vice president of the corporation. **D. C. Adams** becomes manager, Cleveland export department.

—o—

Roy Utley has been named head of the service department, De Soto Motor Corp., Detroit. Previously he had been in charge of Chrysler Corp.'s tank training school.

—o—

Kingsford E. Graburn has been elected president, Pittsburgh Coal Co. Ltd., wholly owned Canadian subsidiary, Pittsburgh Coal Co., Pittsburgh. Mr. Graburn, who has been vice president of the subsidiary for a number of years, succeeds the late Percy F. Ballou.

—o—

Dr. Alexander J. Allen has been appointed Westinghouse graduate professor of engineering, University of Pittsburgh. The establishment of a graduate professorship in engineering marks another development in the work-study plan sponsored by Westinghouse and the University of Pittsburgh.

—o—

John J. Davis Jr., recently appointed manager of railroad materials sales for Carnegie-Illinois Steel Corp. in Chicago, has announced appointment of **John A.**

D. C. ADAMS

JOHN B. MORROW

R. W. OWENS

M. J. SANDLING

English Jr. as assistant manager. **Marcus L. Aurelius**, formerly Chicago office sales engineer, has been named assistant to manager of sales, railroad materials and commercial forgings division, Pittsburgh.

—o—

Gerald J. Leuck has been appointed director of research, Glyco Products Co. Inc., Brooklyn, N. Y. Previously Dr. Leuck was associated with The Miner Laboratories, Chicago. In his new post he will form a new research and development laboratory for Glyco Products.

—o—

Ralph Kelly, president, Baldwin Locomotive Works, Eddystone, Pa., has been elected a director of General Steel Castings Corp., Eddystone.

—o—

Ralph Woodward has joined B. C. Ames Co., Waltham, Mass., as sales engineer. Previously he was associated with Norton Co., Worcester, Mass.

—o—

Theodore S. Bonnema, formerly production manager, Oster Mfg. Co., Cleveland, has been made vice president in charge of production, and **Lester D. Martin**, previously comptroller, has been named treasurer.

—o—

Arthur H. Hanks has been made superintendent of the cold drawn department, Dunkirk, N. Y., plant, Allegheny Ludlum Steel Corp. Mr. Hanks, formerly assistant superintendent, succeeds the late E. H. Highley.

—o—

Allison C. Neff, former manager in Cleveland for Ohio Corrugated Culvert Co., Middletown, O., has been appointed manager of the central division, Armco Drainage & Metal Products Inc., whose parent company, American Rolling Mill Co., Middletown, recently purchased physical assets of Corrugated Culvert. Mr. Neff is president of the Cleveland Society of Professional Engineers.

—o—

A. O. Bates, for 14 years plant manager at Parker Appliance Co., Cleveland, has joined **R. P. Rosenberry** to form a new firm, Ray P. Rosenberry & Alfred O. Bates Inc., Cleveland, management and production consultants, with offices in the Terminal Tower building. Mr. Rosenberry is a partner in the firm of Rosenberry & Zaebst, public accountants and tax consultants, and is president, Straehle Machine Products Inc.

—o—

John Bain Morrow, president, Pittsburgh Coal Co., Pittsburgh, has received the Percy Nicholls Award of the American Institute of Mining and Metallurgical Engineers which is given annually for "notable scientific or industrial achievements in the field of solid fuels."

—o—

Harry S. Cooper, president, Cooper Screw Mfg. Co., Los Angeles, has been appointed to the OPA national screw industry advisory committee.

—o—

R. E. Shafer has been appointed sales manager, Wheland Co., Chattanooga, Tenn., and **R. S. Henry** has been named purchasing agent.

—o—

M. H. Corbin has been elected a director of Standard Varnish Works, Port Richmond, N. Y., and has been appointed vice president in charge of sales of both the New York and Chicago divisions.

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Charles N. Kane has been made manager of the New York zone, Pontiac division, General Motors Corp., Detroit, succeeding **M. C. Thompson**, who becomes assistant general sales manager.

—o—

Daniel W. Talbott, formerly plant superintendent, Symington Gould Corp., Rochester, N. Y., has been appointed general manager, Cooper Alloy Foundry Co., Hillside, N. J.

—o—

Frank E. Ross has been appointed assistant in the western regional office of the Aircraft Manufacturers Council and its parent organization, the Aeronautical Chamber of Commerce. For the past year Mr. Ross has been director of information, Aircraft War Production Council.

—o—

Westinghouse Electric Supply Co., New York, has announced appointment of **Charles H. Whiteacre** as stores manager for the New England district, and of **J. R. Bostwick** as manager of the southwestern district stores, with headquarters in Dallas, Tex.

—o—

M. J. Sandling, formerly vice president and sales manager, Howell Electric Motors Co., Howell, Mich., has joined Reliance Electric & Engineering Co., Cleveland, as representative in western Michigan, with headquarters in the Pythian building, Kalamazoo.

—o—

Col. Kenneth R. Collins has assumed command of the eastern procurement district of the AAF Air Technical Service Command, with headquarters at 67 Broad street, New York.

—o—

Henry Barnhart, formerly manager, shovel and crane division, Lima Locomotive Works Inc., Lima, O., has been made vice president in charge of shovel and crane division, and **Albert Jay Townsend**, chief mechanical engineer, has been appointed vice president in charge of engineering.

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Terry Fisher will be in charge of the sales office which Cutler-Hammer Inc., Milwaukee, is opening at 108 North Main street, South Bend, Ind.

—o—

George E. Simons has been appointed advertising and sales promotion manager of the Electric Air Conditioning and Commercial Refrigeration divisions, General Electric Co., Bloomfield, N. J.

—o—

L. Boyd Hatch, executive vice president and a director, Atlas Corp. New York, has been elected a director and member of the executive committee, Graham-Paige Motors Corp., Detroit.

—o—

Ira Mosher, vice president and general manager, American Optical Co., Southbridge, Mass., has resigned. He has not revealed his plans for the future.

—o—

John C. Howard has resigned as director of the Office of Defense Transportation's Division of Rates to join the traffic organization of Bethlehem Steel Co., Bethlehem, Pa. He is succeeded

by **Harry Wilson,** for many years vice chairman of the Traffic Executive Association, eastern territory.

—o—

Roy McGiffin, who joined Lewyt Corp., Brooklyn, N. Y., last year as director of sales, has been appointed general manager. **J. Nugent Lopes,** previously head of public relations at National Gypsum Co., Buffalo, has joined the corporation as director of public relations.

—o—

Edward R. Stettinius Jr., under-secretary of state and formerly chairman, United States Steel Corp., Pittsburgh, was recently awarded the honorary degree of Doctor of Laws by New York university.

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Samuel R. Neal has been elected president of Root, Neal & Co., Buffalo, to succeed his father, the late R. H. Neal.

—o—

William P. Michell has been named assistant chief engineer, Mack Trucks Inc., New York. Mr. Michell recently returned from Great Britain where he had been serving in an advisory capacity on military truck transport at the invitation of the British government. He had joined the Mack organization in 1923 and in 1937 was made assistant to the chief engineer.

—o—

L. H. Schneider has been appointed general manager of production, Toledo Stamping & Mfg. Co., Toledo, O. Previously Mr. Schneider was plant manager, Detroit Harvester Co.'s Dura division.

—o—

A. W. Lohr has been appointed acting manager, market development department, industry departments, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

—o—

George Moore, formerly controller, H. H. Robertson Co., Pittsburgh, has been made treasurer, and **J. K. Davis,** previously assistant secretary, has been named secretary.

—o—

Harry S. Ransom has been appointed by Ohio Steel Foundry Co., Lima, and Springfield, O., as special representative in the Pittsburgh district. For the pa 15 years Mr. Ransom has represent Ft. Pitt Steel Casting Co., McKeespo Pa., in the Pittsburgh area.

—o—

John P. Fleming, for the past 14 ye general superintendent of the forge sh of American Locomotive Works in Sche ectady, N. Y., has joined Barium Ste Corp., Canton, O., as general manag of the Canton plant.

—o—

George R. Allen has been appoint general sales manager, brass divisio Kerotest Mfg. Co., Pittsburgh. For t past eight years Mr. Allen has been sal manager, standard products divisio Mueller Brass Co., Port Huron, Mich.

—o—

A. C. Reppenhagen, formerly gene manager, Experimental Tool & Die C Detroit, has been made secretary, Mi West Abrasive Co., Detroit.

—o—

Norman M. Sedgwick has been nam manager of compressor sales, Le Roi C Milwaukee, succeeding **Donald Heffro** resigned.

OBITUARIES . . .

Beram D. Saklatwalla, 63, partner in the Alloys Development Co., New York, was one of 24 persons killed Nov. 4 in a plane crash near Hanford, Calif. A consultant in chemical and metallurgical fields, Dr. Saklatwalla was the author of many papers published for technical societies here and abroad and held more than 130 United States and foreign patents for his inventions. He was a Fellow of the American Association for the Advancement of Science and holder of the 1924 Grasselli Medal of the Society of Chemical Industry.

Born in Bombay, India, Dr. Saklatwalla graduated from the University of Bombay and continued his technical education at the Royal Polytechnic Institute in Charlottenburg, the Mining Academy and the University of Berlin, Germany. He came to the United States in 1909 and joined Vanadium Corp. of America, New York, pioneering in devising smelting processes and in finding applications for vanadium in steel metallurgy. He resigned in 1935 to organize the Alloys Development Co.

—o—

Thomas Midgley Jr., 55, president and chairman of the board of the American Chemical Society, inventor of ethyl gasoline and discoverer of the compound on which modern air conditioning and refrigeration are based, died Nov. 2 in Worthington, O.

—o—

Francis A. Hubbard, 54, development engineer for Bell Telephone Laboratories, New York, died Nov. 6 in that city. As assistant chief engineer of International Standard Electric Co. Mr. Hubbard laid the long-distance telephone cable from Stockholm to Gotheborg and from Milan to Turin to Genoa. He established the first trans-Andean circuit in 1928, and later served as vice president and general manager, Mexican Telephone & Telegraph Co.

BERAM D. SAKLATWALLA

—o—

Howard Fisher Woodfin, 61, president, Lincoln Iron Works, Rutland, Vt., died recently in New York.

—o—

John Raymond Magarvey, 88, former vice president of American Locomotive Co., New York, died Oct. 31 in Avon Park, Fla. Mr. Magarvey was prominent in civic and business circles in Schenectady, N. Y., before his retirement several years ago.

—o—

Adolph Barjansky, 29, engineer with Cleveland Pneumatic Tool Co., Cleveland, died Nov. 7 in that city. In addition to his regular work, Mr. Barjansk had organized a Technical Translatic Service, of primary use to engineerir companies in their handling of foreig technical documents.

—o—

Clyde McManus, 37, president, Mc Manus Machine Co., Petoskey, Mich died Oct. 29.

—o—

Walter C. Audretch, 57, traveling rep resentative of American Rolling Mill Co Middletown, O., died Oct. 30 in No wood, O.

—o—

J. Brombacher, 78, president, Superb Water Heater Co., Los Angeles, die in Alhambra, Calif., Oct. 23.

—o—

Andrew H. Gairns, 72, who retire four years ago as Chicago district man ager, American Car & Foundry Co. New York, died Nov. 4 in La Grange Ill.

—o—

Edward G. Bonsky, 51, superintendent of plant No. 2 of Diebold Inc., Canton, O., died Oct. 30 in Durham, N. C.

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Alfred L. Schellhammer, 75, vice president, Pennsylvania Furnace & Iron Co., Warren, Pa., died Oct. 28. Mr. Schellhammer was the inventor of a gas heating furnace.

—o—

Charles Stevenson White, 56, manager of purchases and stores, New York Central railroad, died Nov. 4 in New York. Mr. White has been associated with the New York Central for 24 years.

—o—

George A. Mahoney, 59, president of Houghton & Richards Inc., Boston, died Nov. 4 in Newton, Mass.

Dominion Withdraws Restrictions On Some Types of Consumer Goods

Reports 27 types of new construction machinery and equipment now may be sold without restriction. Release considerable quantity of aluminum sheet for manufacture of spun and drawn aluminum kitchen utensils

TORONTO, ONT.

CANADIAN government officials announce withdrawal of restrictions on the manufacture and sale of various types of consumer goods, but while it is understood raw materials will be made available, shortage of labor continues a problem for production of this type of goods.

It is not expected that civilian manufacturing will attain any large proportions this year since it will require time to swing over from war to peacetime operations and there is still some question of tool supply.

H. H. Bloom, administrator of farm and construction machinery and municipal service equipment in the Wartime Prices and Trade Board, announced that 27 types of new construction machinery and equipment now may be sold without restriction. The relaxation accompanies extensive revision of the board's controls over new construction and included permission to manufacture a few types of equipment formerly not allowed.

The list which may be sold without restriction includes bulldozers for mounting on tractors, 25 draw-bar horsepower or less, blade ditchers, snow plows for mounting on tractors of 25 horsepower or less, pile hammers and certain types of hoists.

The board said relaxation of the controls has been made possible by a falling off in demand for construction machinery because of completion of many wartime construction projects and better supplies of metals. A similar restrictive order in the United States has been revoked. Manufacturers are still required to obtain the administrator's approval of their quarterly production schedules.

Although all restrictions on the use of aluminum are shortly to be removed by order of the Department of Munitions and Supply, it is not likely there will be any possibility of aluminum foil being available for civilian use for some time.

At present, all available aluminum foil capacity in Canada is tied up with United Kingdom's contracts for supplying the anti-radar streamers used extensively in modern aerial warfare. These contracts are understood to extend until at least the end of the year. Until they are canceled or expire there will be no available capacity for manufacturing aluminum foil in Canada.

One important step taken within recent days by Department of Munitions and Supply officials was the release of a considerable quantity of aluminum sheet for manufacture of spun and drawn aluminum kitchen utensils. It is expected that the new utensils will be available for consumers by Christmas. Actually a program for manufacture of utensils was drawn up last February but lack of manpower and fabricating capacity is given as the reason there has been no production.

The Dominion's Bureau of Statistics reports Canadian production of copper in August amounted to 45,370,804 pounds, compared with 45,585,045 in July and 46,222,900 in the corresponding month of last year. During the first eight months of this year, Canada produced 377,675,610 pounds of copper, compared with 388,542,859 in the corresponding period of 1943.

Nickel production in August was 23,846,740 pounds, compared with 23,410,619 in July and 21,334,008 a year ago.

Production during the eight month period totaled 186,031,271 pounds, 4.8 per cent below the output in the corresponding period of 1943.

Canada's External Trade at $427 Million in September

TORONTO, ONT.

Canada's external trade, excluding gold, was valued at $427,051,000 in September, compared with $416,510,000 in August, and $384,640,000 in the corresponding month last year, the Dominion Bureau of Statistics reports. During the first nine months of the current year, value was $3,907,041,000 compared with $3,414,075,000.

Merchandise imports totaled $159,710,000 compared with $157,324,000 in August and $137,271,000 in September, 1943. Total for the nine months stood at $1,330,015,000, compared with $1,276,973,000.

Exports of domestic merchandise were valued at $264,619,000, compared with $257,021,000 in August and $244,914,000 in September last year. Aggregate for the nine months amounted to $2,546,621,000, compared with $2,119,184,000.

The value of foreign exports was $2,722,000 compared with $2,165,000 in August and $2,454,000 in September, 1943. During the nine months value was $30,406,000, compared with $17,918,000.

Duties collected amounted to $15,428,000, compared with $15,954,000 in the preceding month, and $14,587,000 in September, 1943. Aggregate for the nine months was $135,318,000, compared with $124,641,000.

The United States was the leading source of supply. The value of merchandise imports from that country amounted to $135,588,000, compared with $113,476,000 in September, 1943, and during the first nine months $1,106,805,000, compared with $1,046,762,000.

Commodity imports from the United Kingdom were valued at $7,092,000 compared with $9,871,000 in September of last year. Total for the nine months stood at $71,981,000, compared with $100,200,000.

87 Ships Being Built in Canada for Pacific Action

TORONTO, ONT.

The Department of Munitions and Supply announces that 87 ships now are being built in Canadian yards for action in the Pacific. Of this total, 21 are maintenance vessels, 50 transport ferries, and 16 coastal cargo ships.

The maintenance vessels are floating workshops and are being equipped with all machinery necessary to repair ships at sea and are under construction at West Coast yards at a cost of approximately $2 million each. The transport ferries are the largest warships being built in Canadian yards and are for use in amphibious operations. Few details of the ferries have been released for security reasons.

The coastal cargo ships are of 350 tons and are being built in Quebec and West Coast yards, all for use in the Pacific. The department announced that Canada's frigate program has been completed or is nearing completion, but Canadian shipyards still have a number of 4700-ton and 10,000-ton cargo vessels to deliver. In addition two tribal class destroyers are under construction.

Produces 7637 Vessels Since Outbreak of War

TORONTO, ONT.

According to a report by Wartime Information Board, since the outbreak of war to Aug. 30, 1944, Canada produced 7637 cargo ships, tankers, combat vessels, tugs and other types of water craft. Service and trainer aircraft numbered 13,457, while army vehicles including armored units, tanks, universal carriers and motor vehicles totaled 699,100 units.

Output of communication equipment in the same period was valued at $302 million and various other types of instruments at $104 million. Other production figures for the period include guns and small arms, machine guns, rifles and mortars, 1,305,884 units; guns or barrels or mountings 118,000 units; heavy ammunition, filled, 100,000,000 units.

In addition approximately 25 million shells, cartridge cases or other components have been shipped abroad.

WING TIPS

Air Technical Service Command at Wright Field, O., reorganizes functions of buying and supervising production and inspection of aircraft for AAF. New division called Procurement Division; work divided into three different sections

A STREAMLINED reorganization which centers in one division of the Air Technical Service Command, Wright Field, O., the functions of buying and supervising production and inspection of aircraft for the Army Air Forces, was announced recently at ATSC headquarters.

The new division, called the Procurement Division, is one of six set up in the unification of the former Air Service Command and Materiel Command under Lieut. Gen. William S. Knudsen and his deputy director, Maj. Gen. Bennett E. Meyers.

Heading the Procurement Division is Brig. Gen. Orval R. Cook, a veteran of 22 years' service in the AAF, including more than 10 years at Wright Field. The Procurement Division's deputy chief is Col. Donald C. Swatland, an infantry lieutenant overseas in the last war and a nationally prominent corporation lawyer, who volunteered for army service early in 1942.

Also on General Cook's executive staff are W. E. Donnelly, assistant to the chief, Col. H. A. Shepard, chief of the division's control section, and Maj. W. T. Tutt, General Cook's administrative assistant.

The Procurement Division has a two-fold job. First it helps AAF headquarters determine what types of aircraft can be produced in quantity to meet the Army's current and anticipated requirements. Second, it procures from the 15,000 manufacturers in the aircraft industry the 450,000 items, from complete B-29s to the goggles in a flyer's helmet, which the AAF requires, and sees that the schedules and specifications are met.

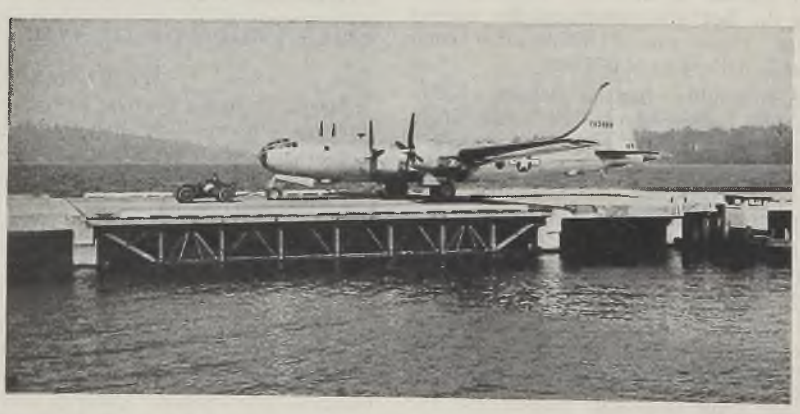
To accomplish these missions, General Cook has organized the Procurement Division's work into three sections—resources control, production, and quality control—as compared with 14 sections which did the same work under the former Materiel Command.

"These sections comprise a well-integrated organization which provides direction and all possible assistance to the aircraft industry in meeting AAF requirements on time," General Cook said. "The increased pace of the war requires that we at home speed up our efforts to provide our men in combat with the planes and equipment they need to overwhelm the enemy quickly and hasten their homecoming."

The resources control section, headed by Col. George H. Moriarty, determines the quantities of basic materials and semi-fabricated and standard parts required in aircraft production. It provides for the necessary manufacturing facilities and tooling. Since shortages exist on many of these productive factors—such as materials and tooling—Resources Control Section arranges priorities on which to allocate the available supply.

Chief of the production section is Col. George E. Price, who negotiates, prepares, and administers contracts for the purchase of AAF planes and equipment. His section sees that production is maintained to meet AAF schedules, and supervises the modification of aircraft to assure that planes are equipped with the latest developments in science and engineering. The section also allocates government-furnished equipment, such as engines, propellers, and radio, to aircraft manufacturers throughout the country.

Col. Bryant L. Boatner, chief of quality control section, establishes the policies and procedures under which 14,0 officers and civilians inspect and accept all aircraft, aircraft accessories, and equipment for the AAF. Inspection begins with the raw material and follows through to the finished product to make certain that AAF aircraft is the best that American skill and ingenuity can produce.



DESTINATION TOKYO: On their way to war, Boeing B-29 Superfortresses cross this unusual bridge at the Renton, Wash., plant of the Boeing Aircraft Co. The plant, located on the shores of Lake Washington, is separated by narrow Cedar river from the airfield where the bombers take off. The stream is navigable, though seldom used, and a removable bridge was installed to permit boat travel up the waterway

Ford Awarded Contract fo 2000 More Army Gliders

Ford Motor Co., Dearborn, Mich., h been. awarded a new contract for t construction of 2000 additional troo carrying gliders for the Army Air Force The gliders will be manufactured at t company's Iron Mountain, Mich. plar The new contract is to be complete December, 1945. Production will started as soon as present contract con mitments are concluded. With the con pletion of the new contract, Ford, t largest single producer of gliders, w have made more than 5000.

Allison Now Producing Jet Propulsion Plane Engines

Allison division, General Motors Corp Indianapolis, has announced it is co-op erating with General Electric Co. i building a quantity of jet engines fo jet propulsion aircraft, making it th first builder of reciprocating engines t enter this new field. Facility contrac for $12.5 million has been negotiated covering buildings and equipment fo the jet engine project, including 17 test cells.

Meanwhile Solar Aircraft Corp., San Diego, Calif., has received a major order for components of the jet engine which, together with the company's regular exhaust manifold business, will boost weekly output to around $1 million by next midsummer.

Concurrently the AAF has announced a substantial cutback in the contract for P-59-A jet-propelled fighter plane produced by Bell Aircraft Corp. However, it is believed that other planes of this type are in the preliminary production stages by other builders.

October Plane Output Holds Close to Schedule

Production of aircraft in October totaled 7429 planes having an airframe weight of 75,400,000 pounds, exclusive of spares, compared with 7598 planes with an airframe weight of 90,000,000 pounds, including spare parts, in September. J. A. Krug, chairman, Aircraft Production Board, said last month's output represented "on schedule" performance from the standpoint of overall numbers

Now...30% Longer Battery Life in the New PHILCO "Thirty"

Post-War Planners—Please Note

Be sure to include the new Philco "Thirty" when considering all future purchases of motive power storage batteries. In the years ahead, this revolutionary new long-life construction, with FABRICATED INSULATION*, developed by Philco research, will save you dollars in depreciation, up-keep and replacement costs. It's your post-war battery—available now in certain types and limited quantities. Write today for complete information.

*Patent applied for.

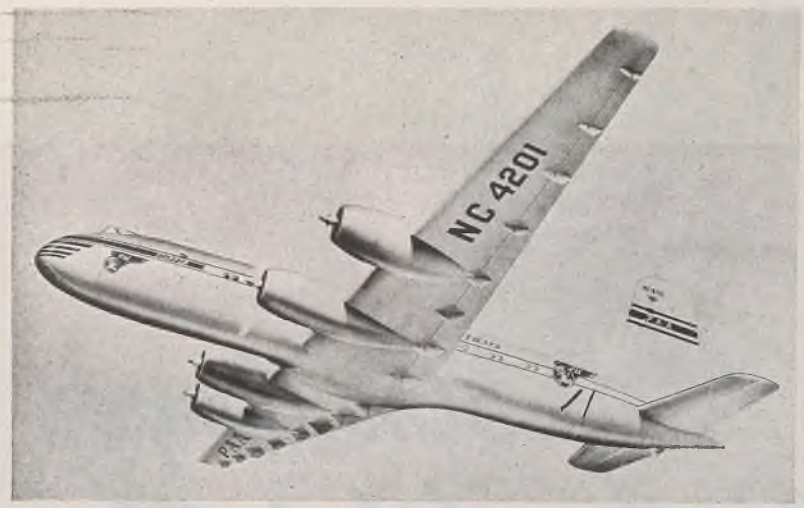
PHILCO CORPORATION
Storage Battery Division, Trenton 7, N. J.

A

UNRETOUCHED PHOTOGRAPHS of Philco "Thirty" (A) and Conventional Type (B) cells at conclusion of accelerated life test, in motive power cycle service, charged and discharged in series, in the same circuit. Note sediment space; Philco "Thirty" is clear; conventional cell is filled.

B

For 50 Years a Leader in Industrial Storage Battery Development



POSTWAR AIR TRAVEL: Spacious pressurized cabins will provide comfortable travel for 108 passengers at an altitude of 20,000 feet and a speed of 300 miles per hour in this DC-7, which will be built at the Douglas Aircraft Co.'s Long Beach, Calif., plant. The postwar plane will be twice as large as the giant clippers now flying Pan American's transoceanic routes

but that production of certain urgently needed types was sharply below schedule. Production was generally satisfactory in Army standard heavy bombers, carrier-based fighters, most transports, trainers and miscellaneous models but was not up to schedule in the superbomber class and heavy transports as well as in certain new improved models in other classes which are being brought into production.

The salvaging and scrapping of certain classes of surplus Army and Navy combat aircraft and equipment that have no commercial market and are seriously interfering with military operations have been authorized by the Surplus War Property Administration. Up to Nov. 1, 18,031 planes had been declared surplus, of which 5183 had been sold.

GE Develops Automatic Temperature Control

An automatic temperature control system, designed by General Electric Co., Schenectady, N. Y. primarily for fighter planes, operates the flaps which regulate the flow of air to the engine. It employs a temperature-sensitive material that automatically controls the cooling of the engine head, oil, and carburetor air or coolant temperature.

In most other systems, vents for the air flow are opened only when the pilot works a switch on his control panel. This requires the flier to watch his temperature gage closely and to put the system into operation manually. In the GE system the temperature-sensitive material—a combination of metallic oxides—acts to start opening the flaps at some predetermined temperature. When the highest allowable operating temperature is reached, the flaps will be full open. Using a delicate relay of only 0.0008-watt in power, the modulating control can stop the flaps at any position between open and closed, the position depending on the temperature of the engine.

Device Measures Thickness Of High-Stress Parts

Development of a device which accurately and rapidly measures the critical thickness after final machining of highly-stressed parts of airplanes was reported recently at the SAE National Aeronautic meeting in Biltmore Hotel, Los Angeles.

Wesley S. Erwin, Research Laboratories Division, General Motors Corp., Detroit, described the device, originally used in the inspection of hollow steel propeller blades, as the "sonigage." It consists of a simple variable-frequency electronic oscillator, and X-cut quartz crystal transmitting mechanical vibrations to metal, and a power output meter indicating the metal's resonant frequency. Since the product of resonant frequency and thickness equal one-half the velocity of sound, which for any one metal is constant, frequency and thickness are inversely proportional and the device can measure thickness from vibrations in the .020- to .400-inch range with a maximum error of less than 2 per cent.

In operation, the quartz crystal, which is only one inch square and 60 one-thousandths of an inch thick, is placed in contact with the metal. The oscillator dial is tuned to the resonant frequency. Power supplied by the oscillator maintains resonant thickness vibration against the internal damping of the metal. The power output meter indicates the metal's resonance point so sharply as to be altered by detuning as little as 1 p cent.

The device is so simple in operatio Mr. Erwin said, that no particular sk is required, adding that since it nee contact only with one surface of a pa being measured, the "sonigage" shou be applicable to other uses where rap inspection of sections is necessary. H said that for use with a specific met the oscillator tuning condenser dial c be calibrated to read thickness direct and reported that the device already h operated satisfactorily in tests with ste aluminum, brass, copper, and silver.

AAF Seeks To Speed Contract Settlements

Efforts by the Army Air Forces speed contract settlement and reconve sion to civilian production were stresse at the world headquarters of the A Technical Service Command, Wrig Field, O., by its deputy director, Ma Gen. Bennett E. Meyers.

ATSC, in addition to its responsibili for design, manufacturing, supply an maintenance of all Army Air Forc equipment throughout the world, also responsible for contract settlemer and disposal of surplus property resul ing from such settlements.

"Today we are training over 300 carefully-selected officers to handle th complicated details of contract termina tion quickly and fairly," General Meye declared.

"The Air Technical Service Comman now has first priority on officers for thi job, wherever they may be located ou of the combat zones. Our choice fall on men who in civilian life were suc cessful bankers and corporation exec utives, recognized lawyers, property managers and production experts. Onc trained, they work in teams compose of a contracting officer, a negotiator property disposal officer, legal officer and an accounting officer.

"We are not only training qualified men to handle the Army's part of the termination job. We are also offering to manufacturers all the information at our disposal that will help them in winding up the contracts on their own end," he said.

Chevrolet Production of Aircraft Engines Large

Production in a 30-month period of 51,050 Pratt & Whitney aircraft engines has been disclosed by Chevrolet. The period covers the two and one-half years from production of the first P&W engine by Chevrolet on March 30, 1942, to Sept. 30, 1944, and output during that time totals over 61 million horsepower.

Currently, Chevrolet is producing three models of P&W Aircraft engines, two 14-cylinder 1200-horsepower models and a new 18-cylinder model, developing more than 2000 horsepower.

The MONTGOMERY PROCESS* makes it possible to form large, light-weight conical or circular hollow sheet steel shapes, quickly and economically from .025 to .062, 1010 cold rolled steel. All seams formed by this process are welded by CONTROLLED HEAT FORGING, making it possible to keep the entire surface as strong as it was in its virgin state.

We are now in a position to take orders from manufacturers of steel products who want to avail themselves of our modern facilities. A complete engineering and designing staff is at your service.

WRITE FOR COMPLETE INFORMATION

*Patent Applied For

Fabricated from .025 STRIP STEEL

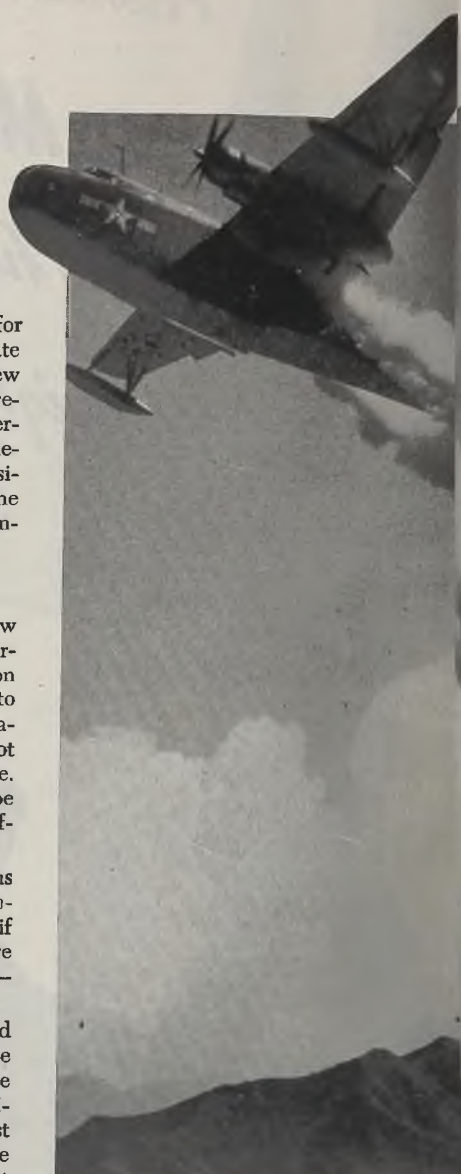
Harry E. Montgomery

METAL Spinning WORKS

820 EAST FIRST STREET TULSA 3, OKLAHOMA

New Products Hold Hope for Postw

Research authority suggests tax concessions should be extended industrial companies to compensate for funds spent in developing new products to provide jobs for millions of additional workers when peace comes



"MANY new materials, methods and devices developed by the war are either directly or indirectly, separately or combinedly, adaptable to an infinite variety of new peacetime products," according to Andrew A. Kucher, research laboratories, Bendix Aviation Corp., Detroit, in a report to the Committee for Economic Development at Indianapolis, recently.

"The accelerated pace of things and the reduction in space-time implies a tremendous growth in transportation. Jet propulsion is off to a magnificent start. Two-way communication for moving vehicles, navigational aids particularly for aircraft, including completely automatic pilot, automatic ground position indicator, radar perception, and network communication, are some of the omens of the future. The personal airplane and many new and useful things for better living for all are verging upon reality.

"The great advances which have been made during the past several years were possible by reason of sincere devotion to the task and the provision of unrestricted facility and equipment necessary to effect these great things."

Nowhere in American industry can a better example be found of a small business which has grown up, than Bendix Aviation, according to Mr. Kucher. In 1938, the corporation comprised a total of 10,000 people, producing a gross volume of business of less than $50 million of which three to four million were engineering dollars.

In 1943, Bendix Aviation employed over 70,000, with a gross business of almost a billion dollars, of which $14.9 million was devoted to engineering and development. The engineering force includes over 3000.

"It is certain that if we at Bendix could expend $15 million annually for several years following the war, on peacetime devices, that numerous useful things requiring great numbers of people to produce would be provided," said Mr. Kucher. "It is hardly likely that such amounts can be made available for strictly engineering development. However, the point to be derived is that the amount expended is bound to have a direct relationship to the magnitude of future productivity. Technical development is the key to America's greatness.

"The burden to provide employment will continue to rest upon industry. Industrial management carries the direct responsibility for its continuing existence, always hopeful for its expansion and growth. The unfortunate part of the whole thing is that the new product development dollars must precede the income dollars. These engineering dollars are all risk dollars. The development of new devices and new business involves great financial risk to the sound structure of any established industrial enterprise.

Urges Premium for New Enterprise

"It is obvious that the creation of new devices and new business is vastly different from the resumption of production of prewar devices. The reconversion to the production of automobiles, refrigerators and other established fields cannot be used as the measure for the whole. Millions of additional people must be engaged in completely new lines of effort.

"It appears that a tremendous stimulus and assurance for the successful expansion of new enterprise could be given if a premium rather than a penalty were attached to the creation of new things—particularly for individuals.

"If, when a product of research and engineering became merchandisable, one were permitted to reconstruct his income tax returns and apply such early expenditures against the profitable years, at least there would be a much greater incentive to take the risk. Better yet, why not let the developer or owner of a new product resulting from research and engineering enjoy a three-year tax-free period?

"Once it is decided to do a specific thing, the following program must be effected:

"1—The time and money required to effect the desired end point must first be estimated.

"2—Appropriation must be made.

"3—Available talents must be corralled.

"4—The primary concept must be reduced to a preliminary working model.

"5—Painstaking tests reveal weaknesses and deficiencies.

"6—A vast array of unknowns are met and gradually solved.

"7—The device is perfected through the construction of successive models.

"8—An acceptable working device is finally devised.

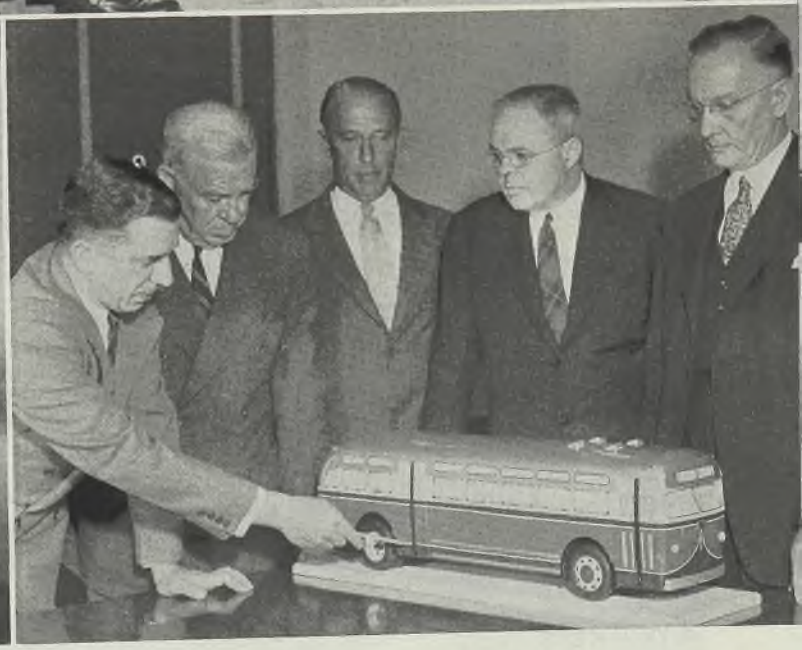
"9—Small quantities are produced for field test, in the home, on the road or in the air.

"10—Bugs which develop in the field are eliminated.

"11—Manufacturing methods, processes and costs are studied.

"The mortality of new devices at this stage is high, not because of poor judgment or poor execution, but because completely unknown factors, of which we know nothing at the outset, and which we

Postwar Employment



humans are as yet incapable of predicting, rear their ugly heads and smite us down.

"If everything adds up, and the device is deemed satisfactory, we have only reached a beginning. The problems of manufacture, distribution and sales are equally involved, and replete with pitfalls which may spell failure.

"We all know that any major improvements require three to five years from the primary development stage through proving test and into production. We also know that product development is a progression of errors. Things become realities, not through the things we know but in spite of them. We are all amateurs in the things which we have not done. It is this indeterminate quantity which makes product development so costly.

"It is said that if you want something done, give it to a busy man. That applies to the initial phase of product planning for the future. The organizational approach to the problem must be effected from the top down. Procedures for analyzing and deciding the course to be followed; sifting and reducing the welter of things to a simple, straightforward, time-conserving procedure, all aimed to permit specific action to be taken as soon as pressing war problems relax. In order not to be indefinite on this point, much direct effort must be applied on postwar product planning and development.

Jet propulsion fascinates many observers as an aid to transportation of the future. At left above, a heavy Martin Mariner flying boat takes off at a Pacific outpost with jet propulsion's aid. U. S. Navy photo Officials of the Admiral Co., Chicago, examine a postwar model radio - phonograph - recorder-television set, top of page. NEA photo Immediately above, officials of Mack Trucks Inc., New York, approve a new 41-passenger city-type bus, which the company intends to build for delivery in 1945

Plans Postwar Expansion of Low-Alloy Steels

Republic Steel Corp. to produce high-strength steels to meet future demands for light-weight equipment

PLANS for a large expansion in its production and sale of high-strength low-alloy steels to meet anticipated postwar demands for light-weight equipment in the transportation field were announced recently by Republic Steel Corp., Cleveland.

N. J. Clarke, vice president in charge of sales, stated that Republic has acquired license rights for the manufacture of "Cor-Ten" and "Aldecor" steels. At the same time, Republic will continue to produce and market its own trademarked product, "Republic Double strength Steel," which the company developed for the trade some years ago.

"Cor-Ten," widely used for many years, is a patented steel produced by Carnegie - Illinois Steel Corp., and other subsidiaries of U. S. Steel Corp. "Aldecor," a comparatively recent product among the high-strength, low-alloy steel, was the result of research by Alloys Development Corp., Pittsburgh, and was developed by Republic Steel Corp.

"The trend which began several years before the war toward the use of lighter but stronger steels by the transportation industry will accelerate sharply as soon as wartime restrictions on steel production are lifted," Mr. Clarke said.

"Republic believes that the addition of these two leading brands of high-strength steels will help to round out our range of products available for the construction of railroad freight and passenger cars, street cars, buses, trucks and trailers, and other similar applications in the transportation field."

AWARDS . . .

Army-Navy production awards were presented to the following war plants for excellence in the manufacture of war materials:

Aerial Cutlery Mfg. Co., Marinette, Wis.

American Type Founders Inc., Elizabeth, N. J.

Atlas Powder Co., Zapon division, North Chicago, Ill.

Chicago Electric Mfg. Co., Chicago.

Crystal Research Laboratories Inc., Hartford, Conn.

Dover Stamping & Mfg. Co., Cambridge, Mass.

Fonda Gage Co., Stamford, Conn.

General Aniline & Film Corp., Rensselaer, N. Y.

Goodyear Tire & Rubber Co. of Alabama, Gadsden, Ala.

VETERAN EMPLOYES: Close to a century of continuous service is represented by, left to right, Herbert Bohle, Earl D. Nuneviller and Earl M. Robinson. They have been with the service department of Brown Instrument Co., Philadelphia, division of Minneapolis-Honeywell Regulator Co., for 30, 33 and 33 years respectively

BRIEFS . . . .

Paragraph mentions of developments of interest and significance within the metalworking industry

General Electric Co., Schenectady, N. Y., reports that International General Electric will supply nine 90,000 kva generators for the Soviet's Dnieprostroi hydroelectric plant.

—o—

Colonial Broach Co., Detroit, has published a four-page folder describing its expanded line of improved hydraulic presses.

—o—

Allen Billmyre Co., Mamaroneck, N. Y., announces the appointment of Johnson & Scott, 918 Dermon building, Memphis, Tenn., as its representative in Tennessee.

—o—

El Paso Saw & Belting Supply Co., El Paso, Tex., has been appointed wholesale distributor covering the El Paso district for household appliances for the Edison General Electric Appliance Co., Chicago.

—o—

Miguel Pons, Lima, Peru, is interested in acting in Peru as agent for American manufacturers of iron, steel, metals, etc.

—o—

United States Rubber Co., New York, has agreed to purchase the assets and business of the L. H. Gilmer Co., Philadelphia, manufacturer of industrial V-belts.

—o—

Daven Co., Newark, N. J., reports all the developments and advances of its former standard single unit attenuators have been incorporated in its newly improved dual-unit attenuators.

—o—

Struthers Wells Corp., Pittsburgh, recently issued an attractive and informative new bulletin on its complete line of standard and specially designed high pressure autoclaves.

—o—

Barnes & Reincke, industrial designers and engineers, have moved their Chicago office from 664 North Michigan avenue to 230 East Ohio street.

—o—

Westinghouse Electric & Mfg. Co., Pittsburgh, reports its high-speed X-ray photographs, taken in a millionth of a second, are adding knowledge to the science of ballistics.

—o—

Dow Chemical Co., Midland, Mich., at a meeting of Optical Society of America in New York demonstrated techniques in applied electron microscopy. Three dimensional pictures of views through the microscope revealed the shape of ultra-microscopic crystals of which magnesium and other metals are composed.

—o—

Firestone Steel Products Co., Akron, O., reports its oxygen cylinders are the first used in American war planes which are designed to withstand cannon fire without exploding.

—o—

Raybestos-Manhattan Inc., Passaic, N. J., is distributing a booklet to its employes and 2300 men and women in the armed forces, distributors and customers, which reveals the role the company has fulfilled in the war effort and the part it will play in the postwar period.

—o—

Joshua Henry Iron Works, Sunnyvale, Calif., is producing 30 large turbo-generator units for the Soviet Union which

will be used to supply electricity in devastated factories.

—o—

Metals and Minerals Division, Department of Commerce, Washington, is completing a survey on refineries and pipe lines for the Defense Plant Corp.

—o—

Vita-Var Corp., Newark, N. J., presented to each of its employes a $25 war bond on the occasion of the company's receipt of the Army-Navy "E" award.

—o—

Charles Herman Contracting Co., New York, reports that after the war the emphasis in industrial plant design will be toward flow of materials, increased efficiency in the handling of materials, thereby reducing costs and increasing production.

—o—

American Trucking Associations Inc., Washington, announces that volume of freight transported by motor carriers in September decreased 0.76 per cent under August. Carriers transported an aggregate of 2,322,662 tons in September.

—o—

Hibbard, Spencer, Bartlett & Co., Chicago, has purchased from Montgomery, Ward & Co. a six-story warehouse at 401 West Lake street. The building contains 180,000 square feet of floor space.

—o—

American Institute of Steel Construction, New York, has opened an office in the First National Bank building, 735 North Water street, Milwaukee, with W. H. Hart as district engineer.

U. S. Steel Corp.'s Plants Receive 20 Safety Awards

Illustrating the fact a steelworker is safer in the mill than in the home or on the street, United States Steel Corp.'s subsidiaries received 20 awards in a recent nationwide competition sponsored by the National Safety Council. Subsidiary companies represented were Carnegie-Illinois Steel Corp. with 14 winning plants, U. S. Steel Supply Co. with five, and American Steel & Wire Co. with one.

Among the winners were three plants of U. S. Steel Supply Co., Pittsburgh, St. Louis and Baltimore, and the Wood Works of Carnegie-Illinois Steel Corp., McKeesport, Pa., all of which completed a full year without accidents. At Wood Works the award tells only a portion of the story, since operations were carried on continuously for 626 days without a lost-time accident.

Great strides in accident prevention have been made since the turn of the century. Today the accident frequency rate in steel making facilities of U. S. Steel is only about 3.7 per cent per million man hours worked. This rate is about one-tenth of the figure at the time safety campaigns were begun.

Doehler, Jarvis Companies Plan To Merge in January

Recent details of the plan to merge the Doehler Die Casting Co., New York, and the W. B. Jarvis Co., Grand Rapids, Mich., are believed to indicate that the directors of both companies have agreed on a merger as of Jan. 1, 1945, under the name of Doehler-Jarvis Corp., subject to approval of stockholders of both companies at meetings to be held soon.

A new board, it is indicated, will include eight of the present directors of Doehler and five of the directors of Jarvis. H. H. Doehler is scheduled to become chairman and L. A. Jarvis to be president. C. Pack will be vice president; F. J. Koegler, vice president, treasurer and controller; D. H. Osborn, vice president and secretary; and L. H. Pillion, A. C. Gutmueller, W. G. Gutmueller and E. R. Zabriskie, vice president.

Doehler-Jarvis is expected to issue 749,685 shares of $5 par common stock in a two and one-half for one exchange for the 299,874 outstanding shares of Doehler Die Casting, including 2761 shares of treasury stock and 300,000 shares for 300,000 shares of the Jarvis company.

Wickwire Spencer Divisions Moved to Massachusetts

Wickwire Spencer Steel Co., New York, announced recently, that on Nov. 1, the general sales offices of the Springs and Formed Wire division and of the Automotive division was located at New Bond street, Worcester, Mass.

The Morgan plant, where the products of these divisions are manufactured, is also located at Worcester. A district sales office of these divisions will continue to be maintained at 500 Fifth avenue, New York.

Penicillin Producer Specifies Stainless Steel for Equipment

STAINLESS steel is playing an important role in the highly exacting production of pencillin, the "miracle drug." Equipment used in the process must be kept absolutely clean and sterile and strong enough to forestall repairs and replacements that might slow down production and risk lives. Stainless steel, being bright, strong, smooth and rustless, possesses the right combination of qualities.

One of the most interesting pieces of stainless equipment in the plant of Chas. Pfizer Co., New York, is the turntable (shown at the right) where the vials are stoppered, the last and most critical step in the process. About 15 feet in diameter and made of stainless steel made by American Rolling Mill Co., the table revolves as the vials are filled and closed.

During this operation, the drug is exposed to the atmosphere for a short period and, since it must be absolutely sterile, asceptic cleanliness must be observed. Although under ordinary conditions the air in this room is filtered and dried to a relative humidity of less than 10 per cent, there are times when ordinary air is admitted. Under such conditions, ordinary steel might rust. Furthermore, Pfizer officials are of the opinion that a highly polished surface is necessary to insure absolute cleanliness.

Munitions Output 4% Behind Schedule

SEPTEMBER munitions production, valued at $5.3 billion, was 2 per cent below the monthly average for the year, and missed the first-of-the-month goal by 4 per cent. Ammunition and "other equipment and supplies" were the only categories to show an increase over August, the latter being the lone classification to meet scheduled output.

The War Production Board reports September munitions production by major categories in relation to established schedules as follows:

Ammunition, 1 per cent below schedule; guns and fire control equipment, 11 per cent below; combat and motor vehicles, 9 per cent below; aircraft (airframes, engines, propellers, spare parts, and aircraft equipment) 5 per cent below; communication and electronic equipment, 5 per cent below; ships (value of work done on Army, Navy and Maritime Commission ships, including maintenance and repair) 7 per cent below; other equipment and supplies, 1 per cent above.

SHIPBUILDING — Deliveries of Navy vessels on a tonnage basis rose 29 per cent during September, but was still 12 per cent short of scheduled output. Navy conversions of combat loaders missed their reduced September schedules, despite the fact that they have been given priority over all other ship programs, even maintenance and repairs.

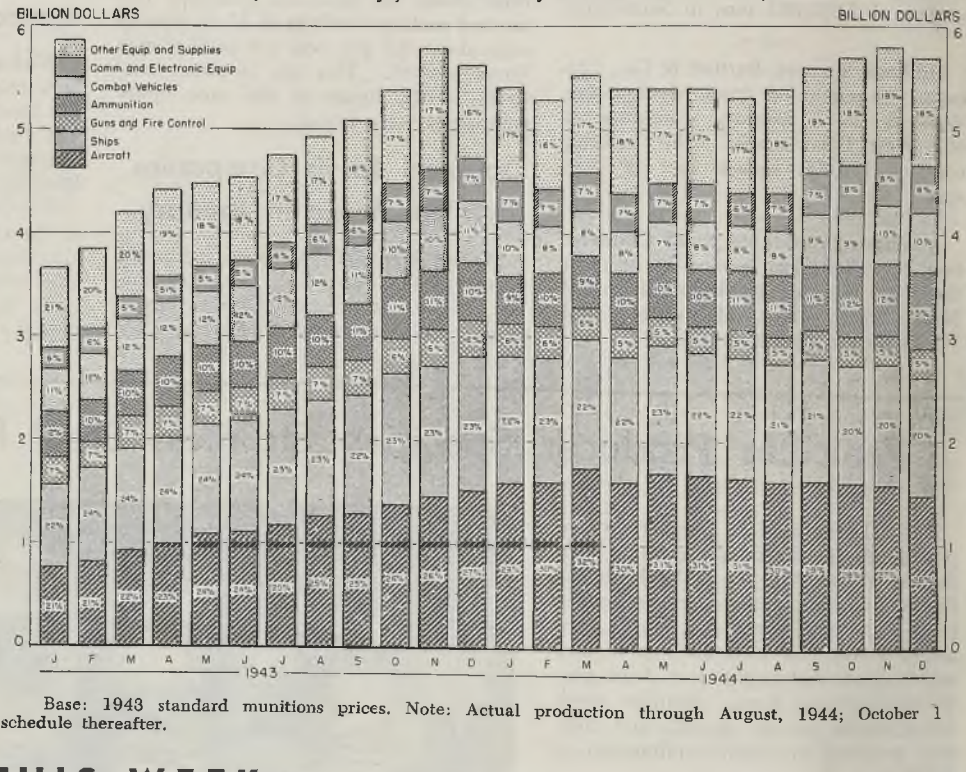
Maritime Commission ship construction ran 2 per cent ahead of August. Completion of 127 vessels, totaling 1,187,000 deadweight tons, was virtually on schedule.

ORDNANCE—For the first time in recent months, September output of ordnance and vehicles, valued at $1,294,000,000, failed to record an increase. The heavy field artillery program met or exceeded September goals, and output must be maintained at the September pace to meet requirements for the remainder of the year. Production of heavy artillery ammunition was up 16 per cent in September, and schedules call for an additional increase of 36 per cent to meet requirements.

Deliveries of heavy-heavy trucks increased nearly 400 to 4850 during September, but failed by 560 to meet the schedule, which had been sharply lowered for feasibility reasons.

COMMUNICATION—Output of airborne radio for the Navy fell short of the September goal by 16 per cent, and for the Army by 4 per cent. Communication and electronic equipment production as a whole, at $343 million for September, was slightly below August.

MONTH BY MONTH OUTPUT OF MUNITIONS IN THE U.S.
1943–1944
Each Major Munitions Category Shown As Percentage Of Month's Total Munitions Output



Base: 1943 standard munitions prices. Note: Actual production through August, 1944; October 1 schedule thereafter.

FIGURES THIS WEEK

	Latest Period*	Prior Week	Month Ago	Year Ago
INDUSTRY				
Steel Ingot Output (per cent of capacity)	95.5	95.6	95.5	99
Electric Power Distributed (million kilowatt hours)	4,360†	4,358	4,375	4,414
Bituminous Coal Production (daily av.—1000 tons)	2,030	1,967	2,008	1,671
Petroleum Production (daily av.—1000 bbls.)	4,720	4,741	4,692	4,389
Construction Volume (ENR—unit $1,000,000)	$32.4	$22.2	$26.5	$35.2
Automobile and Truck Output (Ward's—number units)	21,595	21,035	16,865	19,585
TRADE				
Freight Carloadings (unit—1000 cars)	910†	918	878	755
Business Failures (Dun & Bradstreet, number)	11	15	27	42
Money in Circulation (in millions of dollars)‡	$24,409	$24,216	$23,881	$19,354
Department Store Sales (change from like week a year ago)‡	+8%	+17%	+9%	+12%

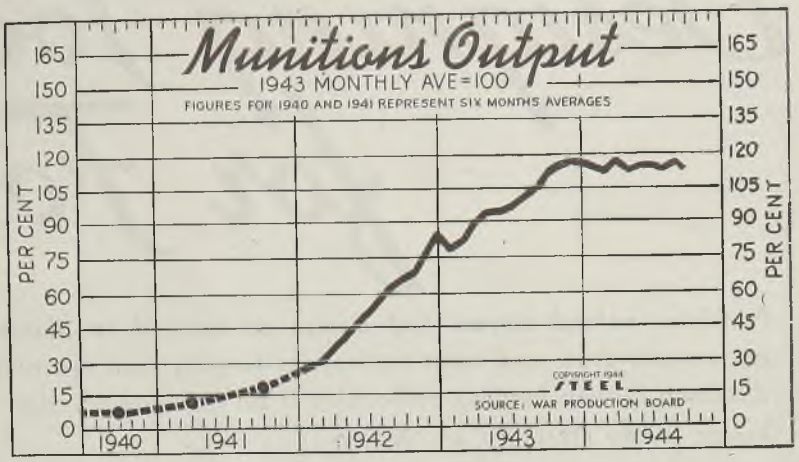
*Dates on request.
†Preliminary. ‡Federal Reserve Board.

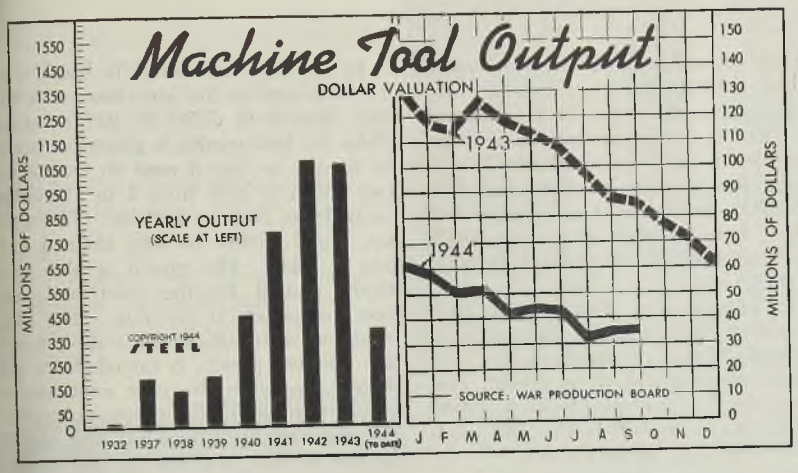
War Production Board's Munitions Index

(1943 Monthly Average = 100)

Month	1940	1941	1942	1943	1944
Jan.	–	–	29	78	116
Feb.	–	–	31	82	113
Mar.	–	–	36	90	118
Apr.	–	–	42	95	115
May	–	–	47	96	115
June	–	–	52	97	115
July	–	–	58	101	113
Aug.	–	–	64	105	116
Sept.	–	–	67	107	†114
Oct.	–	–	69	114	...
Nov.	–	–	76	117	...
Dec.	–	–	84	118	...
	7*	11*	18*		

*6-Month average. †Preliminary.





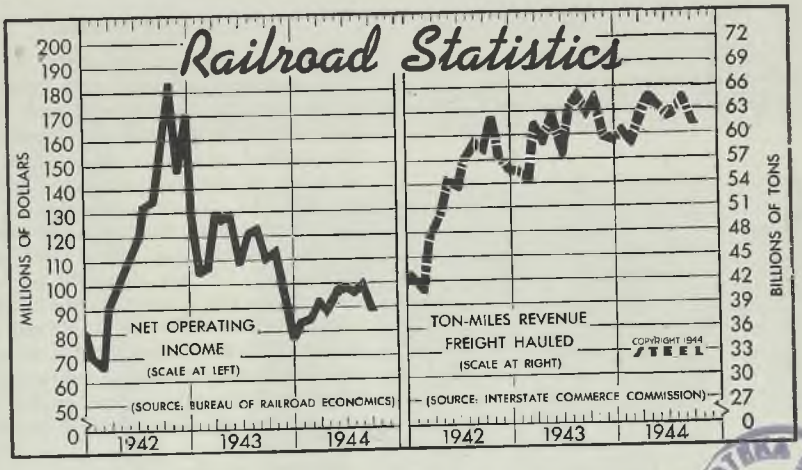
Machine Tool Output

(000 omitted)

	1944	1943	1942
Jan.	$56,363	$117,384	$ 83,547
Feb.	50,127	114,594	84,432
Mar.	51,907	125,445	98,358
Apr.	41,370	118,024	103,364
May	41,819	113,859	107,297
June	41,471	108,736	111,090
July	32,753	97,428	113,596
Aug.	35,177	87,405	117,342
Sept.	35,876	85,842	119,883
Oct.	.....	78,300	130,008
Nov.	.....	71,811	120,871
Dec.	.....	60,861	131,960
Year			
1942			1,321,862
1941			812,462
1940			450,000
1939			210,000

Statistics of Class I Railroads

	Net Operating Income			Ton-Miles Revenue Freight		
	1944	1943	1942	1944	1943	1942
	(millions)			(billions)		
Jan.	$82.8	$105.3	$66.8	60.5	55.1	43.0
Feb.	84.5	105.8	64.4	59.3	54.4	40.8
Mar.	92.5	129.7	90.6	68.0	61.2	48.3
Apr.	87.7	128.7	101.6	60.4	59.1	50.0
May	98.5	129.5	109.7	64.0	62.1	54.2
June	99.8	109.0	118.7	62.0	58.0	53.9
July	98.6	127.8	133.6	62.8	63.7	57.0
Aug.	101.4	132.3	135.9	64.5	65.1	58.6
Sept.	89.1	110.3	155.1	61.0	62.5	58.2
Oct.	.....	113.1	184.8	..	65.0	62.2
Nov.	.....	96.4	149.0	....	59.6	57.0
Dec.	.....	76.9	174.4	....	59.4	55.0
Avg.	....	$113.5	$122.9	....	60.5	53.2



FINANCE

	Latest Period*	Prior Week	Month Ago	Year Ago
Bank Clearings (Dun & Bradstreet—millions)	$10,629	$9,413	$10,537	$9,000
Federal Gross Debt (billions)	$211.8	$211.5	$211.0	$169.2
Bond Volume, NYSE (millions)	$35,880	$34,858	$43.2	$44,666
Stocks Sales, NYSE (thousands)	3,868	4,567	4,634	4,007
Loans and Investments (millions)†	$54,088	$54,079	$54,673	$52,982
United States Government Obligations Held (millions)†	$40,092	$40,197	$40,731	$39,218

†Member banks, Federal Reserve System.

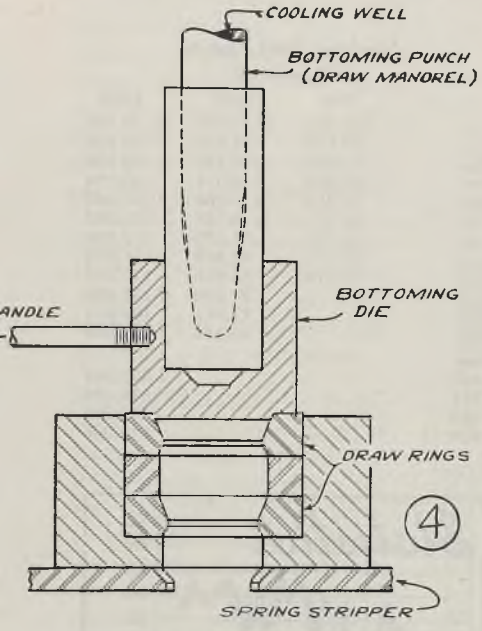
PRICES

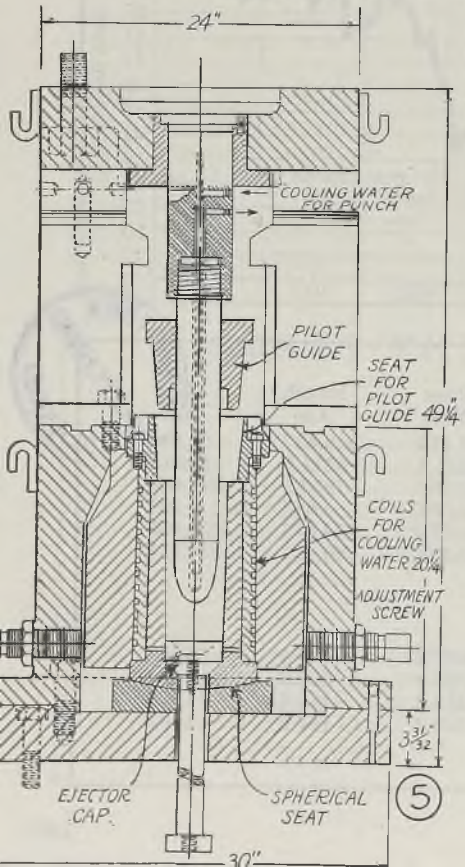
STEEL's composite finished steel price average	$56.73	$56.73	$56.73	$56.73
Spot Commodity Index (Moody's, 15 items)†	246.6	248.4	253.3	244.8
Industrial Raw Materials (Bureau of Labor Index)‡	113.5	113.2	113.2	111.8
Manufactured Products (Bureau of Labor index)‡	101.1	101.2	101.1	100.3

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

Designing Tools for Forging

Principles behind correct tool design as applied to pierce-bottom-and-draw and other methods of forging shell are ably discussed by two leading authorities in an outstanding contribution to the literature on forging





THE pierce-bottom-and-draw forging method, used in this paper as a basis for discussion, was developed by Mr. Culhane who used it in the production of large quantities of shell during World War I. During this war he has participated in its further development in co-operation with a large number of manufacturers who have selected this method for forging shell.

The present large demands for artillery ammunition, and the innovation of new types of shell, are necessitating continuous retooling and development. Presented are the principles behind correct tool design as applied to this and other methods of shell manufacture.

The Forging Method

The pierce-bottom-and-draw method [1, 2, 3] can be considered as a cross between conventional pierce and draw method and the recently developed one-shot method of forging shell. The wall thickness of the pierced slug "bottle," see Fig. 13, is approximately 35 per cent thinner than that generally forged by the conventional pierce and draw method [1, 4, 5, 6] and about 20 per cent thicker than that forged by the one-shot method [7, 8, 9, 10]. From 65 to 95 per cent of the total movement of the metal is completed in the piercing operation. Two relatively light sizing operations, a bottom and a draw, then complete the forging, Fig. 13.

Although mechanical presses can be employed for piercing in the pierce-bottom-and-draw method, vertical hydraulic presses are generally used**, Figs. 1, 2 and 3. A small secondary cylinder actuates the ejector (die bottom) on the hydraulic equipment, whereas on mechanical equipment the ejector is generally actuated by means of a spring loaded yoke.

Fig. 4—Completion of the bottoming stroke. Note the draw rings through which the bottle will pass after the bottoming die is removed

Fig. 5—Assembly of piercing tools in the piercing press

In piercing, the "slug" (a blank, Fig. 13, obtained by the separation of a billet), heated to 2150 to 2175 degrees Fahr. for best results, is placed vertically in the die so that it rests on the ejector cap which is held from 1 to 1½ inches away from the die bottom. This ejector, Fig. 7, holds the slug about 1 inch into a pilot. The punch is also positively guided by the pilot and centers the punch in the slug. The slug, centered with regard to the die pot and the piercing punch, is forced down and leaves the pilot; the pilot continues to act as a guide for the punch throughout the piercing operation. If the slug is square it does not rest on the ejector, but remains about an inch above the ejector, being supported by the boat tail until the piercing force is enough to drive it into the boat tail.

On hydraulic presses the length of the stroke is set by stop blocks. On the return stroke of the press the ejector pushes the pierced slug "bottle" part of the way out of the die, and if the bottle clings to the punch, the pilot guide is lifted until it contacts stops and strips the bottle from the punch. The punch and die are generally lubricated by swabbing with graphitic oil.

To avoid pits in the shell cavity, the cavity of the bottle is generally descaled between piercing and bottoming by means of a reamer or a blast of steam or compressed air.

After being pierced, the bottle is transferred to the second press, Fig. 3, and placed in position in the bottoming tool which has been centered by slipping it into a ring seat, Fig. 4. During bottoming, the mandrel centers itself in the shell cavity and finishes the piercing, Figs. 4 and 13. On the hydraulic presses, the proper base thickness is obtained by limiting the stroke with adjustable stops.

After bottoming, the mandrel and shell are raised, and the bottoming pot and the press stops are removed. During this interval the forging is not in contact with bottoming pot or draw rings, but is held on the mandrel by friction or supported by a pair of tongs chained to the ram. On the second stroke of the press, the shell forging is finished by a

By GEORGE ESPEY and PAT CULHANE*

draw through one or two ring dies, Fig. 4. Two spring-operated plates strip the shell from the mandrel on the return stroke.

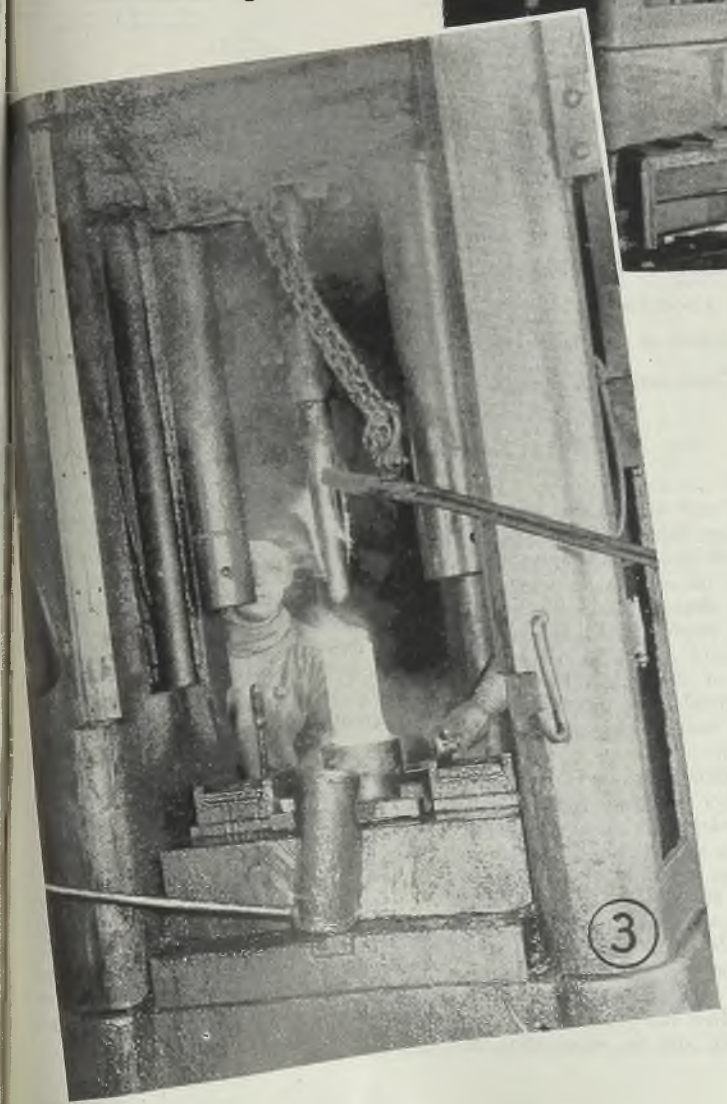
Between the forging of each shell the draw mandrel is generally cooled externally by immersion of the tip in running water and then a graphitic oil lubricant. This is done by manually lifting a small container filled with running water so that it surrounds the punch. This cooling cup may be seen resting on the lower platen in Fig. 3.

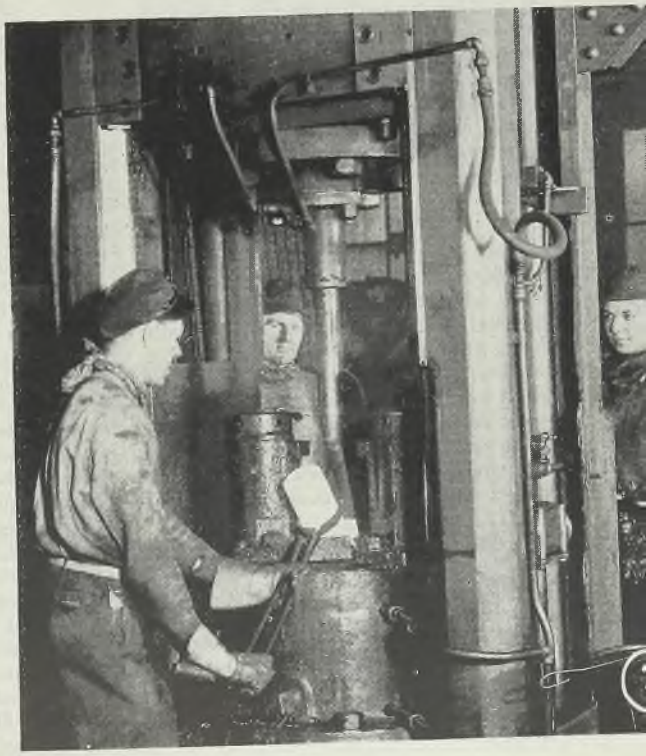
As the bottoming die pot becomes hot,

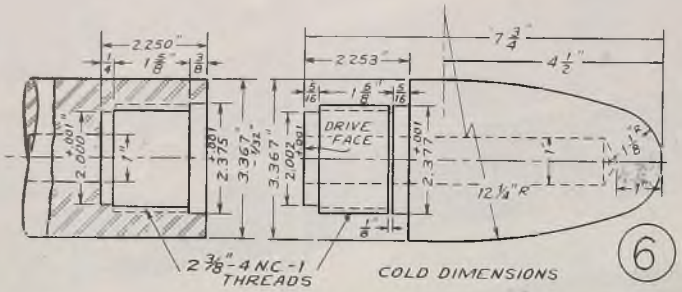
Fig. 1—Pierce (right) and bottom and draw (left) presses are shown forging shell. (Photos for Figs. 1-3 courtesy Hydraulic Press Mfg. Co., Mt. Gilead, O.)

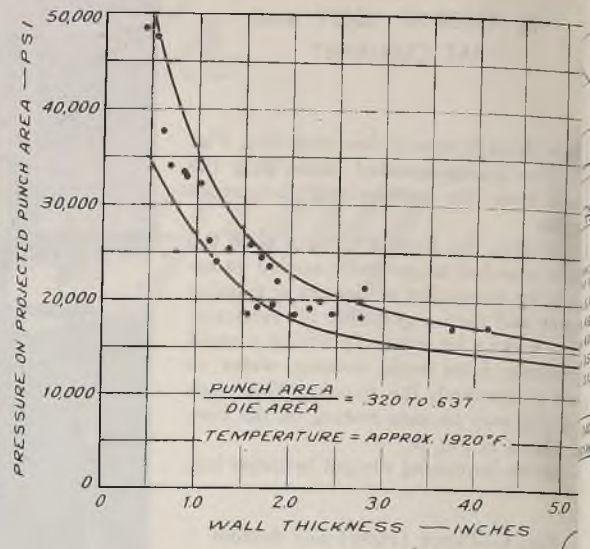
Fig. 2—The pierced shell "bottle" is shown here being removed from the piercing press

Fig. 3—Here the pierced shell "bottle" is shown in position for bottoming









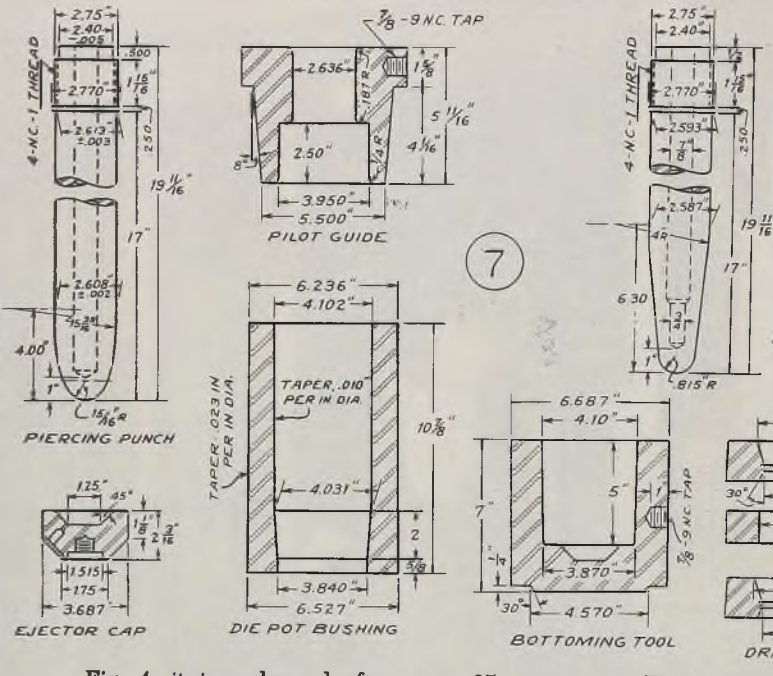


Fig. 4, it is exchanged after every 25 or 30 shells for a cool one from a water cooling tank nearby.

During World War I large presses were successfully converted to the forging of small shell by placing the tooling for two independent piercing operations symmetrically in the piercing press and by putting the tooling for four independent bottoming and drawing operations in the second press. The flow of forgings was similar to that of two forging lines with the two draw mandrels on the opposite corners of the platen being used alternately with the pair at the other two corners.

Principles of Tool Design

Tool design should start the same day the decision is made to forge shell. The time schedule under which delivery of finished forgings must be made usually has a great influence on tool design. If finished forgings are to be produced upon short notice, regardless of cost, the tools must be designed and adapted to the equipment available. On the other hand, if large quantities of shell are to be produced economically over a period of more than a very few months the tools and their design should be considered of primary importance with the selection and purchase of equipment being secondary. The decision as to the forging method to be employed should be based only on previous results or a thorough investigation of the principles of tool design and metal flow, as well as the more obvious factors affecting economical production.

Since the dimensions of the forging and the number of operations per shell are interdependent, the major designs of each should be settled simultaneously in order to obtain optimum distribution of work between the various operations and within the operations themselves. If tools are not designed with this thought foremost in mind, later modifications involving only tool dimensions and/or contour will often still permit large savings in tool life and the elimination of recurring difficulties and scrap. This applies to all methods of shell forging.

The often heard statement that power is the cheapest thing in the shop, and therefore not to be considered, is false from the tool designers' viewpoint, particularly in conjunction with mechanical forging. Since large power requirements represent high forging pressures and/or friction (wear), each dollar spent on power generally demands that management follow it with considerable more money in the form of tool costs, maintenance and repairs.

Piercing Tools

With correct tool design and forging practices a few major variables determine the life of piercing tools, these are: (1) the "piercing pressures" (pressure on projected punch area), or in shop lan-

(*Please turn to Page* 148)

Fig. 6—Details of shrink fit for 105 millimeter piercing punch

Fig. 7—Detail of working tools for forging 90 millimeter high explosive shell

Fig. 8—Effective taper obtained by construction

Fig. 9—Effect of wall thickness on piercing forces[14]

Fig. 10—Effect of base thickness and wall thickness on piercing pressure[13]

Fig. 11—Effect of relative wall thickness on piercing pressure[13]

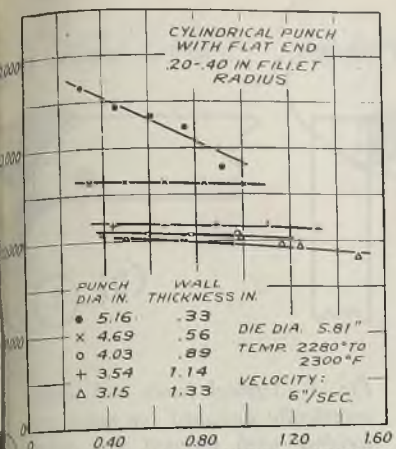
Fig. 12—Effect of piercing velocity and temperature on piercing pressures[13]

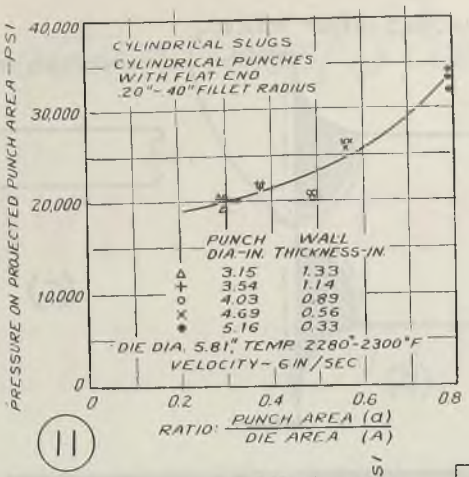
Fig. 13—Cross-sections of stepwise forging of 90 millimeter high explosive shell, M 71 (hot dimensions)

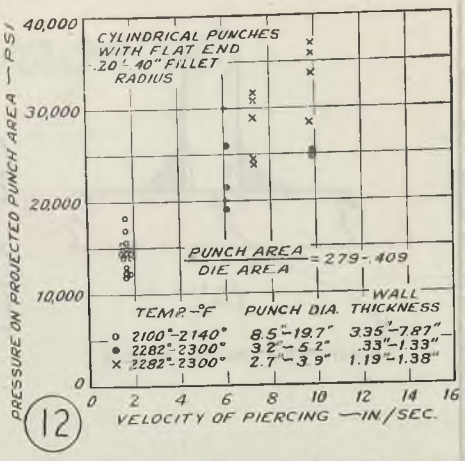
Fig. 14—Effect of temperature on piercing pressure[12]

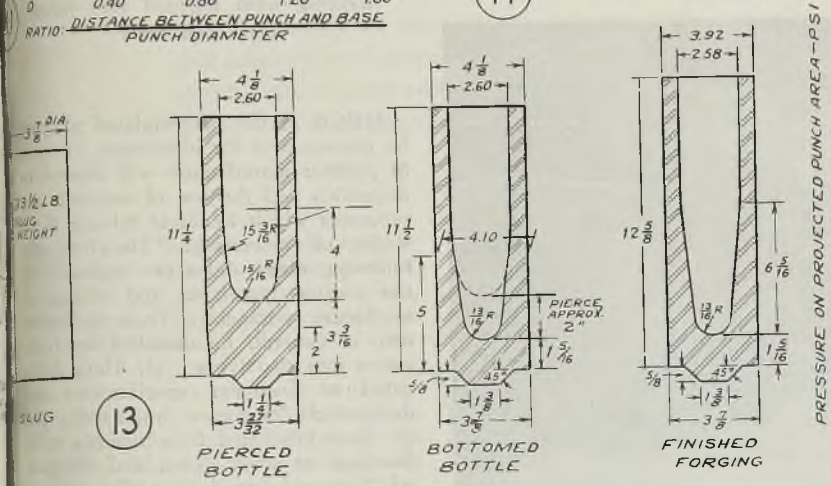
*Mr. Espey is field engineer associated with Case School of Applied Science, Cleveland, and formerly research engineer for the ASME Shell Forging Research Committee. Mr. Culhane is a well-known munitions consultant residing at 3356 East Fairfax Road, Cleveland Heights.

**The operations in forging 75 millimeter and 90 millimeter shell by the pierce-bottom-and-draw method on one type of hydraulic press are described and profusely illustrated in Reference 2.









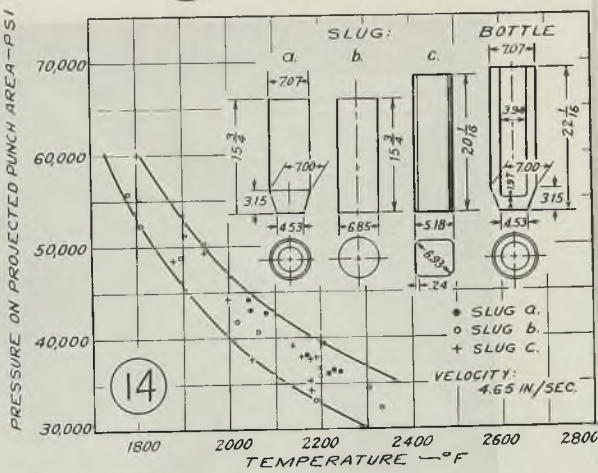


TABLE I

DATA ON PIERCING BOTTLES FOR VARIOUS SHELL AND OTHER MUNITIONS DURING WORLD WAR I[14]

Type of Forging	Cross Section and Size of Slugs, Diam. in Inches	Length of Slugs, Inches	Slug Weight, Pounds	Wall Thickness, Inches	Piercing* Pressure Lb./In.²	Max. Diam. of Punch, Inches	Base Thickness, Inches	Ratio: Annular Area to Punch Area	Ratio: Punch Area to Die Area
1. 75 mm. Shrapnel	Round 3.23	5.43	12.3	0.433	48,000	2.56	0.867	0.700	0.588
2. H.E. 75 mm. Shell	Round 3.23	7.48	17.2	0.552	47,400	2.31	1.180	1.180	0.458
3. Howitzer Shell 58 mm.	Round 3.23	4.61	10.6	0.630	37,700	2.05	0.788	1.600	0.415
4. 105 mm. Shrapnel	Round 4.53	6.50	29.3	0.709	33,900	3.54	1.180	0.970	0.508
5. 155 mm. Cartridge Case	Round 6.77	3.74	37.5	0.788	24,900	6.24	0.867	0.570	0.637
6. H.E. Howitzer Shell, 120 mm.	Round 5.43	9.45	61.7	0.856	33,300	4.02	1.180	1.050	0.488
7. H.E. Howitzer Shell, 105 mm.	Round 4.53	11.22	50.7	0.886	32,700	3.15	1.575	1.440	0.409
8. H.E. Howitzer Shell, 155 mm.	Sq. 5.71; Diag. 7.32	14.18	127.0	1.025	32,200	5.33	1.379	0.915	0.522
9. H.E. Howitzer Shell, 145 mm.	Round 6.38	12.20	110.0	1.140	26,200	4.74	1.379	1.195	0.456
10. H.E. Howitzer Shell, 155 mm.	Round 7.08	12.49	139.0	1.220	24,200	5.12	1.379	1.175	0.460
11. H.E. Howitzer Shell, 190 mm.	Round 9.05	13.39	242.0	1.339	26,300	..	2.760	0.930	0.518
12. H.E. Howitzer Shell, 149 mm.	Round 7.01	12.00	130.0	1.540	18,500	4.17	1.770	2.040	0.329
13. H.E. Howitzer Shell, 279 mm.	Sq. 10.44; Diag. 12.60	21.30	595.0	1.574	25,900	9.85	2.760	0.740	0.575
14. Hydrogen Gas Shell	Sq. 9.05; Diag. 11.02	8.27	181.0	1.652	19,200	7.68	0.788	1.040	0.490
15. H.E. Shell, 293.4 mm.	Round 12.60	21.50	760.0	1.690	24,500	10.31	3.150	0.765	0.567
16. H.E. Shell, 279.4 mm.	Sq. 10.63; Diag. 14.38	18.90	595.0	1.770	23,600	10.63	2.760	0.775	0.554
17. H.E. Shell, 240 mm.	Sq. 9.05; Diag. 11.02	21.70	463.0	1.810	19,500	7.84	2.760	1.140	0.468
18. H.E. Shell, 270 mm.	Sq. 9.85; Diag. 13.19	16.14	430.0	1.838	21,900	9.54	2.760	0.920	0.521
20. H.E. Shell, 279.4 mm.	Sq. 11.02; Diag. 13.78	18.70	640.0	2.010	19,900	9.85	2.760	0.980	0.505
21. H.E. Shell, 274.4 mm.	Sq. 10.44; Diag. 12.60	23.40	673.0	2.050	18,500	8.82	2.760	1.150	0.465
22. H.E. Shell, 320 mm.	Sq. 11.02; Diag. 13.78	32.30	1070.0	2.200	19,200	10.80	3.150	0.980	0.505
23. H.E. Shell, 370 mm.	Sq. 14.50; Diag. 16.92	26.20	1430.0	2.320	19,800	13.15	2.950	0.835	0.545
24. H.E. Shell, 370 mm.	Sq. 14.50; Diag. 16.92	21.80	1170.0	2.440	18,500	12.91	2.950	0.895	0.528
25. H.E. Shell, 340 mm.	Sq. 12.60; Diag. 16.92	31.30	1390.0	2.760	18,200	11.50	3.540	1.190	0.457
26. H.E. Shell, 400 mm.	Sq. 14.50; Diag. 16.92	32.30	1760.0	2.790	21,300	12.20	4.330	1.120	0.528
27. Torpedo Tube	Octagon, Diam. 18.90	40.00	3330.0	3.740	17,100	13.78	5.120	1.370	0.422
28. H.E., 520 mm.	Sq. 18.30; Diag. 21.70	31.10	2755.0	3.940	.....	14.56	5.120	1.310	0.433
29. H.E, 520 mm.	Sq. 18.30; Diag. 21.70	44.50	3970.0	4.130	17,370	13.98	5.120	1.525	0.396
30. H.E.	Octagon, Diam. 22.80	38.20	5300.0	5.320	13,380	13.78	5.120	2.130	0.320

*Total tonnage required for piercing $= \frac{\text{Piercing pressure} \times \text{Punch Dia.}^2 \times \pi}{8000}$

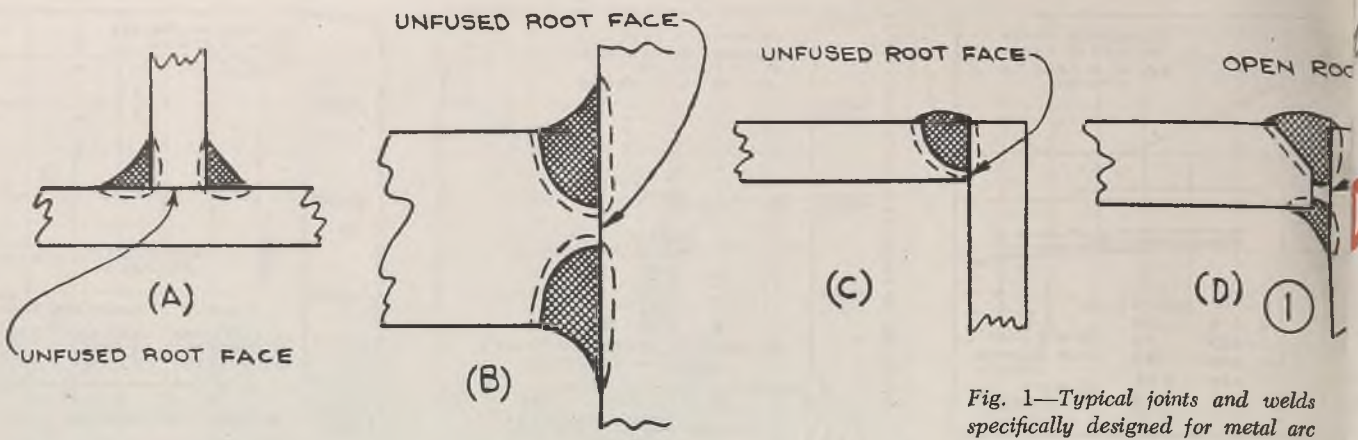


Fig. 1—Typical joints and welds specifically designed for metal arc welding with unfused root faces and open roots

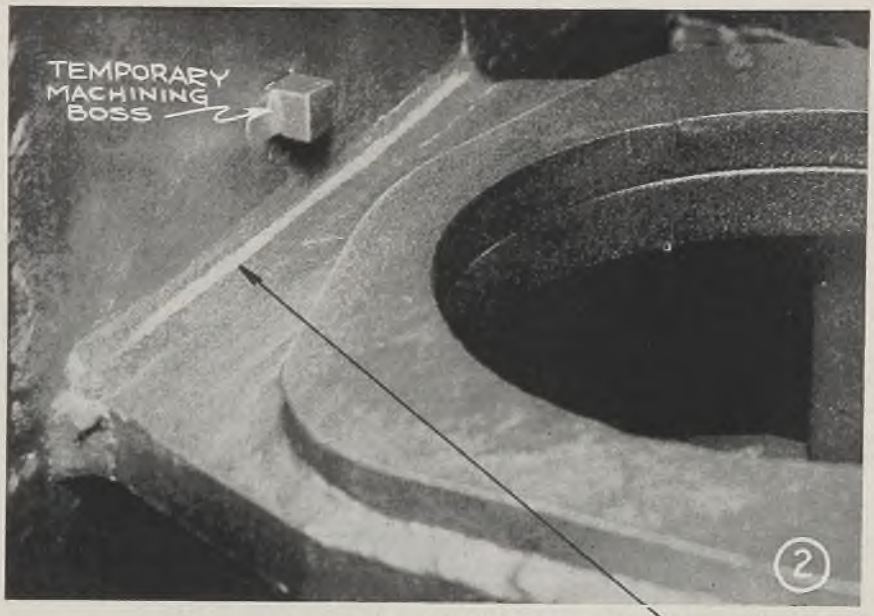


Fig. 2—Direct-current Magnaflux pattern of a non-relevant root opening in fillet-welded T-joint

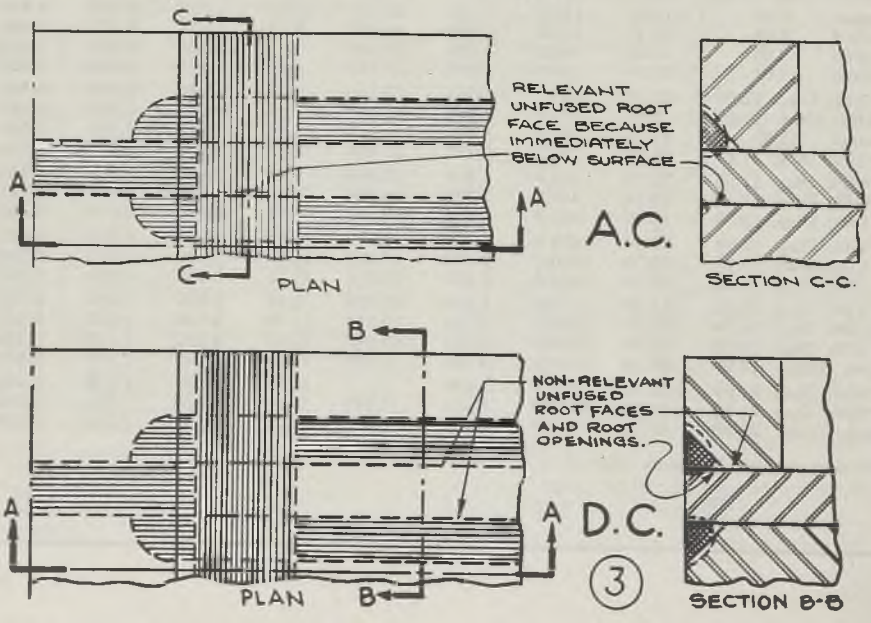


Fig. 3—Comparative direct-current and alternating-current Magnaflux patterns of single bevel and square butt welds showing relevant and non-relevant unfused roots and root openings

MUCH of the contemplated planning by management for elimination of waste in postwar manufacture will depend on inspection and the use of materials and processes which facilitate salvage in all stages of processing. Therefore, the following observations are applicable to the routine inspection and salvage of machinery weldments. These weldments can, in general, be classified by fabricators into two types: (1) Those fabricated to customer specifications and designated "customer inspected"; and (2) those fabricated to company's specifications, as stock items, and designated "non-customer inspected".

In practice, the only difference between these two is the necessity for facilitating customer inspection, keeping their inspectors informed of errors and defects and securing their approval of recommended salvage procedures by Salvage Requests. In the main plant of the company with which the author is associated, the inspection department is independent of the engineering and production departments, the chief inspector reporting direct to the assistant general manager. On inspection and salvage problems, involving welding and allied processes, the chief engineer of the division and the director of welding function in an advisory capacity. The weight given to their opinions, individually or collectively, is dependent on the problem involved.

Findings Put to Use

The fundamental information obtained from two researches conducted by the author, one on inspection and the other on salvage, has been put into practical use and incorporated in the subject matter. These researches are, respectively: "An investigation to determine the relative effectiveness and utility of direct current and alternating cur-

Routine Inspection and Salvage of

DEFECTIVE MACHINERY WELDMENTS

Important economic advantages are to be obtained from systematic inspection of parts and application of proven salvage procedures for reclaiming rejected work. An authority in this field, whose investigations provided the basis for more liberal use of welding on naval vessels, submits data also presented recently before the American Welding Society

By JAMES W. OWENS
Director of Welding
Fairbanks, Morse & Co.
Beloit, Wis.

rent for the Magnaflux inspection of fusion welds—also for the detection of laminations and segregations in plain carbon steels, and an investigation on the precision welding of plain carbon steels.

As defective material will be found and errors will be made by workmen in all stages of weldment fabrication and processing, inspection is intimately bound up with both waste and salvage. This is particularly true of medium carbon steel weldments because the possibility of salvaging them is great, regardless of their state of completion. Therefore, use of weldments for machinery fabrication, also the techniques and procedures involved must be regarded by management as of major economic importance.

This paper, therefore, has three major objectives: First, to illustrate by contrast the necessity for an open-minded approach to the inspection and salvage of weldments in order to eliminate waste; second, to outline inspection methods and procedures which have been evolved to obtain the maximum economic advantages for machinery weldments; third, to outline salvage methods and procedures for partially and completely machined weldments which are technically and economically sound.

Contrast of Design, Inspection and Salvage Requirements and Procedures: As boilers, unfired pressure vessels and diesel engines are classified as "machinery", and as the inspectors of welded boilers and unfired pressure vessels may be called upon to inspect diesel engine block weldments and their auxiliary parts, and vice versa, these products will be used to illustrate the potentially wide variations in design, inspection and salvage requirements and procedures. The desirability and/or necessity for inspectors to seek individual and collective advice from those capable of furnishing it before rendering decisions has been demonstrated. Indeed, this should be a requirement in specifications, codes and rules governing inspection.

Salvage Committees, consisting of

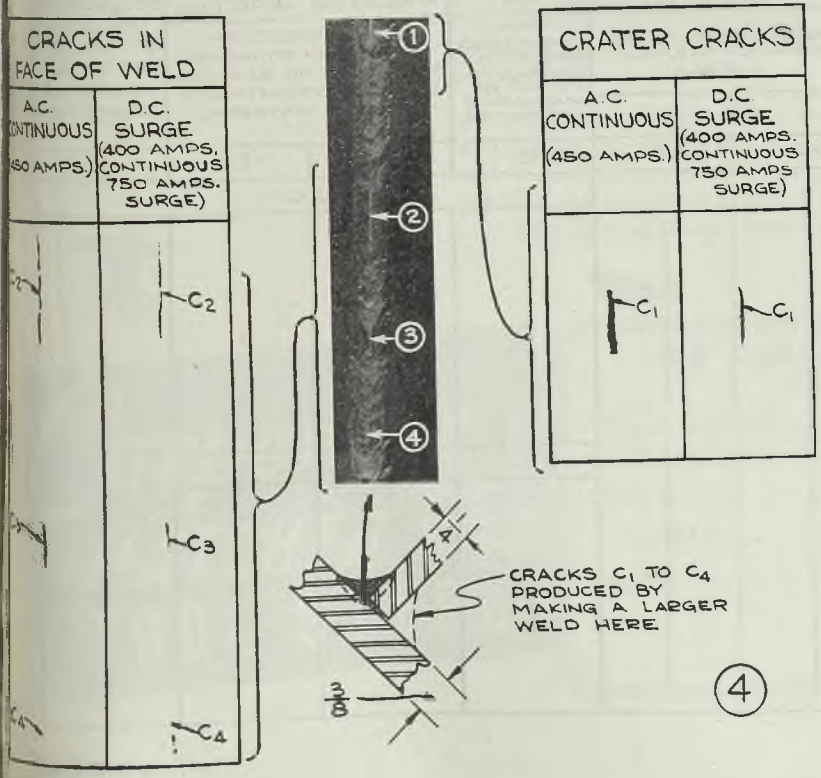
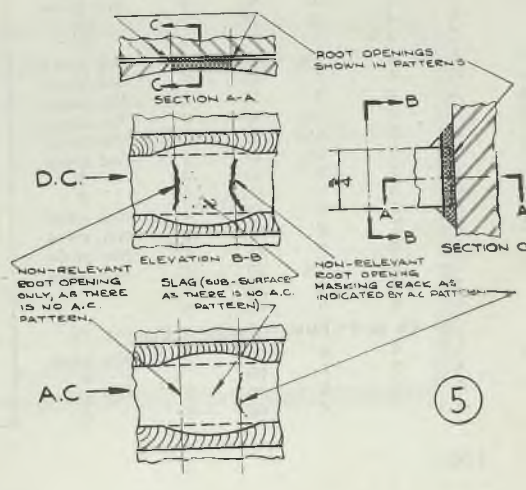


Fig. 4—Comparative Magnaflux patterns of cracks in face and crater of fillet weld

Fig. 5—Comparative patterns of square butt weld showing a non-relevant root opening, subsurface slag and a crack masked by pattern of non-relevant root opening



representatives from inspection and engineering divisions concerned, have and are being used satisfactorily by the company for minor nonrepetitive defects. However, for repetitive defects and defects beyond the scope of these committees, the use of Salvage Requests previously referred to has been found necessary and has proven entirely satisfactory. On customer-inspected products, these requests are addressed to the customer's representative via the company's chief inspector, and on non-customer inspected work, they are addressed to the company's chief inspector.

Inspection of weldments starts at the templates and dies for the details and at the fixtures for subassemblies and final assemblies to be sure of their accuracy before use in routine production. Each is checked by flame cutting, forming, assembling for welding at least one piece. If found correct, the template, die or fixture is steel stamped by an inspector.

Inspection of Base Metal: Certified mill reports of each heat are accepted by our company for all low and medium carbon steels. However, the chemical analyses and physical properties of the base metals used in weldments which are subject to heat treatment (other than stress relieving), are obtained under routine laboratory procedures. In products

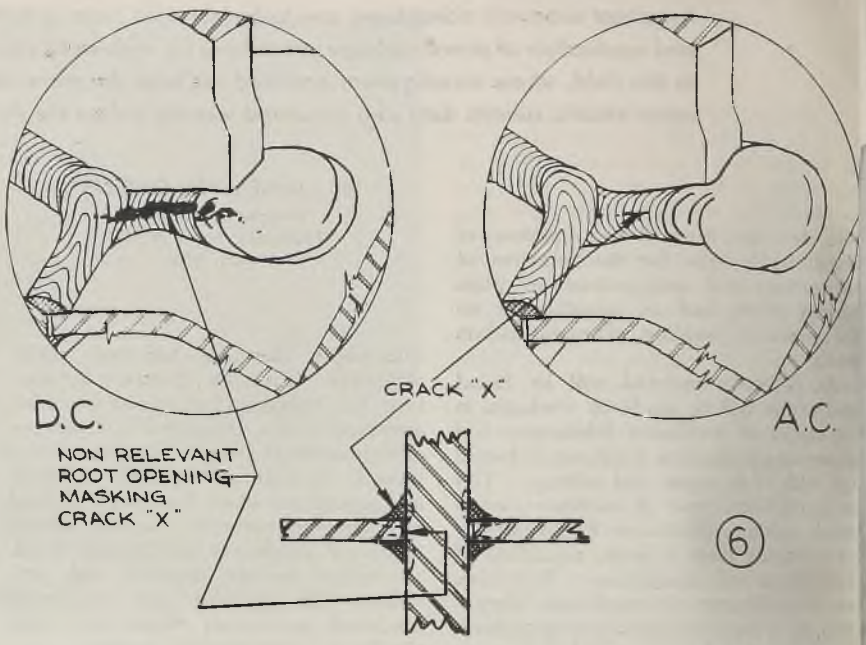
TABLE I
RECOMMENDED SPEEDS FOR THE VARIOUS GRADES OF MACHINE FLAME CUTTING REQUIRED IN MACHINERY FABRICATION

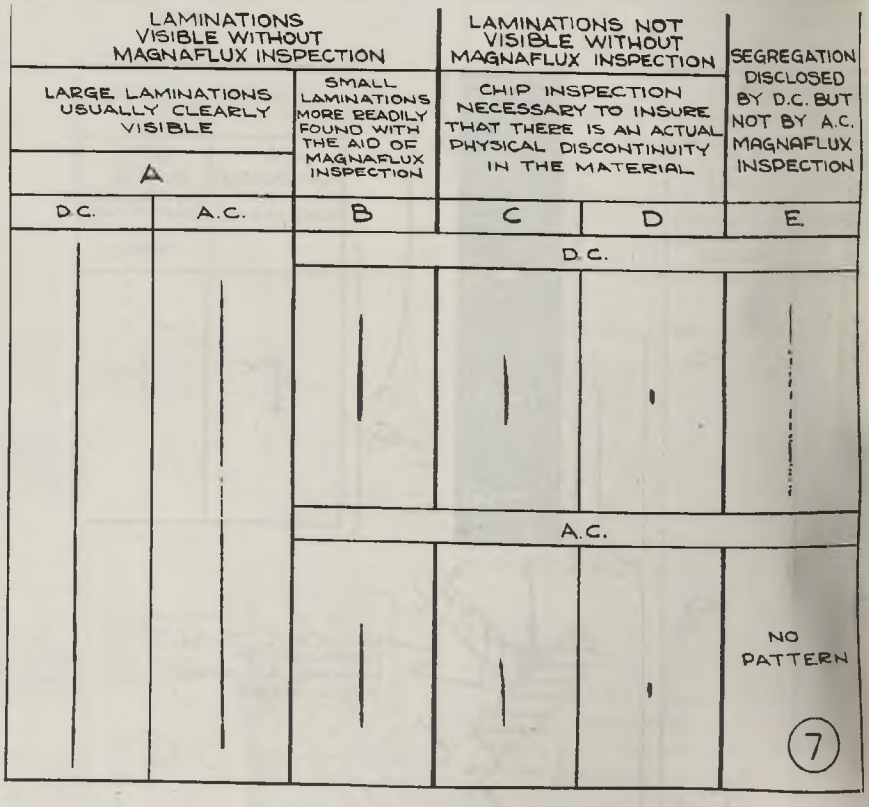
(Data Given is for Air Reduction Sales Co.'s Torches)

(inches)	Grade of Cut	Tip Size	Speed inches per min.	Gas Pressures (Lbs./sq. in.) Oxygen	Acetylene	Speeds Recommended by Manufacturer (in./min.)
	(A) ¼ to ⅜ Plates—Grades A and C Cuts					
¼	A	0	19	20	2½	20
¼	C	0	22	30	2½	20
⅜	A	1	19	20	2½	Not given
⅜	C	1	22	30	2½	Not given
⅜	A	1	17	20	2½	19
⅜	C	1	20	30	3	19
	(B) ½ to 1½" Plates—Grades A, B and C Cuts					
½	A	2	12	25	3	17
½	B	2	14	30	3	17
½	C	2	17	40	3	17
⅝	A	2	11	25	3	Not given
⅝	B	2	14	30	3	Not given
⅝	C	2	16	40	3	Not given
¾	A	2	11	30	3	15
¾	B	2	13	36	3	15
¾	C	2	14½	40	3	15
⅞	A	2	10	35	3	Not given
⅞	B	2	12	40	3	Not given
⅞	C	2	13½	45	3	Not given
	A	2	10	38	3	14
	B	2	12	42½	3	14
	C	2	13½	47½	3	14
⅛	A	2	9	40	3	Not given
⅛	B	2	10½	45	3	Not given
⅛	C	2	12	50	3	Not given
¼	A	2	8	42½	3	Not given
¼	B	2	9½	47½	3	Not given
¼	C	2	10½	50	3	Not given
¼	A	3	8	40	3	Not given
¼	B	3	9½	45	3	Not given
¼	C	3	10	50	3	Not given
⅜	A	3	8	42½	3	12
⅜	B	3	9	47½	3	12
⅜	C	3	10	52½	3	12
	(C) 1⅝ to 1½" Plates—Grades A and C Cuts					
	A	3	7½	45	3	Not given
	C	3	9	50	3	Not given
	A	4	7	45	3	Not given
	C	4	9	50	3	Not given
	A	4	6	45	3	10
	C	4	8	50	3	10
	A	4	5½	45	3	Not given
	C	4	7	45	3	Not given
	A	4	5	45	3	Not given
	C	4	6½	50	3	Not given
	A	5	5½	45	3	Not given
	C	5	7½	50	3	Not given
	A	5	5	45	4	8
	C	5	7	50	4	8
	A	5	5	45	4	Not given
	C	5	8	55	4	Not given
	A	5	5	45	4	Not given
	C	5	7½	55	4	Not given
	A	6	6	60	5	7
	C	6	6	60	5	7
	(D) 4½ to 6" Plates—Grades A Cut					
	A	6	6	60	5	Not given
	A	7	6	60	5	6
	A	7	5	60	5	Not given
	A	7	4	60	5	5

Fig. 6—Comparative patterns of fillet-welded T-joint showing the masking of a crack in face and crater of fillet weld by its non-relevant root opening

Fig. 7—Comparative direct-current and alternating-current Magnaflux patterns of laminations and segregations





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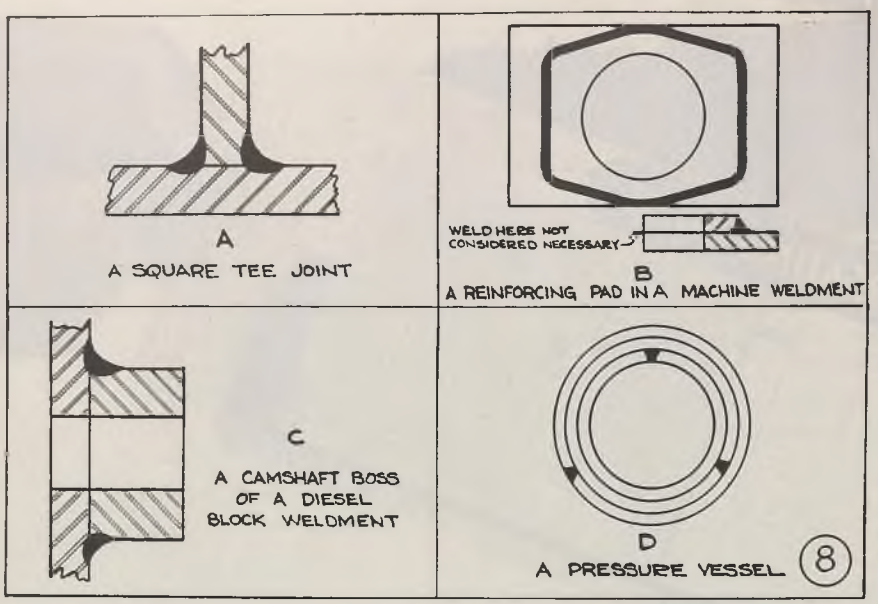

Fig. 8—Typical laminated construction used in fabrication of weldments

or parts of products, wherein laminations in the completed weldment as prohibited by specification, a routine Magnaflux inspection of all edges is undertaken after all shaping and forming operations on the details have been completed prior to their use in subassemblies and assemblies. Localized laminations are completely melted or chipped out and welded as a routine operation. If the lamination is extensive, the inspector's attention is called to it for a decision as to whether the laminated section should be removed and a new section welded in its place or whether the part should be scrapped.

The major point to be borne in mind is that this Magnaflux inspection of detail parts can be quickly undertaken and minimizes expensive salvage operations or high scrap losses. However, as laminations and segregations occasionally will be found during machining, their acceptability or unacceptability should be considered by inspection as wholly dependent on the product and their location in it. In general, segregations are not objectionable in machinery weldments, and two illustrations, Figs. 8 and 9, are submitted to assist inspectors to pass judgment. Fig. 8 shows typical laminated construction used in the fabrication of weldments and Fig. 9 shows typical objectionable and non-objectionable laminations.

Inspection of Flame Cutting: As the "grade of cut" can vary widely, from that of a manual cut by an unskilled operator to that of a machine cut made by a skilled operator, definite standards and procedures have been established to insure economical fabrication. By "grade of cut" is meant the relative squareness of the cut edges, its freedom from nicks, also depth and uniformity of surface serrations produced by the flame. As the grade of cut is primarily determined by speed of cutting, it is obvious that inspection is confronted with a major problem whenever an incentive system of paying operators is used. Regardless of this, the problem has been satisfactorily solved by the following routine:

1. Preparation of standard samples cuts for the various grades and over the entire range of thicknesses normally used in production. The speeds of cutting, tip sizes and gas pressures are steel stamped on each sample. See Table I.
2. By conveniently locating these samples for the use of flame cutters, time study men, foremen and inspectors.
3. By specifying the grade of cut required on the operation sheet.
4. By prohibiting all grinding on flame-cut surfaces except those manually cut and exposed, or specifically called for on the drawing. Grinding is generally considered to be a relatively cheap operation. However, it easily can become one of the most expensive operations when all factors are taken into consideration.

An A grade of cut is the best that can be made. It is used for the edges of members subject to fatigue stresses and for exposed edges in general. B and C grades are used principally for nonexposed or partially exposed surfaces, e.g. the root faces of T-joints, also for welded surfaces and surfaces to be machined.

Table I shows that in general, the speeds of machine flame cutting recommended by the manufacturers of these machines are too high for even the lowest grades of cutting required in machinery fabrication and that the differences between the grades of cut vary appreciably over the entire range of thicknesses. As a result, in material over 4 inches in thickness, only the grade A cut is specified, as grades B and C would, in general, be unacceptable for any part of a machine, both from the standpoint of cost and serviceability. In material ¼ to ⅜-inch and 1⅝ to 4 inches in thickness, the A and C grades are specified as there is not enough difference between the A and B grades to justify the inclusion of both. In ½ to 1½-inch material all three grades are called for.

Salvage operators assigned to the repairing of flame cut nicks are conveniently located to the flame cutting and inspection departments. After the part has been flame cut, it is slagged with a pneumatic slagging hammer, inspected, salvaged if necessary, and reinspected. These salvage operators are specially

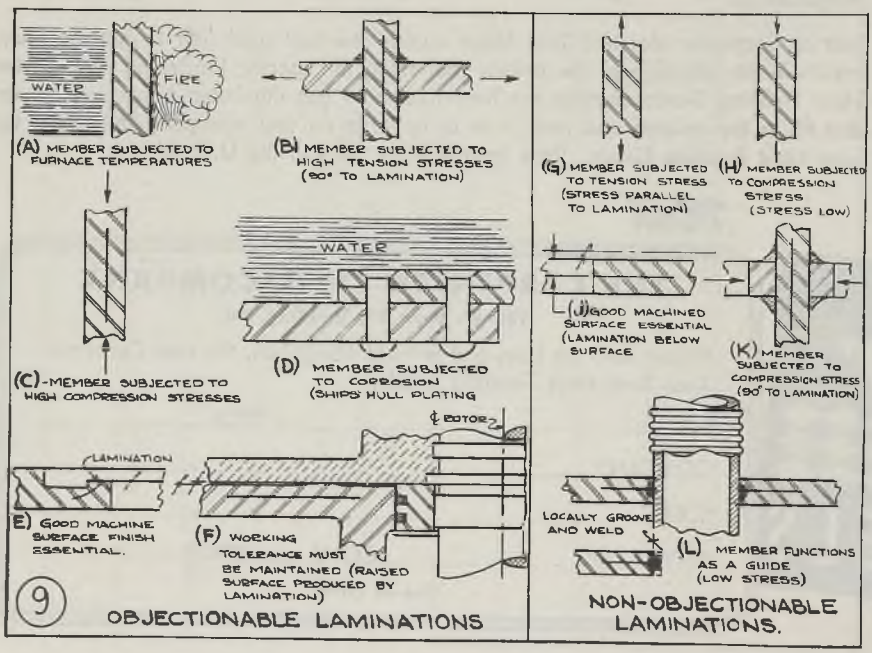

Fig. 9—Typical objectionable and non-objectionable laminations

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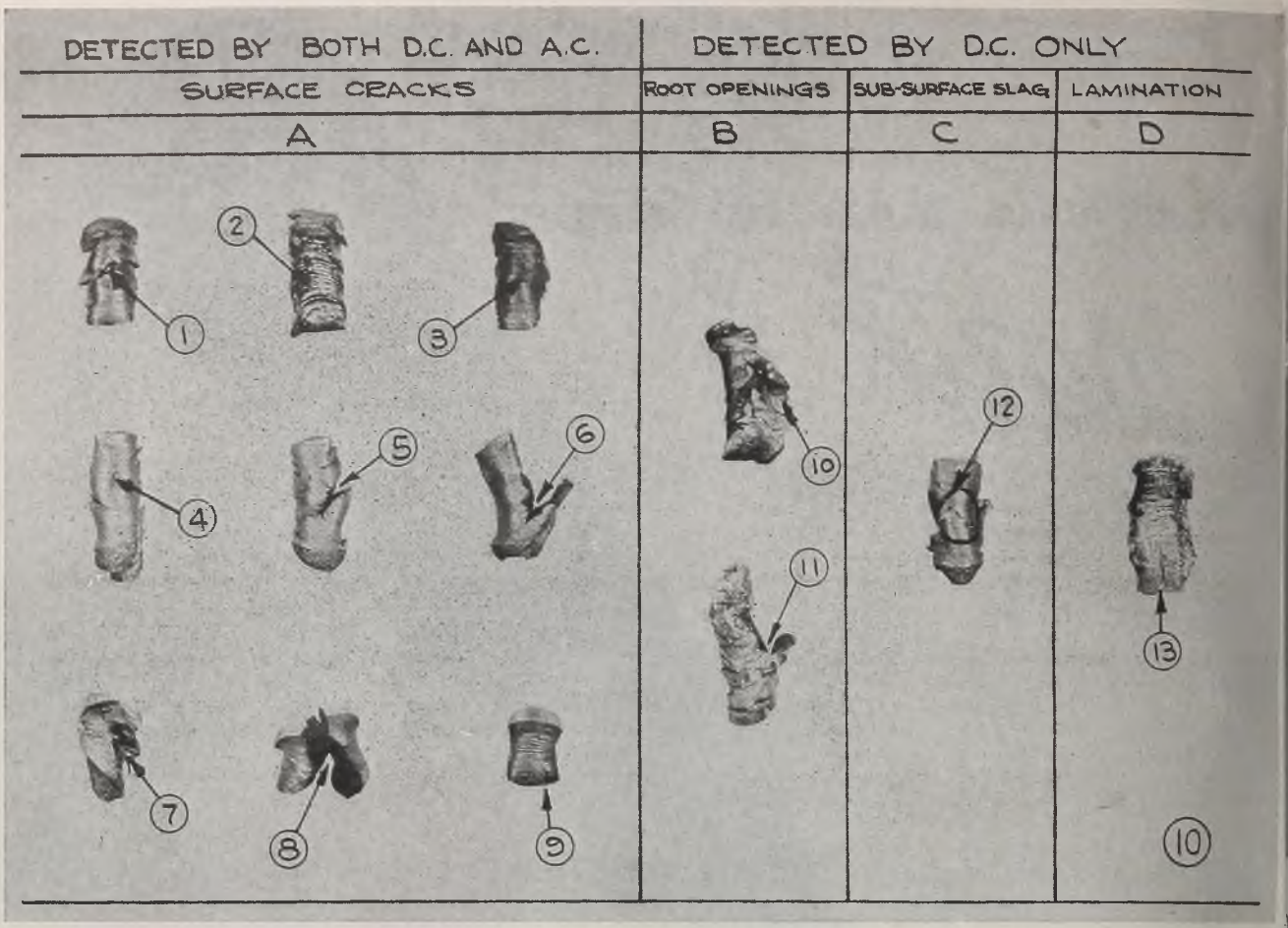

Fig. 10—Typical surface cracks, root openings and subsurface slag in welds, also lamination on plate edge as observed by chip inspection

trained for this type of work. They should never be students or trainees, as improperly salvaged flame cut scars can result in high scrap losses and very expensive salvage operations. The salvaging of the thrust bearing saddles of a completely machined diesel engine block weldment is only one of hundreds of cases which can be cited by fabricators to prove this point.

Progressive Inspection of Assembly and Welding Operations: A progressive dimensional and qualitative inspection of the major operations involved in assembly and welding has been found to be necessary in the fabrication of company's diesel machine blocks. This procedure insures the early detection of defective workmanship and the placing of responsibility where it belongs. It also appreciably minimizes the likelihood that the part will ultimately be salvaged or scrapped.

A printed form is used. On this form is listed all of the major production and inspection operations, with spaces after each operation for initialing and dating on their completion by foremen and inspectors, respectively. This form is not only a progressive record of all operations, but is used by the production department to chart the daily status of all blocks in production. On completion of a block, the form is filed by the inspection department.

Layout-Inspection: This is the major dimensional inspection operation in the company's welderies. It requires an accurately machined layout table, small screw jacks for leveling purposes, surface blocks, surface gages and other precision tools. White cold water paint or a layout stain is freely used to facilitate the scribing of layout lines on the weldment. These lines are centerpunched at appropriate locations after all shifting has been completed and the layout operator is satisfied that the weldment will clean up when machined. Furthermore, to differentiate these centerpunch marks from all others, they are enclosed in an O stamp. All errors found in layout-inspection are noted on appropriate routine forms and corrections made by the operators responsible or by operators assigned to the salvage department and specially trained to correct defects. These centerpunch marks are used by the machine operator to set up the weldment for machining. A welding layout-inspection should be accurate enough to eliminate the usual machine shop layout.

Nondestructive Inspection: The author has investigated the comparative use of direct and alternating-current equipment with the assistance of Magnaflux Corp. Conclusions and recommendations are as follows:

—Direct current, with the appropriate current setting, frequently discloses root openings and unfused root faces characteristic of the design and definitely intended by the designer (See Figs. 1 to 6, inclusive). On the other hand, openings and unfused root faces positively are not disclosed by alternating current regardless of current density employed, unless they are immediately below the surface, as shown in Fig. 3.

—Direct and alternating currents are equally effective in locating cracks in faces and craters of welds in plain carbon steels, provided the direct current Magnaflux pattern (picture) is not masked by the pattern of an adjacent root opening or other subsurface discontinuity (See Figs. 5 and 6).

—Subsurface slag inclusions are a type of discontinuity disclosed by direct current as shown in Fig. 5. Its relevancy should be wholly based on design and service requirements.

—Direct and alternating currents are equally effective in detecting laminations at plate edges as in Figs. 7A, B, C and D. However, alternating current is preferable to direct current for the production inspection of laminations, as direct current discloses segregations.

—Alternating current generally should be used in the inspection of fillet welds, butt welds designed for partial penetration and for inspection of plate edges for laminations.

—Direct current generally should be used for the inspection of butt welds designed for 100 per cent penetration

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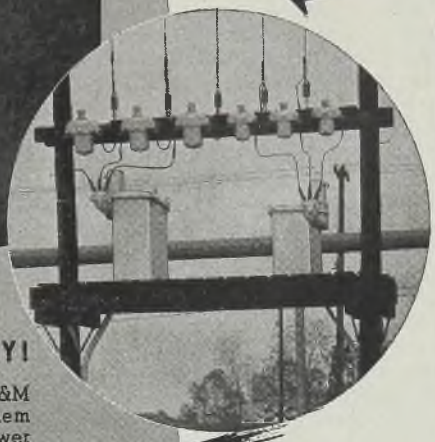

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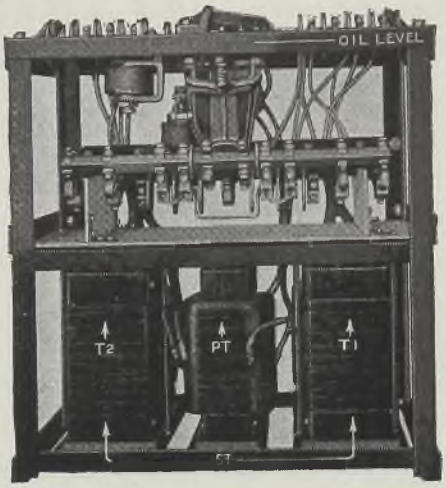

Note clean-cut design of this reduced voltage starter mechanism for 2300 volt motors.

CLEAN-CUT DESIGN

1. Single, quick-break, double-throw contactor operated by a single magnet.
2. Two liberally-rated auto-transformers marked T_1 and T_2.
3. Potential transformer (marked PT) for 220 volt push button circuit.
4. Current limit relay trips mechanical latch to transfer from reduced to full voltage.
5. Variable reactor on top of mechanism permits quick change of transition-setting, when desired.
6. Continuous torque acceleration.
7. High torque efficiency in starting.
8. Adjustable, magnetic type overload relays, arranged for magnetic reset from push button.

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also for relative freedom from porosity.

The following should also be borne in mind when using Magnaflux inspection: To date, it is impossible to completely eliminate fabrication cracks in the base metal, in welds and in weld craters at points of high stress concentration, such as manhole reinforcements, closing welds in large assemblies, the ends of gussets in way of intersecting members and in square corners. However, precision welding, as outlined in following paragraphs, will go a long way in solving this problem. Cracks will be found, after stress relieving, even though the product has been Magnaflux inspected before stress relieving and all observed cracks chipped out, rewelded and again Magnafluxed. All locations subject to high static, dynamic and fatigue stresses in service, should be investigated for cracks both before and after stress relieving. It is essential that a routine inspection procedure be used which involves the recording of all cracks and their reinspection after repairs have been made. When laminated material must be kept out of a product, this can be accomplished through routine inspection of the part prior to its assembly in the product, using both direct current and alternating current. Should laminations later be found in the product, their harmfulness should be analyzed on the basis of Figs. 8 and 9.

Prohibition of Grinding and Peening of Weld Faces Prior to Final Inspection: The remarks on the grinding of flame cut edges, under inspection of flame-cutting, are equally applicable to grinding and peening of weld faces prior to the final inspection of the weldment. The principal reasons for their general prohibition is the impossibility of properly inspecting faces of welds, if ground or peened and the fact that their use encourages defective workmanship. Grinding at this stage of weldment fabrication should, in general, be specially indicated by inspectors, and at no time should the peening of the faces of welds be sanctioned except in a precision welding procedure as previously outlined. One of the few grinding exceptions is that of corner welds which should be a "must", provided weld is reinforced at its root face or when appearance is the only reason for grinding and strength is not a factor. Unsightly corner welds can spoil the appearance of an otherwise excellent job.

Inspection of Cleaning Prior to Final Inspection: All weldments should be cleaned, thoroughness required to be embodied in specifications for the product. For example, foundry flasks would require only the removal of the slag from the welds to facilitate their inspection, but in diesel engine fabrication, mill scale, weld spatter, sand, shot, grit and other foreign matter must be completely removed from all water, oil and air passages and surfaces. This extreme care is necessary to avoid scoring bearings, wrecking pumps and causing physical damage to moving parts and surfaces in general. Another requirement of importance for this type of product is the removal of metal slivers which catch lint and cause the clogging of water, oil and air passages.

The appearance of many a weldment has been ruined by painting over welc spatter. Two cleaning methods hav been found effective. The first metho requires the use of a light pneumati scaling hammer and a wire brush, usua ly referred to on drawings as "chisel an wire brush". The second method i sand (shot) blasting which should alway be used when mill scale must be re moved in addition to weld spatter. Thi latter method requires the use of th pneumatic scaling hammer.

Salvage of Partially and Completel Machined Weldments: Machinery welc ments are invariably machined and ar therefore stress relieved to insure th obtaining of required machining tole ances, varying from plus or minus 0.01 inch to plus or minus 0.0005-inch, de pending on the product, also the locatio and function of the machined surfac Because of these close tolerances, it usually inadvisable or impossible to us the welding process in the salvage machined weldments unless (1) weld in a location which would not chang machining tolerances by shrinkage or b the introduction of residual or reactio stresses in the product, or (2) precisio welding can be employed to preve shrinkage and avoid these stresses, or amount of welding can be appreciabl reduced by making the repair primaril mechanical. As an alternative, an in spector can approve a defective produc "as is" if, in his judgment, the defec does not affect serviceability or inte changeability. The acceptance of lam nations, under certain conditions and i certain locations is a case in point.

(To be continued next week)

Bearing Output Boosted by

High Speed Megatherm Unit

PRODUCTION line process of high speed continuous heat treating, using Megatherm high frequency energy, has been developed by the Industrial Electronics Division, Federal Telephone and Radio Corp., Newark, N. J., subsidiary of International Telephone and Telegraph Corp. The application is to finished bearing pins, each 2½-inches long by ½-inch diameter, case hardened to a depth of 0.025-inch while automatically fed through a hopper into continuous induction unit, leaving the heating coil at a rate of 75 bearing pins per minute.

With 5-megacycle energy, surfaces of parts treated are heated above critical temperature in less than 1 second. When heat is applied at high speed to the surface, there is insufficient time for it to penetrate into the core and only a thin surface layer experiences a change in physical state. The central portion of the parts retain their original toughness and strength.

Factory application of this process involves the following equipment: Hopper from which unhardened parts are fed into the glass tube, the heating coil, the induction unit, a connection providing a continuous flow of water for quenching, and an ordinary work table carrying suitable containers for finished and hardened products which are ejected from the heating fixture.

Develops Unusual Hardness

Surface hardness is rockwell C-60, above file-hardness. The metal is chromium molybdenum steel NE-9442. Pins are finish ground prior to heat treating, and after the hardening process there is no scale or warpage. The high speed of the process makes it possible to surface harden parts after finish grinding. Elimination of much costly finishing, formerly required on hardened steel parts, gives a considerable saving.

The coil is a single layer approximately 1 inch long by ¾-inch diameter. It has 5 turns of small copper tubing, is grounded and does not carry high voltage. It is exposed to continuous wetting by water used for quenching.

A protective feature incorporated in the unit is simple push button control, requiring no tuning or other technical adjustment. Cost of operation depends upon the size of the unit, the popular 25 kilowatt model costing approximately 50 cents per hour. Units are compact, requiring floor space of 4x4 feet.

The method has been applied to pieces as small as ⅛-inch in diameter and to bearing surfaces up to 6 inches in diameter.

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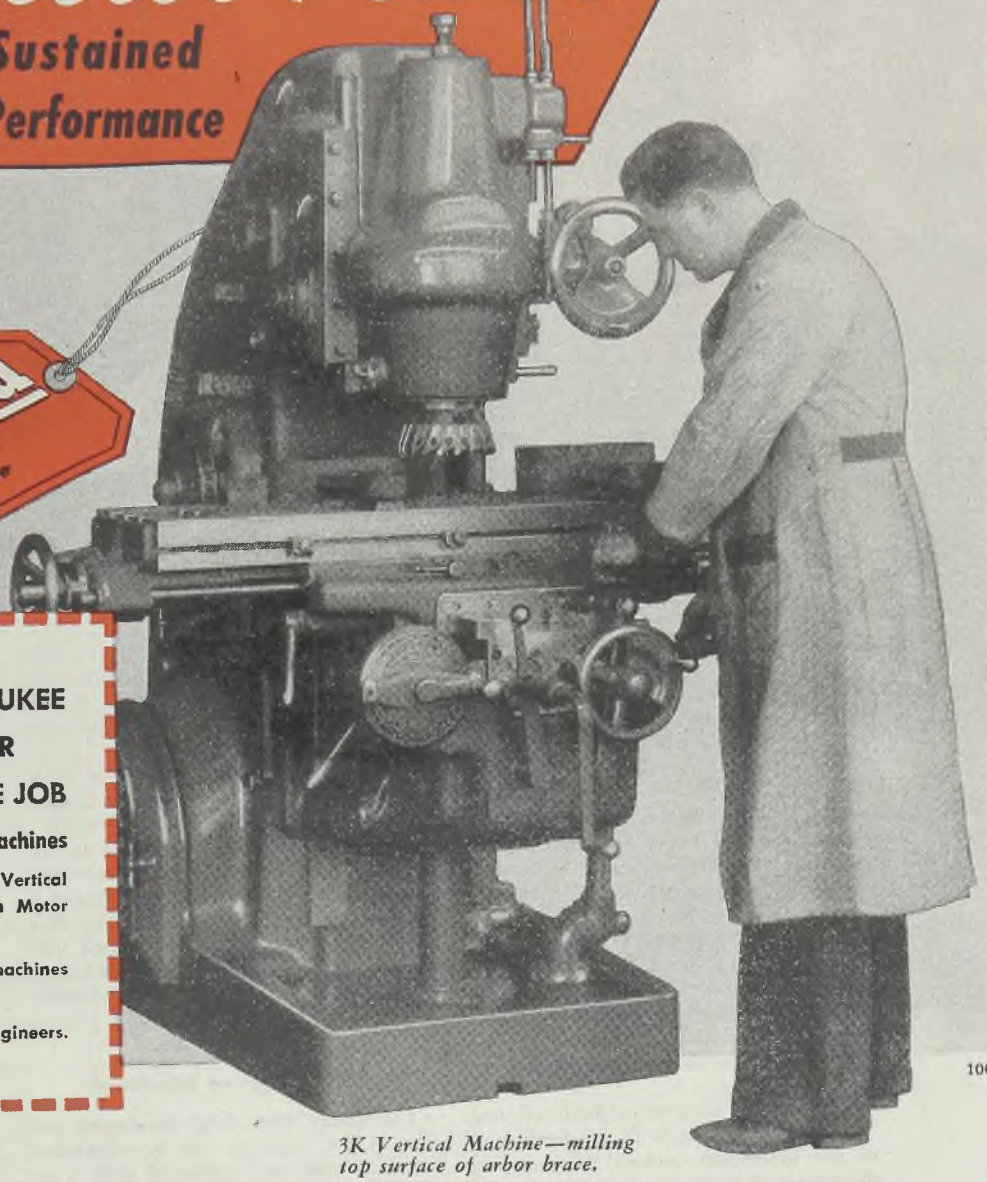

3K Vertical Machine—milling top surface of arbor brace.

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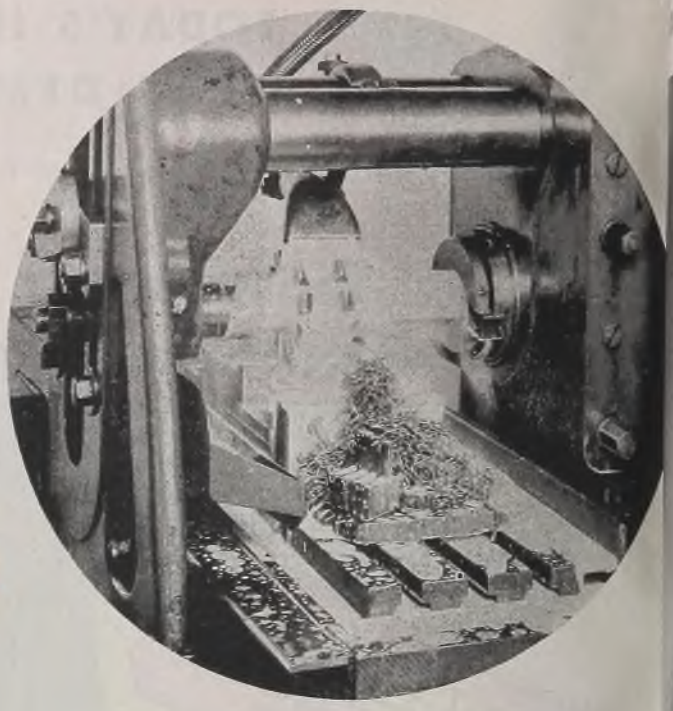

The Selection and Use of Cutting Fluids

Detailed consideration of origin and development of cutting fluids provides ready index for improved production procedures. Tables of machinability simplify selection of correct fluid type for any job

AMERICAN industry is producing today as it never has before. Many factors are responsible for this phenomenal output, but one factor that may be too little appreciated for the part it plays in the accelerated flow of metal products is the use of cutting fluids.

Some cutting fluids marketed and in use today are little different in characteristics and performance than they were prior to Pearl Harbor, but others are new developments capable of coping with improved alloys and with higher cutting speeds and heavier cuts. These have been developed without fanfare, but lacking these improved products, metal working could not have attained its present fast pace.

General use of cutting fluids on machine tools dates back to the latter part of the nineteenth century when it was discovered that the use of water extended tool life, permitted an increase in cutting speeds and resulted in improved finish. Use of water-soda mixtures, as well as straight lard oil and sperm oil, brought further improvement. However, each of these materials had some disadvantage, such as rusting, oxidation and ultimate rancidity. Mineral oil was found to work well on many jobs. When mixed with lard oil or sperm oil in varying percentages, heavier cuts could be taken because of its improved "wetting ability" and greater film strength characteristics.

Advances in machine tool design and the advent of tougher metals, including many special alloys, called for additional improvements in cutting fluid characteristics. These were obtained by the addition of sulphur, phosphorus, chlorine, etc. in varying percentages and combinations. During this transition period, cutting compound or paste and soluble oil came into general use.

At the same time, efforts were being made in the laboratory to find a satisfactory method for evaluating cutting fluids. When such tests first were set up, the data secured were found to have little or no correlation with results obtained in actual performance. Furthermore, little correlation originally could be made with extensive field tests. These difficulties were due to lack of a common denominator for evaluating tests, and also to lack of control over variables.

Scientific Method Introduced

Laboratory tests later developed and now in use, however, can be substituted for field tests and employed with a remarkable degree of accuracy in predicting cutting fluid performance. The lathe used for testing is equipped with suitable devices for controlling variables, including volume, velocity and temperature of cutting fluid, cutting speed, feed and depth of cut. Tool grinding fixtures which insure that tool angles and nose radii are identical for all tests are used to eliminate the tool as a variable. This procedure has helped tremendously in developing the highly efficient cutting fluids in use today.

To understand how a cutting fluid works we must know just what functions it performs. Needless to say, the term "cutting fluid" is a misnomer as the fluid itself has no cutting action. It may required to perform any one or more th one of a number of functions, includi cooling, lubrication, prevention of wel ing of chips to the tool and washing aw of chips. In some cases it must provi protection against rust, at least for a re sonable period. Depending on which the various metals and operations a involved, the cutting fluid may be straight mineral oil, low in viscosity; soluble oil or cutting compound; miner and lard oils blended together in varyi percentages; or a combination of mine oil and sulphur with or without the adc tion of either lard oil or sperm o chlorine, phosphorus or some other cor pounds.

Selection of a suitable cutting fluid f a given metal and operation involves mo study than ordinarily is required to sele a lubricant for a steam turbine, air con pressor or even a locomotive. Consider tion of variables such as:

(a) Characteristics of metal being ct
(b) Operation being performed
(c) Severity of the operation

is simply one of many problems involve in selection of the proper cutting flui for a specific purpose.

Suppose we examine the problem in volving characteristics of a metal bein machined. It may be ferrous or nonfer rous. If ferrous, it may be a mild stee such as 1110 or 1112, or it may be nickel nickel-chromium or a molybdenum steel If nonferrous, it may be aluminum, magnesium alloy, bronze, brass, etc.

To simplify this problem, metals have been grouped according to machinability The machinability rating is based on the

Tables used in this article were prepared from data developed by the Independent Research Committee on Cutting Fluids, and by Prof. O. W. Boston, University of Michigan.

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A NAME TO REMEMBER WHEN YOU THINK OF LATHES

cutting speed used for AISI-1112 cold drawn steel, classed as 100 per cent when machined with a suitable cutting fluid at 180 feet per minute under normal cutting conditions. The machinability rating of any other metal is the per cent of cutting speed, compared to this standard, which may be used. Such a classification table provides an answer for item (a) in the foregoing list. See Table I.

Items (b) and (c) in the list just mentioned are more or less interlocking in that the nature of an operation usually determines its severity. Sawing or surface grinding can be classed as least severe while internal or external broaching top the list for severity. With knowledge of the machinability classification of the metal being machined coupled with knowledge of the operation, Table 2 can be used to aid in selecting the type of cutting fluid required.

Soluble oils provide maximum cooling because of the high specific heat of water in their emulsion. By increasing the proportion of soluble oil to water the lubricating property of the emulsion is increased. Therefore, when soluble oils are used it is necessary to increase the ratio of oil to water as the severity of operation increases. Soluble oils are particularly suited to milling, drilling, sawing and grinding operations. However, they are not recommended for use in automatic screw machines since the water in the emulsion may break down lubrication of slides and bearings.

Increasing Film Strength

Straight mineral oils provide a limited amount of lubrication which may be improved by adding fatty oils to give increased film strength. The more fatty oil used, the higher the film strength. However, the amount of fatty oil that can be blended with mineral oil is limited by cost and stability of the mixture. Straight fatty oils tend to become rancid and increase their viscosity in service, which accounts for a decline in use.

In order further to increase film strength, chlorine may be added to the oil. Sulphur can be used to increase film strength but the manner in which it is blended has a very decided effect on performance of the ultimate product. Sulphur content alone does not indicate the lubricating ability or film strength of the finished product. As a matter of fact, free sulphur held in suspension in the oil may act as an abrasive and increase tool wear.

When cutting operation severity increases to the point where the additive, selected to impart only additional lubricating effect to the cutting fluid, cannot operate efficiently, it becomes necessary to add sulphur as an anti-weld agent. It is thought that its action is due to the creation of sulphide films, which have low shearing stress between chip and tool. Therefore, a proper combination of various other ingredients, properly mixed, will produce a cutting fluid with the necessary and desired properties of film strength and anti-weld tendency, insuring effectiveness on any machining job.

Although American industry is produc-

TABLE I

Machinability Rating of Ferrous and Nonferrous Metals

Class I — Ferrous (70% or higher)

AISI	Rating %	AISI	Rating %
1110	85	1113	135
1115	85	4023	70
1117	85	4027*	70
1118	80	4119	70
1120	80	Malleable Iron	
1132	75	(Ferritic)	100-250
1137	70	(Pearlitic)	70
1022	70	Cast Steel	
1016	70	(0.35% C.)	70
1111	95	Stainless Iron	
1112	100	(Free Cutting)	70

Class II — Ferrous (40% to 65%)

	1141	65	4615	65
	1020	65	4640*	55
	1030	65	4815	50
	1035	65	5120	65
	1040*	60	5140*	60
	1045*	60	5150*	55
NE	1330*	65	5045*	65
NE	1340*	60	NE 8024	60
NE	1350*	55	NE 8124	55
	2317	55	NE 8233	60
	3045*	60	NE 8339*	60
	3120	60	NE 8620	60
	3130*	55	NE 8630*	65
	3140*	55	NE 8720	65
	3145*	50	NE 8739*	60
	4032*	65	NE 8744*	55
	4037*	65	NE 8749*	50
	4042*	60	NE 8817	60
	4047*	55	NE 9415	55
	4130*	65	NE 9425	50
	4137*	60	NE 9430*	65
	4145*	55	NE 9440*	60
	4150*	50	NE 9450*	45

Class IH — Ferrous (40%-50%)

1008	50	6120	50
1010	50	6145*	50
1015	50	6152*	45
1050*	50	NE 9250*	50
1070*	45	NE 9260*	45
1320	50	NE 9261*	50
1330*	50	NE 9162*	45
1335*	50	NE 8442*	45
1340*	45	NE 8447*	40
2330*	50	NE 8949*	50
2340*	45	Ingot Iron	50
3240*	45	Wrought Iron	50
4340*	45	Stainless Steel 18-8 FM	45
		Cast Iron	50

Class IV — Ferrous (40% or less)

2515*	30	Manganese	
3310*	40	Oil-hardening**	30
52100**	30	Tool Steel, Low Tungsten	
Ni-Resist*	30	Chromium and Carbon**	30
Stainless 18-8		High Speed steel**	30
(Austenitic)*	25	High-carbon, High-chrome	
		tool steel**	25

Class V — Nonferrous (above 100%)

Metals	Rating %	Metals	Rating %
Magnesium alloys		Aluminum 17 S-T	
Dow "J" (wrought) 92.3 Mg.		(4 Cu, 0.5 Mn, 0.5 Mg, 95 Al)	300-1500
6.5 Al., 0.2 Mn., 1 Zn	500-2000	Brass, leaded F. C., C. D.	
Dow "H" (cast) 90.8 Mg.,		(62 Cu, 35 Zn, 3Pb)	200-400
6 Al, 0.2 Mn, 3 Zn	500-2000	Red, leaded (78.5 Cu,	
Aluminum, 11 S-T3 (5.5 cu,		20 Zn 1.5 Pb)	180
0.5 Pb, 0.5 Bi, 93.5 Al.)	500-2000	Bronze, Phos. leaded (94 Cu,	
2-S (100 Al) O to H temper	300-1500	1 Pb, 5 Sn)	100
		Zinc	200

Class VI — Nonferrous (below 100%)

Aluminum bronze (cast)		Monel Metal, *regular	
10 Al, 0.2 Fe, 0.5 Sn	60	(68 Ni, 29 Cu, +)	40
Brass, Yellow (63 Cu, 37 Zn)	80	As cast, "H" (65 Ni, 29 Cu,	
Red (80 Cu, 20 Zn)	60	2 Fe, 2.75 Si, 0.2 C, 0.7 Mn)	35
Bronze, Mang. (59 Cu, 39 Zn		As cast, "S" (64 Ni, 29 Cu,	
0.5 Mn, 0.8 Fe)	60	2.5 Fe, 3.75 Si, 0.1 C, 0.5 Mn)	20
Bronze, Phos. (95 Cu, 5 Sn)	40	Rolled, (67 Ni, 31 Cu, 1.16	
Copper, cast	70	Fe, 0.7 Si, 0.1 C, 0.8 Mn)	45
Copper, rolled (¼ hard)	60	"K" (66 Ni, 29 Cu, 0.9 Fe,	
Everdur (Cu-Si) 95.8 Cu,		0.5 Si, 0.15 C, 2.75 Al)	50
1.10 Mn, 3.10 Si	60	Inconel, temper B, cold	
Everdur (Cu-Si) 95.6 Cu,		drawn* (78 Ni, 14 Cr, 6 Fe)	45
1.0 Mn 3.0 Si, 0.4 Pb	120		
Gun Metal (cast) 88 Cu,			
10 Sn, 2 Zn	60	*Annealed	
Nickel (hot-rolled)	20	**Spheroidized Anneal	
Nickel (cold-drawn)*	30		

TABLE II

CUTTING FLUID RECOMMENDATIONS

Groups of Metals Based on Machinability Classification

Severity*	Operation	Class 1	Class 2	Class 3	Class 4	Class 5**	Class 6
1	Broaching, Internal	Sulf.	Sulf.	Sulf.	Sulf.	ML	ML
2	Broaching, External	Sulf.	Sulf.	Sulf.	Sulf.	ML	ML
3	Tapping, Plain	Sulf.	Sulf.	Sulf.	Sulf.	ML	ML
2	Threading, Pipe	Sulf.	Sulf.	Sulf.	Sulf.	ML	ML
3	Threading, Plain	Sulf.	Sulf.	Sulf.	Sulf.	ML	ML
4	Gear Shaving & Cutting	Sulf.	Sulf.	Sulf.	Sulf.		
4	Reaming	Sulf.	Sulf.	Sulf.	Sulf.	ML	ML
5	Drilling, Deep	EM-10	Sulf.	Sulf.	Sulf.	EM-20	EM-10
6	Milling, Plain	EM-25	EM-15	EM-15	Sulf.	EM-25	EM-15
6	Milling, Multiple Cutter	Sulf.	Sulf.	Sulf.	Sulf.	ML	ML
7	Boring, Multiple Head	Sulf.	Sulf.	Sulf.	Sulf.	EM-20	EM-10
7	Multiple Spindle-Automatic Screw	Sulf.	Sulf.	Sulf.	Sulf.	ML	ML
8	High-speed Light Feed Automatic Screw Machines	Sulf.	Sulf.	Sulf.	Sulf.	ML	ML
9	Drilling	EM-20	EM-20	EM-10	EM-10	EM-30	EM-10
9	Planing, Shaping	EM-20	EM-20	EM-10	EM-10	EM-30	EM-10
	Turning, single point tool, form tools	EM-20	EM-20	EM-10	EM-10	EM-30	EM-10
10	Sawing, circular, hack, grinding	EM-30	EM-30	EM-50	EM-50	EM-50***	EM-50
	Grinding, Thread	Sulf.	Sulf.	Sulf.	Sulf.		

Key to Symbols used in Above Table

Symbol	Product
Sulf.	Sulfurized Cutting Fluid.
ML	Mineral-Lard Oil.
EM-10	Soluble Oil Emulsion.

Notes: * Greatest severity designated as 1. Least severity as 10.

** Soluble oils must not be used on magnesium—use light mineral oil.

*** Certain grinding jobs on aluminum may be performed to advantage with sulfurized cutting fluid for improved finish.

ing as it never has before, there is good reason to believe that many plants, now considered to be at peak production, can further increase their output through applying one or more measures to improve operating conditions. Among the more important of these are:

1—Scientific Selection of Cutting Fluids—Since tool life and/or finish life have important effects on output, as well as production costs, it becomes evident that only the cutting fluid which affords longest tool life (consistent with finish when important) should be used. Where soluble oil emulsions are used, their strength should be checked at regular intervals to insure uniform results.

2—Filtration—Too little attention is paid to the need for filtering cutting fluids. This process may be ignored in the case of roughing cuts, but for finish cuts and grinding, fluid-borne abrasive solids in the form of fine metal chips and scale or particles from the grinding wheel can have a highly deleterious effect on tool life and work finish. This is particularly true where machines are provided with individual circulating systems having such high circulation rates that the fluid does not have sufficient time to drop harmful fine solid particles in the sump. Conventional strainer mesh seldom is fine enough to remove these solids, resulting in recirculation with the fluid. Undue wear of table rests on centerless grinders often can be traced to abrasive solids carried by the cutting fluid.

3—Tool Angles—Standards have been established for correct tool angles on single point tools of various metals. Attempts usually are made to adhere to these standards when tools first are ground, but in many plants the machine operator simply goes to a grinding wheel and sharpens the tool free hand. After a few trips the angles may be off to the extent that tool life is shortened and its performance is impaired. Even where tools are sharpened in the tool crib or in the tool room, it often is found that incorrect angles result because of lack of suitable methods. This causes reduced production and needless waste of tool steel through too frequent regrinding. Some sort of a locating and grinding fixture should be provided to insure regrinding and dressing of tools to correct angles.

4—Tipped Tools—A stream of cutting fluid should be directed over tipped tools the moment they start to cut. If allowed to heat from lack of cutting fluid cooling and lubrication, tips are likely to check or crack when fluid does strike them. In other words, the same care that they receive when being ground by an expert should be given tools when cutting.

If these precautions are applied, increased production is certain to result and longer service from tools so benefited.

Electrical Wire Coated By New Plastic Compound

A new nylon plastic compound permits coating of electrical wire at more than 1000 feet a minute. It can be extruded in standard equipment at temperatures attainable by present commercial wire coating processes. Laboratories of its maker, E. I. DuPont deNemours and Co. Inc., have extruded nylon jackets seven mils thick (overall diameter 40 mils) on a commercial machine with a 2-inch screw at a speed of better than 1000 feet per minute.

The die employed is a modified, self-centering tubing design permitting free flowing of nylon. A tube of nylon is extruded and slipped over the wire, with wall thickness primarily controlled by wire speed. Coatings less than one mil in thickness are said to have been applied by this method.

This compound is claimed to be sufficiently heat stable to be left in the extrusion machine during shutdowns. There is no danger of polymer deterioration if machine temperatures drop 25 to 30 degrees below nylon's melting point. Compound may be left in the machine for hours in this state, or it may be cooled and left in the machine indefinitely.

Advantages stated for this method of wire coating are: Flame resistance; self extinguishing after being ignited by a free flame subsequently removed; and resistant to almost all solvents except alcohol. It has been suggested as a sealing compound for interstices between individual wires in a multi-strand cable, and for use as a barrier between materials in a cable which might contaminate each other.

Nonferrous Alloy Tool Permits Faster Cutting

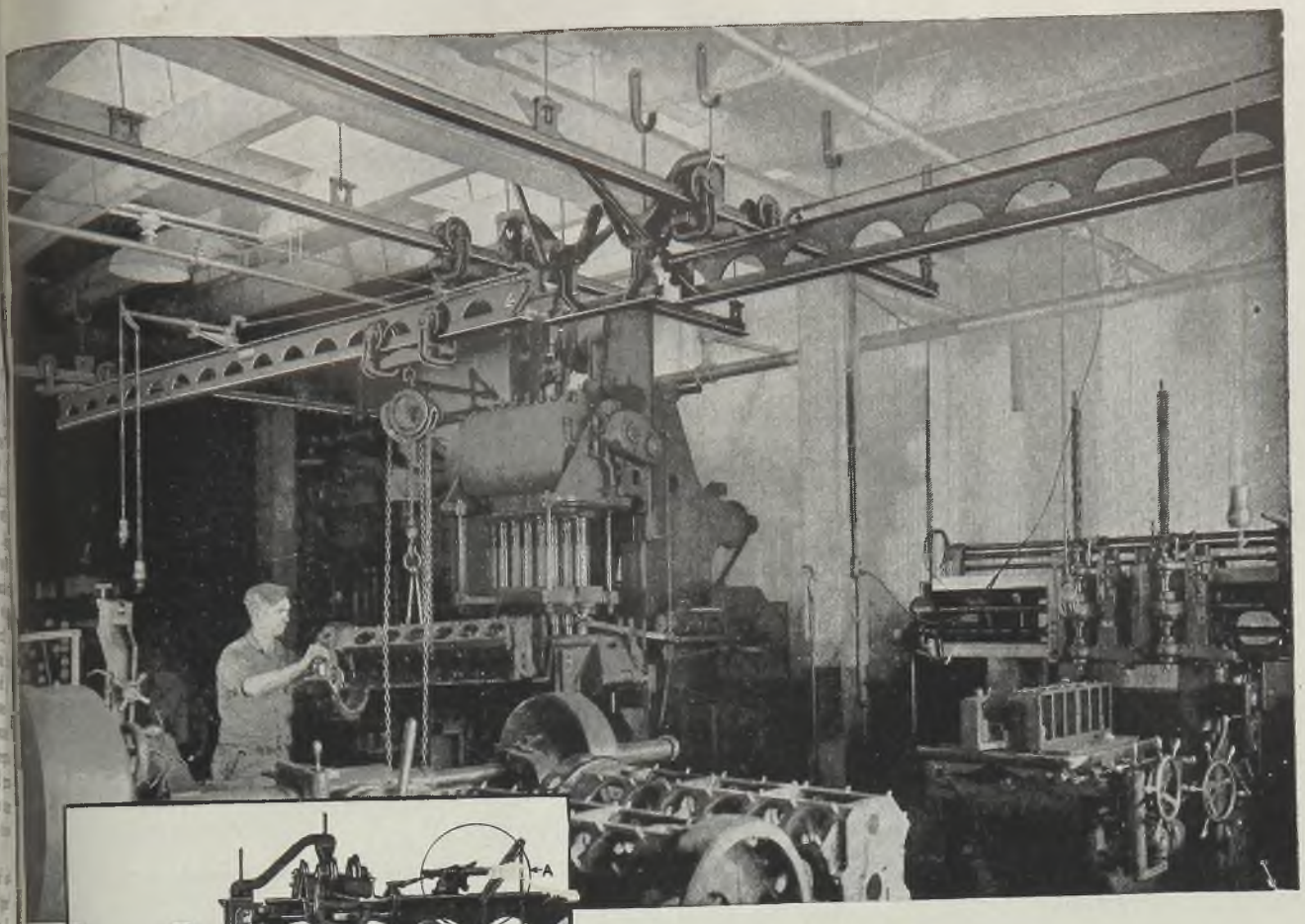
An improved cutting tool of cast nonferrous alloy (chiefly chromium, tungsten, and cobalt), with a hardness range from 60 to 62 rockwell C, is said to bridge the gap between high-speed and cemented carbide cutting tools. It is cast to shape and used in as-cast condition, i.e., other than surface ground. High red hardness is indicated by only one rockwell C point drop at temperatures ranging as high as 1900 degrees Fahr.

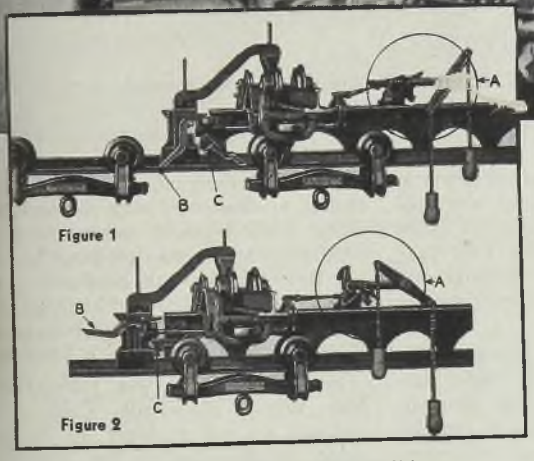
Increased feed, speed, and cut depth are stated to be possible on many applications where high speed tools now are used. Peak efficiency is achieved at cutting speeds from 20 to 80 per cent over high speed tool top speeds. Because of inherent tool toughness, even chilled casting intermittent cutting is possible.

Both flats and squares, surface ground to tolerances of 0.000 and −0.005-inch, are furnished for tool holder bits or for milling cutter inserts by Jessop Steel Co., Washington, Pa. Round sections are centerless ground to the same tolerances. Die inserts or other complicated sections are furnished in as-cast condition.

—o—

Tests made on killed bessemer steel show that its yield strength and fatigue properties surpass those of open-hearth steel having the same tensile strength.





TRANSFER BRIDGE MECHANISM

Transfer bridges are cranes except one or both ends are provided with an interlock. Carriers cannot be passed through an interlock until the bridge is aligned with another bridge or overhead rail and locked into position by the manually-operated throw-out (A). This causes the safety forks (B and C) to raise automatically and permit free travel. The mechanism prevents all possibility of a carrier running off an open end. Figure 1 shows a bridge in line with a connecting rail, with safety forks down, before throw-out has been operated. Figure 2 shows forks raised, after throw-out has been operated.

TRANSFER BRIDGES SIMPLIFY ENGINE HANDLING

Twelve-cylinder motors for fire engines built by The Seagrave Corporation, Columbus, Ohio, are easily moved from any point in one bay to any point in an adjacent bay in their machine shop, by means of Cleveland Tramrail transfer bridges. Because of a column of posts separating the bays it is impossible to make use of cranes spanning the entire width of the two bays.

The bridges interlock with short stationary rails, permitting the engines to be taken from one to the other without any intermediate handling. The carriers can also be transferred to the overhead Cleveland Tramrail rail system which provides handling coverage for nearly the entire factory. Thus engines can be delivered directly from the transfer bridges to all parts of the large shop.

The transfer bridges shown are of the hand-propelled two-runway type. Other bridges also are built for three, four and more runways either hand-propelled or electrically driven.

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OVERHEAD MATERIALS HANDLING EQUIPMENT

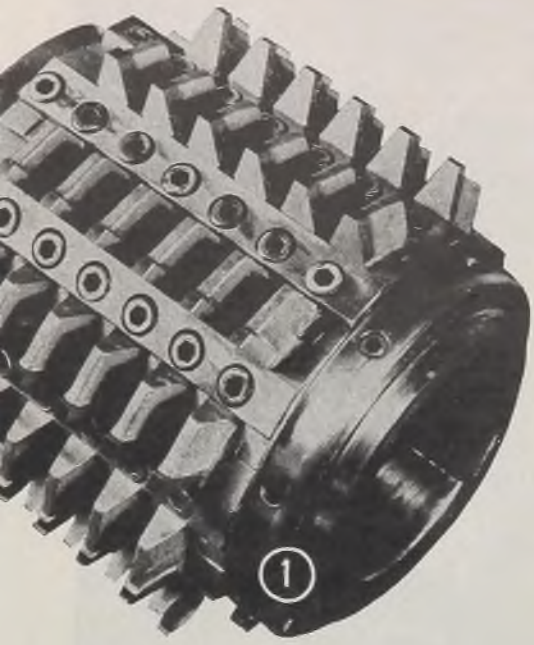
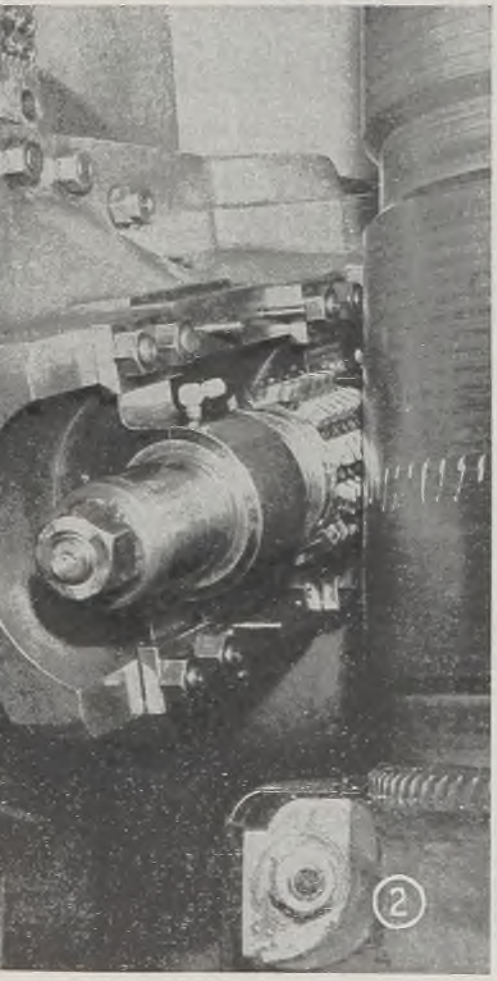


Fig. 1 — Five-pitch, single-thread composite hob, 6 inches in diameter with 2½-inch bore, with cemented carbide tips on strip teeth

Fig. 2 — Composite high-speed steel hob on 72-inch hobber taking locating cut on special low-carbon steel blank



Increased Marine Gear Production Indicated by Performance of Composite

HIGH-SPEED HOB CUTTER

Standard hob body with mechanically held strips of cemented carbide for cutting edges, used in tests as climb hob, permits roughing cuts at spindle speeds of 100 revolutions per minute. May bring redesign of hobbing machine for even greater speeds

VERY satisfactory results in recent tests sponsored by the Bureau of Ships, Navy Department, Washington, may provide a solution for one of the most serious bottlenecks in the construction of marine steam propulsion units—the hobbing of main-propulsion reduction gears. It also is possible that the tests may result in important changes of design and method affecting the gear-cutting industry.

At the completion of experiments, Navy engineers indicated that they might proceed immediately with further development of the tools involved and broader application of principles which tests seem to vindicate.

Tests centered around the use of a composite hob, consisting of a hob body and mechanically held strips of cemented carbide for cutting edges. Operated as a climb hob, the tool permits roughing cuts at spindle speeds of 100 revolutions per minute instead of the present speed of 35 revolutions per minute with standard high-speed steel hobs. There were indications, moreover, that if changes were made in the design of hobbing machine permitting faster operation, the hob would probably perform even more satisfactorily at higher speeds, perhaps 150 revolutions per minute (225 feet peripheral speed) instead of the present norm of 45 feet peripheral at 40 revolutions per minute. With the 72-inch machine used, 100 revolutions per minute was the maximum possible speed.

In 1942, when it became apparent that even the best available hobbing methods could not keep pace with the program for the production of marine steam propulsion equipment, the Bureau of Ships initiated research into the possibility of improvements in gear-cuttin speed.

When the design was finally approve the Cleveland Hobbing Machine C supervised construction of two hobs, inches in diameter, with 2½-inch bor They were 5-pitch, single-thread typ with strip teeth, the left-hand one ha ing teeth tipped with cemented carbi (Kennametal K 4-H) and the right-har one with teeth of 18-4-2 high-speed ste (Braeburn Alloy Stee Co.'s Twin Van

Site of the tests was Joshua Henc Iron Works, Sunnyvale, Calif., who assistant general manager, E. D. Alm aided development of the project. preparation for the experiments, Gou & Eberhardt engineers visited the turbi plant to check adjustment of the 72-inc hobbing machine to be used in t climb-hobbing operation for lead ar form. Low-carbon pinion blanks we prepared and mounted on the machin for initial tests were to be made softer metal.

Experiments started July 11 in t turbine shop, with interested represent tives of the Navy, gear and machine-to industries present.

First, the right-hand hob with 18-4- teeth was used on the 72-inch machin with the prepared blank, feed up, rot tion down, climb hobbing at normal 3 revolutions per minute and 0.045-inc feed. Then the left-hand hob with ca bide tips was adjusted and tested a speeds up to 100 revolutions per minut with 0.045-inch feed, also climb hobbin This completed, operations were repeate on the blank regularly used for pinio of 8500-horsepower C-3 marine turbine Complete performance records we

(*Please turn to Page* 170)

UNITED

Continuous Electrolytic Plating Lines

★★★ HIGHEST SPEED PRODUCTION

★★ PLATES ONE OR BOTH SIDES

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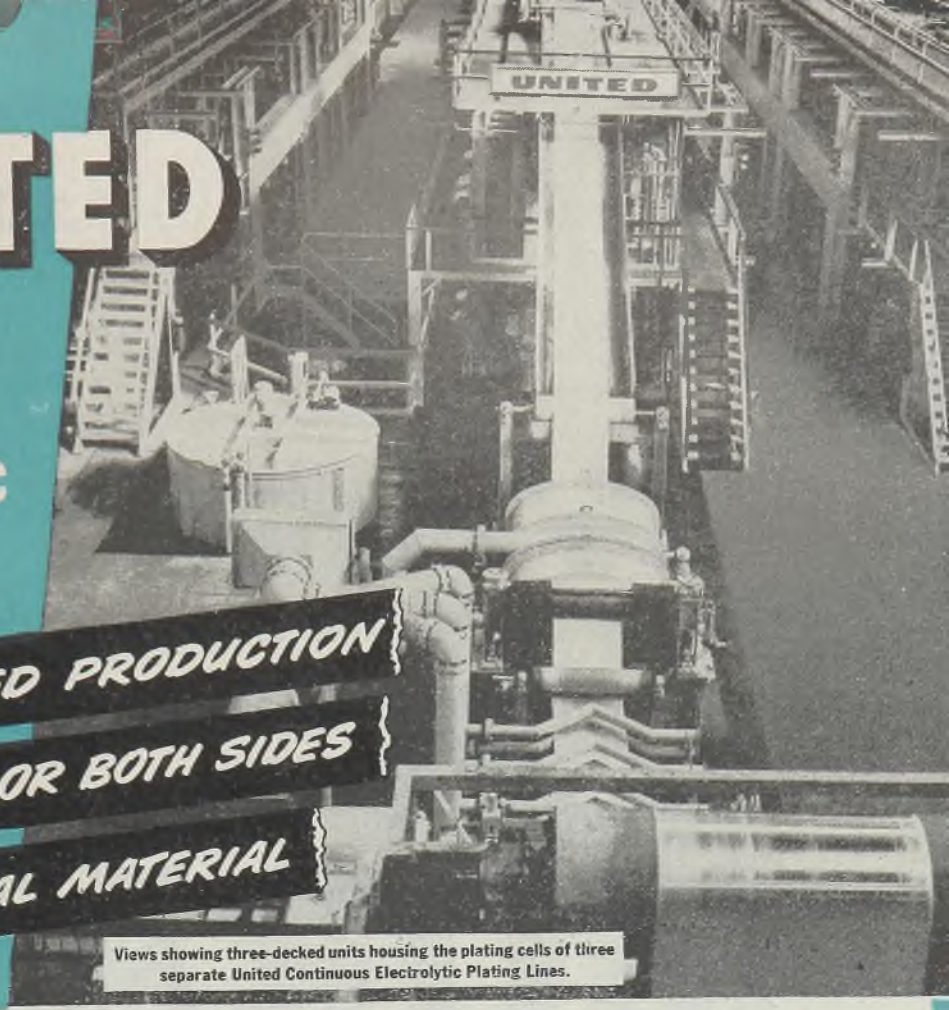

Views showing three-decked units housing the plating cells of three separate United Continuous Electrolytic Plating Lines.

Developed in collaboration with the Hanson-Van Winkle-Munning Company of Matawan, N. J., UNITED CONTINUOUS ELECTROLYTIC PLATING LINES take strip steel in coil form from Cold Rolling Mills, and after side-trimming, cleaning and pickling, deposit tin on the strip electrolytically, producing finished tinplate at the rate of 1000 feet or more a minute, many times faster than by conventional hot dip methods. (★★★ *Up to 1300 feet per minute.*) ★★ One side of the strip, or both sides at the same time, may be plated with either a similar or dissimilar material in any desired thickness of coating. ★ Only about 1/3 as much tin is required than would be needed to produce the same amount of plate by hot dipping.

Comparable savings of time and metal are effected in the application of *zinc* coatings, with the added advantage of producing, by the electrolytic process, a tighter bond between zinc and steel than can be achieved by any other method.

UNITED CONTINUOUS ELECTROLYTIC PLATING LINES in present daily operation are delivering consistently high quality tin and zinc plated strip at peak production with minimum interruptions for adjustments or maintenance.

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Consult UNITED engineers for further information, recommendations and estimates.

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Left: Tin coated strip steel rising to top of electrical induction heater through which it descends to receive bright, shining surface.

Right: Electrotinned steel strip in bright finish being removed at end of United Continuous Electrolytic Plating Line.

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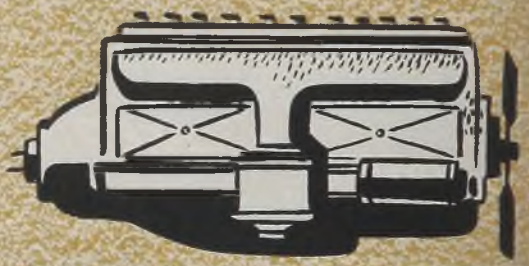

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Moraine Porous Metal (Porex) is a unique product of powder metallurgy. It is made in four basic grades of fineness, with almost infinite graduations between them, and is available in varied shapes to meet design requirements.

If your product involves the flow of air, liquid or gases—as either an actuating medium, a combustion medium or a lubricating medium—you should find out what Moraine Porous Metal can do to improve your product's performance and extend its operating life. Moraine Porous Metal is performing varied functions for many industries—automotive, aviation, refrigeration, petroleum, pneumatic tool, industrial equipment, tractor, electric motor and others. Consult the Moraine Products Engineering Department for recommendations.

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INTEGRATED INSPECTION

Planned installations of X-ray units utilizing from 5000 to 1 million volts provide accurate, dependable examination of a great variety of materiel and insure flawless quality

THOUSANDS of different parts for military ordnance are inspected by X-ray radiography employing from 5000 to 1 million volts at plants of one of the largest users of industrial X-ray equipment in the country, the Ford Motor Co. Units are used in all phases of industrial radiography, from the study of very thin metallurgical samples to inspection of steel castings 8 inches thick. Vital parts for tanks, bombers, gun mounts, armor plate, gun directors, turbo-superchargers, and aircraft, tank, truck, and jeep engines are checked by General Electric X-Ray Corp. installations for bubbles, cracks, or other structural flaws.

More than 125 persons are employed in various X-ray departments. In order to utilize all apparatus to the fullest extent, the company maintains an apprentice training school to teach new operators how to handle the equipment and process films. A 140,000-volt industrial X-ray unit is used for training purposes, and every worker who has anything to do with an X-ray department is well schooled in his job.

Units Suited To Job

Many sizes and shapes of cast aluminum, magnesium, and steel are used in aircraft construction Therefore, the use of one X-ray unit for inspection of all parts is impossible. At the Willow Run plant, for example, where the volume of castings to be examined is extremely large, more than one automatic or semiautomatic unit is used, allowing the selection of voltages best suited for the type of work.

Castings entering an X-ray department are segregated into groups according to the unit best suited for their examination. Passage through sorting tables, numbering machines, and record entries precedes the transfer to gravity conveyors where operators place the castings, with proper fixtures and identification numbers, on cassettes which hold the film. Castings then are pushed onto a conveyor belt which carries them into the exposure chamber and out the opposite side according to a set cycle of operations. After radiography, castings usually are stored in numbered bins until final disposition can be made after film study.

Two 1-million volt X-ray units routinely inspect, in 16 minutes, the same number of steel parts that required 60 hours with low-powered apparatus. One unit is in the $27,000,000 aircraft engine building at River Rouge, which has been turning out 2000-horsepower Pratt & Whitney engines. The other is in the new steel foundry.

The million-volt unit at the aircraft engine plant is used to examine heavy steel castings, turbo-supercharger parts, and an assortment of bomber and glider castings. This nondestructive testing procedure reveals such faults as blow holes, tears, shrinkage cavities, inclusions and cracks. This unit can examine 64 times the volume formerly checked with a 400,000-volt unit.

A large number of castings are examined at each exposure because of the large spherical angles available for useful radiographic examination with the million-volt apparatus. The limiting factor on examinations per day is almost entirely dependent upon handling facilities. Fifty films have been exposed simultaneously at this plant.

The other million-volt unit, in the steel foundry, examines unmachined crankshafts for a 500-horsepower tank engine, and also heavy castings for the M-8 light armored car. It is less than 5 feet high and 3 feet in diameter, and is conveniently located in a laboratory 50 feet long and 35 feet wide which has 18-inch concrete walls to protect personnel against stray radiation. One large preparation room is built at each end of the concrete X-ray room, and a standard-gage railway track interconnects all rooms. Two specially-built flat cars, about 8 feet square, are used to carry prepared castings into the exposure room. During exposure, one flat car is reloaded with castings and films and markers are placed in position. One room is used for unloading castings from the car. All three rooms are provided with electrically operated heavy duty cranes.

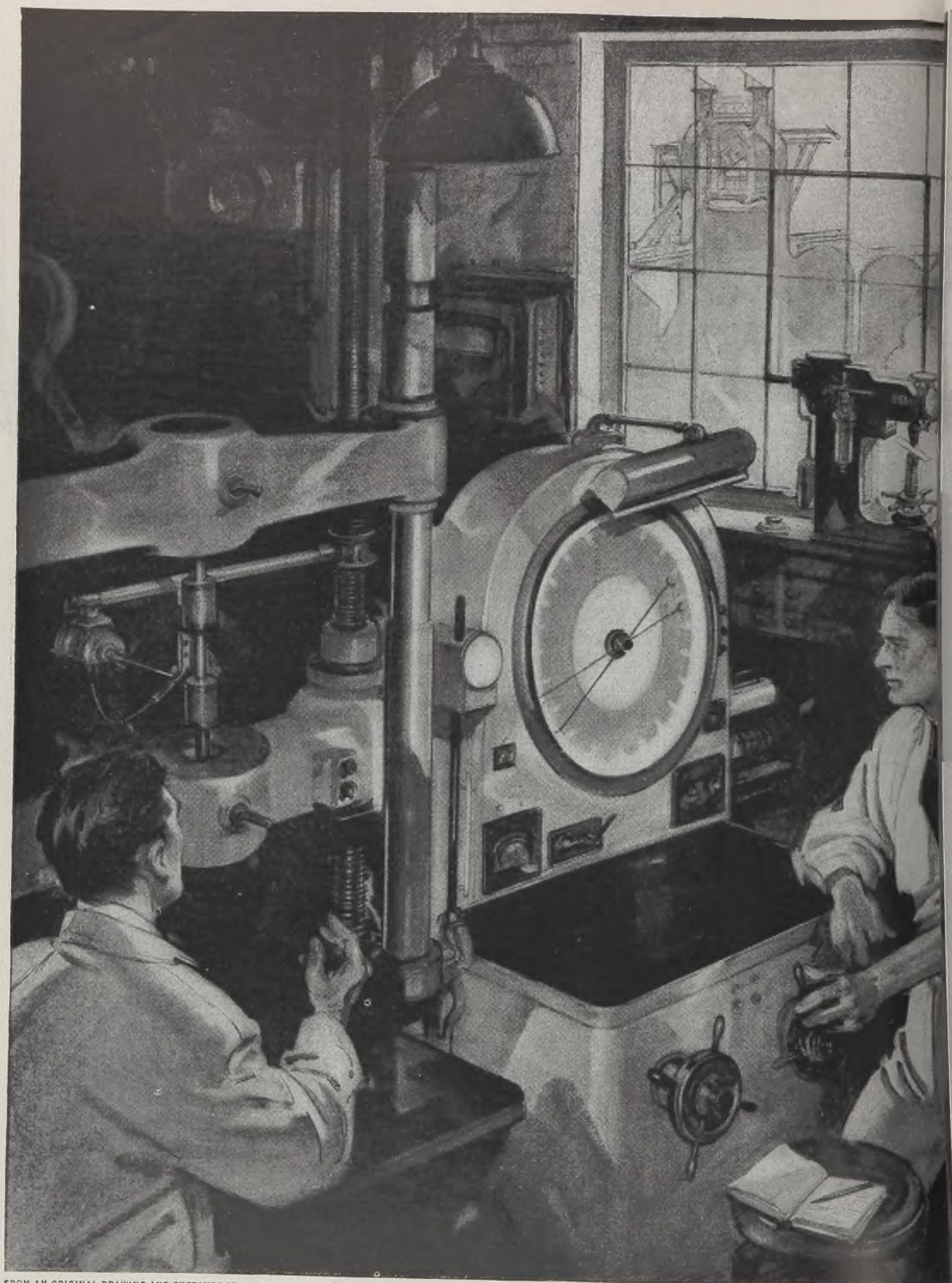
To speed examination of every crankshaft for the V-8 tank engine, a wooden fixture was designed so that 12 of the big crankshafts, each weighing about 250 pounds, could be X-rayed at one time. They are fitted into the fixture, and placed on a large lead covered truck operating on tracks. Three different exposures are taken from different angles. Films in cassettes are placed in racks under points where crankshafts are suspended in the fixture. Cassettes slide out quickly for changing. Thirty-four minutes are required to X-ray all 12 crankshafts one way. Two groups of six crankshafts are radiographed from a different angle in 18 minutes, or a total of 36 minutes for both. Thus all 12 crankshafts are given three exposures in a total of 70 minutes.

Here is how X-ray apparatus of different voltages is used in vital inspections:

Willow Run Bomber Plant—This plant has three units for radiographic inspection of aluminum, magnesium, and bronze parts. A 220,000-volt unit, with the X-ray head mounted on a jib crane, makes it possible for engineers to prechart exposure procedures for automatic and semiautomatic units.

Electric Furnace Building—A 400,000-volt instrument, in a lead-lined room 12 feet long and 6 feet wide, is used to ex-

(*Please turn to Page* 172)



FROM AN ORIGINAL DRAWING AND SKETCHES AT J&L PILOT PLANT RESEARCH LABORATORY BY ORISON MACPHERSON.

METALLURGY IN ACTION

How far will steel stretch and what "pull" can it take before it breaks in two, are facts important to quality control, quickly determinable by the tensile testing machine shown in illustration. Many other sensitive and intricate machines are employed today by the great force of trained steel research engineers and metallurgists in their work in laboratories and steel plants.

Better mortar due to metallurgist. The army had difficulties with field mortars, base couldn't stand the gaff, wore out before barrel. Young J&L metallurgist suggested trying special J&L-made armor plate for base. Ordnance worked it out. New base proved superior, even permitted greater powder charge, which lengthened mortar's range.

Miniature steel works, with small steel furnaces and rolling mills, is invaluable adjunct to department of research and metallurgy at J&L. In this pilot plant, first of its kind in steel industry, many important developments in steels were worked out before the war. Since the start of the war, a number of advancements in steel products were perfected here, put in production in J&L and other steel plants, contributed greatly to the arming and protecting of our fighting men.

Steel armor rolled on J&L strip mills, for tanks, guns, planes, after Army Ordnance proved it under fire, was developed (1942) in J&L pilot plant, from a peace-time formula of metallurgical research. The basic formula was one that J&L metallurgy had successfully worked out for oil country steel obliged to take severest punishment.

Metallography, or microscopic examination of steel, was developed by Sir Henry Clifton Sorby in 1849, is routine practice today.

Ginger snap micro-photo was submitted in jest to late Prof. Albert Sauveur (1863-1939) dean of American metallurgists, because structure of cookie resembled Sauveur's experimental photos of mild steel under microscope. Despite joshing, Sauveur persisted in development of science of metallography, now universally in use in steel research, and was awarded Bessemer medal of 1924. He held chair of metallurgy at Harvard.

De Re Metallica, first scientific treatise on mineralogy and metallurgy, 20 years in preparation, profusely illustrated with woodcuts, was written in Latin and published in early 16th century by Georgius Agricola, pen name for Georg Bauer, a Saxon. The work, translated into other languages, was text book for several centuries. Recent English translation (1912) was made by Herbert Clark Hoover and wife, the late Lou Henry Hoover.

"To arouse intelligent minds to action" was stated purpose of another pioneer scientific author, Vannoccio Biringuccio. His *Pirotechnia*, published 1540, treated of mineralogy and metallurgy and sold 30,000 copies, a medieval best seller.

Tapping a 150-ton heat of basic open-hearth steel at a shop in the Great Lakes area

By JOHN D. KNOX
Steel Plant Editor, STEEL

Open Hearth Steelmakers Discuss SHOP PROBLEMS

SUFFICIENT labor for filling the gaps in furnace relining crews is one of the most important problems with which open-hearth operators are faced at the moment. Not only is there a scarcity of labor at various steelmaking shops but the quality has depreciated to the point where the time of furnace rebuilds has increased as well as the costs. This was the consensus of opinion of many steelmakers attending the joint meeting of the Ohio Section, National Open-Hearth Committee and the Ohio Valley Section of the American Institute of Mining and Metallurgical Engineers, Deshler-Wallick hotel, Columbus, O., Oct. 27-28.

Discussions Are Candid

Following the usual type program, which always resulted in open and frank discussion at former meetings of these groups, the technical sessions were built around questions and answers concerning mutual problems encountered at various open-hearth shops. Because the remarks were "off-the-record" the names of those who entered into the discussions have of necessity been deleted from the following running report of the meeting.

At a plant in the Great Lakes district the supply of labor for crews doing the relining jobs became so tight that the company was obliged to turn this class of work over to an outside contractor. Costs were reported out of line ranging from 10 to 20 per cent higher on rebuilds. After 80 to 100 heats the roof usually requires patching; after 190 heats the furnace is taken off for a rebuild, the time for which is running about 2 days longer and from 15 to 20 cents per ton higher because of labor conditions.

A Pennsylvania operator reports the life of his 70-ton furnaces is up 13 per cent and on 200-ton furnaces, 16 per cent. The limiting factor, he said, in shop operation is the plugging of checkers. He told of a permanent vacuum system that had been installed on the larger furnaces, pointing out that brickbats are removed from the bottom of the checker chambers through a 6-inch pipe which discharges into a large box carried on a buggy. He explained that after the furnace is taken off and cooled down somewhat, the checkers are cleaned, the vacuum pipe is attached to the permanent connection and the steam aspirator turned on. Steam pressure is 125 pounds per square inch, no water is used to cool the checkers and the cost of moving the accumulation 2 feet be the checkers is economical.

Another plant with a vacuum syst installed at its No. 1 shop reports it clean out all flue dust from the chec on its 100-ton furnaces in 11 hours w a total of 164 man-hours. This is per cent of the time formerly consum The flue dust must be brought dry the aspirator extension pipe. At pres 22 vacuum installations are being op ated at open-hearth plants in this count

Repair costs have been improved one shop by adhering to a fixed a fast rule of taking the furnace off line after 125 heats and installing new roof regardless of the condition the old roof. The new roof runs 268 to 275 heats and no patching done. By following this procedure t superintendent explained that repair co are improved and that there is nev more than one furnace off the line the same time.

Practice reported by another operat involved roof life of 260 heats on 18 20-inch roofs. Back and front of roo are patched between 180 and 190 heat

Special Refractory Applications

A progress report on a basic line furnace brought to light the ease wit which slag is removed from the bas end. The slag is granular and can raked out while the furnace is operatin Removal of 1300 cubic feet was ac complished at cost of 9 cents per cubi foot. The fantail never becomes blocke with slag and hence there is a saving 24 hours when it becomes necessary t make repairs. After 253 heats the tot repair time was 80 hours which wa 90 hours less than when operating o

silica ends and represented a saving of $4500 based on a running charge of $50 an hour for off-time, as well as a saving in brick amounting to $12,000. It was brought out that it requires about 600 heats to break even on the cost of basic brick and that the life of a basic end will exceed 600 heats. The basic furnace shows an average of 15½ tons per hour compared to 14 tons an hour on acid lining, and time of heats 10 hours and 45 minutes compared with the usual shop practice of 11¾ hours.

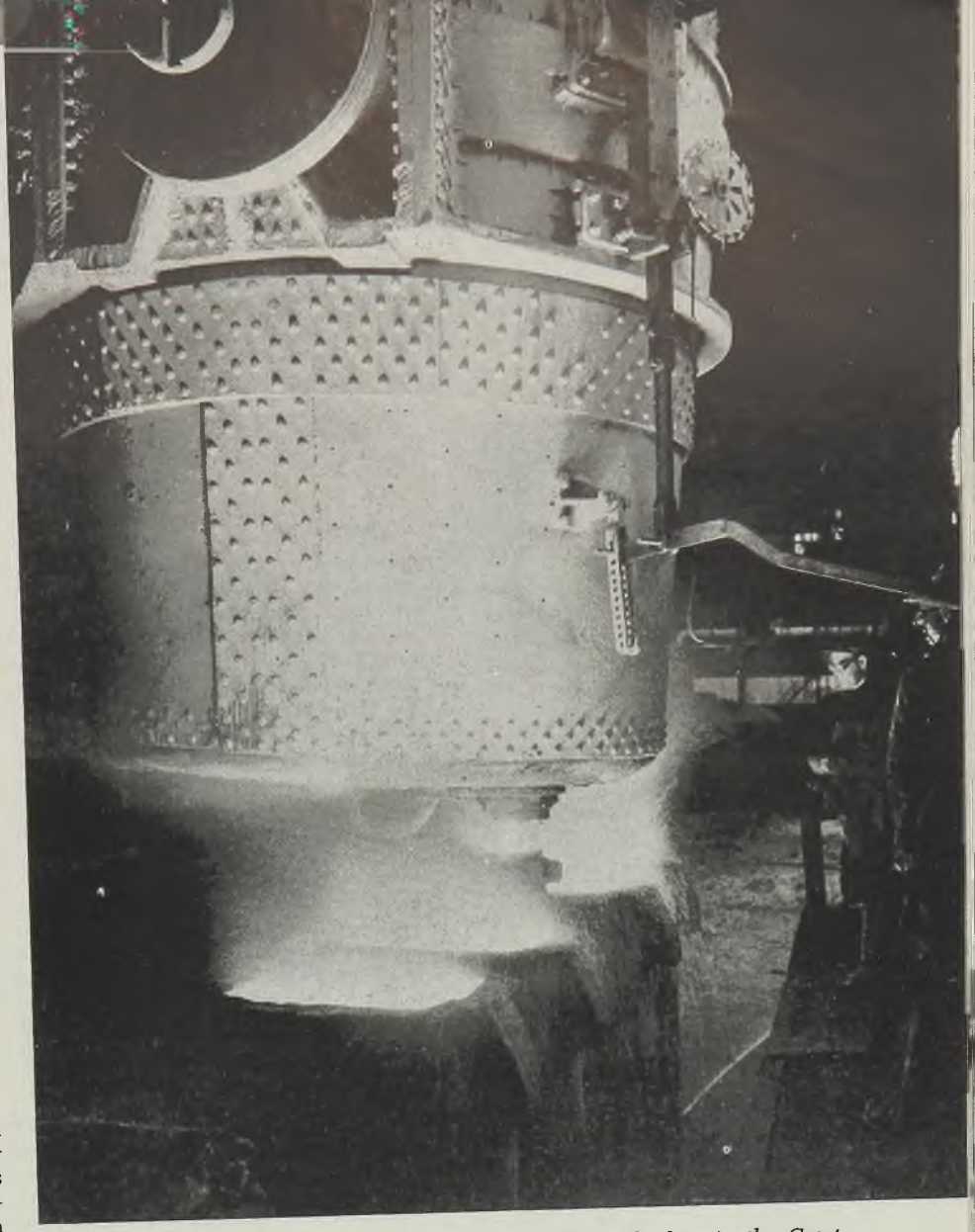
The port roof of this installation was replaced 2½ times in 21 months. The front wall of solid basic brick construction was not eroded at the port but down in the wall. Because the brick failed mechanically the suspended type of construction was adopted. The nose of the fantail was built of basic brick. Going into the fantail with aluminum brick gave more room in the checker chambers and less obstruction.

Remarks on the suspended type of basic roof were submitted as a progress report rather than in the light of a definite recommendation. Two furnaces with this type roof are operating at a shop in the Great Lakes district. A roof life of 274 and 276 heats respectively is reported; anticipated life is 237 heats per roof. Brick consumption per ton of steel is 5.23 pounds for the suspended-type roof compared to 6.44 pounds per ton for the sprung type. The suspended type wears thinner before collapse whereas with the sprung type the crew has to move in and patch.

Suited to Endwall Service

One operator in discussing his experience with a complete frontwall laid up with mullite brick stated that after 45 heats and at tapping time there was severe dripping due to iron oxide attacking the brick. Subsequent discussion brought out the fact that mullite brick are not recommended for frontwall construction but are highly satisfactory for endwalls; and also that magnesite serves as a rapid flux to mullite. Mullite has a high softening point, a high operating temperature and will effect a definite fuel saving. One operator related he had increased the life of tapholes from 5 weeks to 30 weeks by ramming mullite around the outside of the pipe.

Information submitted concerning the application of Gunmix to electric furnace linings was that the product can be projected through a temperature range of 1200 to 2200 degrees Fahr. Lining life is increased 40 per cent although on some 50-ton furnaces the life of linings has been extended 60 per cent. Use of this product for open-hearth linings heretofore has been limited by the size of the gun used in making the application but it was announced that before long a large size gun will be available for this purpose. A point brought to the attention of steelmakers when applying this product to electric furnace linings at weekend shutdown was that it should be projected on the furnace bottom a heat or so before the shutdown rather than applying it after the last heat is out.



Pouring a 100-ton heat of basic steel at an open-hearth shop in the Great Lakes district. Steel freezes at an entirely different rate at the bottom of the ingot than at the top—a factor of tremendous importance in the light of inclusions according to well-known metallurgists

Bottom Performance: Ramix bottoms were reported by one operator as having been in service for 6 years. Performance of Magnamix bottoms installed on two open hearths this year was reported as satisfactory with bottom delay on one of the units totaling only 5 minutes. A method for installing tap holes which has afforded efficient practice on large furnaces at a Pennsylvania plant involves putting chrome ore on the bottom, placing the pipe in position then packing Ramex (of plastic consistency) all around the pipe by using a dolly.

Factors Affecting Cleanliness: The majority of rejections usually encountered can be traced to the bottom of the ingot. Particular emphasis was attached to the fact that steel in the bottom of the mold freezes at an entirely different rate than in the upper portion with the result that materials are more apt to be trapped in the lower section. An explanation for the cause of sandy inclusions in aluminum-killed steels was that when the ladle is used more than once, the basic slag pulls sloughed-off brick particles and these pass up through the molten steel. These particles tend to slide off toward the wall of the ingot and if the steel does not wet the wall of the mold sufficiently the refractory particles from the ladle become trapped.

A method of preventing inclusions recently tried by a steelmaker involves filling the mold with straw and then pouring the steel through it. Results obtained were not stated. Another procedure involves having a bath of highly fluid slag in the mold so that when the steel is poured therein the slag will serve as a flux. Indications are that the method will work successfully. A silicious slag is said to be more efficient than a basic slag.

PRACTICAL PRECAUTIONS FOR PREVENTING . . . .

Concentration Cell Corrosion . . .

Observing several simple practices will avoid a rapid and destructive attack which takes place in crevices, beneath scale, and other deposits

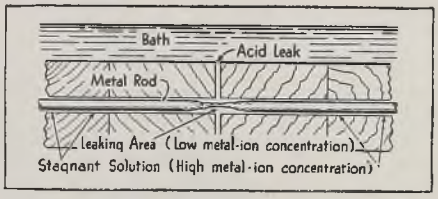


Fig. 1—Leaking liquids build up a metal-ion concentration by soaking timbers around a tie-rod. Corrosion is accelerated by washing away of metal-ions

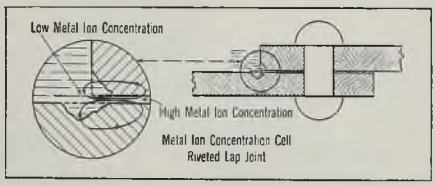


Fig. 2—Riveted lap joint overlaps —a typical area of metal-ion concentration

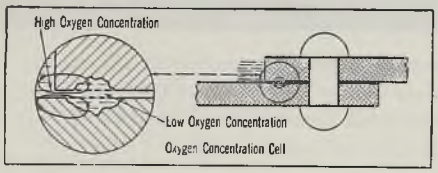


Fig. 3—Lap crevice, typical oxygen-cell site. Crevice is circulation barrier, leading to attack by preventing equalization between inside and outside oxygen concentrations

TENDENCY of a metal to go into solution is influenced by the concentration of ions of that metal in the solution in immediate contact with the metallic surface. The lower the metal-ion concentration, the greater the tendency for the metal to dissolve, or in other words, the higher its solution potential as measured in volts. If the concentration of metal ions in a solution at one point on a metallic surface is appreciably different from the concentration of metal ions at another point, the resulting difference in potential will cause an electric current to flow between the two points. Current flow direction will be from metal to solution, at the point where metal-ion concentration is low, and from solution to metal where metal-ion concentration is high. Cells of this type are illustrated in Figs. 1 and 2.

In practice, according to International Nickel Co. Inc., New York, concentration cells of the metal-ion type may be associated with differences in velocity between two points on a metallic surface. Here, metal ions in corrosion products may be removed continuously at one point, while they accumulate at another.

Oxygen concentration cells are similar in nature to metal-ion cells. A metal or alloy may be in contact with a solution under conditions where the concentration of dissolved oxygen at one point is considerably greater than at some other point on the same metallic surface. This type of cell is illustrated in Fig. 3. Flow of current is from metal to solution at low-oxygen concentration point, and from solution to metal at high-oxygen concentration point.

Oxygen cells and metal-ion cells often oppose each other. In many cases, especially with copper and high-copper alloys, an oxygen concentration cell may be initiated and, through its effect, bring about an increase in metal-ion concentration in the original anodic area vicinity, so that finally a metal-ion cell will be set up with a potential in the opposite direction. The result will be to reduce, or eliminate, the corrosive effect of the oxygen concentration cell.

Metals differ in response to the effects of concentration cells. Oxygen cell behavior may be complicated by the passivating effect of oxygen. For example, if a metal or alloy depends upon an oxide film for corrosion resistance, and an oxygen cell gets started, the absence of oxygen at anodic points precludes repair of passive film in this region. Subsequently, the oxygen cell will be dominated by a more powerful cell set up between established anodic areas and surrounding metal where passive film is intact, and where available oxygen promotes corrosion reaction by depolarizing reaction with hydrogen. These active-passive cells, to be considered as oxygen concentration cells of particularly aggressive form, may develop potentials as high as 500 microvolts on materials like stainless steel under favorable conditions, resulting in pits.

Pitting may occur in almost any metal or alloy, under loosely attached, porous materials shielding the underlying metal from free contact with a solution, especially if the solution body is in motion. Crevices between overlapping metallic surfaces may become sites for anodic areas, with severe corrosion. Therefore cracks and crevices should be avoided in fabricating corrosion-resisting equipment.

PRACTICES FOR PREVENTING CONCENTRATION-CELL CORROSION

1. **In new equipment specify butt joints and emphasize necessity for complete weld metal penetration to guard against minute crevices.**
2. **Avoid lap joints or seal completely with weld metals, solder, or caulking compound provided crevices and voids underneath can be avoided during application or eliminated promptly at later appearance.**
3. **Lap or spot-welded joints showing evidence of crevice corrosion should be thoroughly cleaned and all channels for liquid penetration — rivet heads, overlaps, and all crevice-like areas—sealed with weld-metal, soldered, or caulked.**
4. **In vessel design avoid sharp corners, stagnant areas, or other sites favorable to the accumulation of precipitates and other solids.**
5. **Maintain frequent, thorough cleaning of all metal areas subject to accumulations of deposits, scale, or "skins".**
6. **In design and operation of tubular flow heat exchangers, endeavor to provide for uniform flow of liquid with a minimum of turbulence and impingement.**
7. **Provide suitable strainers in heat exchanger cooling medium lines to prevent local obstruction with tubes which may start deposit attacks or result in turbulence or impingement.**
8. **Remove all wet packing materials (unless of corrosion inhibiting type) from any equipment scheduled for a long shut down period, or concentration conditions under packings may become similar to those under deposits.**
9. **Soaked timbers in contact with metal surfaces—tie rods, pipes, staybolts, etc.—promote concentration-cell effects. Therefore keep tie-rods tight and promptly repair all leaks in wooden tanks, even those that might otherwise be considered trifling.**