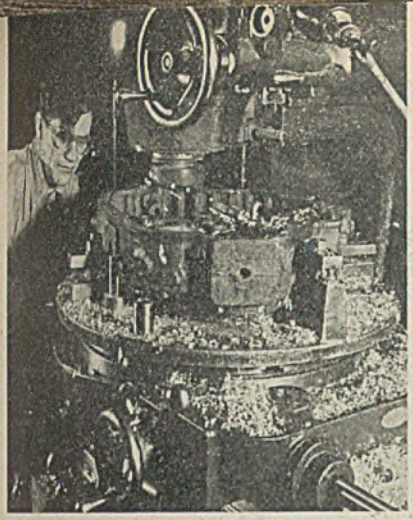


High speed machine tools, like this miller, will compete strongly for postwar orders. Page 49

STEEL

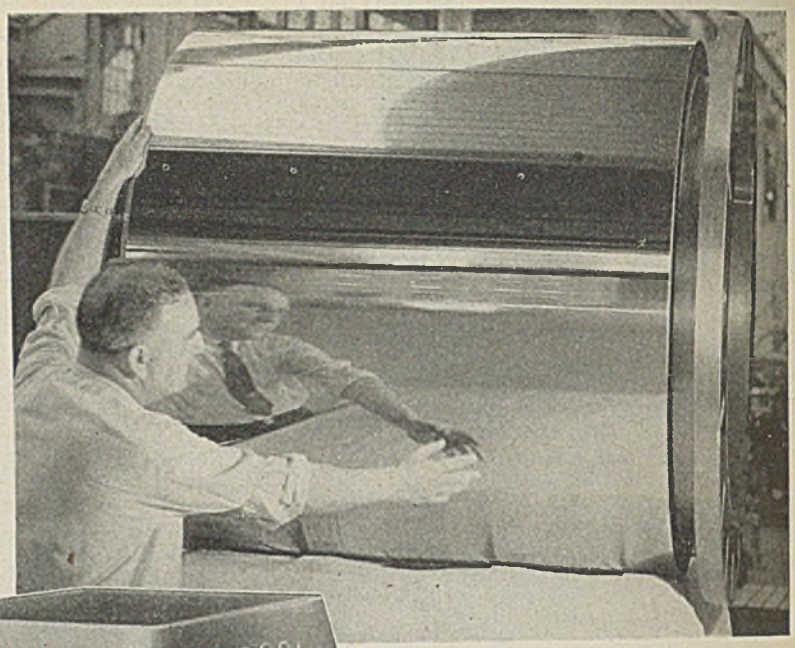
The Magazine of Metalworking and Metalproducing

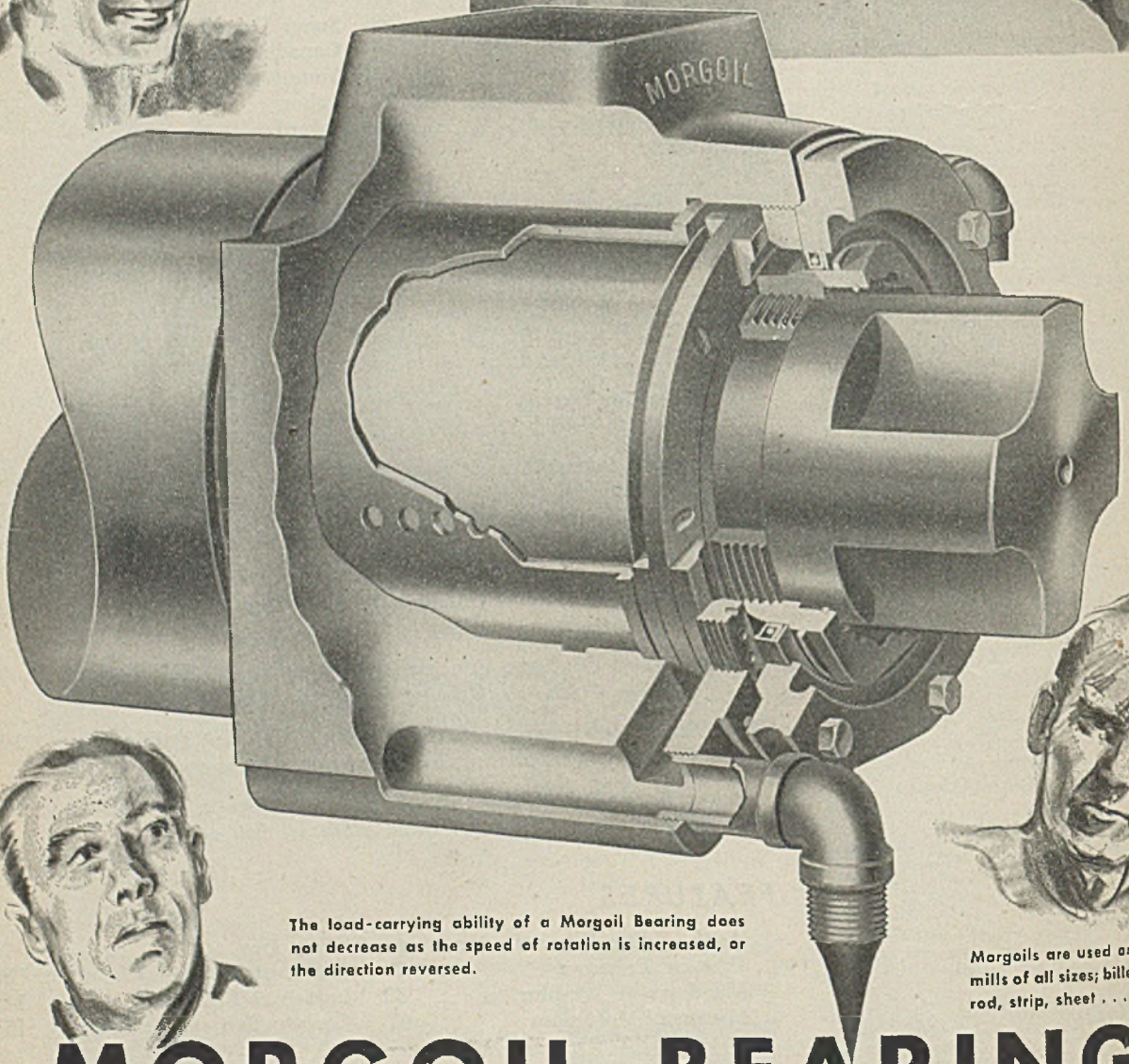
OCTOBER 18, 1943

Volume 113—Number 16

Load is distributed over a wide area — not concentrated in a few points. That makes sense to me.

The load rides on a film of oil, under pressure between two highly finished surfaces.





The load-carrying ability of a Morgoil Bearing does not decrease as the speed of rotation is increased, or the direction reversed.

Morgoils are used on hot or cold mills of all sizes; billet, merchant, rod, strip, sheet . . .

MORGOIL BEARINGS

ride on a film of oil

B-113

MORGAN CONSTRUCTION COMPANY • WORCESTER, MASS.

STEEL
October 18, 1943

The Future of Small Business

It is disconcerting to go into a huddle with industrialists and to find that many of them are dubious about the future of "small business."

Press these men for explanations and they say that in spite of lip service from the government, the little industrial outfit has not fared very well in the war. They say that most legislation which is supposed to hit the big fellow actually hurts the little fellow. They say that the general trend is toward merger, consolidation and bigness; that the small house is confronted with constantly growing threats to its welfare.

If this view is correct, then all business has something to worry about. If it is true, "big business" has much to worry about. The private enterprise system is based upon opportunity to all. If we get to a point where only the big and strong can survive, then the system of private enterprise will become a system of industrial giants subject to government control and regulation.

Many years ago we ran an editorial expressing anxiety over the plight of small business. Almost immediately we received a frank letter from an individual whom most contemporaries would have called the No. 1 spokesman of big business. The gist of his comment was as follows: "Opportunity for small business is fundamental to the preservation of the system of private enterprise. Big business should be the first to recognize this fact and to promote opportunities for the beginners in business. When and if big business becomes so blind that it can't see the desirability of maintaining opportunities for the little fellow, big business itself is doomed."

This comment is as pertinent today as it was 20 or more years ago when it was written. No experienced person should have any illusions about big and little business. Both have their advantages and disadvantages. The little fellow, just starting, may have the potentialities of a Ford Motor Co. or he may be promoting a nuisance value with the deliberate idea that some big outfit will buy him out at a fancy figure. The system can be abused, but its advantages far outweigh its disadvantages.

Right now the government and politicians are pretending to be the sole friends of small business. They talk big and do little. Big, medium and little business has a stake in the problem. The smartest thing business—regardless of size—can do, is to promote opportunity for the little fellow.

CASUALTIES AT HOME: Walter Tangeman, retiring president of the National Machine Tool Builders' Association, told members attending the organization's 42nd annual convention that output required of machine tool builders in 1944 will represent approximately $325,000,000 worth of machine tools. This is about one-fourth of the peak capacity built up by the industry in the present war.

Problems involved in scaling down operations to this level and in adjusting to postwar conditions were discussed at length at the Chicago meeting, at which attendance broke all previous records. Renegotiation, termination of contracts, shifting from machine tools to other war work, and postwar markets were among the subjects discussed.

In concluding his report of this meeting, Guy Hubbard refers to the fine job the machine tool industry has done in meeting the challenge of this war and adds this significant thought: "That this fight has not been without its casualties is borne out by the fact that within the past year nine major execu-

(OVER)

tives of nine of the 176 companies constituting this association have died. The majority of these men died suddenly and in the prime of life. . . . They gave their lives for their country just as surely as do those who are killed in action. . . ." —p. 49

° ° °

FAR TOO MUCH UTOPIA: Many industrialists will agree heartily with Alfred P. Sloan Jr., chairman of General Motors, in his charge that in the general discussion about what is to happen after the war "there is far too much Utopia—too little realism."

Mr. Sloan cites two approaches to the postwar problem. One is stratosphere planning, which attacks the problem from the top and is the favorite device of the spenders. The other is sea-level planning, which attacks the problem from the bottom and is the realistic approach.

Sea-level planning, as Mr. Sloan envisages it, is the planning of producers. It takes into account and utilizes the great force of individual initiative, which is the keystone of the system of private enterprise.

We suggest this further differentiation: The stratosphere planners seek to spend money; the sea-level planners seek to create goods for which a market exists or can be developed. —p. 57

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WAR-TO-WAR PROGRESS: That steel ingot and casting production in September was the highest for any 30-day month in the history of the industry comes as no surprise to most steelmakers. With new capacity available and with operations maintained at 100.4 per cent of official capacity, a new record was to be expected.

However, few persons realize the extent to which improved practice enters into current production records. C. D. King, chairman of the operating committee of United States Steel Corp. of Delaware, presented to a meeting of A.I.M.M.E. interesting comparisons of production achievements in the two World Wars.

A modern steelworks in 1918 tapped 110 net ton heats, had a daily output of 194 tons per furnace and a fuel consumption of 6,600,000 Btu. per net ton of ingots. Today a modern steelworks taps 169 net ton heats, has a daily output of 310 tons per furnace and a fuel consumption of 3,700,000 Btu. per net ton. Also last year 230 blast furnaces in the United States made one-third more pig iron than 351 stacks made in 1918 at the peak of World War I production.

Can we expect even greater progress in the forthcoming quarter-century? —pp. 79, 109

A.S.T.E. LOOKS AHEAD: One of the most vigorous technical societies in the metalworking industries today is the American Society of Tool Engineers. It has 14,000 members, most of whom have enrolled since 1939. The society has done much to make industry more conscious of the importance of the work of tool engineers.

At the recent meeting of the society in Indianapolis, the technical program indicated the broad scope of tool engineering. Discussion ranged from deep freezing as a phase of heat treating to plant layout, materials handling and postwar planning.

Reading between the lines of the report of the meeting, one gets the idea that tool engineers rapidly are becoming conscious of the tremendous economic significance of the work they are doing. To the extent that they make it possible to produce more goods at less cost, they are laying a sound foundation for the postwar economy. —p. 52

° ° °

PACKAGING IN WARTIME: After watching the care with which certain wartime products, as for instance aircraft engines and parts, are packaged to insure safety in shipment and protection from corrosion, one wonders whether industry will go back to its previous rather slipshod habits of packaging when the pressure of war is removed.

This is not to say that all wrapping, crating, coating, packaging, etc. before the war was bad. Admittedly, considerable progress was made in the decade before the war. Nevertheless, losses from improper attention to these details remained unnecessarily high. There was room for much improvement.

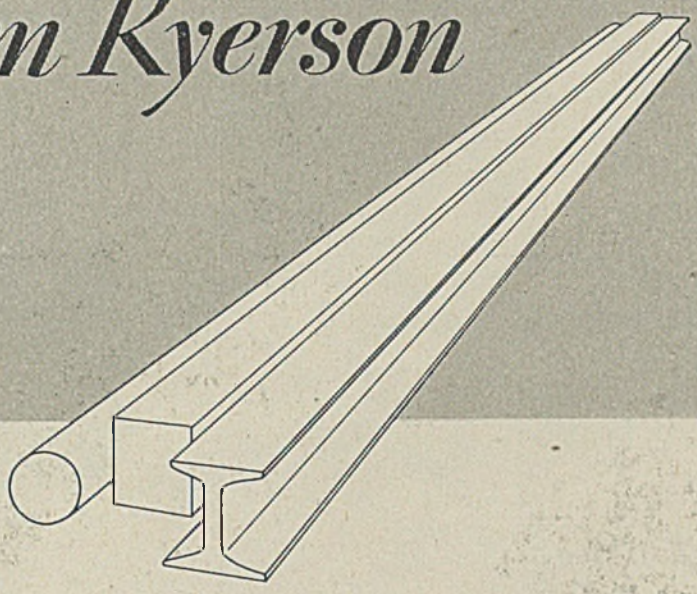
War has furnished an opportunity to go to extraordinary lengths to protect intricate mechanisms, parts and highly finished surfaces. Seldom has anybody complained too much about the high cost of such protection.

How much of this newly acquired technic can we adapt to peacetime conditions at costs which will conform to competitive requirements? —p. 70

E. L. Shaner

EDITOR-IN-CHIEF

WAR STEEL... *quickly from Ryerson*



Steel for weapons—for essential industries—steels for maintenance—special aircraft steels and NE alloys—all are immediately available in Ryerson stocks! When shortages occur, Ryerson technical experience finds an alternative. When speed is paramount, Ryerson operating men make delivery on time. Call Ryerson first, whatever your steel requirements, for prompt, effective cooperation! Joseph T. Ryerson & Son, Inc.; Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.

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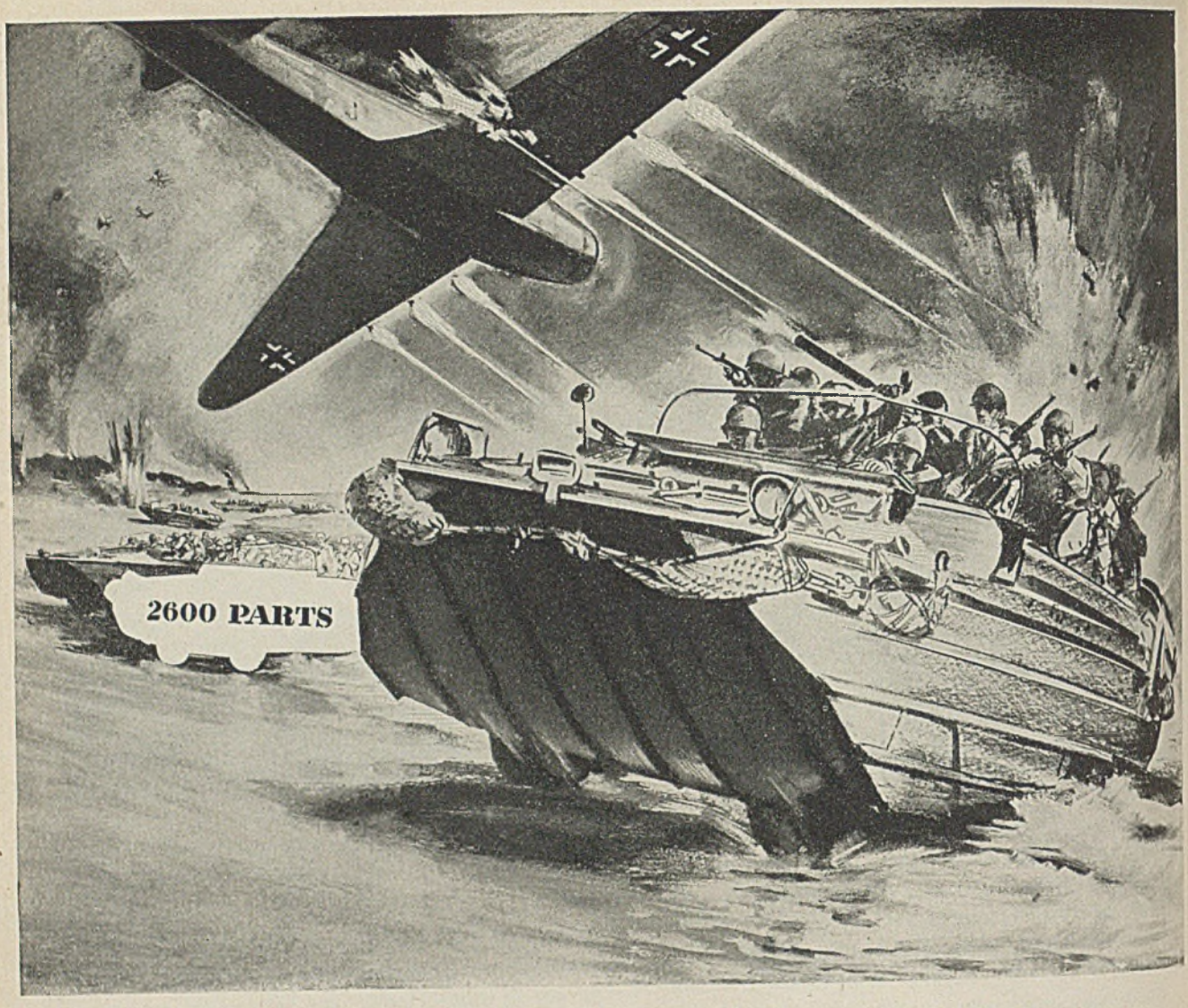


SAVED BY THE THOUSANDTH PART OF A DUCK

Down comes a Focke-Wulf in a screaming dive, while the Duck's "land legs" churn sand and water for seconds that seem to last forever!

Thousands of parts make the big Duck "walk". Piston, connecting rods, agile on oil-rinsed bearings, pour power to straining gears and drive shaft. Vibration tests each metal fastener.

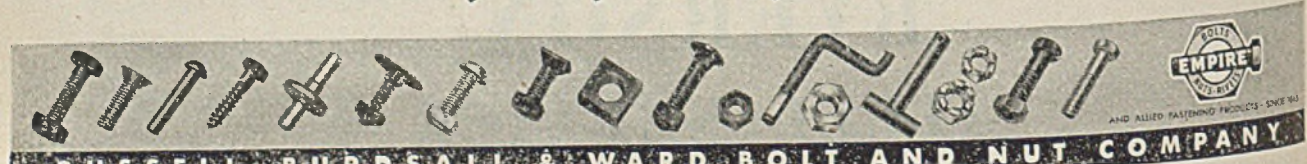
The wheels still sink, dig deeper—then, seconds later, get firm hold . . . Bullets lash the surf scant yards behind.

Perhaps you helped to save the boys who rode the Duck that day . . . Perhaps a few minutes' extra care some months ago, the time you took to check and double-check some tiny part, an extra thought you gave to better, faster machines and methods—helped keep that amphibian roaring on to victory . . . *For—every part, down to the smallest, counts.*

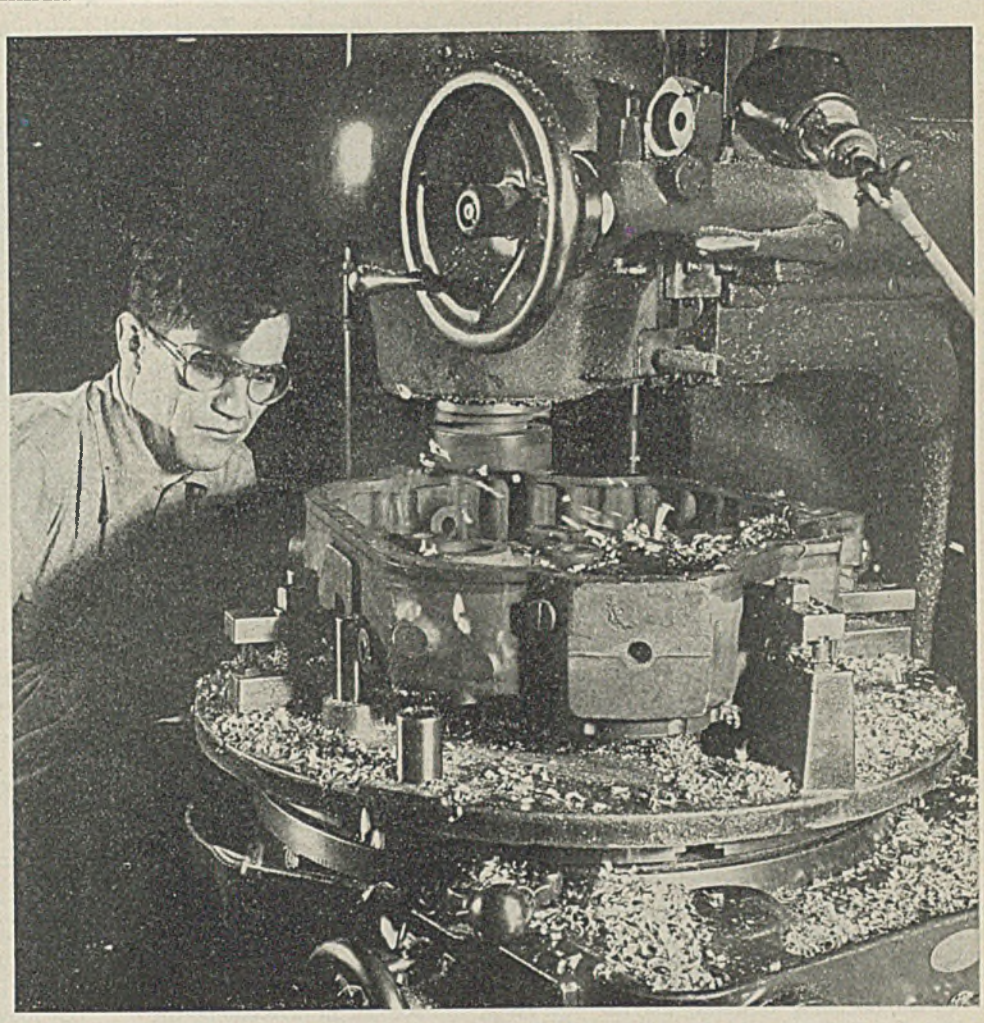
At R B & W's three great plants where millions of big and little fasteners are made each day, we workers realize how much *each* bolt, nut, screw or rivet may count for life or death on a distant shore or sea . . . how much is gained from R B & W's special manufacturing processes, its vast production facilities coordinated in a hard-driving campaign to help get this war over quick!

If you would like the workers in your plant to feel with us this keener sense of battle-urgency, we will gladly send the picture and story of the Duck in poster form. Write us. No advertising matter—and the poster's free. Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, New York.

RB&W *Making strong the things that make America strong*



RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY



HIGHER SPEEDS: Just as high-speed motor cars with four-wheel brakes literally pushed slow-speed, slow-starting and slow-stopping vehicles off prewar trunk highways, so also will high-speed, quick-actuating machine tools push the logy ones out of consumer goods production lines after the war. This will speed up postwar obsolescence of production machine tools — possibilities of ultra high-speed cutting of metals apparently having merely been scratched as yet. OWI photo by Feininger of a Pratt & Whitney aircraft engine operation in a Milwaukee miller.

What Does the Future Hold?

Industry executives ponder course at annual convention of National Machine Tool Builders' Association. . . Renegotiation and termination of contracts along with reconversion problems present major headaches

By GUY HUBBARD
Machine Tool Editor, STEEL

"WHAT does the future hold for the machine tool industry, and how best can we meet that future?"

Those undoubtedly were questions uppermost in the minds of 305 members of the National Machine Tool Builders' Association who set a record for attendance at that organization's forty-second annual convention at Edgewater Beach hotel, Chicago, Oct. 10, 11 and 12.

Puzzling problems do indeed face this industry which was called upon right from the first hour of the national and world emergency to implement the arsenal of democracy, and which now—in what we hope may be the eleventh hour of the war—finds itself faced with declining demand for its own products and problems of conversion to other war work when the cream of that work has to a considerable degree been skimmed off.

The situation as it stands today was well expressed by Walter W. Tangeman, retiring president of the association, in the following way: "As machine tool manufacturers, the major portion of our production job would seem already to have been accomplished. Even though the requirements for war material do change, the machines we have built are universal enough to be moved from service to service.

"New projects will of course arise, for which new machine tools will have to be provided. The manpower situation —critical as it is—should provoke the installation of a number of labor-saving tools. Some of the old tools, with which we went into the war, must be replaced. Our allies still are in need of large numbers of our machines. However, on the basis of our present estimates, the machine tool output for 1944 will represent only about one-fourth of the peak capacity built up by our industry.

"It therefore appears that the output required of us in 1944 will represent approximately $325,000,000 worth of machine tools. This does not mean that all manufacturers will experience this decline to one-fourth their peak effort. On the other hand there may be little or no demand for certain types of tools. To operate intelligently, each one of us must therefore study his own situation—his present backlog of orders, current rate of sale and the trend of cancellation. Ob-

New Officers of the National Machine Tool Builders' Association

WILLIAM P. KIRK

J. Y. SCOTT

JOSEPH L. TRECKER

NEW officers of the National Machine Tool Builders' Association for the 1943-44 term, elected at the organization's forty-second annual convention in Chicago last week, are as follows:

President, J. Y. Scott, president and treasurer of the Van Norman Co., Springfield, Mass.; first vice president, Joseph L. Trecker, executive vice president, Kearney & Trecker Corp., Milwaukee; second vice president, William P. Kirk, vice president and sales manager, Machinery department, Pratt & Whitney division, Niles-Bement-Pond Co., West Hartford, Conn.; treasurer, E. Blakeney Gleason, vice president, Gleason Works, Rochester, N. Y.

New directors were elected as follows: William P. Kirk, C. N. Kirkpatrick, president of the Landis Machine Co., Waynesboro, Pa.; and R. E. LeBlond, president of the R. K. LeBlond Machine Tool Co., Cincinnati.

viously, such studies must be specific with respect to types and sizes."

Discussion, both formal and informal, during this meeting, indicated that over and beyond declining business, the rising tide of cancellations, and problems involved in conversion to war work other than machine tools, renegotiation is a major headache of the industry at present. To paraphrase a saying of Abraham Lincoln regarding an entirely different subject, the grievance lies, "Not in the use of a bad thing, but in the abuse of a good thing."

No member of the industry denies that a law to curb excessive war profits was not an excellent thing. However, when that law is administered in a manner which has been compared to the liquidation of a pickpocket by the use of a machine gun in crowded Times Square, it does indeed become a serious menace to the continued existence of the great majority who are honest and law-abiding.

The association's case on renegotiation has been presented in the form of a brief to congressmen, senators and the public. Thorwald S. Ross, president, Rivett Lathe & Grinder Inc., and Charles Safford, president, Lovejoy Tool Co., have appeared as witnesses for this cause before the House Ways and Means Committee. That committee will, according to Mr. Tangeman, recommend some changes in the renegotiation law. Changes advocated by the association are along the following lines:

1. Renegotiation on the basis of profits before taxes should be abandoned. Should be made wholly in the light of profits after taxes.

2. Extent to which a company's product is expendable in the war effort should be taken into account in determining the amount of the company's earnings to be recovered by the government through renegotiation.

3. Companies which have saturated their postwar markets by reason of their wartime production, should be allowed to retain out of their earnings reserves necessary to maintain service to industries dependent on machines already installed; to finance engineering research leading to new developments and to carry those new developments beyond the experimental stage into actual production for use.

Interest in Contract Terminations

Regarding another subject toward which everyone at this meeting literally was "all ears," Tell Berna, general manager of the association, said: "One of the other serious problems facing us is that of termination of contracts. The services already have been working on this in connection with reductions in certain war programs. However, the amounts involved thus far are small compared to the amounts which will be involved when the fighting stops and a total of $75,000,000,000 in contracts must be canceled and adjusted.

"This problem soon will become one of painful importance to machine tool builders. As a matter of fact cancellations in our industry already are high—having averaged $15,000,000 per month from January to July, inclusive, while in August they still amounted to $6,800,000. That represents cancellations on about 1000 machines in one month.

"As long as machine tool builders operate on pool orders, a canceled machine goes back into the pool—but pool orders shortly will be worked out. There were only 9500 unassigned machines in pool orders in August. The industry sold 9700 machines during that month and shipped 17,000.

"What might be called 'Continuity Orders' are essential to relieve contracting officers of the enormous volume of work involved in adjusting cancellation charges on hundreds of machine tools every month. If the goverment does not establish that procedure, machine tool builders from now on will be starting manufacturing lots in their shops on a normal commercial basis—with greatly increased risks. Under such conditions 'stop-work' orders and cancellations will become problems of grave difficulty. Machine tool builders cannot continue to accept cancellations 'no charge.' They cannot run the risk of being caught, when peace comes, with big inventories of parts and subassemblies for which there will then exist little if any market.

"All the armed services now are reviewing their cancellation procedure. The Army has a new policy, detailed in Procurement Regulation No. 15, dated Aug. 14, 1943, and in War Department Manual TM 14-320, dated July 7, 1943. The latter is entitled, War Department Termination Accounting Manual for Fixed Price Supply Contractors. Also,

a new statement of Navy policy is in the making and will be available shortly.

"The Division of Procurement Policy of the War Production Board now is working on a 'Termination Article' which they hope will become standard throughout all branches of the goverment. In its major features it resembles the War Department article. If adopted, it will be inserted in all new contracts and may be substituted for existing termination clauses in existing contracts at any time. If the contract is to be canceled, this new clause may be inserted by mutual consent before work is stopped."

In summing up the situation, Mr. Berna said: "Our industry is very fortunate in that a declining demand will enable commitments and inventories to be reduced gradually from now on. Hence when peace brings the final deluge of cancellations, machine tool builders will find themselves in a relatively favorable position. Nevertheless, the task of securing prompt and fair settlements on termination undoubtedly will continue to be a serious one for some time to come."

Some of the problems as seen along the Washington front were brought out by John S. Chafee, director, Tools Division, War Production Board. Mr. Chafee emphasized that the situation in heavy forging and forming machines is still very critical, and that there is a place where machine tool builders can be of immediate service as subcontractors.

He also bore down on the seriousness of the antifriction bearing situation. Machinery builders are going to be asked to turn back every bearing which possibly can be spared from their stocks, so that these can be reallocated to places where lack of such bearings is delaying assembly of vital equipment. He stressed the need for continued action toward further standardization in chucks and collets.

As far as conversion to other war work is concerned, he brought out the rather surprising fact that small companies have done so to the extent of 30 per cent, while large ones show only 5 per cent. From data now at hand, it appears that 83 per cent of America's machine tool building capacity still is devoted to building machine tools, 9 per cent has swung over to other war work, and 8 per cent is "down" at the moment. Mr. Chafee implied that WPB might survive as some kind of postwar government-industry agency.

Another who came from the Washington front was John B. Campbell, director, Production Resources Division, WPB. In speaking on Machine Tool Builders as subcontractors, Mr. Campbell urged them to look toward the small diesel engine program (for landing barges, etc.) as an active source for subcontracting work. Other possibilities which he mentioned were synthetic rubber-working machines; the tractor, truck and farm implement programs; and the aircraft engine program.

While there was some discussion of South American trade in group meetings, the only public discussion of foreign prospects was by Fred McIntyre, vice president, Reed-Prentice Corp., who recently returned from a lend-lease mission to Australia. He mentioned a growing spirit of independence—almost of isolationism—in Australia, growing out of the defense crisis there following Pearl Harbor. As far as tool building in Australia is concerned, he thinks that the war has advanced it almost 50 years—especially in the building of the larger tools. As a matter of fact, Australia evidently will be a factor to be reckoned with in the postwar sale of machine tools and other industrial equipment throughout the Far East.

Postwar planning came in for some attention, although all who dealt with it bore down on the fact that the industry's war job still is far from finished and that the major facilities of the industry still must be kept going full steam ahead for war.

Frederick V. Geier, president, Cincinnati Milling Machine Co., pointed out that there lies ahead a job of retooling for peacetime production in which the machine tool industry must play an early and major role—just as it did in tooling up for war production. Upon this will depend to a large degree how many of the 56,000,000 people who will want jobs after the war will have jobs. To time it properly, there must be provision of men and materials—especially

(*Please turn to Page* 152)

Present, Past and Pending

STEEL ADVISORY COMMITTEE MEETS IN PHILADELPHIA

PHILADELPHIA—Steel industry advisory committee of the War Production Board inspected Navy yard here Oct. 14, discussed diversion of alloy steel from open hearth furnaces and the progress of the iron and steel expansion program.

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STEEL LEADERS PLEDGE CO-OPERATION IN SCRAP DRIVE

COATESVILLE, PA.—Leaders of the steel industry have pledged full co-operation in the victory scrap drive and individual companies have agreed to buy up to one million tons of the scrap collected, over present inventories.

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REMAINDER OF MINES RETURNED TO OWNERS

WASHINGTON—Coal Administrator Harold L. Ickes has returned the remaining 1700 out of the 3300 mines seized by the government last May to their owners.

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UNION ADMITS "NO STRIKE" PLEDGE VIOLATED

CLEVELAND—Local 1298, United Steelworkers of America, has adopted a resolution pledging adherence to the union's no strike pledge and admitting a three-day strike by its members at the American Steel & Wire Co. two months ago was a violation.

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PROBE OF CUTTING TOOL SALE PUSHED

WASHINGTON—Pending completion of the Senate investigation of the circumstances surrounding the recent sale of cutting tools at junk prices by the Army Air Forces at Detroit, purchase of such tools has been frozen. Probe so far is said to disclose that most of the tools were standard and could be used for other war purposes.

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ARMCO TO BUILD LANDING CRAFT FOR NAVY

MIDDLETOWN, O.—American Rolling Mill Co.'s fabricating division is starting work on the first of 78 landing craft for the United States Navy.

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NEW OPEN HEARTH TO BE LIGHTED AT ST. LOUIS

ST. LOUIS—First of three new open hearths in the new plant built by Defense Plant Corp. and to be operated by Granite City Steel Co., will be lighted by the end of October. Remaining two units probably will be placed in operation in November.

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WANTED: 100,000,000 POUNDS OF IRON SLIVERS

WILMINGTON, DEL.—E. I. du Pont de Nemours & Co. requires 100,000,000 pounds of tiny slivers left after cast iron is drilled or machined, to be used as a reducing agent in making aniline for dyes.

o o o

U. S. STEEL EXPANSION NEARLY COMPLETE

NEW YORK—Greater part of United States Steel Corp.'s $700,000,000 expansion program has been completed and placed in operation, according to Irving S. Olds, chairman. Remainder will be completed soon.

Stress Design and Production Progress at Fall Convention

Engineering discussions range from intricacies of gear design and production to materials handling and postwar planning. . Plant layout provides added phase of activity from standpoint "the plant is a tool"

LAST WEEK more than 600 members of the virile American Society of Tool Engineers met in Indianapolis to hear more than a dozen experts present latest information on engineering subjects ranging from the intricacies of gear design and production to materials handling and postwar planning.

Real emphasis on tool design began around 1929 as was reflected in the incorporation of the ASTE in 1932 but five years later the organization still had less than 2000 members. Today, membership is over 14,000, nearly two-thirds of which joined since 1939, and the scope of activities has been expanded to encompass most problems which bear a direct relationship to tooling.

Materials handling and plant layout, added to the technical program this year, are considered just as important by the group in proper tooling as individual machine setups themselves. In fact, as one man put it, "The plant is a tool".

As for the importance of the technical sessions, consider some of these developments set forth by various speakers:

Steel bars can be heat-treated continuously at a cost of $15 a ton by the induction heating method compared with mill extras of $30 a ton. A tractor company is installing such equipment and the steel companies are interested.

"Deep-freezing" or sub-zero transformation definitely improves the physical properties of steel and it is predicted that every hardening room will have some means of refrigeration as well as heating furnaces in the relatively near future. One industrial engineer alone is working on improved plant layouts for postwar involving expenditure of $200,000,000.

The automobile industry is planning production of 18,000,000 cars in the first three years after the war.

The process of gear shaving can be applied to production of large gears with diameters up to 18 feet with the same economics as in making smaller gears.

Groundwork has been laid for production of machine parts from powdered metals with tensile strengths up to 166,000 pounds and toolmakers Vee blocks are being made with hardness of 62 Rockwell C. Bearings up to 36 inches in diameter may be produced before long. Present maximum is 18 inches.

In a session on new heat treating techniques, G. B. Berlien, chief metallurgist, Lindberg Steel Treating Co., Chicago, said that cutting qualities of high speed steels were definitely improved by refrigerating to low temperatures.

He cited the case of a machine shop which was encountering difficulty in machining SAE 2330 heat-treated forgings. Best possible results obtained from stock bits made of 18-4-1 or 18-4-1-4 high speed steel and heat-treated conventionally was 25 pieces per grind.

Placed in Mechanical Refrigerator

As a means of improving performance, bits were preheated to 1525 degrees Fahr., then transferred to a furnace operating at 2350 degrees and subsequently quenched in oil. After cooling to 300 degrees in the oil, they were permitted to cool to 200 degrees in air and then were transferred to a mechanical refrigerator operating at minus 120 degrees and held for 6 hours.

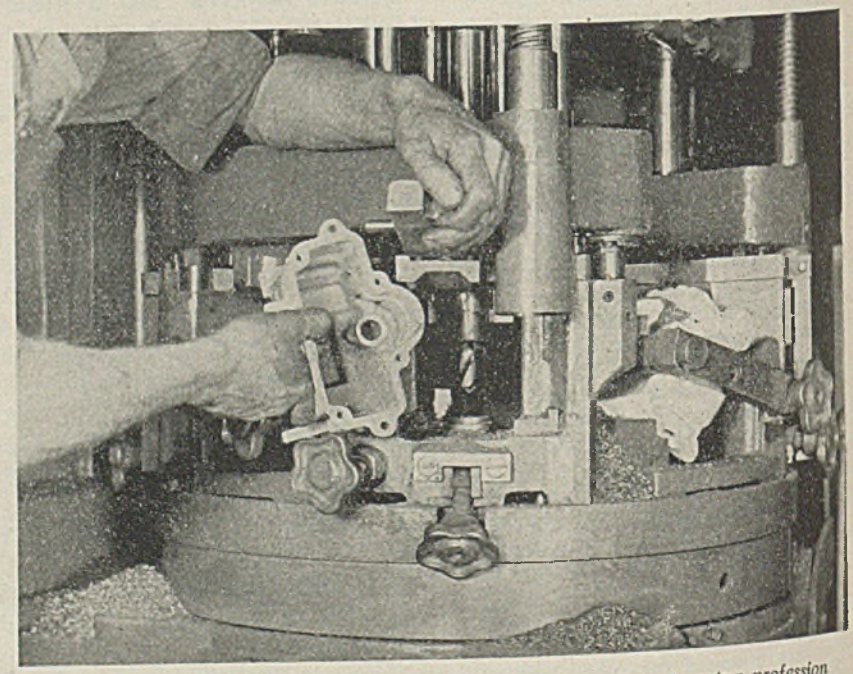
The bits were allowed to resume room temperature normally and then were tempered at 1050 degrees for 3 hours. After air cooling from tempering to about 200 degrees, the bits again were refrigerated to minus 120 degrees, allowed to resume room temperature and finally were tempered at 1050 degrees for 3 hours.

The process resulted in an astounding increase of 400 per cent in cutting efficiency and repeating the process several times brought comparable results. Other types of steel respond equally well to the refrigerating treatment, the nickel carburizing steels for instance showing increases in Rockwell hardness of 12 to 15 points.

Induction heating as a method for heat-treatment is still regarded in its infancy by Dr. H. B. Osborn Jr., research and development engineer, Tocco division, Ohio Crankshaft Co., Cleveland. Development of the process in the last three or four years has been rapid but many new applications are in the offing. In addition to the continuous heating of bar stock, work now is being conducted on the malleablization of chilled cast iron, as one example. The process has found wide favor in the current war effort as a means of heating large sections such as bombs and shell cases prior to further forming operations.

Doctor Burton emphasized that the material to be heated need not be steel nor magnetic but simply a fairly good conductor. Dielectric heating has greatly speeded up processing of many nonconductors such as in laminating plywood. Incidentally, Doctor Burton has worked out a formula for determining the optimum frequency required for heating a bar of given cross-section. It is 720 divided by the diameter squared.

In discussing the manufacture of ma-



Jig and fixture design, a major contribution of the tool engineering profession to the American system of manufacturing, makes it possible for ordinary machine operators consistently to achieve "tool room accuracy" on parts at mass production speed. Postwar developments of it on new American machine tools should put this country ahead when peace comes. This gear housing setup is by Maytag Co. on a W. F. & John Barnes machine

chine parts from powdered metals, Andrew J. Langhammer, president, Amplex division, Chrysler Corp., Detroit, also stated that this industry is still in its infancy as far as the application of the art to machine parts is concerned. Apparently, a great future is in prospect for the process. Chrysler Corp. alone has some 5000 war commitments, which include the production of several hundred items in both ferrous and nonferrous metals, such as gears, ratchets, levers, pillow blocks, cams, gibs, hubs with internal and external splines and the like.

Mr. Langhammer was quick to inform his listeners, however, that "The art of powder metallurgy is not a panacea."

"Although such operations as turning, boring, facing, reaming, counterboring, milling, broaching, hobbing, gear cutting, grinding, etc., can be eliminated, there will always be a need for machine tools", he said.

The process does have its definite applications, he said. For example, a gun sight can be made in a matter of seconds with the process as contrasted with two hours by conventional machining methods. Saving in costs run as high as 80 per cent.

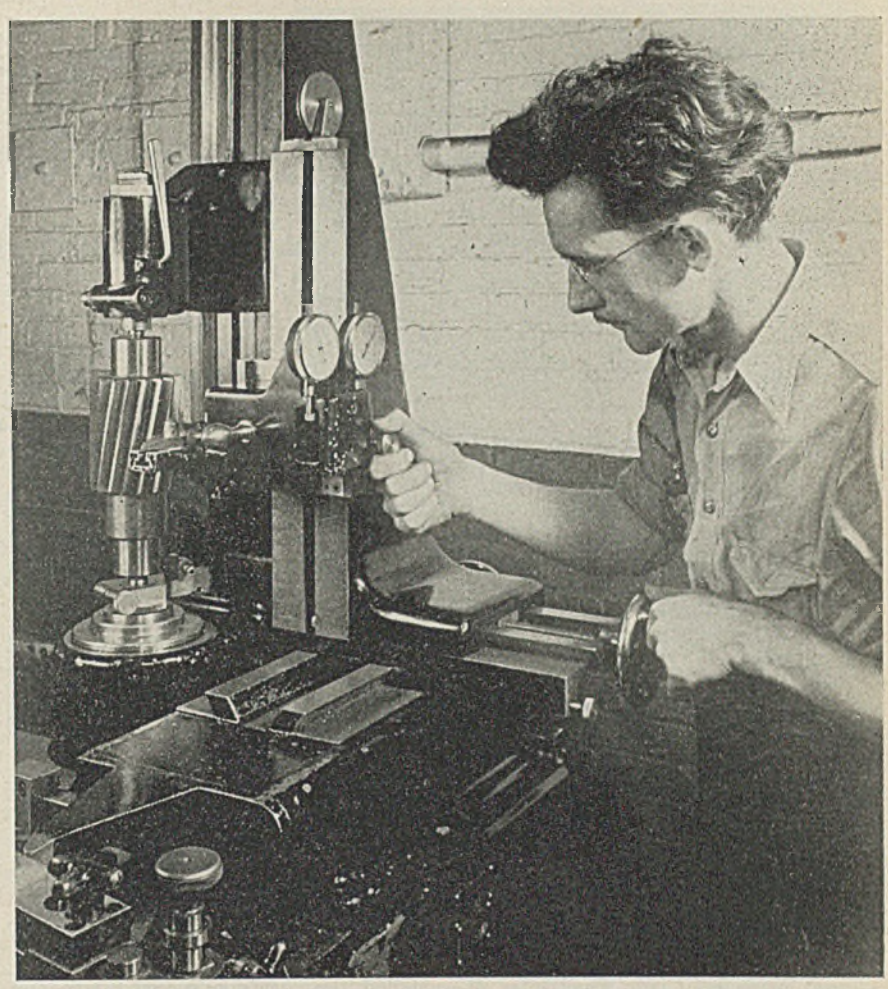
As for materials, Mr. Langhammer said Chrysler is "iron-minded". Much greater quantities of powdered iron are available from domestic sources with improved qualities and his company will never go back to the European product.

"Chrysler does not recognize size as a necessary limitation for powder metallurgy," he said. "Rather we look at it from the standpoint of the economics involved. If the design is sound, the volume assured and the economics favorable, we can probably undertake to make such a part."

In addition to being prepared to produce pieces up to 36 inches in diameter, Chrysler has studied production of bars 6 by 2½ inches by 13 feet long. Tensile strengths up to 166,000 pounds appear to be entirely feasible. Iron powder bearings will stand loads up to 60,000 and 90,000 pounds per square inch and bronze bearings up to 7500 pounds. Chrysler also has developed a method for heat-treating both ferrous and nonferrous parts.

Several addresses were made on the subject of gears ranging from the heavy-duty type made by the Falk Corp., Milwaukee, to small, high stress gears required for aircraft motors. Cutting gears with diameters up to 12 and 16 feet have presented a particularly trying problem, W. P. Schmitter, Falk's chief engineer said, due to the limited amount of equipment available and much credit is due to the tool engineer for providing, probably for the first time, the jigs, fixtures and tools essential to meeting the heavy demand for drives such as the 30,000 horsepower units for destroyers.

In selecting materials for large gears, Mr. Schmitter has found that any analysis capable of being heat-treated to the required minimum physicals will perform satisfactorily. It is for this reason that the NE and other lean alloy steels have been successfully used for gearing. However, grades high in carbide forming elements have been favored in order to secure the maximum resistance to profile abrasive types of wear. Use of medium sulphurized steels (0.07-0.10 per cent sulphur) has materially aided the gear cutting problem, he said.



Things once confined to the laboratory have been brought into common use in the shop by American tool engineers. To insure that parts such as this gear follow exactly the careful theory embodied in the design, instruments of precision check every detail of the finished work to "tenths" or less. Apparatus such as this cuts time of precision checking to where inspection can keep pace with production. Westinghouse-Nuttal photo

Use Castings for Large Gears

Industrial gearing can be made from rolled bars, forgings or castings but for large gears the latter are preferred because of the absence of extreme directional properties usually associated with rolled forgings or plate. Falk usually uses a manganese-molybdenum composition for large cast steel gears.

Production of gears for aircraft presents an usually difficult problem, said Charles G. Pfeffer, production engineer, Wright Aeronautical Corp., Paterson, N. J., for reasons of space limitation and extremely high stresses. In contrast, gears for most ordinary purposes can be made with sufficient mass to provide the physical characteristics specified. In the aircraft field, gear ratios of 10 to 1 and 6 to 1 are not uncommon and the production of such gears has taxed the skill and ingenuity of engineers.

In discussing gears in the Allison motor, Richard S. Kegg, supervisor of gear laboratory, Allison division, General Motors Corp., Indianapolis, brought home similar points. Some gears in this engine of fine pitch run at 28,000 revolutions per minute under heavy loads. Carburizing often is difficult since some sections of the same piece must have different hardness ratings. This is solved by copper plating the sections requiring lesser hardness, carburizing, stripping off the copper and recarburizing. Carbon, of course, does not penetrate the copper and proper timing results in the correct hardness. Quenching dies are used to maintain dimensions.

The Allison engine has gone through 19 model changes in the past 2½ years which have been accompanied by many advancements in production techniques as well as improvement in design, according to Dimitrius Gerdan, Allison engine development engineer.

Prestressing by shotblasting now is

being followed as a regular production procedure. Crankshafts so treated increased 20 per cent in strength and similar improvements were noted in the physical characteristics of connecting rods. Less polishing also was required. Crankshaft physicals, too, have been improved by nitriding. With the safety factors provided, no failures have been reported on the fighting fronts.

Allison engineers also have found that scratches in soft steel reduce fatigue life from 30 to 40 per cent although these may be only 0.001 to 0.003-inch deep. The condition was accentuated in higher quality steels.

In the session on materials handling and plant layout, Randolph W. Mallick, section engineer, headquarters manufacturing engineering department, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., said that upon tool engineers, plant managers and production engineers, more than any other category of technical groups in industry, falls the responsibility of utilizing plant and equipment for "getting out the goods".

Many fail to appreciate the real value of an effective plant layout since it is something which can not be readily seen or felt. A plant may be neat and clean with operators putting forth good effort into their work, he said, yet the production schedules, shipping reports and payrolls may tell another story. The causes may be hidden in improper plant layout.

Ezra W. Clark, vice president and general manager, Clark Tructractor division, Clark Equipment Co., Battle Creek, Mich., said that in the postwar period America will be in competition in the markets of the world with Europe and the Orient where the standards of living and the bare cost of maintaining life are so low that American plants cannot afford high handling costs.

By way of stressing the importance of handling, Mr. Clark said that it costs more to move a ton of steel through plants in Detroit than to ship that steel from Pittsburgh to Detroit. In the last two years, however, the army and navy air force have done more to emphasize the importance of efficient materials handling than industry has been able to do in the last 20 years. And, industry is planning to improve its handling methods in the postwar era.

A new wrinkle in handling attributed by Mr. Clark to George Stringfellow of Thomas A. Edison Inc. is the use of "consumable pallets" such as of die casting metal which can be melted after serving as a handling medium.

Probably one of the most modern handling systems in use today is in a bomb plant being operated by Mechanical Handling Systems Inc., Detroit, and described in a joint presentation by W. V. Casgrain, president, and L. J. Bishop, vice president. Practically all handling functions are mechanized from the point where the pipe from which the bombs are fabricated is picked up in the yard and on through forming and assembling operations and finally to the shipping platform.

Conveyor systems have experienced their greatest development since the end of the last war, Mr. Casgrain said. This type of handling system was used in handling bulk materials as early as 1880 but it was not until 1912 that Ford installed the first conveyorized assembly line.

L. R. Twyman, manager, Machinery Products division, Vickers Inc., Detroit, said he expected a greater tendency toward the use of single purpose machine tools in the postwar period. Single purpose machine tools such as for machining cartridge cases came into increasing use during the tooling up of the nation's war plant. Conversion of these high production machines to peacetime operations will be difficult and it will be largely up to the tool engineer to do the job.

Mr. Twyman also noted a tendency toward the use of standard machine tools with single purpose fixtures. With the use of hydraulic power, such tooling functions as indexing, clamping, chucking, locating and transferring may be readily accomplished. It is possible to control sequence of action with respect to machine tool feed cycle.

John C. Cotner, president, Logansport Machine Inc., Logansport, Ind,, described the application of pneumatic and airdraulic devices to tools and machines. Controls of these types are finding wide application in industry, especially among aircraft builders. One of the new interesting developments is an air-operated gage for rapid checking purposes. If air escapes from the gage too rapidly it is immediately apparent to the operator that the pieces being checked are not of correct size.

No new officers were elected by ASTE inasmuch as these were named at the spring meeting in Milwaukee. Ray H. Morris, vice president, Hardinge Bros. Inc., West Hartford, Conn., heads the organization. The spring meeting will be held in Philadelphia.

THE TOOL ENGINEER

"The tool engineer can control the economic destiny of the world," Adrian L. Potter, executive secretary, American Society of Tool Engineers, told an editor of STEEL at the organization's eleventh semiannual meeting in Indianapolis last week. "By making it possible to produce goods at lower cost," he said, "people will be able to live better on smaller incomes in the postwar period."

Mr. Potter defined the tool engineer as the man familiar with the techniques necessary to produce a given part in quantity at minimum cost and who decides in large measure upon the machines on which the part shall be made and the material from which it shall be fabricated. The engineer often decides upon location of machines in the plant and is an important factor on plant and product design.

WPB Schedules 15,983 New Cars

Steel and other materials authorized for construction of 10,122 units for railroads in first quarter of 1944 and 5861 in succeeding quarters

WAR Production Board last week scheduled for production 15,983 additional new freight cars, of which 10,122 are for delivery during the first quarter of 1944, 4456 during the second quarter, and 1405 during the third quarter.

Under the Controlled Materials Plan the board allotted steel and other materials for the fourth quarter of 1943 for the construction of 10,122 new cars. However, due to the time lag in getting the allocated materials flowing into car builders' shops these cars will be produced during the first quarter.

At the same time the Office of Defense Transportation has drawn upon authorized advance allotments for sufficient tonnage of steel for the first and second quarters of next year to the extent of scheduling an additional 5861 cars, making a total of 15,983 so far scheduled. Additional units will be scheduled.

The list of builders and the number of units each will build is as follows:

American Car & Foundry Co., 2889; Bethlehem Steel Co., 1500; Fruit Growers Express, 217; General American Tank Car Co., 550; Greenville Steel Car Co., 450; Mt. Vernon Car Mfg. Co., 35; Pressed Steel Car Co., 50; Pullman-Standard Car Mfg. Co., 1800; Ralston Steel Car Co., 100; Austin-Western Road Machinery Co., 4; Atchison, Topeka & Santa Fe shops, 100; Chicago, Burlington & Quincy shops, 1000; Chicago, Milwaukee, St. Paul & Pacific shops, 700; Despatch shops, 1000; Great Northern shops, 600; Illinois Central shops, 600; Maine Central shops, 8; Pittsburgh & West Virginia shops, 5; Reading shops, 1850; St. Louis-San Francisco shops, 100; St. Louis Southwestern shops, 100; Virginia Bridge Co., 500; Virginian Railroad shops, 1000; and Wabash Railroad shops, 825.

Guard Against Private As Well as Government Monopoly, Warns Senator

Former head of Temporary National Economic Committee recommends new patent law, federal incorporation act, ban on participation in international cartels

SEN. JOSEPH C. O'MAHONEY

"We stand in gravest danger of losing the entire economic basis of democratic institutions."

WASHINGTON

EASILY the most important postwar economic planning development to date in Congress is the report and recommendation which the Senate Special Committee on Postwar Economic Policy and Planning received last Tuesday from Sen. Joseph C. O'Mahoney (Dem., Wyo.), chairman of its Industrial Reorganization Subcommittee.

Senator O'Mahoney spent the summer recess holding hearings along the Pacific Coast. He learned from businessmen what postwar planning they are doing individually and by communities. He asked questions as to what type of legislation was needed. So helpful were these meetings in regard to studying the Pacific Coast economy that Senator O'Mahoney recommended the full committee appoint other subcommittees to conduct similar field investigations in all other important industrial areas in the country.

Senator O'Mahoney's report is a long one. It includes not only the material he gathered from Pacific Coast witnesses, but also a vast assortment of information compiled for him by government bureaus.

"Out of this study," said Senator O'Mahoney, "and of these hearings there arise clearly the outlines of the task which this committee has assumed. It would be impossible to overestimate the magnitude of the problem. I have no question in saying that in my judgment we are confronted with the bald question as to whether or not we here in America are going to lay down an economic policy that will preserve economic freedom and full opportunity for our citizens.

"We stand in gravest danger of losing the entire economic basis of democratic institutions. The forces of totalitarianism surround us not only upon the war fronts, but upon the economic front and it is not impossible that we shall find ourselves so thoroughly involved in totalitarian procedures that it may be possible to escape only by enduring profound disturbances."

Senator O'Mahoney is worried by a number of problems:

1—Despite all efforts made by Congress to help small business 100 large corporations hold more than 70 per cent of the war business. There was little else that could be done because these large corporations had the facilities and the managerial ability needed to produce for war. While many thousands of smaller companies are working on subcontracts, the present setup involves too much concentrated power; the small companies do not have the freedom they should enjoy in a real democracy.

2—One of the highly complex problems is what to do with government-owned manufacturing plants after the war. From the beginning of the program to the end of May, 1943, there were 17,478 new plants or expansions of old ones at an estimated cost of $19,998,000,000. This includes 2426 plants that were built at government cost of more than $15,000,000,000. It would have been far better had these plants been paid for out of private funds —but again this would have been impossible.

3—Hundreds of thousands of workers have been drained from farms and out of the forests and there have been heavy movements of other workers to war manufacturing areas where they will not be able to get employment when war production ceases. A thoroughgoing control over movements of these workers may be necessary to prevent postwar collapse. The approach on this problem to some extent might be suggested by the present plan of the Selective Service System not to discharge soldiers and sailors until definite jobs and places to live have been found for them.

Much of Senator O'Mahoney's report had to do with the national debt; it is costing $2,800,000,000 to service it this year and next year considerably more will be required. "If we are going to pay that debt," said the senator, "we will have to keep private enterprise alive."

Too many people think that when we talk about the postwar economy it is a matter of a decision between free enterprise and government control. "It is also a question of free enterprise against monopolistic control. This question lies at the very core of the problem which this committee must face. It will not do to dismiss the issue in the belief that either the government or the few corporations which dominate war industry can manage the economic system for the benefit of all the people."

The senator added the advocates of arbitrary private power in the field of commerce and industry and the advocates of arbitrary government power appear to be competing for control of the system.

"Social service workers, upon the one hand, who are convinced that only an all-powerful government can create and maintain opportunity for full employment for the masses, and business executives, upon the other hand, who call themselves defenders of free enterprise, but who are in fact advocates of monopoly, are both taking positions now for the conflict which they believe to be certain for control of the economic system after the war."

A certain amount of overall government control will have to be exercised after the war and, due to the way this country has had to regiment itself during the war, the postwar control no doubt will be rather elaborate. Just as centralized and co-ordinated management is required in producing for and

fighting the war, so centralized management will be necessary after the war.

"Whatever we may think of planning and planners," the senator declared, "the moment we contemplate the nature of the world in which we live, we know that planning has come to stay, that management is here, and that the task of those who wish to preserve the traditional principles of the democratic system is to find the way to make management responsive to popular controls. . .

"The authority of public administration must be tempered by the enactment of a law which will create an administrative system establishing and preserving the right of judicial review over all administrative decisions.

"If we believe in a free enterprise system," he said, "we believe in the profit system. If we believe in profits then we must make up our minds to make profits possible by encouraging the owners of capital to risk its investment."

Urges Federal Incorporation Law

Senator O'Mahoney recommended a wise federal incorporation law be enacted and he thought the type of measure he had in mind should not be objectionable to business.

"This does not mean subjecting business to control by discretionary government managers because those managers would be made subject to administrative law. It does not even mean that they would be subject to the degree of control which is now exercised by government because a federal incorporation law could be so drafted as to set organized business free from governmental regimentation by setting up the standards of responsibility and conduct.

The senator implied the laws which created present regulatory commissions did not clearly define the powers delegated to them—that maladministration is prevented by careful drafting of laws. "A federal charter law may be so drawn as to preserve opportunity for little business and by so doing make it possible to utilize the whole productive power of big business and little business to bring to the markets the goods and services which must be produced if the national debt is ever to be paid.

"We must have a new patent law," he said, recommending that the committee make a special study in this matter.

A postwar control also should be set up so that large corporations could be watched and prevented from participating in international cartels or in agreements not in harmony with the best interests of the country as a whole.

Senator O'Mahoney devoted a considerable portion of his report to the fact that whereas the national debt is growing by leaps and bounds, state and municipal debts are showing a tendency to decline. He raised the question whether money for all sorts of things should continue to be shoveled out of Washington.

POSTWAR PREVIEWS

CONTRACT TERMINATION—Industry, through Committee for Economic Development, offers program for speedy settlement of war contracts. See page 60.

AUTOMOBILES—Costs after the war to be higher due to lowered production rates and increased wage scales. See page 68.

YOUNGSTOWN STEEL—Mahoning and Shenango steel mills, although in a high-cost producing area, expect to receive a fair share of business after the war ends. Construction of the long-proposed Lake Erie-Ohio river canal would lower transportation costs, place the district on parity with other major producing centers. See page 76.

POWDERED METALS—Groundwork has been laid for manufacture of machine parts from powdered metals with high tensile strengths and at savings in time and cost. Size will not necessarily be limiting factor. See page 52.

INDUCTION HEATING—Steel bars can be heat treated continuously at a cost of $15 a ton by induction method, still regarded in its infancy. See page 52.

REFRIGERATING METALS—"Deep freezing" definitely improves physical properties, and hardening rooms of the future will have some means of refrigeration as well as heating furnaces. See page 52.

GEAR SHAVING—Process can be applied to production of gears up to 18 feet in diameter with same economies as in making smaller gears. See page 52.

PLANNING—General Motors chairman asks for more realism, less Utopianism. Says rules for converting or disposing of war plants must be made now. See page 57.

CONTROLS—Senator O'Mahoney warns monopoly in private industry must be avoided as carefully as government domination of business. See page 55.

STOCKPILING—Hearings on modified Scrugham bill to provide for postwar stockpiling of critical minerals to be held before Senate Committee on Mines and Mining. See page 58.

FLAME CUTTING—Lack of machine tools for certain jobs has caused production engineers to improvise special setups in which the oxyacetylene cutting torch is used as a "machining" tool to handle various problems of metal cutting, many of which appear to have postwar significance. See page 82.

CARBIDES—Now that characteristics of carbide cutting tools are becoming more widely known and information is available to show how to overcome their deficiencies, continued expansion of their use is expected. See page 84.

SPECIFY ON PERFORMANCE—The trend toward specification of steel on basis of their performance (using hardenability data) may change many practices in steelmaking and marketing. One supplier already is furnishing such data.—See page 88.

ELECTROTINNING—With an estimated capacity near 50,000,000 base boxes annually, 26 electrotinning lines are reported either installed or projected. After the war when general line cans can again be made, they undoubtedly will be produced from electro-tin plate. See page 103.

CONVERSION—Faced with declining orders, machine tool builders are looking toward other war work, although 83 per cent still are engaged in building machine tools. Because the decline in demand for tools will be gradual, the swing to other work also will be gradual. See page 49.

Stratosphere vs. Sea Level Approach

General Motors chairman holds present discussions contain too much Utopia—too little realism. Offers definite program for conversion of war industries to peacetime production

LAYING down a challenge to industry to prepare now for its postwar responsibility of creating jobs for the American consumer, Alfred P. Sloan Jr., chairman, General Motors Corp., speaking to the Detroit Economic club last week outlined a definite program for conversion of war industries to peacetime production.

Noting that there are two approaches to meeting this problem—stratosphere planning, which attacks the problem from the top and is the planning of the spenders, and sea level planning, which attacks the problem from the bottom and is the realistic approach, Mr. Sloan declared that there was too much of the former and too little of the latter. He described sea level planning as "the planning of the producers. Its foundation is the great force of individual initiative—the keystone of our system of free enterprise.

"In the general discussion now taking place about what is to happen after the war there is far too much Utopia—too little realism," he asserted.

Taking up the challenge—jobs—that our economic, industrial and political leadership faces in the postwar period, Mr. Sloan warned that "never again can we afford to take the risk to the stability of our institutions of a 50 per cent utilization of our economic resources with millions of people out of employment and millions more working short time, irrespective of what the underlying causes may be.

"But we cannot meet this challenge by adopting panaceas or by the conjurer's trick of pulling rabbits out of the hat," he declared. "We have tried all that. It has failed us. The problem can be solved permanently only within the structure of sound economic policy. No nation, no political group, no industry, no leader can persistently transgress the dictates of economic law."

Examining the matter of government-owned plants, Mr. Sloan said: "This problem presents real difficulties. Most of these plants are designed for a specific, highly specialized purpose, of necessity largely unrelated both in type and capacity to any peacetime needs. Their conversion to other purposes involves both a shrinkage in value and an investment of additional capital for different machinery in part and for retooling. Many plants are of such magnitude that few can afford to buy or effectively operate them at any price. But after all the real worth of this huge investment is not its cost, not its liquidating value, but the contribution it will have made to victory and the contribution it can make to a peacetime economy. Such are the facts. They should be faced realistically. We should establish the rules now, whatever they must be."

To this suggestion for attacking the problem of postwar adjustment, Mr. Sloan added the following:

1. "Management should place orders promptly to build up stocks of supplies and parts while plants are being rehabilitated, to enable raw material suppliers to continue production, thus reducing the problem of shifting employment into peacetime channels.

ALFRED P. SLOAN JR.

2. "Management should plan to release orders promptly, to modernize equipment and to bring maintenance up to normal standards.

3. "While working capital is tied up in war inventories, industry will be handicapped in its efforts to reconvert. We should establish the rules (of cancelling war contracts) now.

4. "Billions of dollars of inventory and other billions of dollars of machinery that are now, or upon cancellation of contracts will become, the property of the government must be moved out of existing plants before reconversion can be started. A parallel problem includes disposition of war goods in process and materials for peace purposes. Action on these contingencies is important.

5. "In any highly integrated scheme of mass production a plant must be made completely available before the production of peacetime goods can be got under way. And in a group of plants the length of the period of reconversion might well be determined by the last plant turned back.

6. "The cost of reconverting plants is a legitimate cost of the war effort. Reserves for that purpose should be permitted as a business expense.

"The most vital question that faces the economy because of its long-pull implications," said Mr. Sloan, "is whether, after the deferred accumulated demands for goods have been satisfied, we can continue to maintain a rising national income with expanding job opportunities. Or must we accept a shrinkage, perhaps an economic collapse?"

In further discussing postwar management opportunities, Mr. Sloan suggested:

"We must not only intensify research, as commonly termed, but we must further extend it into other operating functions, such as distribution, labor relations, personnel, etc.

"Job opportunities must be further multiplied by creating new things.

"It is essential that we reinvest our savings promptly and productively. They must not remain static.

"Any attempt, knowingly, to restrict markets in any way tends to destroy the output, to control prices, or to limit the very foundation upon which our system of free enterprise rests. It applies with equal force to monopolistic and restrictive practices of all types—whether indulged in by labor, management or any other group affecting production or distribution."

Steel Construction Group Convention Scheduled

American Institute of Steel Construction will hold its twenty-first annual meeting at the Westchester Country club, Rye, N. Y., Oct. 19, 20 and 21. Clarence B. Randall, vice president, Inland Steel Co., Chicago, will be the speaker at the annual dinner, his topic being "New Angles and Old Shapes." Engineering sessions and a symposium on "Steel Construction in the Postwar Period" are scheduled.

Holub Heads Northern Ohio Chapter of Scrap Institute

David Holub, D. C. Holub & Co., Akron, O., was elected president of the Northern Ohio chapter of the Institute of Scrap Iron and Steel at the annual meeting of the chapter recently. Other officers elected are: First vice president, Abner Cohen, the M. Cohen & Son Co., Cleveland; second vice president, Jack Levand, Luria Bros. & Co., Cleveland; treasurer, Browne A. Shapero, the Max Friedman Co., Cleveland; secretary, Joseph B. Horwitz, Joseph B. Horwitz Co., Cleveland.

WINDOWS of WASHINGTON

Manpower Utilization

IN THE belief that full utilization of manpower now at work in the war plants would increase production by some 25 per cent, War Manpower Commission has 135 consultants in the field and ten in Washington whose job it is to help employers get more production per worker. WMC says many employers think their job is production and the government's job is to supply workers and community facilities—and hence management has not accepted responsibility for its manpower problems to the degree it should. While WMC thus feels free to go around and advise manufacturers on how to use workers, Paul McNutt, WMC director, at his press conference last week, gingerly admitted no such contacts are being made to find out how the various government agencies are utilizing manpower.

Are We Bike Riders?

Considerable beneath-the-surface acrimony has been stirred up over the question whether more companies should be permitted to manufacture bicycles. Only two companies now are making bikes, the Westfield Mfg. Co. in Massachusetts and the Dayton Mfg. Co. in Ohio. When the limitation order became effective there was a large stockpile of bicycles; today this stockpile has been practically exhausted. Recently Office of Civilian Requirements decided not to request the War Production Board to allocate any additional materials for the manufacture of bicycles; it said it had conducted a thorough-going survey which proved that this is not a nation of bicycle riders like England and the Scandinavian countries. Hence OCR decided it would not take responsibility for requesting further diversion of steel and rubber into bicycle manufacture. Office of Price Administration officials claim the OCR survey was of a very sketchy character and did not reveal the true situation.

Now Self-Sufficient

Another new industry in which the United States now is entirely self-sufficient is the manufacture of jewel bearings. For a long time previous to the war we were importing approximately 150,000,000 jewel bearings, mostly of sapphire, annually from Europe. They were of three types, the V, used in electrical instruments; the ring, used in watches and clocks; and the cup, used in compasses. We now are making all these bearings from synthetic sapphire and from natural sapphires mined in Montana. The latter are used for making bearings to carry relatively heavy loads and withstand severe shocks. For the light element type of electrical instruments, the Bureau of Standards has found that hot-molded bearings made of glass containing 20 to 25 per cent aluminum fully meet requirements. We also have become self-contained in the manufacture of diamond dies, including small sizes for superfine wire. Total needs for small and large dies are being met, including sizes 0.002 to 0.003-inch. Within the past few months technique has been evolved to the level where improved quality now is being obtained by drilling the dies in such a way as to make the whole operation visible; this new technique will be in use by all manufacturers no later than January of 1944.

Need Mining Machinery

Manufacturers of mining machinery will be called on to manufacture such equipment in the value of around $75,000,000 in 1944. This includes $37,000,000 of locomotives, shuttle cars, cutting machines, mine crawler trucks, conveyors of various types, loading machines and electric coal drills. It also includes $26,000,000 of repair parts. All this is on top of the $12,000,000 backlog now on the industry's order books. The program is based on the coal program which calls for production of 620,000,000 tons of bituminous and 65,000,000 to 68,000,000 tons of anthracite in 1944. Critical components now under study include bearings, gears, castings, forgings, electrical equipment, marine hardware, various types of cable and various rubber products.

STOCKPILING

The Senate Committee on Mines and Mining will hold hearings soon on the stockpiling bill, S. 1160, introduced by Sen. James G. Scrugham (Rep., Nev.) last spring. Modified somewhat, the bill continues unchanged with regard to its main objectives—stockpiling of critical minerals for a period of a year after the war, and assuring operators of submarginal mines they will continue to have a market for their minerals after the war at prices paid them during the war. The bill provides that minerals thus purchased will not be consumed but will be held in reserve for a future emergency. As rewritten, the bill has a "conservation" clause which, says Senator Scrugham, "for the first time recognizes the necessity for finding some method of preventing the loss of our marginal ore deposits due to changing conditions."

Open Rolling Capacity

There is still some open capacity in rerolling mills. Since no new ingot production is involved at these mills, every effort is being made to utilize their full capacity to ease the pressure of demand for steel products rolled from billets and slabs. Current thinking is that a broader use of rail steel in the form of concrete reinforcing bars presents the best way to get the rerolling mills into full production.

New Gunsight Camera

A gunsight aiming point camera, weighing two pounds, 4 x 6 inches, worth $290, photographs everything within the aerial gunner's range and records hits and misses on movie film. Invention of Corp. Fred Behm, instructor at the Army Air Forces Training Command Technical School at Yale University, it will provide the air combat forces with means for furnishing proof they have shot down enemy planes. It has a motor and photographs 64 frames a second at speeds greater than 300 miles per hour and 32 per second at between 200 and 300. It has two automatic heaters which cut in at 45 degrees Fahr. permitting operation of the camera in cold weather or at high altitudes. Another device cuts off the heaters at 90 degrees. Every fighter and bomber plane is to be fitted with one of these cameras.

Prefabricated Homes

Bureau of Standards, as a result of extensive investigations and research in connection with the wartime house construction program, has reached certain conclusions. One is that prefabrication will play a much larger part in future home building than before. Industry in the ship, tank and airplane construction program, has learned a lot about prefabrication and it is quite likely prefabricated parts of homes will come into more general use, thus greatly reducing cost of construction. Another is that there will be keen competition between manufacturers of different building materials; steel, aluminum and magnesium are expected to compete actively with lumber and clay. More attention also will be paid to home safety; fireproofing will be applied to low-cost homes. The bureau also looks for an intensification of the effort to get pressure group stipulations out of municipal building codes and, instead, approach a national standard.

Small but Effective

Ordnance Department's little M-3 submachine gun has been adopted as the standard submachine gun of the Army and will gradually supplant other weapons of this type. Weighing less than nine pounds, it is capable of firing 450 caliber 0.45 bullets per minute and costs less than $20. It is more accurate than other weapons in this class and easier to control; it has a collapsible stock and can be fired from hip or shoulder. Immersion in sea water had little effect on its reliability in recent landing attacks; even under conditions of excessive dust in the desert it could be depended on for accurate, deadly fire. The weapon represents a complete and radical departure from previous conceptions of gun manufacture. It uses neither the raw materials or machine tools normally required. All but two of its parts are stamped out of steel sheets. The gun can shoot 10,000 rounds before it gets too hot to handle.

One way trip...to death!

A DEVASTATING MIGRATION occurs at irregular intervals in Norway. Countless hordes of rodents, known as "lemmings," emerge from nowhere. They seem to be led by some invisible Pied Piper.

They travel in parallel lines three feet apart, straight through hay and corn stacks, across mountains instead of around...on and on to the brink of the sea. But they don't stop there. They swim straight to a point miles out in the ocean. Then they swim in circles until they drown!

Several theories have been advanced about the fatal pilgrimages of lemmings, but the most likely one is that they are searching for an island which no longer exists. It is an age-old custom: blindly attempting to live by landmarks which disappeared long ago.

The custom is represented by men who hooted at automobiles—by the men who laughed at Wright—and by the men who said democracy couldn't compete with a dictatorship. Happily, those men can be belied by a reliable index—that of the machine tool industry.

We gave Germany a 7-year head start, and passed her in about a year. For every one machine tool produced today by the Nazis, **we are now producing 5.**

The Conomatic, a key machine of peacetime industry, is well known to the production men of America. Those with their eye on the future are already thinking in terms of peacetime production—after victory is won—with Cone Multiple Spindle Automatic Lathes.

CONE Automatic Machine Company, Inc., Windsor, Vermont

Economic Group Offers 4-Point Program To Speed Settlement

Government must prepare now if long delay is to be avoided in reconverting billions of dollars' worth of plant facilities to peacetime activities and averting mass unemployment in post-war period

A FOUR-POINT program to assure orderly termination of war contracts has been offered by the Committee for Economic Development for congressional action.

Prompt and drastic action by the Congress will be required to expedite the reconversion of industry and to avoid needless unemployment after the war, the committee warned.

At present, the committee pointed out, there are about 100,000 prime war contracts and several times that many subcontracts. They total $60 to $75 billions, and include $10 to $15 billions in inventories.

Action now, the committee said, will avert the situation of the last war when the government terminated about 32,000 separate war contracts, with an aggregate uncompleted value of about $5 billions. Some 7000 of these remained unsettled a year after the armistice, about 800 found their way into the courts, and a few cases were not settled for more than 20 years after the war's end.

To meet this war's contract settlement problem, the committee proposed:

1. Creation by Congress of a government board with broad powers to establish uniform and simplified policies for the guidance of the several war agencies in the settlement of terminated contracts.
2. Delegation of clear-cut authority to the contracting agencies to make final settlements with contractors within the framework of policies and procedures established by the contract settlement board.
3. Enactment of legislation to establish a clear and simple avenue to the courts for all contractors, and provide adequate legal machinery for expeditious handling of disputes.
4. Provision for mandatory loans by the government to contractors and subcontractors in amounts equal to a substantial proportion of proper settlement claims.

None of the fundamentals outlined can be achieved without new congressional action, the committee said.

CED's program is regarded as especially significant as private industry's alternative to government's postwar planning. Since Congress abolished the National Resources Planning Board, the government counterpart of CED, the administration has been watching closely what private industry develops in the way of a program of its own.

To maintain a high level of productive employment after the war will be the greatest need of this country, the committee report stated with emphasis.

"Of great importance for attainment of this goal will be the prompt and equitable settlement of war contracts terminated by the government. Prompt settlement will be necessary to free working capital, to clear plants of wartime inventories and equipment, to permit business to attain high levels of peacetime production as rapidly as possible and thus provide jobs for workers."

Rapid unfreezing of working capital will be of particular importance to small business, the report said. "At the end of the war many thousands of small manufacturers will have their limited financial resources so tied up in war work that they will be unable to convert to civilian production until their working capital is released."

The report stated that "the cost to the nation from mass employment as a result of failure to take bold action now, in our judgment, will far outweigh the financial risks of the government from the adoption of the program recommended herein."

Business as well as government has an important share of the responsibility for speedy settlement of contracts, CED admonished. It urged contractors and subcontractors to educate themselves fully as to the procedures for contract settlement.

Revised Bill Provides Partial Advance Payments to Contractors

HEARINGS on contracts termination, with a view toward speedy enactment of a law to assure prompt cash settlements when government contracts or subcontracts are terminated, were started Oct. 14 before the Murray subcommittee of the Senate Committee on Military Affairs. They are scheduled to run at least through Oct. 26.

Last week, also, the House Committee on Military Affairs held an executive session on the same subject and started readying its own series of hearings, tentatively slated to start this week.

Contracts termination has become a hot potato since Comptroller General Lindsay C. Warren on Sept. 21 addressed a letter to the chairmen of the House and Senate Committees on Military Affairs. In it he inferentially questioned the legality of the present termination negotiation procedure of the armed forces and suggested that such negotiated termination settlement is an infringement upon his rights under the Budget and Accounting act of 1921.

Mr. Warren declared that under S. 1268 (HR 3022 in the House) "the contracting officer's determination of the amounts to be paid will be based largely on the contractor's representations as to the amounts owing and that no sufficient effort will be made in the vast majority of cases to verify or scrutinize the excessive statements of cost supplied by the contractors . . . . I am convinced that the contracting officers will allow improper payments which, perhaps, will total millions of dollars." Mr. Warren held that all such termination settlements should be handled by his General Accounting Office.

This insinuation that the armed forces are inefficient and cannot be trusted in their disposition of public funds naturally aroused intense resentment in many directions. Up to that time the Army and Navy had been studying the subject of contracts termination in a leisurely way. Mr. Warren's charges and recommendations changed all that and Under Secretary of War Robert P. Patterson came out with a revision of S. 1268 which has had the approval of the Navy Department, the Maritime Commission and the War Production Board with WPB reserving the right to make additional recommendations later.

S. 1268 (STEEL of Aug. 23, p. 66), introduced last spring by Sen. James E. Murray (Dem. Mont.) provides that payments in the case of terminated contracts would amount to "not less than 75 per cent of the amount certified by a contractor or subcontractor" and "the payment shall be made in not less than 30 days after the certification." It also would authorize direct or guaranteed loans above the 75 per cent minimum. Senator Murray's bill resulted to a considerable extent from information he unearthed in his capacity as chairman of the Senate Small Business Committee.

The trouble is that S. 1268 has some of the faults of the Contracts Renegotiation act. It is loose and indefinite and does not give sufficient protection to the government. It would require payments to be made upon certificates of contractors, regardless of their solvency, without any administrative check as to the propriety, reasonableness or legality of the amount shown in the certificate. It deprives the government of its right of set-off or counterclaim of amounts due it by the contractor. Its requirement for mandatory direct payments to subcontractors by the government might result

in duplicate or overlapping payments. Such procedure would also present legal, accounting and administrative complications, which would tend to delay rather than expedite the final settlement of terminated contracts and subcontracts.

The War Department's revision of the bill was designed to take care of most of these objections.

Section 1 provides that each government agency that has been authorized to place war contracts automatically be authorized to make advance or partial payments to the prime contractor or to a subcontractor to the following extent:

"(1) Whenever the whole or any part of the amount payable to a subcontractor upon a subcontract has been finally determined by agreement between the prime contractor and subcontractor or otherwise, and has been approved by the department or agency as properly to be included in determining the amount payable by the government to the prime contractor in connection with such termination, the amount so approved may be paid to the prime contractor or directly to the subcontractor for the account of the prime contractor.

"(2) Where any amount payable to a subcontractor upon a subcontract has not been so determined and approved, the department or agency from time to time may estimate the approximate amount so payable and properly to be included in determining the amount payable by the government to the prime contractor in connection with such termination and may pay not more than 90 per cent of this estimated amount to the prime contractor or directly to the subcontractor for the account of the prime contractor.

Advance Limited to 90 Per Cent

"(3) The department or agency from time to time may estimate the approximate amount payable to the prime contractor in connection with such termination, after deducting the final or estimated amounts payable with respect to subcontracts, and may pay not more than 90 per cent of this estimated amount to the prime contractor.

"(4) Whenever, at any time before final settlement, the department or agency finally determines, by agreement or otherwise, any amount or amounts to be payable to the prime contractor in connection with such termination, the department or agency may pay to the prime contractor such amount or amounts to the extent that such payment will not duplicate any amounts paid under the foregoing paragraphs.

(b) (1) Except as provided in paragraph (2) below, all advance or partial payments made to or for the account of a prime contractor under subsection (a) shall be applied against the amount finally determined to be payable by the government to the prime contractor in connection with such termination; but the authority conferred by this section shall not otherwise limit in any way the authority of the department or agency to make payments upon the final determination of any amount payable in connection with a termination of a prime contract. Where such advance or partial payments exceed the amount finally determined to be payable to the prime contractor, the excess advance or partial payment shall be treated as a loan to the prime contractor, except as provided in paragraph (2) below.

Loans Will Pay Interest

"(2) Where the advance or partial payments made to a subcontractor by a department or agency under subsection (a)(2), or by the prime contractor at the direction or with the approval of the department or agency, exceed the amount finally determined to be payable to such subcontractor and includible in determining the amount payable by the government to the prime contractor in connection with such termination, the excess shall be treated as a loan from the government directly to such subcontractor. In such cases the prime contractor shall not be liable to the government for such excess, and if he paid it to the subcontractor, shall receive credit from the government for the amount of such excess.

"(3) Any such excess advance or partial payment shall be repayable on demand and shall bear interest at such rate, not to exceed 6 per cent per annum, as the department or agency concerned may fix by general regulation or otherwise, for the period from the date the excess advance or partial payment is made to the date on which it is repaid. No officer of the government in the absence of fraud on his part shall be liable for the making of any such excess payment.

"(c) In its discretion, a department or agency may exercise the authority and discretion conferred by this section with respect to any two or more prime contracts or subcontracts as a group or unit, whenever the department deems such action appropriate."

Section 2 of the revised bill would authorize the Army, Navy, Maritime Commission and the Treasury

"(1) to enter into contracts with any Federal Reserve Bank, Reconstruction Finance Corp., or any other public or private financing institution, guaranteeing such financing institution against loss

(*Please turn to Page* 110)

STARTS SECOND MILLIONTH: Oliver Iron & Steel Corp. completes production of its millionth 37-millimeter shell at its Pittsburgh plant, as President Theodore Smith inspects one of the shells

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

DISTRIBUTORS: A distributor placing a rated order with a manufacturer calling for direct delivery to the distributor's customer must identify such rated order with the customer's allotment number. This ruling is contained in direction No. 4 to CMP regulation No. 3.

DELIVERY OF STEEL: Direction No. 18 to CMP regulation No. 1, dealing with conditions under which controlled materials producers are required to accept orders for delivery of steel, has been revoked. These conditions are spelled out in CMP regulation No. 1 and there is no further need for the directive.

SODIUM METASILICATE: Plans for placing sodium metasilicate distribution under allocation Nov. 1 were discussed at a meeting in Washington recently by manufacturers of the chemical. The proposed order would be similar to the phosphate allocation order, under which the consumer or primary distributor reports only once to the WPB requirements for use and resale for the last two years by quarterly periods. Thereafter the consumer certifies on his purchase order the use to which the material will be put and does not file request forms with the WPB. Consumers requiring less than 800 pounds per month on an anhydrous basis need not state end use.

STEEL PRODUCERS AND CONTROLLED MATERIALS CONSUMERS: The following definition of a producer of steel under CMP is given to clarify the question of who shall file the various reports required of a producer and to determine who shall be allocated steel for conversion from one controlled material form to another: A manufacturer who (1) produces steel ingots or castings, or (2) operates a steel (or wrought iron) rolling mill or converts steel (other than by coating or sheet metal forming) from one controlled material form to another and prior to June 30, 1943, regularly sold steel in controlled material form. The booklet, "Instructions on Bills of Materials," dated May 15, 1943, contains definitions of the forms and shapes of steel, both carbon (including wrought iron) and alloy, which are classified as controlled materials in schedule 1 of CMP regulation No. 1 The following is an additional list of definitions of products which unless otherwise specifically indicated are controlled materials: Wire nails, cut nails, lead-headed nails, horseshoe nails, foundry nails, chain link fence fabric, wire rope, couplings, tool bits, welded wire reinforcing mesh, fence post fasteners, cast steel magnets, coated steel wire, coated and lithographed tin plate, terne plate, and black plate, bedstead tubing, stainless clad steel, special coated sheets, welding rods and wire. Any form and shape of steel listed in schedule 1 of CMP regulation 1 produced by a forging process is classified as controlled materials when produced by a producer of steel. Beginning with the fourth quarter the following will be classified as class B products: Boat spikes, dock spikes and wharf spikes, gage rods, mine ties, clip bolts, rail clips, and nut locks, frogs, crossings, switches, switch stands, rail anchors, rail braces, guard rails, and guard rail clamps.

BILLS OF MATERIALS: Revocation of direction 13 to CMP regulation No. 1, dealing with complete bills of materials, was announced. This action is taken because prime and secondary consumers may no longer be required to submit complete bills of materials according to supplement No. 1 issued Sept. 25, 1943.

APPEALS: A revision of priorities regulation No. 16 governing the filing, granting and denial of appeals from various L and M orders of the WPB was issued recently. Of principal interest to manufacturers is the new list A to the regulation, enumerating orders from which appeals must be filed with WPB regional offices.

ZINC: The amended order on zinc uses, M-11-b, removes lend-lease supplies from the list of general exceptions and adds to the list many new items such as coin coatings used by the Treasury, and tokens. As a result of the change processors are now required to include lend-lease material in their totals when figuring the amount of zinc to which they are entitled under percentage limitations. New percentage limitations restrict users to 60 per cent of their 1941 consumption on all grades.

INDEX OF ORDERS

IDENTIFYING ORDERS: Distinction between use of allotment numbers for identification purposes by class A and class B product manufacturers has been clarified through issuance of interpretation 19 to CMP regulation 1. A manufacturer of a class B product ordering production material needed to make the class B product must use the allotment number identifying his allotment and authorized production schedule in placing orders for such production material. Such manufacturers must not use the allotment numbers appearing on orders placed with them by their customers. Manufacturers of class A products, however, receive allotments from their customers rather than from WPB, and therefore use the allotment numbers appearing on such customers' orders when they order production material needed to make class A products. The interpretation also calls attention to the fact that an allotment number or symbol alone never constitutes an allotment of controlled materials.

L ORDERS

REFRIGERATORS: Permission to produce approximately 230,000 domestic ice refrigerators during the fourth quarter of 1943 granted by WPB in schedule V of order L-7-c. (L-7-c)

LAMPS: Some photoflash and photoflood incandescent lamps for civilians have been freed from restrictions requiring purchasers to submit preference ratings. General simplification of order L-28 and removal of some restrictions on manufacturers were also affected by the recent amendment to the order. (L-28)

BEDSPRINGS: Quota assignments for production of coil, flat, box and fabric bedsprings during the 12 month period beginning Oct. 1, 1943, have been put on a unit basis instead of a weight basis in order to bring production in line with the determinations of the Office of Civilian Requirements in amendment I to order L-49. Interpretation I concerning renovators of bedsprings was revised and interpretation II concerning renovators of innerspring mattresses was also issued. (L-49)

LABORATORY EQUIPMENT: Control over the distribution of laboratory equipment has been eased by WPB through issuance of order L-144 as amended. Authorization of purchase orders for items on list A is still mandatory except in the case of distributors' purchase orders. No authorization is now required for items not on list A since the amended order removes former additional restrictions on deliveries. (L-144)

TRUCK PARTS: A serious shortage of certain truck replacement parts made necessary the uprating of preference orders from AA-2x to AA-1 for production and distribution of these items. Trailers, passenger carriers, off-the-highway motor vehicles and motorized fire equipment must be handled in the last quarter of 1943 and the first quarter of 1944 as though orders bore a preference rating of AA-1, according to the provisions of an amendment to limitation order L-158, effective Oct. 11, 1943. Replacement parts for passenger automobiles and light trucks must continue to be produced and shipped as though orders therefore bore a preference rating of AA-2x. This amendment is designed to make available a sufficient quantity of essential parts to maintain vital motorized transport. (L-158)

STEEL RAILS: To permit the use of longer fence posts made from steel rails for snow fences where previously permitted lengths were too short, the WPB issued limitation order L-211, schedule 14, as amended, and amendment 2 to conservation order M-126. Stainless steel may now be used in buckets and pails for use in chemical plants and plants handling explosives. All kinds of iron and steel are permitted in the manufacture of weed cutters and clean out doors. Other provisions of amendment 2 to M-126 are for the purpose of implementing limitation order L-267 (motion picture equipment) and for purposes of clarity. (L-211)

SURGICAL EQUIPMENT AND SPECTACLES: Restrictions on the use of metals in medical and surgical furniture and related equipment are eased by schedule 3 of order L-214 as amended. Metal frames for corrective spectacles may not be manufactured in eye sizes larger than 144.5 mm in circumference according to an amended version of general limitation order L-214, schedule 2. (L-214)

M ORDERS

MINERALS: Amendment 1 to general inventory order M-161 as amended Sept. 29 permits exceptions from restrictions of CMP-5 and CMP-5a for materials on list A ordered for maintenance, repair or operating supplies. Any person may receive or order for delivery any quantity of listed material without restriction and without charging such material to his base period quota except to the extent that purchases of the same material were taken into account in arriving at this quota. (M-161)

PREFABRICATED PIPE: Prefabricated pipe has been designated an unclassified product subject to the terms of general scheduling order M-293. Heavy demand for this type of shop-fabricated pipe has resulted in the move to assure its delivery according to prearranged schedules for highly critical programs. The pipe is an unclassified product and as such is subject to reporting only where individual fabricators have received instructions from WPB requiring it. Such instructions will be issued only to those manufacturers whose situation is sufficiently critical to justify periodic reporting. (M-293)

CHEMICALS: Oxidized petrolatum, vinsol resins, methyl abietate, hydrogenated methyl

abietate and cellulose sponges will be placed under allocation Nov. 1 by amendment to miscellaneous chemicals order M-340. (M-340)

ALUMINUM RESIDUES: Aluminum residues such as skimmings, dresses, fines, grindings, sawings, and buffing containing less than 30 per cent metallic aluminum have been removed from the definition of aluminum scrap by WPB. The definition previously had specified 15 per cent. At the same time relief is afforded from the obligation to segregate aluminum scrap under the segregation program to persons who do not generate 1000 pounds or more per month of aluminum scrap in any one plant in any month. (M-1-d)

CHROMIUM: Direction 1 to general preference order M-18-a permits consumers of high carbon ferrochrome, ferrochrome briquets and high carbon chrom-X to receive deliveries after November without previous application on form WPB-689 (formerly PD 53 B) or any other application. This direction makes no other changes in present regulations covering use of chromium. (M-18-a)

STOCK REPLACEMENT: Direction 2 to general preference order M-21-b-2 permits a warehouse or dealer to replace in stock deliveries made to farmers from April 1 to Dec. 31, 1943, even though the distributor did not obtain a certificate or endorsement as provided under priorities regulation 19. (M-21-b-2)

MOLYBDENUM: Supplementary order M-110-a as amended permits the acquisition of 500 pounds or less of molybdenum by foundries to fill authorized controlled materials orders or orders rated AA-5 or higher without going through allocation proceedings. (M-110-a)

P ORDERS

ALUMINUM INGOT: Directive P-8, effective Oct. 1, supersedes completely the directive of May 31, 1943, together with any previous instructions and directives in conflict with this new directive. The new directive defines the conditions under which orders and shipments of aluminum pig and ingot may be accept d and the method of reporting such shipments on form WPB-2593 (formerly CMP-23). (P-8)

RADIO SUPPLIES: Preference rating order P-133 has been revised to make it the exclusive controlling order for obtaining maintenance, repair and operating supplies for radio communication and radio broadcasting. CMP regulations 5 and 5A governing expenditures up to $500 for capital equipment under the MRO rating no longer apply to these businesses. (P-133)

PRICE REGULATIONS

STEEL DRUMS: Ceiling prices for reconditioning services performed on 50 to 58 gallon used steel drums are established as 90 cents per drum for "basic" reconditioning services and $1.40 per drum for "total" reconditioning, both prices based on delivery to customer in accordance with the seller's past practice in handling transportation charges. At the same time, a reduction of 25 cents per drum in the ceiling price of raw drums of 14 to 16 gallon, 29 to 33 gallons and 50 to 58 gallons capacity was authorized, increasing by 25 cents the spread between the price of unreconditioned and reconditioned drums. For California, Oregon and Washington, ceilings of $1.10 per drum for "basic" reconditioning and $1.65 per drum for "total" reconditioning are provided. The deduction from the ceiling price for selling a reconditioned drum, unpainted, is reduced from 15 to 10 cents. (No. 43)

CAST IRON BOILERS AND CAST IRON RADIATION: To assure essential production of cast-iron radiation, the OPA authorized a 3 cent per foot increase in sheet prices of all types of cast-iron radiation. Cost studies by six producers who account for 90 per cent of sales showed all producers but one obtaining less than total costs from sales at the present time. The adjustment will increase costs to jobbers and other distributors reselling radiation. Provisions of the regulation covering resales remain unchanged. (No. 272)

MALLEABLE IRON CASTINGS: Producers of malleable iron castings were authorized by the OPA recently to apply for adjustment of prices on any castings where the maximum price is not sufficient to warrant continuance of production of castings necessary to the war effort. Previously, applications for adjustment of maximum prices for these castings were considered by OPA only if the casting involved was being produced in connection with a government contract or subcontract. (No. 241)

GRAY IRON CASTINGS: Sellers of gray iron castings were given a streamlined procedure for obtaining permission to add overtime costs to maximum prices by OPA. The provisions are contained in amendment No. 6 to maximum price regulation No. 244, effective Oct. 11. The three methods provided by the regulation for determining maximum prices are: (1) Base period method establishes maximum prices at the highest prices the seller sold or offered for sale the same or substantially the same casting between Aug. 1, 1941, and Feb. 1, 1942; (2) formula method establishes maximum prices for castings not sold or offered for sale during the base period by use of seller's pricing formula (including costs, overhead rates) which he employed on Feb. 1, 1942; (3) pr base period method the seller uses as his maximum price for a casting not sold or offered for sale during the base period, the price at which he last contracted to sell the casting prior to Aug. 1, 1941. (No. 244)

COAL: Effective Oct. 9 amendment 67 of maximum price regulation No. 120 adds to the district 22 price schedules for size groups 4 and 6, respectively, from all mines in the following subdistricts; No. 1, $4.30 and $3.75; No. 2, $4.05 and $3.45, and No. 9, $4.30 and $3.75. Order 246, effective Sept. 30, grants adjustment to War Eagle Coals Inc. of Bramwell, W. Va., by permitting coals produced at its mine in district 8 to be sold and purchased at f.o.b. mine prices under revised prices. (No. 120)

Clarify Rule on Customer's Improper Steel Rejection

If a steel producer has shipped a replacement order for steel rejected by a customer for failure to meet specifications or for other defects, and it develops that the rejection was improper, the customer must either return the replacement material or furnish the producer with the necessary certification and charge the proper allotment, the War Production Board ruled last week with the issuance of an amendment to direction No. 16 to CMP regulation No. 1.

The direction does not apply to replacement orders for stainless steel. Replacement orders for such steel are governed by direction No. 1 to supplementary order M-21-a.

SRC Inventory Records Go To Regional Offices

All inventory records of Steel Recovery Corp., Pittsburgh, which was closed Sept. 30 in the effort toward decentralization, are being turned over to regional War Production Board offices, John J. Tice, Cleveland regional manager, announced.

Holders or purchasers of surplus materials are urged to contact the regional offices which can approve the sale of idle and surplus steel for any use permitted by WPB regulations, regardless of quota or allotment.

Ferroalloys Now More Plentiful

Easing in critical supply position reflected in new materials list issued by WPB

A MARKED easing of ferroalloys and many nonferrous metals was evidenced in the tenth material substitutions and supply list, issued last week by the War Production Board.

The list, prepared by the WPB Conservation Division, groups the materials most essential to the war program in three categories on the basis of their current availability: Group I—Materials in insufficient supply to satisfy essential war demands; Group II—Materials in sufficient supply to meet war needs; Group III—Materials in excess of essential needs and recommended as substitutes for scarcer materials.

Supplies of a few chemicals, including sulphuric acid, have become more critical. Although a number of important plastics have moved to group II, it is expected that this relaxation may prove to be quite temporary.

Because it no longer serves its original purpose, the supplementary list on the last page of issue No. 9 has been discontinued. To further the practice of substituting secondary alloys for more critical grades of material, the Conservation Division has prepared two charts for distribution.

Production of 230,000 Ice Refrigerators Approved

Production of approximately 230,000 domestic ice refrigerators has been authorized by the War Production Board in the fourth quarter of 1943 to meet the increasing need caused by the prohibition on the manufacture of mechanical refrigerators.

WPB Facilitates Purchase Of Class A Products

A procedure to be followed by persons desiring to purchase class A facilities from manufacturers where an allotment of controlled materials is needed but may not be obtained under procedures outlined in CMP regulation No. 6, dealing with construction and facilities, has been established by the War Production Board in direction No. 34 to CMP regulation No. 1.

The procedure applies to applications for priorities assistance to purchase class A products which are machinery or equipment generally carried as capital items on manufacturers' books. In most cases applications for priorities assistance will be filed on form WPB 541 (formerly PD-1A).

MEN of INDUSTRY

T. McGahan has been appointed vice president and general manager of sales and A. E. Klieves has been appointed vice president in charge of operations, Boyle Manufacturing division, United States Steel Products Co., Los Angeles. Other newly appointed officers of United States Steel Products Co., which will soon establish temporary executive offices at 30 Rockefeller Plaza, New York, are: J. A. Connelly, vice president and general manager and William I. Hanrahan, vice president, Petroleum Iron Works division, with plants at Sharon, Pa., Beaumont and Port Arthur, Tex.

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Walter P. Carroll, Chicago branch manager, National Lead Co., New York, has been elected a director of the company.

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C. F. Wolters Jr. and G. J. Soren have been appointed Philadelphia district manager and assistant district manager, respectively, Consumers Chemical Co., Philadelphia, which has become a part of the Diamond Alkali Sales Corp., Pittsburgh. Other chemical distributors which have become a part of the Diamond organization and the men serving them as district managers are: Tri-State Chemical Co. Inc., Memphis, Tenn., E. A. Jones; Central West Chemical Co., Omaha, Neb., V. M. Jacobsen, and Buckeye Soda Products Co., Cincinnati, L. W. Wahl.

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O. C. Field, head of O. C. Field Gasoline Corp., Huntington Beach, Calif., has been elected a director, Consolidated Steel Corp. Ltd., Los Angeles.

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Whitley B. Moore, former general manager of sales, Timken Steel & Tube division, Timken Roller Bearing Co., Canton, O., has been appointed director of sales for all divisions of the company. C. H. McCollam succeeds Mr. Moore as general manager of sales of the Steel & Tube division.

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Richard C. Bachman has become manager of methods, engineering bureau, Carnegie-Illinois Steel Corp., Pittsburgh, and Alexander S. Chalfant has been appointed assistant to the chief industrial engineer in charge of planning.

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Fred L. Black has been appointed special assistant to Vice President A. M. Wibel, Nash-Kelvinator Corp., Detroit.

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Alfred M. Street, formerly assistant publicity manager, Jenkins Bros., New York, has been appointed publicity manager, succeeding Charles C. Chamberlain, who has been named general sales manager.

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R. C. Taylor, vice president, American Can Co., New York, has been elected a director.

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A. L. Woods, former assistant purchasing agent, Wolverine Tube division, Calumet & Hecla Consolidated Copper Co., Detroit, has been appointed purchasing agent succeeding the late Robert H. Gill.

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Capt. Ross P. Schlabach, who has retired from the United States Navy, has joined American Ship Building Co., Cleveland, as vice president and general manager of the Buffalo, Toledo, South Chicago, Ill., Superior, Wis. and Cleveland yards.

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Earl Herring, president and general manager, Airplane Mfg. & Supply Corp., Glendale, Calif., heads the new organizational setup by which Pacific Airmotive, the Manufacturing division of Airplane Mfg. & Supply Corp. and Airplane Parts & Supplies have been united to co-ordinate war production. Other officers of the managing company are: Edward O. Locher, assistant general manager and secretary and treasurer; Ralph B. Lacoe, vice president, and K. R. Jamison, vice president in charge of sales.

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T. L. Kishbaugh has resumed his duties as vice president, Earle M. Jorgensen Co., Los Angeles, after serving the War Production Board as alloy steel specialist for the past 13 months.

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W. E. Addicks, former manager of the Boston sales office, Cutler-Hammer Inc., Milwaukee, has been appointed manager, New York district office.

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Irving B. Babcock has been elected a vice president, General Motors Corp., Detroit. He has also been appointed general manager of the newly formed G.M.C. Truck & Coach division, General Motors, which division is taking over the business of Yellow Truck & Coach Mfg. Co., Pontiac, Mich.

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A. N. Morton, vice president in charge of production, Mack Mfg. Corp., Long Island City, N. Y., has been appointed to the advisory committee for the automotive, farm and tractor liquid-cooled gasoline engine industry, War Production Board.

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Harold Leever, former Western manager, MacDermid Inc., Waterbury, Conn., has been appointed sales manager, succeeding W. D. MacDermid, resigned.

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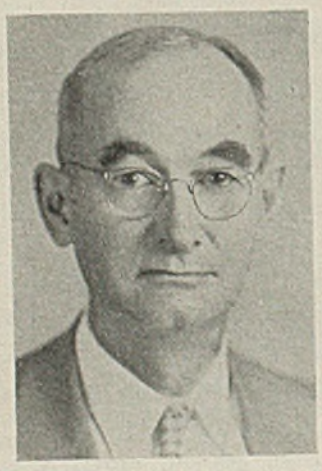
Howard W. Bennett has been appointed manager, specialty division, electron-

FRED L. BLACK

ALFRED M. STREET

EARL HERRING



A. J. BROWN

Who has been named Pacific Coast branch manager, Whiting Corp., Harvey, Ill., as announced in STEEL, Oct. 4, p. 77.

FRED H. CURRIE

Who has been appointed manager of sales, Pacific Coast, Copperweld Steel Co., Warren, O., noted in STEEL, Sept. 27, p. 68.

HENRY H. SCHLICHTER

ics department, General Electric Co., Schenectady, N. Y.

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Henry H. Schlichter, for 20 years on the sales staff, Beardsley & Piper Co., Chicago, has been appointed sales manager.

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Maj. Gen. Walter R. Weaver, recently commanding general of the United States Army Air Forces, Technical Training Command, has become associated with Aviation Corp. in a consultive capacity with headquarters in New York.

VICTOR F. J. TLACH

Victor F. J. Tlach has resigned as president, Darwin & Milner Inc., Cleveland, and has joined American Agile Corp., Cleveland. Mr. Tlach, who held his former position nearly 30 years, pioneered in the development of high carbon-high chromium tool steels.

—o—

Philip Donham has been elected vice president in charge of finance, and **Carl F. Leitten** has been elected vice president in charge of manufacturing, Electro Refractories & Alloys Corp., Buffalo. Mr. Donham, who had been secretary and treasurer, remains treasurer, but relinquishes the duties of secretary to **William Enslin**, former assistant treasurer. **E. Halsey Brister**, formerly abrasive engineer, has been appointed assistant plant manager.

—o—

Parker H. Ericksen has been appointed director of sales, Majestic Radio & Television Corp., Chicago.

—o—

E. Way Highsmith, Hercules Powder Co., Wilmington, Del., has been appointed general counsel, succeeding **John A. Graves**, retired.

—o—

William E. Simons, for many years manager of the Ford Motor Co. assembly plant in Milwaukee, and recently regional director of salvage with offices in Chicago, has joined Heil Co., Milwaukee.

—o—

Charles B. McCoy has been appointed director of sales, Explosives division, E. I. du Pont de Nemours & Co., Wilmington, Del.

—o—

Hoyt Spelman, previously in the export business as manufacturers' representative, has joined the New York sales staff, export department, Republic Steel Corp., Cleveland.

OBITUARIES . . .

J. Edwin Johnson, 49, president, Johnson Engineering & Mfg. Co., Wilkes-Barre, Pa., died Oct. 1 in that city.

—o—

Harry T. Johnson, 69, president, E. A. Clampitt Co., died recently in Los Angeles.

—o—

Donald J. Campbell, 66, president, Campbell, Wyant & Cannon Foundry Co., Muskegon Heights, Mich., died Oct. 11.

—o—

Sayre M. Ramsdell, 45, president, Sayre M. Ramsdell Associates Inc., Philadelphia, and a director and former vice-president, Philco Radio & Television Corp., Philadelphia, died Oct. 4 in Churchville, Pa.

—o—

William H. Armstrong, 66, former president and general manager, Holbrook-Armstrong Foundry, Racine, Wis., and chairman, Wisconsin Highway Commission, died Oct. 6 in Madison, Wis.

—o—

William J. Totten, 82, associated with Andrew Carnegie in his steel enterprises in Pittsburgh in 1880 and at the time of his retirement in 1931 manager of sales, St. Paul office, Illinois Steel Co., now a part of Carnegie-Illinois Steel Co., Pittsburgh, died Oct. 9 in Evanston, Ill.

—o—

Joseph B. Gemberling, 75, retired Eastern division erection manager, American Bridge Co., Pittsburgh, died in Philadelphia, Oct. 3.

—o—

Jacob Klein, 65, founder of J. Klein Inc., Long Island City, N. Y., died in New York, Oct. 5.

—o—

Walter C. Swickert, 47, assistant vice president, Wheeling Corrugating Co., Wheeling, W. Va., died Oct. 4 in that city.

—o—

Charles P. Teeple, vice president and director of research, Crane Packing Co., Chicago, died recently.

—o—

Robert Samuel Peelee, 59, vice president, Peelee Co., Brooklyn, died Oct. 5 in Glenora, N. Y.

—o—

Ollie T. Parker, 40, a member of the engineering department, Mississippi Valley Structural Steel Co., Melrose Park, Ill., died Oct. 5 in Chicago.

—o—

Julius K. Fons, 59, superintendent, Crucible Steel Casting Co., Milwaukee, died Oct. 8 in that city. Mr. Fons was one of the founders and a former vice president of Maynard Electric Steel Casting Co., Milwaukee.

—o—

Nathan M. Garland, 86, former director of the New York branch, Ohio Brass Co., Mansfield, O., died Oct. 7 in Glen Cove, N. Y.

—o—

Edwin R. Millen, 61, purchasing agent for the Syracuse plants, Crucible Steel Co. of America, New York, died Oct. 2.

—o—

Herbert J. Wills, sales engineer, Carborundum Co., Niagara Falls, N. Y., died recently.

—o—

G. L. L. Davis, 67, vice president in charge of sales, Scullin Steel Co., St. Louis, died Oct. 5.

—o—

Philip J. Olin, secretary and treasurer, Donaldson Co. Inc., St. Paul, died recently.

—o—

Budd G. Nice, president and chief executive, Nice Ball Bearing Co., Philadelphia, died Sept. 29.

—o—

F. Joseph Lamb, 69, president, F. Joseph Lamb Co., Detroit, died there recently.

—o—

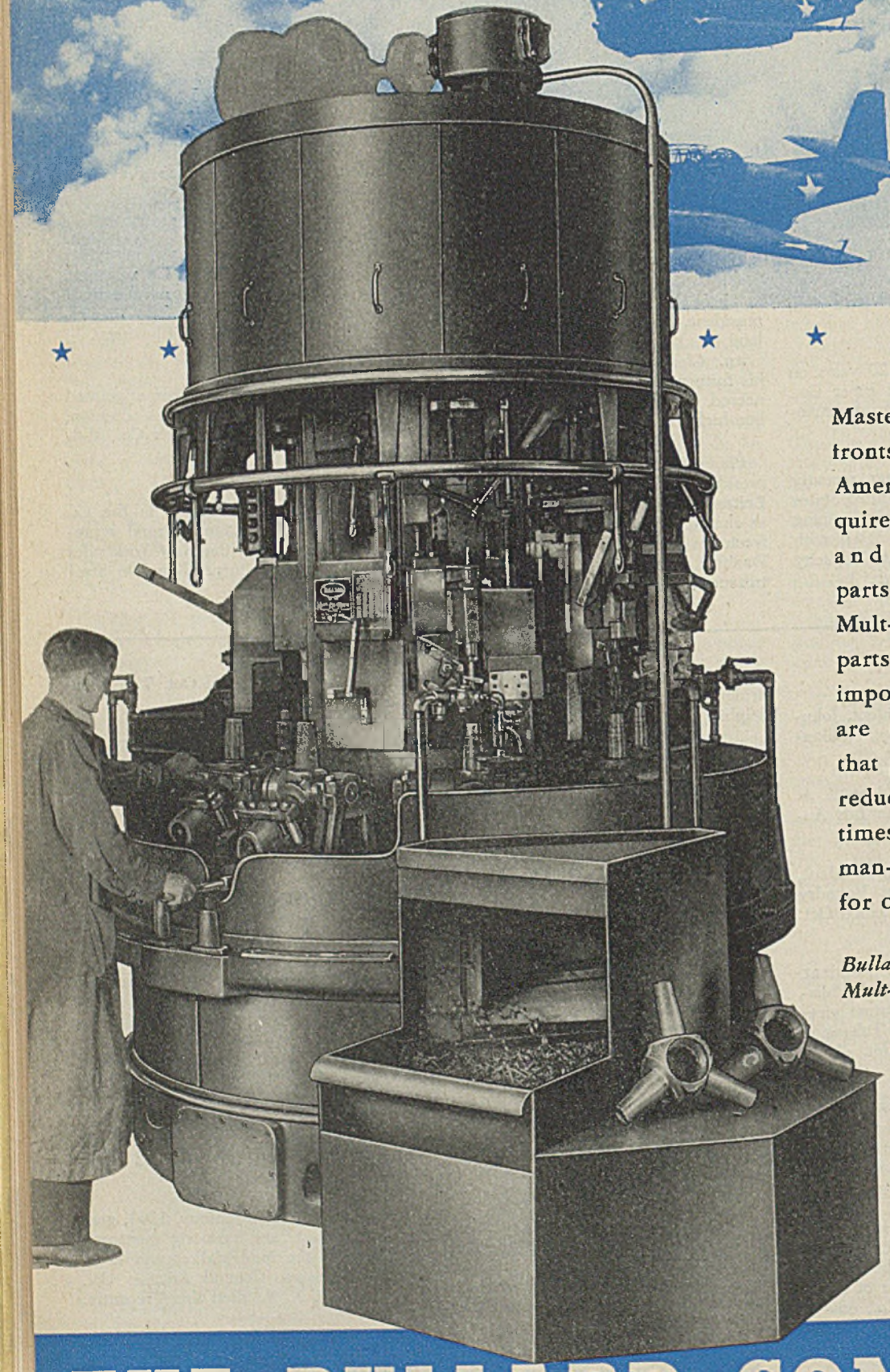
J. E. Brobst, since January, 1943, general consultant, and formerly managing engineer of the industrial control engineering division, General Electric Co., Schenectady, N. Y., died there recently.

—o—

Robert H. Gill, 53, purchasing agent, Wolverine Tube division, Calumet & Hecla Consolidated Copper Co., Detroit, died Oct. 10 in that city.

That These May Fly . . .

U. S. Navy Official Photo



Mastery of the air on all fronts — nothing less can be America's goal. That requires ever more planes and more replacement parts — on time. Bullard Mult-Au-Matics at work on parts for engines of every important American plane are doing much to realize that goal . . . by striking reductions of production times, by constantly freeing man-power and floor space for other work.

Bullard 16"-8 Spindle Type "D" Mult-Au-Matic machining propeller hub spider. This shows the third chucking, with 3 changes of position. The Mult-Au-Matic time for 3 positions is 18 min. 5 sec. as compared to the former production time of 5 1/4 hours per piece.

THE BULLARD COMPANY

BRIDGEPORT, CONNECTICUT

By A. H. ALLEN Detroit Editor, STEEL

MIRRORS of MOTORDOM

Change in management of Hudson naval arsenal was not unexpected. . . Transfer to Westinghouse made to consolidate activities with those of affiliated ordnance plants at other points. . . Detroit primary election result significant

DETROIT

AS INTIMATED in STEEL Sept. 27, page 59, a change in management at the Hudson Naval Arsenal has been effected and the plant after Oct. 28 will be under supervision of Westinghouse Electric & Mfg. Co., which operates naval arsenals at Canton, O., and Louisville, Ky. Earlier reports were to the effect General Motors was being asked to consider taking over the management, but an appreciation of the competitive position of GM and Hudson in the normal automotive picture at once suggests the inadvisability of the corporation's agreeing to any such move.

If indeed GM was consulted by the Navy Department, it may well be that the suggestion was advanced by the former that Westinghouse be invited to step in. C. E. Wilson, GM president, is an old Westinghouse man, it will be recalled, and conceivably he could have lent his counsel to the move which finally developed.

Rear Admiral W. H. P. Blandy's announcement of the change stated that it was determined to be in the best interests of the government, while the commanding officer at the arsenal in a press memorandum said, "This change in management is being made to consolidate the activities of the Center Line (Hudson) plant with those of the affiliated naval ordnance plants at Canton and Louisville, which are now operated by the Westinghouse company. All three of these plants are adjuncts of the Naval gun factory at Washington."

Not a "Black Eye" for Hudson

Industry circles in Detroit are of the opinion the change was inevitable, but does not constitute a "black eye" for Hudson whose limited supervisory personnel was spread so thin in attempting to assimilate the expansive group of naval plants that the job just proved too much to handle.

Every effort is being made to avoid a ticklish labor problem which may develop among the 10,000 employes at the arsenal. Hudson had a contract with the UAW-CIO covering these workers, but the largest plants operated by Westinghouse are covered by contracts with the United Electrical and Radio Workers-CIO. How the labor contract with the new management will be handled remains to be seen, although the logical conclusion would be to continue as at present with a UAW contract.

Riding on a wave of UAW-CIO support, Circuit Court Commissioner Frank Fitzgerald handed a 5 to 3 defeat to Mayor Jeffries as only 32 per cent of the city's voters turned out to name their choices for mayor in a recent primary election. Disclaiming any allegiance to the union, Fitzgerald nevertheless received monetary support of that body to the tune of $30,000 to aid in conducting his campaign. Union leaders are reported feeling stronger politically than at any previous time in the city's history. Final election will be held in November.

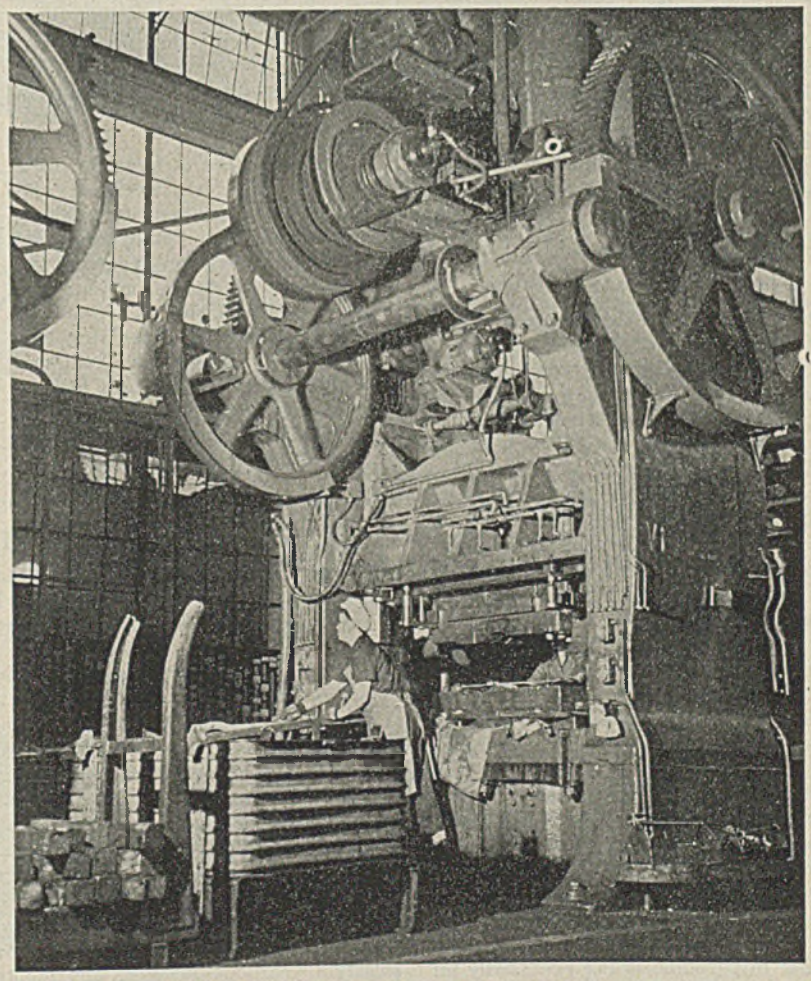
Union campaign fund contribution brings to mind a recent statement over the signature of George Addes, international secretary-treasurer of the UAW-CIO. Reporting to the rank and file on the financial condition of the union for the 14-month period ending June 30, Addes devoted quite a few lines to the labor political picture.

The treasurer declared that the union should support those candidates for office who are "sympathetic to the people's cause," adding, however, that "certainly we are presently in no financial condition" to back these candidates with material support. This statement contrasts strangely with the Detroit donation of course.

Still on the political subject, Addes informed union members that "a third party is something to look forward to in the future," but concluded that "what we are in urgent need of is more friends in Washington immediately." Reportedly the unions are presently concentrating on local elections, with an eye to supporting congressional candidates of their choosing next year.

An examination of the UAW financial report discloses the fact that the organization had a cash balance of $1,011,434.04 as of the close of business on June 30. Additionally, another balance under the heading of "Fund" totaled $1,622,622.85.

Total revenue for the 14 months was



WOMEN IN INDUSTRY: More and more tasks requiring manual effort are being taken over by women. Here a woman helper on one of the large crank presses at the Ecorse, Mich., plant of the Murray Corp. of America is shown stamping steel cross members for a military truck frame

$5,313,545.47, which, added to a balance carried over from the previous year, reached a figure of $6,040,199.96. Included in this figure were some extra income totals, headed "other receipts." Subtracting disbursement from this grand total left a "net" of $1,011,434.04.

Basing the estimate on figures furnished by two Detroit automotive tax experts, the union would have contributed some $600,000 to the national treasury had the earnings been taxed in the manner familiar to factory management. Translating the same amount into war bonds the grand total of 32,000 of the smaller denomination series "E" securities could have been purchased. It is realized of course that the tax on this UAW-CIO income would be small fry compared to the tax on the national union "take," variously estimated at from two to four billions of dollars.

The national CIO union seems to have benefited on a large scale from money collected from the automobile and aircraft workers. Addes' report revealed an average monthly membership of 715,382 with an average monthly "per capita tax" collection of only $268,261.39. This would leave a large amount flowing into the treasury of the parent body, calculating dues at $1 per member per month. Inasmuch as the membership figure was used in reference to "dues-paying members" it is assumed the amount in excess of $715,000 was collected each month by the locals. It is known that the various UAW locals split with the international organization in percentages ranging from 40 to 60.

Speculate on Postwar Autos

On the basis of initiation fee collections the union treasurer estimated an average monthly enrollment of new members during the 1942-43 period of 30,000 with the total membership reaching 1,077,889 on June 30.

Idle moment arguments on the cost of postwar automobiles are raging with increasing intensity with estimates of cost as compared to prewar figures ranging from increases of 25 per cent all the way up the scale to double the money.

One bitter production chief expects that "we'll make cars for about six months after the war, find we can't make 'em and sell at a profit, then shut down every factory in Detroit while we argue out wage rates and hourly production expected of every man."

That this presents the picture for the extremists goes without saying, but all executives and production men are worried about the productivity of the average worker and the general attitude of not seeming to worry about productive effort.

That this trouble is not necessarily an outgrowth of the war is proved by prewar experience of one of this district's leading car producers. This company in 1941 required 10 per cent more workers to hold a daily production figure 20 per cent lower than that of the previous year. Had it been possible to crowd more people into the plant to reach the desired production totals, it would have been done.

That labor cost is not the only factor to be taken into consideration in predicting costs of the cars of the future is a point to be considered. However, material costs are holding firm under war price ceilings and there is no reason to expect a sharp increase in that direction if and when government declares "hands-off" on price controls. Of course lowered production rates and increased wage standards may force supply costs up at a later date.

Attitude of the factory employe seems to reflect his feeling of independence dating back to 1937, and more conservative union leaders are frankly worried that automotive unionism is going to suffer if a new spirit is not infused in the dues payers.

Incentive wage plans are offered by many as the hope of the future with certain groups fighting the idea tooth and nail, and one of the most successful of the plans now in operation tottering on the fence of disaster.

Production of war goods in automotive plants of the nation has reached an annual dollar volume more than double that of the highest mark achieved in any peace year according to *Facts and Figures*, Automobile Manufacturers Association yearbook released this month.

Figure reached in July was $9,500,000,000, the monthly rate being $750,000,000 compared to $417,000,000 a year ago.

Breakdown of the products included in the output reveals that 1038 shops surveyed are devoting 37.8 per cent of their production to aircraft and parts, with military vehicles ranking second in importance for an output percentage of 25.6 per cent. Tanks come third with 15.4 per cent with guns, marine products and ammunition following in that order.

At the end of July the total dollar value of war orders placed with the automotive industry was 26 billions, or more than five times the Pearl Harbor date figure.

The booklet further reveals that employment in the industry as of July was 45 per cent higher than in the peak month of 1941, last year of peacetime production.

Translating the production figures into combat unit horsepower, it is disclosed that an American army infantry division of this war boasts a strength of 450,000 as compared to only 3200 h.p. per division in the first world war.

Highlighting the importance of automotive transportation, the association made a survey revealing that 73 per cent of the war workers of ten states depend on private automobiles for transportation to and from their work. Bus and "other mass transportation" systems were shown to carry only a combined percentage of 15.6 of the same group.

Testifying to the importance of the metals industries, the book strips the "typical passenger car" down to reveal that it contains by weight, 87.59 per cent metals, while 30 other materials make up the balance of the 3500-pound net weight.

SAVING MANPOWER

To meet and exceed output schedules despite diminishing supply of new workers and accelerated draining of established workers into the armed services, technological advances are being made throughout the automotive industry, reports the Automotive Council for War Production.

Ingenious methods and machines are being devised that not only release workers for other jobs, but they increase output and in many instances improve the product.

For instance, a new tire ring locking press was designed and built by one company for military truck production. With this press a single workman centers the wheel, pulls a lever and four iron claws under 21 pounds of pressure are lowered to snap the ring into place. Previously, five workers with mallets drove the locking rings under the wheel rings. It is estimated that the press will save 2500 man-days a year.

WPB Urges Subcontracting In Non-Critical Areas

War contractors have been urged in a letter by Charles E. Wilson, acting chairman, War Production Board, to continue the policy of subcontracting as much work as possible outside the critical labor areas.

Some of the manufacturers, interpreting literally an earlier request not to subcontract within tight labor areas, and not being successful in finding suitable subcontractors outside critical areas, have undertaken to do more work in their own plants and have cut their volume of subcontracting. Mr. Wilson asked that this practice be avoided since it does not relieve the local supply situation and may make certain plants idle and disrupt community transportation and housing.

Lycoming Absentee Rate 2.5% During First Half

The absentee rate at the Lycoming Division of the Aviation Corp., Williamsport, Pa., was reported at the low rate of 2.5 per cent during the last six months. Percentages in recent months have been: Sept., 2.6; Aug., 2.6; July, 2.2; June, 2.08, and May, 2.13.

The outstanding attendance record is attributed to the loyalty of the workers and to supervision by the personnel department.

QUICKER PRODUCTION from UNSKILLED HELP

Assured by VICKERS HYDROMOTIVE CONTROLS

The war cannot wait on long training programs . . . workers to fill manpower shortages must be trained quickly so they can turn out needed production at the earliest possible moment.

Machines equipped with Vickers Hydromotive Controls shorten and simplify training. Most of the required skill can be built into the machine. Complex operations can be reduced to simple routines . . . or can be made automatic. Controls can be interlocked so the job can't be done wrong. Overload and tool breakage can be prevented by exact load limitations which are easily applied.

A Vickers Application Engineer will gladly discuss "hydraulics" in connection with your machines.

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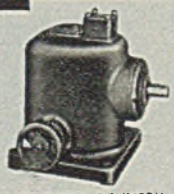
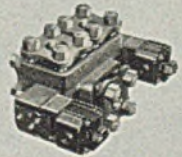
CONSTANT DELIVERY PUMPS

CONTROL ASSEMBLIES

FLUID MOTORS



VARIABLE DELIVERY PUMPS



DIRECTIONAL CONTROLS

PRESSURE CONTROLS

VOLUME CONTROLS

WING TIPS

Extreme care taken in packaging aircraft engines and parts for shipment . . . Primary considerations involve removal of any corroding element and protection of finished surfaces . . . Republic Aviation develops procedure

PACKAGING of aircraft engines for shipment, whether abroad or to installation points in this country, is carried to extreme lengths to avoid any possibility of corrosion damage to the engine. Special pliofilm envelopes and generous use of moisture-absorbing chemicals are the rule. Care of this sort extends even to the packaging of precision engine parts from subcontractors to engine builders.

For example, take the case of various small parts produced by the Republic Aircraft Products Division of the Aviation Corp., Detroit. Of primary consideration is the complete removal of any element such as the perspiration from fingers of inspectors which might corrode the finish of the steel part. Next in importance is the rust preventive oil which is applied over the clean surfaces of the parts to protect the finish.

In the packaging of valve seats, for instance, the finished and inspected parts are degreased in a cleaning solution of trichlorethylene and wiped dry. They are then coated with rust preventive and nested in wooden trays carefully padded to prevent scratches. These trays hold 35 valve seats each, and are used to deliver the parts to the shipping department. Here the valve seats are wrapped in carney cloth (a sort of stockingette) which has also been saturated in rust preventive. This oil-moistened wrapping of soft cloth serves to keep the initial coating as a constant film around the product during its subsequent shipping and handling. To prevent the oil from drying out of the cloth a secondary wrapping of waxed paper is applied. The valve seats then are packed in corrugated folders holding ten units each, which in turn are placed in corrugated shipping containers testing 600 pounds per square inch and of double wall construction.

Only three sizes of corrugated shipping containers are used for all types of engine parts. Ordinary corrugated board separators are used to divide the layers of unit packages from each other within the shipping container. Any excess space is filled with shredded newspaper as additional padding and shock protection.

Locking Plates Need Special Care

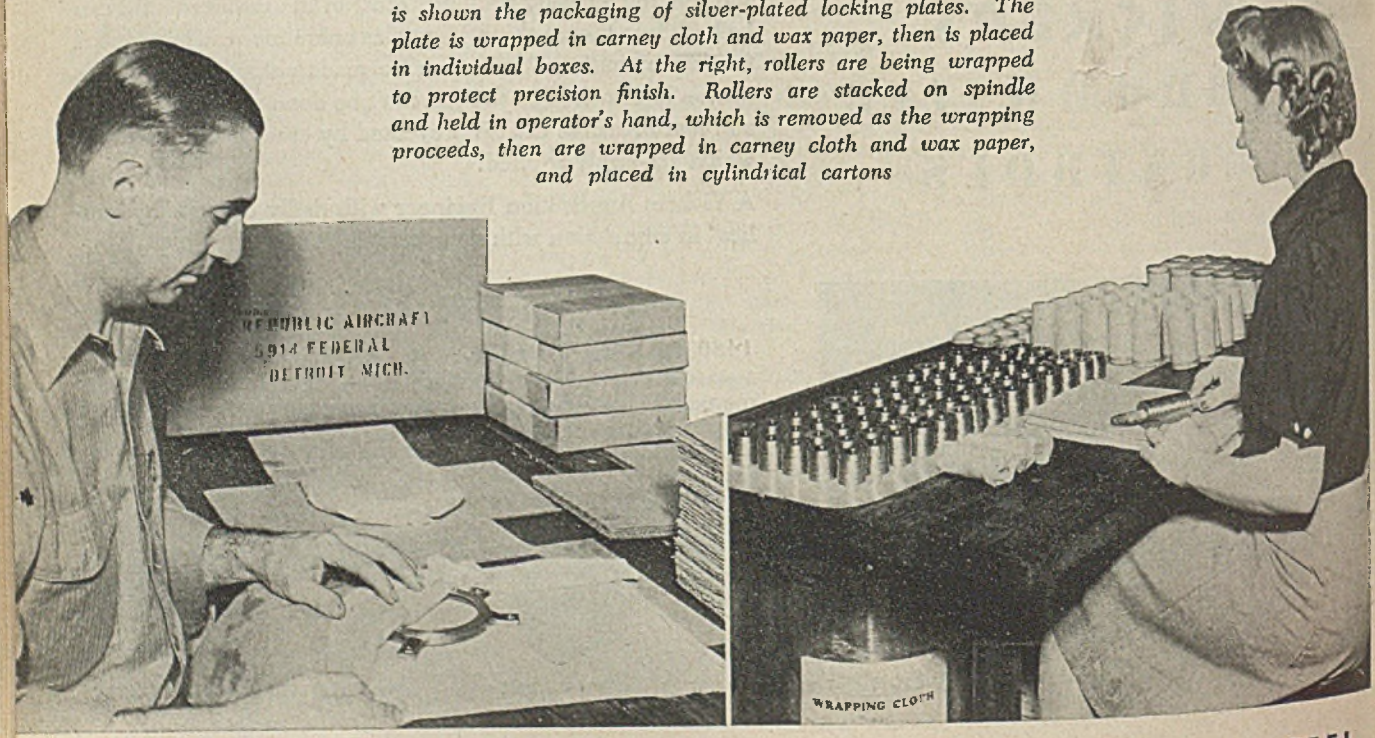
The only exception to the use of ordinary corrugated board partitions within the master container occurs in the packaging of locking plates, which require a degree of finish so fine that one surface must be silver-plated. For further moisture protection in the case of these units, waxed corrugated board partitions and a shipping container with a waxed interior surface are used.

Locking plates are handled throughout the plant processes with unusual care. The accompanying photograph illustrates a corrugated board folder used with each locking plate, inside which the part is laid on a piece of waxed paper with an oil-soaked square of carney cloth as a covering. This special handling prevents corrosion during the period of exposure from inspector's bench to shipping department and also saves many almost imperceptible scratches and mars which would render the part useless. Locking plates are finally packed double in a corrugated folder with a spacer between; each locking plate wrapped in carney cloth with an outer wrapping of waxed paper.

The company makes use of three different sizes of tubular cartons for interior unit packaging within the master shipping containers. These cylindrical cartons are used for such engine parts as crankshaft plugs, spools, pins and rollers. In such cases, carney cloth and waxed paper are used to wrap each individual part; the wrapped parts then being wadded into the capped tubes in such quantities as can be conveniently accommodated.

An exception is made in the case of keepers, which are stacked and wrapped in waxed paper exactly as a teller wraps coins in a bank. These tightly wrapped columns are then laid in layers within the master shipping container, each layer being separated from the next by a panel corrugated board. Being of stainless steel, keepers do not require the degree of moisture protection necessary to other products.

The shipping department employs 12 persons, divided between two shifts. The department has worked out its own solutions to the shipping and handling of highly specialized aircraft engine parts on the basis of its own experience. Prior to the outbreak of war and the resulting mass production of microfinished engine parts, no technique was available for

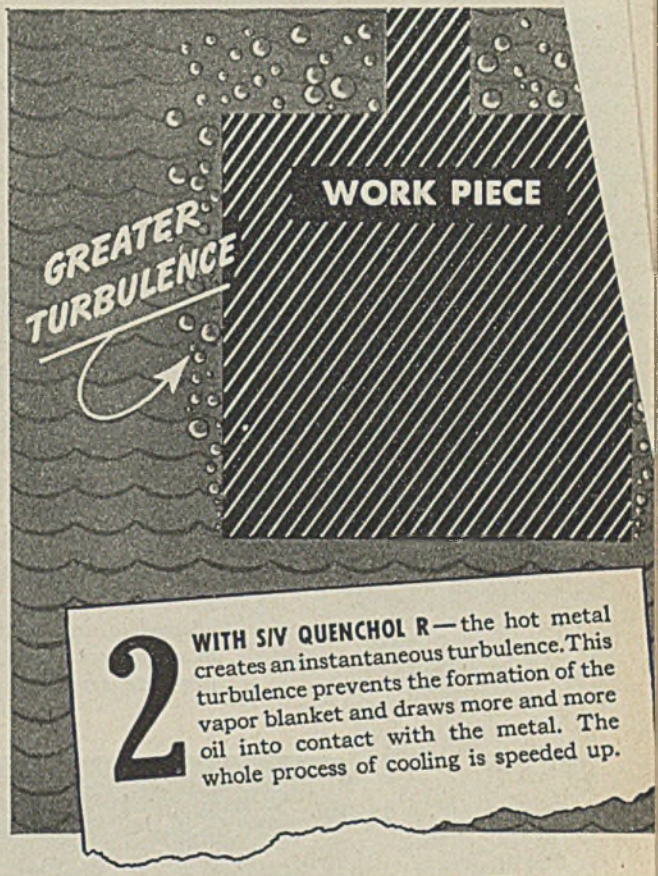


Special care is taken in wrapping airplane parts. At the left is shown the packaging of silver-plated locking plates. The plate is wrapped in carney cloth and wax paper, then is placed in individual boxes. At the right, rollers are being wrapped to protect precision finish. Rollers are stacked on spindle and held in operator's hand, which is removed as the wrapping proceeds, then are wrapped in carney cloth and wax paper, and placed in cylindrical cartons

HOW TO SOLVE YOUR QUENCHING OIL PRO

For Fast Quenching, High, Uniform Hardne... Use *S/V Quenchol R*

1 WITH CONVENTIONAL QUENCHING OIL—the sizzling hot metal creates a vapor blanket around itself. This vapor blanket lasts a brief period, preventing the oil from reaching the metal. Cooling is retarded while the vapor blanket lasts.



2 WITH S/V QUENCHOL R—the hot metal creates an instantaneous turbulence. This turbulence prevents the formation of the vapor blanket and draws more and more oil into contact with the metal. The whole process of cooling is speeded up.

This fast-acting coolant starts working on sizzling hot metal instantly!

ON QUENCHING JOBS that require a fast-quenching oil for greater and more uniform hardness, be sure to investigate S/V Quenchol R. This oil is the fastest-acting coolant in the S/V Quenchol series. It starts working on the metal instantly because it creates an instantaneous turbulence as shown in the illustration.

This turbulence virtually eliminates the vapor blanket that ordinarily retards cooling. The result is, the metal cools at the desired maximum rate.

GARGOYLE Lubricants

CALL IN SOCONY-VACUUM

SOCONY-VACUUM OIL COMPANY, INC.—Standard Oil of N. Y. Div. • White Star Div. • Lubrite Div. • Chicago Div. White Eagle Div. • Wadhams Div. • Magnolia Petroleum Company • General Petroleum Corporation of California

ONE OF A SERIES OF SUGGESTIONS TO AID PRODUCTION

uantity handling of these units. The roblem is simplified by the fact that no xport shipment is involved at Republic; ll finished parts go directly to airplane ngine assemblers for immediate use.

Metal strapping ½-inch wide in two strips crosswise and one strip lengthwise is used to reinforce the sealed containers during shipment, since a high concentration of weight up to 160 pounds per carton is encountered.

Aircraft Engine Building Program Again Reshuffled

Further reshuffling of the aircraft engine manufacturing program has been effected with transfer of manufacture of a high horsepower Pratt & Whitney radial engine from the Muskegon, Mich., plant of Continental Aviation & Engineering Co., to the Garland, Tex., plant of the same company, the latter a facility formerly operated by Guiberson Diesel.

The Muskegon plant in turn will be given over to building the Rolls-Royce Merlin liquid-cooled in-line engine heretofore built in the United States exclusively by Packard at Detroit.

The switch from a radial to an in-line engine at Muskegon will involve comprehensive retooling and re-equipping of that plant, and also will necessitate the removal of present production equipment over 1000 miles to the new Texas location.

Contract for a specified number of Rolls-Royce engines has been awarded to Continental, but statement of the exact amount involved has been withheld by the War Department.

At the moment there is no change in the status of the high-horsepower liquid cooled inverted-vee engine which Continental engineers have designed for aircraft installation. This power plant, it is reported, is still undergoing tests by Air Force engineers, although it is expected that eventually a contract may be placed for their manufacture.

The recent change at Muskegon has no effect on operations at Continental plants in Detroit, which are building Wright radial engines for installation in tanks.

Brazilian Aircraft Engine Plant Nears Completion

Encouraging progress by the Brazilian government in its construction of a mammoth, modern-equipped plant at Baixada Fluminense near Rio de Janeiro for production of 7 and 9-cylinder Wright Whirlwind aircraft engines was announced by Dr. Joaquim Pedro Salgado, air minister of Brazil, during a recent visit to factories of Wright Aeronautical Corp., Paterson, N. J.

The latter organization has been cooperating with the Brazilian project in an advisory capacity and by training key personnel for the new engine plant.

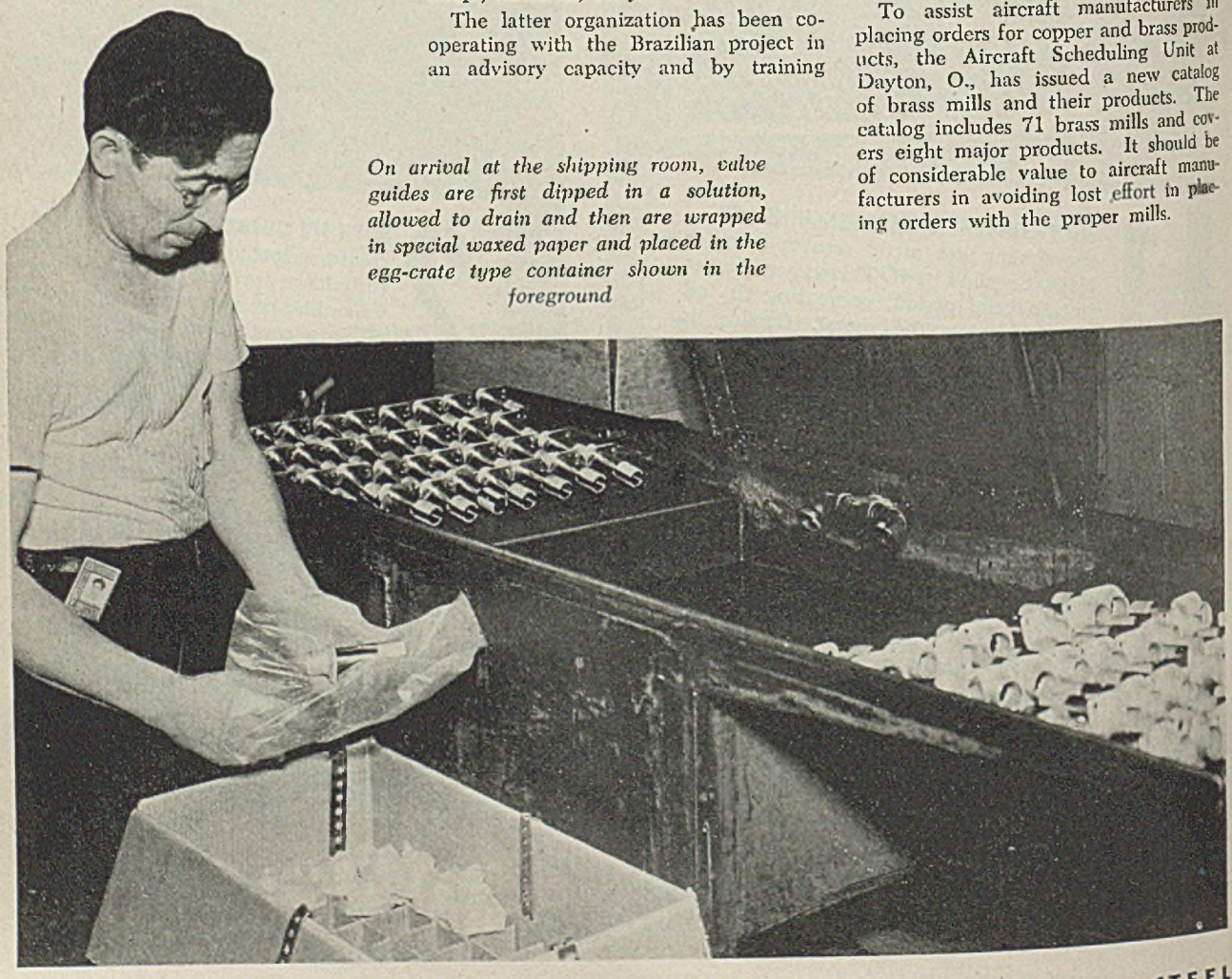
Dr. Salgado visited the Wright engine plants with members of his Brazilian-American group while on a tour of the United States.

The new Brazilian aircraft engine factory, Dr. Salgado pointed out, is operated by a company called "Fabrica Nacional de Motores" and is the first aircraft engine manufacturing organization ever formed in that country. The factory, he explained, is the nucleus of a small but complete "city," incorporating the latest type of plant design, the most modern equipment, including air conditioning and "blackout" facilities, a foundry, and surrounded by a community which includes living quarters for workers, a hospital, a theater, fire department station and even a hotel. An airfield is being constructed as an adjunct to the project.

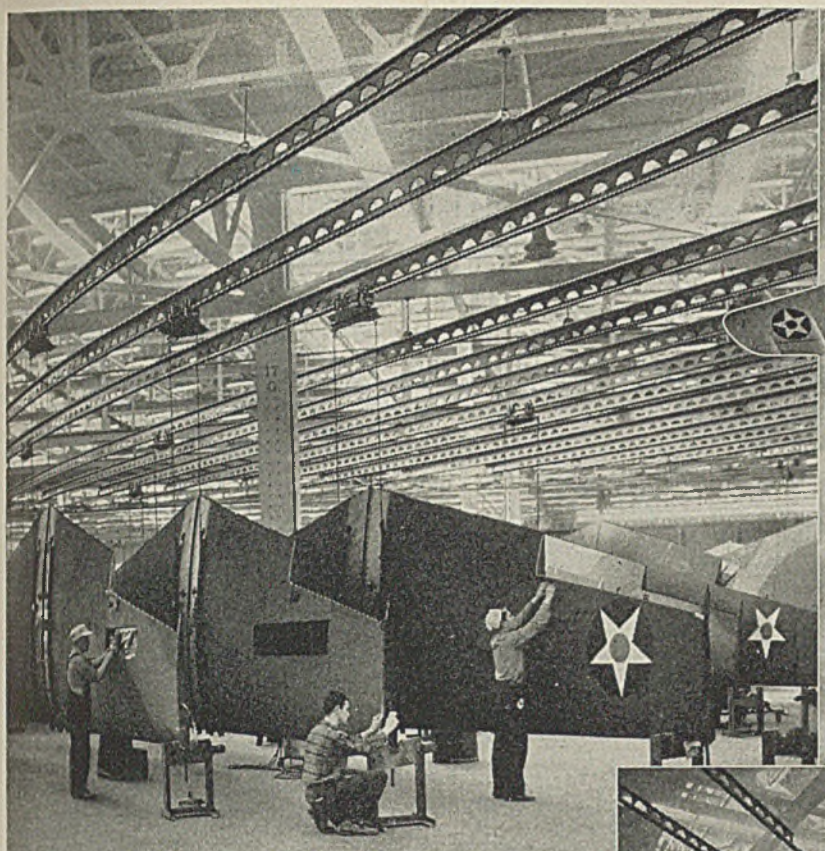
During his tour of Wright factories, Dr. Salgado inspected production of Wright Whirlwind engines of the type which his government will shortly produce, and witnessed assembly of Cyclone engines for installation in the U. S. Army Air Forces' Flying Fortresses (B-17) and other types.

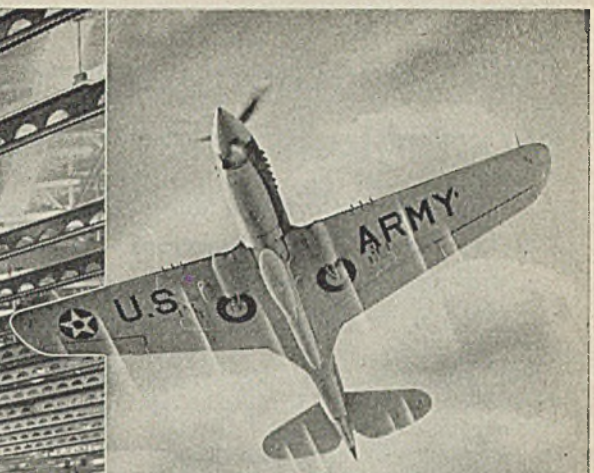
Brass Mills, Products Catalogued by ASU

To assist aircraft manufacturers in placing orders for copper and brass products, the Aircraft Scheduling Unit at Dayton, O., has issued a new catalog of brass mills and their products. The catalog includes 71 brass mills and covers eight major products. It should be of considerable value to aircraft manufacturers in avoiding lost effort in placing orders with the proper mills.



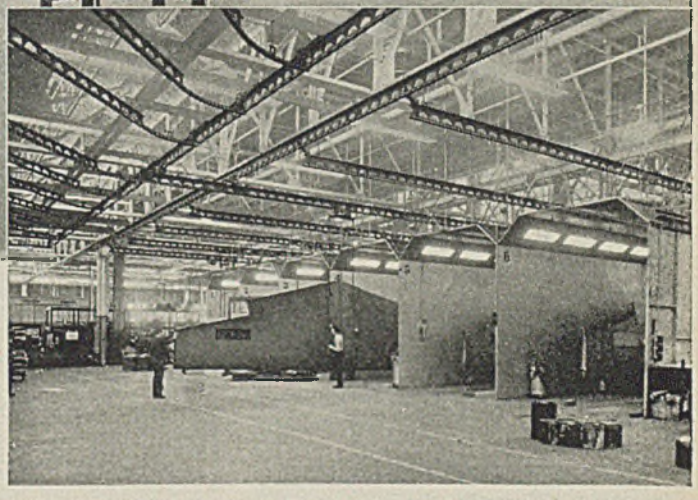
On arrival at the shipping room, valve guides are first dipped in a solution, allowed to drain and then are wrapped in special waxed paper and placed in the egg-crate type container shown in the foreground





CURTISS P-40E-1 U. S. Army Pursuit. This speedy plane is powered with an Allison liquid cooled engine developing in excess of 1000 H.P. and is equipped with a Curtiss electric propeller. In addition to standard equipment it is provided with a camera gun, belly tank and auxiliary set of gun sights in front of the cockpit.

ALL *Curtiss-Wright* PLANTS *served by* CLEVELAND TRAMRAIL



All of the plants of the Airplane Division of the Curtiss-Wright Corporation are served by Cleveland Tramrail overhead materials handling equipment. Thus to a large extent the production of thousands of fighting planes as well as great numbers of giant cargo ships is dependent upon the satisfactory operation of Cleveland Tramrail.

The pictures show how the overhead rail system is used in the wing painting department of one of the plants. Each spray booth is provided with an arch-beam rail that extends to the transfer-bridge runway. The transfer-bridge can be interlocked with any rail and enables the delivery of a wing from any booth to any of the many lines of arch beam or vice versa. On the latter lines the wings are prepared for painting and afterwards given the final touches prior to delivery to the Assembly Department.

Simple hand-pushed Cleveland Tramrail carriers are used for this work, the wings being supported by two wire ropes attached to their middle parts. Slots are provided in the tops of the booths so the ropes can pass through. Turntables on the carriers permit turning the wings around completely and make it easy to negotiate sharp curves.

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CLEVELAND TRAMRAIL

OVERHEAD MATERIALS HANDLING EQUIPMENT

Fall Collection Campaign Gains Momentum After Slow Beginning

Concerted effort now under way throughout country to bring last half 1943 accumulations to 15,000,000 tons. . . Substantial stockpiles needed to assure capacity steelmaking operations over winter months

THE scrap drive, launched Oct. 1 and scheduled to end Nov. 15, is picking up momentum after a slow start. Throughout the country local campaigns are being pushed aggressively with a view to piling sufficient material to assure capacity steelmaking operations over the winter months, but the task of accumulating this reserve promises to be much more difficult this year than last.

At the moment there is no immediate threat to steel production because of scrap shortage. However, supplies of both scrap and ore are so close to the danger point any unexpected interruption in the flow of these materials to the openhearths and blast furnaces would quickly wipe out the margin of safety in supply.

Early this year government salvage officials set the last half year scrap collection goal at 15,000,000 tons. Accumulations over the summer, however, fell short of monthly quotas so that intensified collection effort is necessary before the snow flies if the goal set for the last half of the year is to be attained.

Shipments of scrap declined in July, August and September. July shipments were the lowest since March 1943, and represent the fourth consecutive month in which shipments were below the comparable 1942 period.

The decline occurred as consumption increased. Normally the steel industry is able to build up scrap stocks during the summer months to tide it over the winter. July scrap shipments, however, were 326,000 tons below the 2,500,000 ton monthly average necessary if the last half quota is to be met. Estimates for August and September indicate an even greater spread.

In some circles it is doubted the 15 million ton goal for the last half will be reached, despite the present drive. Chief reasons cited for this is the drop in shipments of industrial scrap, and the fact nearly all dormant scrap accumulations in the plants and on the farms was cleared up in the scrap drive last year. Combined railroad and industrial scrap shipments declined to 898,000 tons in July, the lowest figure since February and 11 per cent below the April 1943 total.

Railroads Produce More Scrap

The railroads have produced more scrap than a year ago but have not been able to scrap as much of their old equipment as normally because of the demand placed on rolling stock and limitations on purchase of new equipment. Order cutbacks and cancellations have substantially reduced the volume of scrap moving from industrial plants in some areas. Considerable dormant scrap is obtainable in industrial plants and on the farms, but there is little likelihood collections during the present drive will match those in last year's effort. Other channels of scrap supply such as special projects and automobile wrecking yards are also less important sources than was the case last year. In addition the OPA ruling setting a maximum of $40 a ton to be paid for scrap obtained from special projects and the WPB order to save non-replacable automobile parts has slowed up the movement of scrap from these two channels.

Although the latest official figures show stocks of purchased and home scrap on July 31 were 6,860,000 gross tons, compared with 5,087,000 reported on the same date a year ago, there is serious need for heavy melting steel and cast scrap.

Recent WPB request to limit production of alloy steels to the electric furnaces, releasing more capacity available for open hearth carbon steel production, has also affected the scrap situation. This move has sharply reduced demand for alloy-bearing pig iron, indirectly causing an excess supply of alloy scrap for use in electric furnace steel production, and at the same time increasing the open hearth heavy melting steel scrap requirements.

The old problem of well balanced distribution of scrap stocks at consuming points is still plaguing the industry, although not to the degree reported earlier this year. Some plants have less than two weeks supply, while stocks at other points exceed 2½ months. Average mill inventories represent a five weeks' supply.

Steel mills in the Youngstown and Pittsburgh areas last year obtained considerable scrap by rail from the Southwest and the New York-New England area as well as by vessel from upper lake ports. The movement by vessel this year is estimated to be off nearly 50 per cent, while the surplus material in the Southwest has been largely cleared up. Sheffield Steel Corp. at Houston, Tex., and the Laclede Steel Co., St. Louis, are taking what little material is now obtainable from this latter source.

While the latest official figure for July shows scrap consumption of 4,570,000 gross tons, or slightly below the peak this year of 4,787,000 recorded in March, the increased steel production the past few months indicates that scrap consumption is currently at a new high. This coupled with declining scrap shipments and prospects of an additional expansion in steel output over the winter months further accentuates the overall scrap supply situation. However, increased pig iron capacity is expected to ease this condition somewhat.

Compared with the consumption of 27,000,000 gross tons in 1917, the peak year of the first World war, the scrap melt in 1940 was 39,750,000 tons; in 1941, 52,800,000; 1942, 54,000,000; while consumption this year is estimated at 54,600,000 tons. Thus dealers' scrap inventories have long since been drained off, the rate of demand is exactly double that of the first World War peak, while the shortage of civilian goods has retarded the flow of unprepared scrap to dealers' yards.

Adequacy of steel scrap supplies throughout the winter months is dependent to a large extent on achievement of the iron ore vessel movement goal of 86,500,000 gross tons. To accomplish this it is estimated about 9,000,000 tons of ore will have to be shipped after Nov.

BUREAU OF MINES STEEL SCRAP STATISTICS

(Gross tons—000 omitted)

	STOCKS			CONSUMPTION		
1942	Purchased	Home	Total	Purchased	Home	Total
Jan.	3,078	1,022	4,100	1,905	2,520	4,425
Feb.	3,028	1,045	4,073	1,844	2,360	4,204
March	3,106	995	4,101	2,022	2,639	4,661
April	3,337	987	4,324	1,997	2,606	4,603
May	3,640	962	4,602	2,047	2,618	4,665
June	3,801	1,058	4,859	1,997	2,467	4,464
July	3,939	1,148	5,087	1,977	2,493	4,470
Aug.	4,085	1,194	5,279	1,967	2,511	4,478
Sept.	4,306	1,239	5,545	1,883	2,541	4,424
Oct.	4,956	1,304	6,260	2,061	2,709	4,770
Nov.	5,363	1,379	6,742	1,905	2,496	4,401
Dec.	5,501	1,429	6,930	2,016	2,481	4,497
1943						
Jan.	5,401	1,476	6,877	1,942	2,550	4,492
Feb.	5,354	1,517	6,871	1,857	2,321	4,178
March	5,343	1,507	6,850	2,102	2,685	4,787
April	5,416	1,502	6,918	2,019	2,673	4,642
May	5,414	1,491	6,905	2,053	2,670	4,723
June	5,385	1,531	6,916	1,944	2,549	4,493
July	5,318	1,542	6,860	1,964	2,606	4,570

1, which achievement will be dependent on weather conditions. The regular fall change in ore loading drafts went into effect Oct. 1, and cargoes at the intermediate draft now range from 500 to 1500 tons less than carried under the wartime emergency loading previously in effect. Loss in smaller cargoes is expected to be largely offset by the added tonnage carried by the new Maritime Commission vessels to be placed in service over the remainder of the season. Through Oct. 1 this year ore shipments were 7,339,158 gross tons behind the like period movement a year ago.

Stocks of iron ore at lower lake ports and furnaces are about 5,000,000 tons below that recorded this time last year; while consumption for the first nine months this year was about 3,300,000 tons greater. Barring early closing of the ore shipping season, steel producers feel that ore stocks will be sufficient.

Army Construction Program $11,000,000,000 Outlay

Emergency construction, real estate acquisition, and the maintenance program of the Army now represent an outlay of about $11,000,000,000, the War Department announced.

Since the beginning of the war construction program in June, 1940, nearly 15,000 separate projects have been undertaken and now more than 90 per cent are in use. The construction of war facilities is now practically completed although maintenance activities will continue.

Army Saves $4 Millions in Utility Renegotiations

Savings of more than $4,000,000 annually have resulted from renegotiation of contracts for utility services at Army installations, War Department announces.

Contract adjustments were carried out by the Utilities Branch, Construction Division, Corps of Engineers.

Metals Supply Situation Impr

Various zinc quotas relaxed to permit greater consu. several directions. . . Reflects building up of scar stocks to fairly satisfactory levels

TORONTO, ONT.

NEW order, relaxing somewhat restrictions on civilian use of zinc, made possible by improvement in the shipping picture, was announced recently by C. D. Howe, minister of munitions and supply.

"With the lessening of shipping losses much valuable material, both finished and unfinished, is being conserved," said Mr. Howe. "The zinc position of the United Nations has thus been eased slightly, but not enough to permit removal of the basic restrictions."

The new order raises from 50 to 65 per cent the zinc quota for zinc oxide in paint manufacture, allows the galvanizing of pipes up to and including 3 inches in diameter, and makes adjustments in other zinc quotas.

With stocks of the metals widely used in war built to satisfactory levels the Canadian metal situation, as well as that of the United Nations, has shown general improvement in recent weeks. Ever since demand for munitions made metals scarce, efforts of the Allied countries have been directed toward the building of stockpiles to a point where extraordinary demands could be met even should there be interruptions in the normal sources of supply. It is now believed stocks of nearly all metals, from aluminum to zinc, have reached desired proportions and that the present problem is to meet current needs of munitions plants.

There is an obvious change in the attitude of the Canadian and United States governments toward new sources of war metals. There is not the same urgency to find and develop new mines in Canada except insofar as it may be necessary to meet exhaustion of present sources of supply. It is felt that with a n producers of copper and zinc ru reduced capacity in this coun elsewhere in the United Nation power could be diverted to them the need warrant and an increase put be more quickly secured through developing new prospects.

It is no secret that production of n tions in Canada is at a record rate. sumption of copper and zinc, usuall brass, has reached what is expected be the high point of the war. Manuf. ture of copper wire also is at the hig est rate. It is reported that new sourc of imported alloy metals have resulte in the building up of satisfactory reserves Cobalt, tungsten, manganese and chrome have been mentioned in this regard. There is no indication of any great change in the restrictions on the use of metals in nonessential industry, for any large nonwar use could endanger stockpiles.

Imports Increase 3,000,000 Tons During Second Quarter

Imports during the second quarter of 1943 showed an increase of 3,000,000 tons over first quarter receipts, Dr. W. Y. Elliott, chief, WPB Stockpiling and Transportation Division, revealed.

Total imports for the first half year amounted to 20,000,000 long tons with June arrivals about twice as great as those in January. Total imports by air for the period reported on amounted to about 3,330,000 pounds. Materials flown here are those most critically needed in war production such as mica and quartz crystals, industrial diamonds, beryllium and tantalite.

They Say:

"We must not be impelled by our good will and our native idealism to rush headlong from the prewar role of indifference to a postwar role of utopianism. Excessive American promises can only lead to disillusionment and resentment abroad and a new cynicism at home."—**Eric A. Johnson**, president, United States Chamber of Commerce.

° ° °

"Unless we are prepared to fight for free enterprise as the platform of our postwar planning, we shall pass from the necessary restrictions of wartime operations into the arbitrary and unnecessary straitjacket of some new and strange ideology."—**George Van Gorder**, first vice president, McKesson & Robbins, Inc.

° ° °

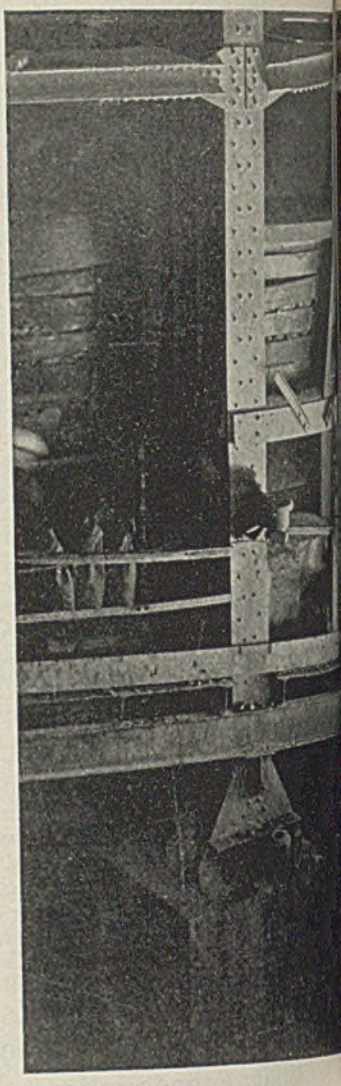
"In order to achieve adequate financing of termination settlements three things are required. First, interest must be allowed on the termination settlement to equalize the position of contractors who use private financing rather than public. Second, the type of financing must be simple. Third, the method must permit advancing of money against inventory, receivables, work in process and payments to the tier of contractors immediately below."—**Col. Bryan Houston**, in charge of terminations for the War Department.

° ° °

"It is not beyond the realm of possibility that labor and management can face the facts of today and take new and more stringent steps under their own steam. The inescapable fact that in any tight labor market area there is not enough labor for everybody was faced by the government. Some means to ration labor had to be devised—a system that would direct workers to the places where they were most urgently needed."—**Paul V. McNutt**, chairman, War Manpower Commission.

F
VALLEY MILLS SEE POSTWAR BOOM

District steel executives confident area producers will receive their fair cut of going business despite some pessimistic predictions that most of the worthwhile business in the future will be placed in lower-cost producing centers



YOUNGSTOWN, O.

YOUNGSTOWN district, long-established eastern Ohio-western Pennsylvania steelmaking area isn't figuring on closing up quietly and quitting the steel business when the war ends and war steel orders are no more.

Executives of the big Mahoning and Shenango Valleys steel plants figure there will be plenty of business in the postwar days; and they figure that the Youngstown district will get its fair cut of the business.

That is the view of industry in spite of all the dire predictions that the valleys were washed up—with all the worthwhile steel business after the war going to lower-cost producing areas, including those steel plants built during the war.

Youngstown is known as a high-cost producing area. It is estimated it costs from $2 to $6 a ton more to make steel in Youngstown than in its principal competing areas—Pittsburgh and Chicago—because of cheap water transportation which those areas have and which Youngstown lacks. The new war steel plants built in those districts has increased competition.

But Youngstown steel executives feel there is going to be plenty of business for all, a tremendous postwar business boom, which will be started when the pentup buying power is released after the war. Folks will use their war bonds, savings accounts and good credit to buy millions of new cars, stoves, radios, refrigerators, furniture, steel toys and other steel goods they haven't been able to buy during the war.

The railroads will need new rails, cars, locomotives, and bridges; new construction, virtually stopped by the war, will boom; and the aircraft industry is going to be big.

"And," commented a Youngstown executive, "Youngstown plants are in an ideal position to cash in on that business; that's because a large share of that new business will be for flat-rolled products—light plate, sheets and strip, tin plate, as well as bars—and most of Youngstown's finishing capacity is in those products."

Executives point out that the automobile industry probably can get back into production within three to six months after the day war ends and they get orders to convert back to their old business, having saved their old jigs and dies and having their power outlets carefully mapped; and there is an immediate market for at least 10,000,000 cars.

The Youngstown area is in an excellent position to handle its share of the business, having solved one of its important problems that of getting sufficient cool water in the hot months. The government built two huge new reservoirs, Berlin reservoir, with a 27 billion gallon capacity, and the new Mosquito Creek reservoir with a 34 billion gallon capacity which will be filled this winter. Berlin this summer supplied so much water that temperatures in the Mahoning river were lowered at least 20 to 30 degrees, and it is estimated that Mosquito Creek reservoir will bring temperatures down another 10 to 15 degrees next summer.

Little Steel Expansion

The district has had comparatively little new war steel construction. A 1100-ton blast furnace was built at Republic Steel Corp.'s Youngstown works, chiefly to make up for the scrap shortage, several other blast furnaces were rebuilt and enlarged; a new by-products coke plant was built at Republic's Warren plant, and some electric furnaces were built at Copperweld Steel Co.'s plant in Warren. And that's virtually the extent of the Youngstown district's war steel expansion.

Youngstown currently has three bessemer converter plants, 83 open-hearth furnaces, and 26 blast furnaces, virtually all of them very modern and efficient units.

And what will happen after the boom of four or five or six years?

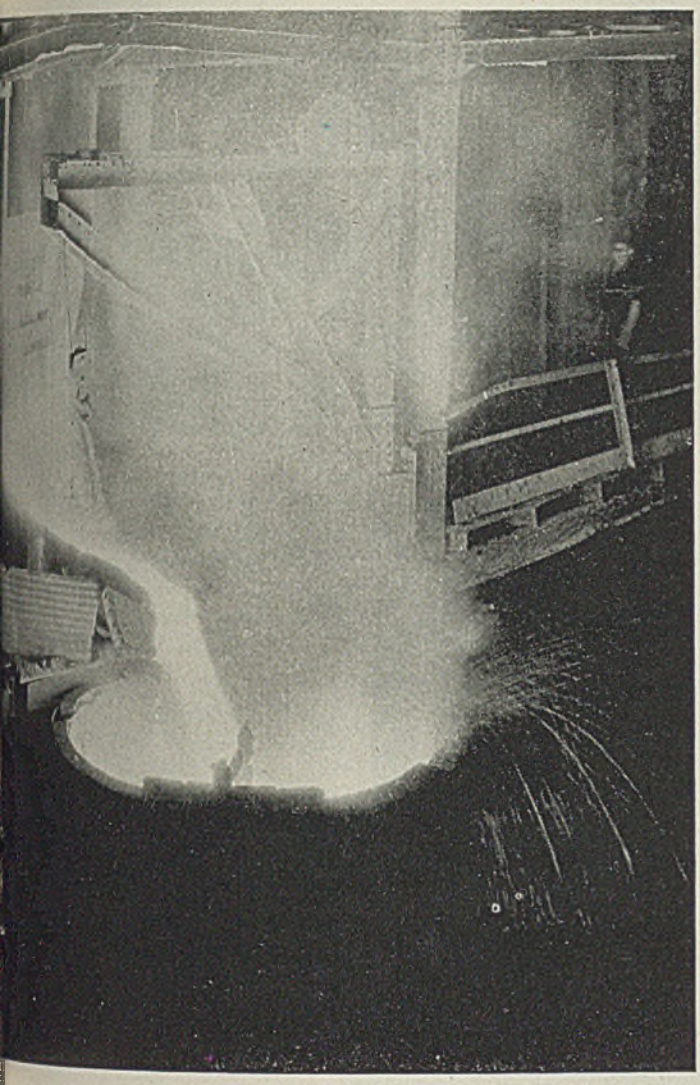
"If," commented one executive, "we get our canal (the proposed Lake Erie-Ohio river waterway from Beaver, Pa. on the Ohio river to Lake Erie near Ashtabula) our future is assured; we'll have at least an even break with competitors."

Executives in Youngstown feel there will be a lot of new markets opened up after the war—a market for steel in house building, for light gage stainless steel sheets for aircraft; that the plastics industry, instead of becoming a serious competitor, will provide new markets for steel for the presses and other machinery used in processing it and as parts for new products it will develop.

Jones & Laughlin Sets New Production Record

The Jones & Laughlin Steel Corp., Pittsburgh, in September again established a new all-time high record for production of steel for war in a 30-day month.

The new record exceeds by more than 1300 tons the company's best previous record of April, 1943. The Otis Works, Cleveland, also established new high marks at its No. 2 blast furnace, its 77-inch hot strip mill and its sintering plant.



Pouring molten steel from an open hearth at Youngstown Sheet & Tube Co.'s Campbell works

Labor Stabilization Plans Become Effective Generally on Oct. 15

CONTROLS designed to check migration of workers, hold down wasteful turnover in essential industries, direct flow of labor to areas where most needed and to make maximum use of the available supply of workers became general over the United States Oct. 15.

All local labor areas were required to adopt stabilization programs embodying the minimum requirements laid down in the War Manpower Commission's regulation No. 7, issued Aug. 16.

In general the plans provide for hiring of essential workers through referral to the United States Employment Service, and issuance of statements of availability to workers recently engaged in an essential activity.

Local areas were not required to adopt the socalled "Buffalo plan" or the "West Coast plan" which exceed the minimum requirements of regulation 7.

Seasonal workers in essential industries may move from one locality to another without losing their occupational classification under certain circumstances, the Selective Service Bureau, WMC, announced.

"Victory Drive" Aimed at Detroit Manpower Crisis

DETROIT

Faced with reports of an imminent "crackdown" by the War Manpower Commission to freeze labor to war jobs and prevent excessive turnover, and likewise with the danger that war contracts may be taken out of the district's plants because of employment shortages, Detroit community and management groups are making a concerted effort to bring about a realistic appraisal of actual manpower requirements.

To classify the importance of various war contracts and to relate them to manpower supply, a Production Urgency Committee has been organized including representatives of WPB, WMC and army, navy and air forces.

Faced with estimated manpower shortage of 82,000 (United States Employment Service figures) by the first of the year, the Production Urgency Committee is expected to take five steps immediately toward solving the problem by determining: (1) The number and character of prime and subcontracts and other work in the area; (2) the number of workers to be needed monthly for at least the next six months; (3) the number of present and prospective workers for the same period; (4) the relative urgency of existing contracts and (5) the procedure to remove contracts from this area to cancel labor shortages and attain balance in worker demand and supply.

All groups represented at the "Victory Drive" meeting were strongly opposed to any program that would result in "freezing" workers to their jobs.

Urgency Committee To Rule on War Contracts

CLEVELAND

Amended regional employment stabilization plan went into effect last Friday in the Fifth WMC region, covering Michigan, Ohio and Kentucky.

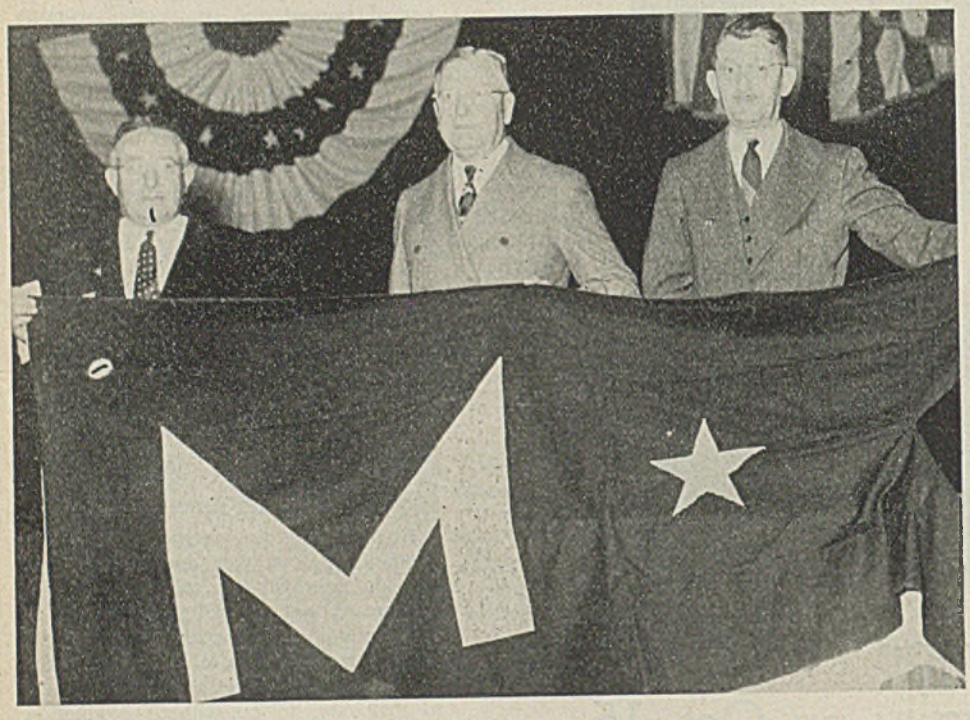
At a meeting last week of 300 war industry representatives and union labor officials, approval was given to a Cleveland manpower control plan placing in the hands of a production urgency committee broad powers to regulate the influx of new or renewed materiel contracts to that city; to redistribute production from one Cleveland plant to another, or to shift it to areas with more adequate labor supplies; to encourage incentive payments to high production workers and to study possible downward adjustment of the manufacture of civilian goods.

Foundry Wage Rates at Cleveland Reaffirmed

Fifth Regional War Labor Board has reaffirmed sound and tested going rates of 77½ cents an hour for foundry labor and $1.20 for journeymen coremakers and molders, in Cleveland.

The following rates set forth in the WLB decision do not affect any higher rates now being paid, but they are the maximum which the board may approve for employes receiving less than these rates.

Journeymen coremakers and molders	$1.20
Production coremakers and molders machine	.90
Cupola tenders	.95
Chippers and grinders	.825
Foundry labor	.775
Janitors, sweepers, etc.	.70



Norton Co. is the first in the Worcester, Mass., area to be awarded three stars for meritorious service on the production front. Holding the pennant, above, are F. W. Smith and A. B. Holmstrom

Indiana Harbor plant of Inland Steel Co. received, left, Maritime "M" award Oct. 4. Left to right with the pennant: Allen D. McLean, Maritime Commission; Wilfred Sykes, Inland president; W. E. Spofford, Maritime Commission

Col. Alfred H. Johnson presents, below, the "E" to Campbell Wood, general manager, Nash-Kelvinator propeller division, and John Haruska, union president

Hamilton Foundry & Machine Co., Hamilton, O., receives the "E," bottom of page

Production Awards Granted To More Industrial Plants

Ceco Steel Products Corp., Manufacturing Division & Auxiliary Plant, Chicago.
Clary Multiplier Corp., Los Angeles.
Crescent Tool Company, main plant, Jamestown, N. Y.
Oklahoma Steel Castings Co., Tulsa, Okla.
S. H. Pomeroy Co. Inc., Bronx plant, New York, N. Y.
Prentiss Wabers Products Co., Wisconsin Rapids, Wis.
Aldrich Pump Co., Allentown, Pa.
Art Metal Construction Co., Jamestown, N. Y.
Askania Regulator Co., Chicago.
S. Blickman Inc., Weehawken, N. J.
Central Tool Co., Auburn, R. I.

September Sets New Ingot Mark

Output was largest for any 30-day month and average weekly production best for all time

STEEL ingot and castings production during September was the highest for any 30-day month in history, the average tonnage produced per week exceeding average weekly production in all preceding months, the American Iron and Steel Institute reports. New furnaces coming into production are primarily responsible for the increased output.

Total September production was 7,488,978 net tons of ingots and steel for castings, an average of 1,749,761 tons per week. In March of this year, a 31-day month, production was 7,670,187 tons, an average of 1,731,419 tons per week. September output compares with 7,562,125 tons in August, which was at the average weekly rate of 1,707,026 tons. In September, 1942, production totaled 7,057,519 tons, an average of 1,648,953 tons per week.

During September the steel industry operated at an average of 100.4 per cent of capacity, highest since the outbreak of the war. In August the rate was 97.9 per cent and in September, 1942, it was 96.4 per cent of available capacity. In March this year, peak month for total production to date, operations were at exactly 100 per cent of current capacity.

September Steel Corp. Shipments Show Loss

Shipments of finished steel by the United States Steel Corp. in September totaled 1,664,577 net tons, a decrease of 39,712 tons from August shipments of 1,704,289 tons. The month's movement was 38,993 tons less than those of September, 1942, when a total of 1,703,570 tons was reached.

For nine months ended Sept. 30 the cumulative total was 15,069,644 tons, compared with 15,761,476 tons in the first nine months last year. In September daily average shipments were 64,022 tons, compared with 65,550 tons in August and 65,522 tons in September, 1942. The following table shows comparative figures of shipments for previous months and years.

(Inter-company shipments not included)

	Net Tons			
	1943	1942	1941	1940
Jan.	1,685,992	1,738,893	1,682,454	1,145,592
Feb.	1,691,592	1,616,587	1,548,451	1,009,256
Mar.	1,772,397	1,780,938	1,720,366	931,905
Apr.	1,630,828	1,758,894	1,687,674	907,904
May	1,706,543	1,834,127	1,745,295	1,084,057
June	1,552,663	1,774,068	1,668,637	1,209,694
July	1,660,762	1,765,749	1,666,667	1,296,887
Aug.	1,704,289	1,788,650	1,753,665	1,455,604
Sept.	1,664,577	1,703,570	1,664,227	1,392,838
9 mo.	15,069,644	15,761,476	15,137,436	10,433,727
Oct.	.....	1,787,501	1,851,279	1,572,408
Nov.	.....	1,665,545	1,624,186	1,425,352
Dec.	.....	1,849,635	1,846,036	1,544,623
Total	.....	21,064,157	20,458,937	14,976,110
Adjustment	.....	*449,020	*42,333	†37,639
Total	.....	20,615,137	20,416,604	15,013,749

†Increase. *Decrease.

U. S. STEEL INGOT 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 1942 made 98.3% of the open hearth, 100% of the bessemer and 87.6% of the electric ingot and steel for castings production										
Jan.	6,576,589	97.8	478,058	85.9	369,395	95.4	7,424,042	96.8	1,675,856	4.43
Feb.	6,033,674	99.3	447,843	89.1	344,532	98.6	6,826,049	98.5	1,706,512	4.00
March	6,785,285	100.9	503,673	90.5	381,219	98.5	7,670,187	100.0	1,731,419	4.43
1st qtr.	19,395,558	99.3	1,429,574	88.4	1,095,146	97.5	21,920,278	98.4	1,704,532	12.86
April	6,509,812	99.9	481,810	89.4	382,532	102.1	7,374,154	99.3	1,718,917	4.29
May	6,664,298	99.1	483,024	86.8	398,057	102.9	7,545,379	98.4	1,703,246	4.43
June	6,188,857	95.0	453,399	84.1	384,645	102.6	7,027,101	94.6	1,638,019	4.29
2nd qtr.	19,362,967	98.0	1,418,433	86.7	1,165,234	102.5	21,946,634	97.4	1,686,905	13.01
1st hlf.	38,758,525	98.7	2,848,007	87.6	2,260,380	100.0	43,866,912	97.9	1,695,667	25.87
July	6,516,387	96.2	466,288	90.6	393,342	94.0	7,376,017	95.7	1,668,782	4.42
Aug.	6,669,944	98.3	484,957	94.0	407,224	97.1	7,562,125	97.9	1,707,026	4.43
Sept.	6,617,102	100.9	480,635	96.4	391,241	96.6	7,488,978	100.4	1,749,761	4.28
3rd qtr.	19,803,433	98.5	1,431,880	93.6	1,191,807	95.9	22,427,120	98.0	1,708,082	13.13
9 mos.	58,561,958	98.6	4,279,887	89.5	3,452,187	98.5	66,294,032	97.9	1,699,847	39.00
Based on reports by companies which in 1942 made 98.3% of the open hearth, 100% of the bessemer and 87.6% of the electric ingot and steel for castings production										
1942										
Jan.	6,322,215	95.3	490,874	86.0	299,017	94.2	7,112,106	94.5	1,605,442	4.43
Feb.	5,785,918	96.6	453,549	88.0	273,068	95.2	6,512,535	95.9	1,628,134	4.00
March	6,572,930	99.0	493,191	86.4	325,990	102.7	7,392,111	98.2	1,668,648	4.43
1st qtr.	18,681,063	97.0	1,437,614	86.7	898,075	97.4	21,016,752	96.2	1,634,273	12.86
April	6,345,133	98.7	454,834	82.2	321,324	104.5	7,121,291	97.7	1,659,975	4.29
May	6,595,440	99.4	453,938	79.5	333,200	104.9	7,382,578	98.1	1,666,496	4.43
June	6,239,674	97.1	452,528	81.8	323,100	105.1	7,015,302	96.3	1,635,269	4.29
2nd qtr.	19,180,247	98.4	1,361,300	81.2	977,624	104.8	21,519,171	97.4	1,654,049	13.01
1st hlf.	37,861,310	97.7	2,798,914	83.9	1,875,699	101.1	42,535,923	96.8	1,644,218	25.87
July	6,345,315	95.7	453,686	79.6	345,957	96.6	7,144,958	94.5	1,616,506	4.42
Aug.	6,414,637	96.5	467,293	81.8	345,725	96.3	7,227,655	95.4	1,631,525	4.43
Sept.	6,286,855	97.9	437,961	79.4	332,703	95.9	7,057,519	96.4	1,648,953	4.28
3rd qtr.	19,046,807	96.7	1,358,940	80.3	1,024,385	96.3	21,430,132	95.4	1,632,150	13.13
9 mos.	56,908,117	97.3	4,157,854	82.7	2,900,084	99.4	63,966,055	96.3	1,640,155	39.00
Oct.	6,750,829	101.5	461,897	80.9	366,788	102.2	7,579,514	100.0	1,710,951	4.43
Nov.	6,371,750	99.0	458,469	82.9	349,593	100.5	7,179,812	97.8	1,673,616	4.29
Dec.	6,471,261	97.6	475,204	83.4	358,075	100.0	7,304,540	96.6	1,652,611	4.42
4th qtr.	19,593,840	99.4	1,395,570	82.4	1,074,456	100.9	22,063,866	98.2	1,679,137	13.14
2nd hlf.	38,640,647	98.0	2,754,510	81.3	2,098,841	98.6	43,493,998	96.8	1,655,653	26.27
Total	76,501,957	97.9	5,553,424	82.6	3,974,540	99.8	86,029,921	96.8	1,649,979	52.14

The percentages of capacity operated in the first 6 months of 1942 are calculated on weekly capacities of 1,498,029 net tons open hearth, 128,911 net tons bessemer and 71,682 net tons electric ingots and steel for castings, total 1,698,622 net tons; based on annual capacities as of Jan. 1, 1942, as follows: Open hearth 78,107,260 net tons, bessemer 6,721,400 net tons, electric 3,737,510 net tons. Beginning July 1, 1942, the percentages of capacity operated are calculated on weekly capacities of 1,500,714 net tons open hearth, 128,911 net tons bessemer and 81,049 net tons electric ingots and steel for castings, total 1,710,674 net tons; based on annual capacities as follows: Open hearth 78,247,230 net tons, bessemer 6,721,400 net tons, electric 4,225,890 net tons.

The percentages of capacity operated in first six months of 1943 are calculated on weekly capacities of 1,518,621 net tons open hearth, 125,681 net tons bessemer and 87,360 net tons electric ingots and steel for castings, total 1,731,662 net tons; based on annual capacities as of January 1, 1943 as follows: Open hearth 79,180,880 net tons, bessemer 6,553,000 net tons, electric 4,554,980 net tons. Beginning July 1, 1943, the percentages of capacity operated are calculated on weekly capacities of 1,531,789 net tons open hearth, 116,494 net tons bessemer and 94,667 net tons electric ingots and steel for castings, total 1,742,950 net tons; based on annual capacities as follows: Open hearth 79,867,450 net tons, bessemer 6,074,000 net tons, electric 4,833,960 net tons. Data from American Iron and Steel Institute.

Weirton Rolls 50,000,000 Pounds of Brass Monthly

Production of nearly 50,000,000 pounds of brass slabs a month on regular steel mill equipment has been achieved by the Weirton Steel Co., Weirton, W. Va., subsidiary of the National Steel Corp., making the company the sixth largest production unit in the brass industry as well as the only steel company operating in the brass field.

The company states it does not contemplate rolling brass during the postwar era.

Heavy Attendance Marks Electrochemical Meeting

Large attendance marked the annual meeting of the Electrochemical Society at Hotel Commodore, New York, Oct. 13 to 16. Major attention at the meeting centered on outstanding developments in electrochemistry associated with the war effort.

One session was devoted to the revolutionary change in the tinning of steel used in the manufacture of cans.

Alloy steels were discussed by Dr. B. D. Saklatwalla, Pittsburgh, in his Richard's Memorial lecture. He stressed in particular the essential constituent, vanadium, in modern steels.

Ivan S. Bloch, market development chief, Bonneville Power Administration, Portland, Oreg., discussed the new electrochemical centers developed during the war in Washington and Oregon.

Manpower Problems Hold Output Gains in Check

INDUSTRY, its pace retarded by various phases of a manpower problem still far from corrected, holds its gains moderately well for the latest weekly period. Steel production continued at the same high level. Distribution of electric power dipped slightly, and bituminous coal daily average output declined by less than 10,000 tons. Revenue freight carloadings increased as seasonal peak demands became heavier. Automobile and truck production was off over 600 units.

MANPOWER—Centralized hiring, now in full use in Pacific Coast cities, will either achieve its aim or convince the administration that no "job plan" can correct the labor shortage. Remaining alternative is a national service law, and some authorities anticipate such legislation if the war continues through midsummer of next year.

LIVING COSTS—National Industrial Conference Board's September living cost index records a 0.3 per cent increase in living expenses of wage earners and lower-salaried clerical workers. Principal factors in upswing were: Food, 0.5 per cent; women's clothing, 0.8 per cent; men's clothing, 0.4 per cent. Total costs are 4.4 per cent higher than a year ago, food accounting for much of this change with its 8.9 per cent increase during the 12 months.

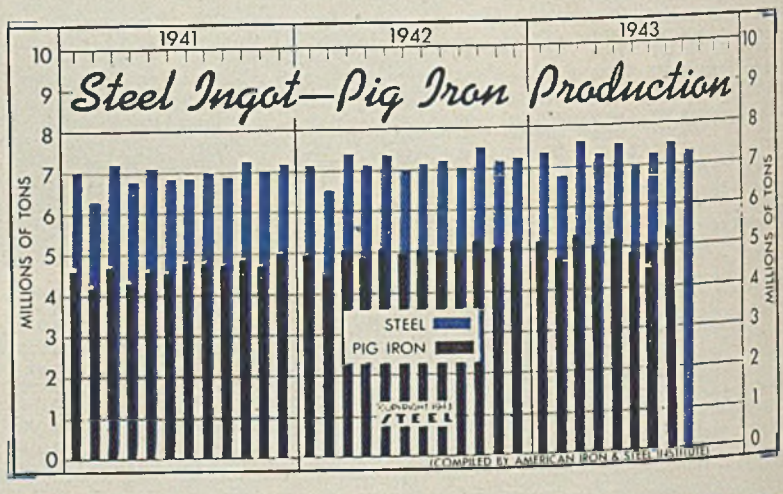
INDUSTRIAL PRODUCTION—Checking industrial indicators back through the summer and spring, the pattern of a production plateau is evident. However, war production must make new gains, for the armed forces will demand 21 per cent more for 1944 than is estimated for the current year. Attainment of this goal would throw upon the railroads an 11 per cent increase in freight to be handled during 1944—a load which new rolling stock to be delivered early next year would help to ease.

LEND-LEASE — During August lend-lease goods and services amounted to a record monthly figure of $1,261,000,000. Lend-lease expenditures since passage of this legislation total $15,235,000,000. England and Russia together are receiving about 70 per cent of this assistance; about 11 per cent goes to China, India, and the South Pacific area, and the rest is shipped to Africa, the Middle East, and miscellaneous recipients.

SHIPBUILDING—Maritime Commission records, covering 901 Liberty ships built in five major shipyards, disclose that since December, 1941, builders have cut construction time from keel-laying to delivery by almost 80 per cent. By April of 1942, vessels were being turned out in about 75 per cent of the December production time; by June only about 50 per cent of the time was required. By December, 1942, the figure was down to 25 per cent of the construction time of a year ago that date, and for this August it is slightly above 20 per cent.

MUNITIONS LOSSES — Statistics on equipment destroyed in the Sicilian campaign hammer home the imperative need of increased war production. More than half the 37-millimeter gun carriages placed in action were lost; nearly half the 57-millimeter guns; over one-third the 75-millimeter gun motor carriages; nearly one-fourth the 105-millimeter howitzer carriages; about one-eighth the 155-millimeter howitzers; 8 per cent of the medium tanks, and 7 per cent of the light tanks.

BUSINESS FAILURES—Wartime liquidation of commercial and industrial companies records a generally consistent downward trend. Total for 1942 was 7868, giving an average weekly figure of 197, and the highest number of failures in any one week was 268. For 1943 only 2771 failures have occurred to date, the average being 69, and the highest total of liquidations occurring in any week this year was 138.



FIGURES THIS WEEK

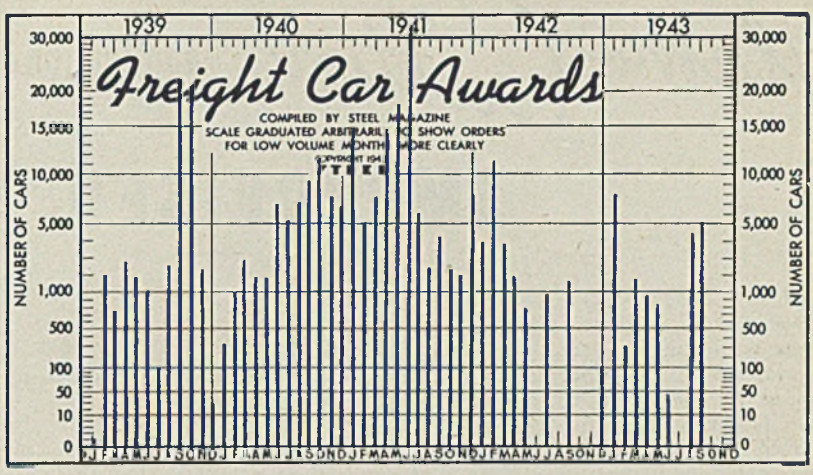
	Latest Period*	Prior Week	Month Ago	Year Ago
INDUSTRY				
Steel Ingot Output (per cent of capacity)	99.5	99.5	98.0	98.5
Electric Power Distributed (million kilowatt hours)	4,359	4,360	4,227	3,683
Bituminous Coal Production (daily av.—1000 tons)	2,017	2,026	1,983	1,934
Petroleum Production (daily av.—1000 bbls.)	4,390	4,324	4,133	3,857
Construction Volume (ENR—unit $1,000,000)	$37.7	$50.7	$41.2	$139.9
Automobile and Truck Output (Ward's—number units)	20,635	21,265	19,900	20,275
TRADE				
Freight Carloadings (unit—1000 cars)	913†	911	886	910
Business Failures (Dun & Bradstreet, number)	42	42	48	173
Money in Circulation (in millions of dollars)‡	$18,883	$18,818	$17,799	$13,830
Department Store Sales (change from like week a year ago)‡	+2%	+17%	+11%	+5%

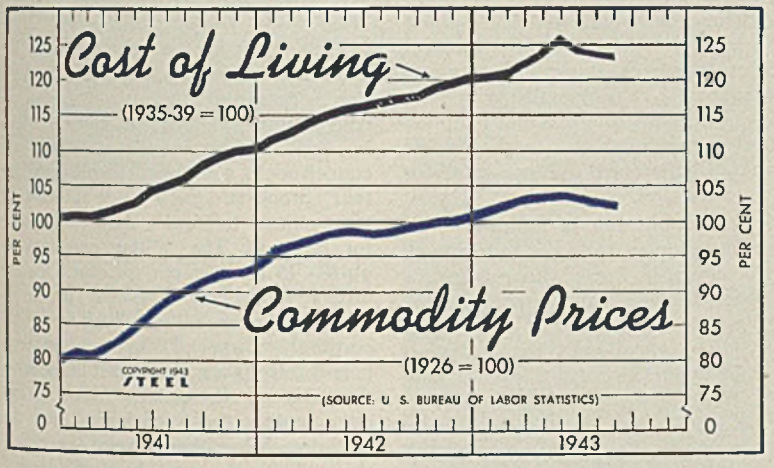
*Dates on request.

†Preliminary. ‡Federal Reserve Board.

Freight Car Awards

	1943	1942	1941	1940
Jan.	8,365	4,253	15,169	360
Feb.	350	11,725	5,508	1,147
March	1,935	4,080	8,074	3,104
April	1,000	2,125	14,645	2,077
May	870	822	18,630	2,010
June	50	0	32,749	7,475
July	0	1,025	6,459	5,846
Aug.	4,322	0	2,668	7,525
Sept.	5,388	1,863	4,470	9,735
9 mos.	23,380	25,893	108,372	38,279
Oct.	.....	0	2,499	12,195
Nov.	.....	0	2,222	8,234
Dec.	.....	135	8,406	7,181
Total	.....	26,028	121,499	66,889





Wholesale Commodity Price—Cost of Living Indexes

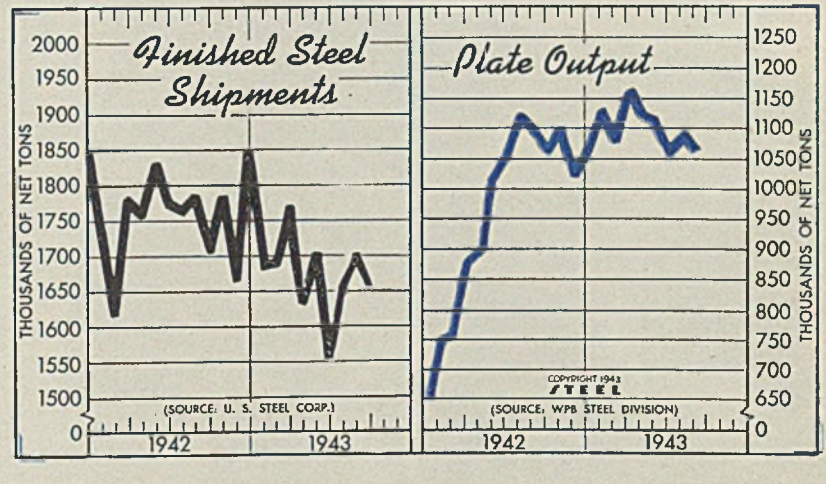
	—Commodities— (1926=100)			—Living Cost— (1935-39 = 100)		
	1943	1942	1941	1943	1942	1941
Jan.	101.9	96.0	80.8	120.6	112.0	100.8
Feb.	102.5	96.7	80.6	120.9	112.9	100.8
Mar.	103.4	97.6	81.5	122.8	114.3	101.2
Apr.	103.7	98.7	83.2	124.1	115.1	102.2
May	104.1	98.8	84.9	125.1	116.0	102.9
June	103.8	98.6	87.1	124.8	116.4	104.6
July	103.2	98.7	88.8	123.8	117.0	105.3
Aug.	103.1	99.2	90.3	123.2	117.5	106.2
Sept.	....	99.6	91.8	.....	117.8	108.1
Oct.	.....	100.0	92.4	.....	119.0	109.3
Nov.	.....	100.3	92.5	.....	119.8	110.2
Dec.	.....	101.0	93.6	....	120.4	110.5
Ave.	.....	98.8	87.3	.....	116.5	105.2

Steel Shipments†—Plate Production‡

(Unit 1000 Net Tons)

	—Shipments—		—Plate Output—	
	1943	1942	1943	1942
Jan.	1685.9	1738.9	1135.4	754.5
Feb.	1691.6	1616.6	1072.0	758.7
Mar.	1772.4	1780.9	1167.7	878.7
Apr.	1630.8	1758.9	1121.0	895.9
May	1706.5	1834.1	1114.9	1012.2
June	1552.7	1774.1	1059.3	1050.9
July	1661.0	1765.7	1089.0	1124.1
Aug.	1704.5	1788.6	1061.0	1097.9
Sept.	1664.6	1703.6	.....	1061.8
Oct.	.....	1787.5	.....	1101.4
Nov.	.....	1665.5	.....	1013.6
Dec.	.....	1849.6	.....	1060.0
Total	.....	21,064.2	.....	11,809.7

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



FINANCE

	Latest Period*	Prior Week	Month Ago	Year Ago
Bank Clearings (Dun & Bradstreet—billions)	$8,913	$9,322	$7,936	$7,371
Federal Gross Debt (billions)	$164.3	$160.7	$144.8	$86.3
Bond Volume, NYSE (millions)	$40.7	$41.8	$70.1	$64.5
Stocks Sales, NYSE (thousands)	3,342	3,096	8,162	4,745
Loans and Investments (millions)†	$50,998	$50,143	$46,612	$35,954
United States Government Obligations Held (millions)†	$36,210	$35,947	$32,510	$22,054

†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)†	247.8	248.7	243.8	235.2
Industrial Raw Materials (Bureau of Labor index)†	112.5	112.6	113.3	102.4
Manufactured Products (Bureau of Labor index)†	100.2	100.1	99.8	99.6

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

Flame Cutting applications greatly expanded by . . . . .

IMPROVISED SETUPS

By FORREST WALDO
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Air Reduction Sales Co.
New York

FLAME CUTTING has its own regular production applications but in these times when machine tools for certain jobs are unavailable or overburdened, the process has stepped in to provide solutions for many production problems.

Such problems are constantly recurring, and since in most cases there is at least partial similarity between a problem at hand and one already solved, a number of improvised applications of flame cutting will be described here.

Most common among the improvisations employing oxyacetylene cutting are those in which the torches are used to pinch-hit for metalworking equipment. For example, thin plates which ordinarily would be blanked out in a press are, instead, piled up in a stack and flame cut to shape. In one operation, 35 pieces are produced by stack cutting, each being identical in size and without burred edges. This process is applied to sheet or plate material of gage thickness and up to ½ or ¾-inch.

The most economical results are obtained when the height of stack is about 2 to 4 inches. When the quantities required are not large, stack cutting proves advantageous as compared with the blanking, because the simple template required for guiding the torch can be made in a fraction of the time needed for making press dies.

A special application of multiple torch cutting developed to meet emergency needs is shown in Fig. 3. In this case a steel mill had been called upon to provide 3½-inch square billets, and while a slab mill was available, there was no billet mill in the vicinity. This impasse was circumvented by devising a 4-torch flame cutting setup for splitting slabs into billets. Results were so satisfactory that six more torches were added to split the 26-foot slabs into nine billets in a single pass. The torch-carrying gantry is powered by a standard portable Radiagraph machine running on tracks fixed at one side.

Flame cutting sometimes takes the form of flame machining, where its function is to remove excess metal. An excellent application of this, and one which is capable of numerous variations, was conceived in a midwestern plant making tank sprockets. Each inside sprocket lug is machined to form a right angle recess for bolting. The milling operation required 45 minutes per sprocket. Doubled orders found the machines unable to handle the increase in milling work. Accordingly, a special 90-degree oxyacetylene torch tip was developed to cut away the bulk of the metal. A special machine guides the torch inward from the end of each lug, then upward to complete the right angle cut. In 8 minutes this torch trims the 13 lugs of a sprocket, leaving only enough metal for finish machining, which is done in 20 minutes. Sprocket production has been doubled.

In another case, 10-inch diameter rabbeting saw blades were formerly cut on a milling machine, using a slitting saw to shape the teeth. Thirty-six cuts were required, in addition to 18 drilled holes at the root of the saw teeth. Production was simplified by flame cutting, since the entire contour was cut in a single operation, producing blades in multiple by stacking several ¼-inch plates.

In another plant, wrenches previously were forged under drop hammers and then machined to size. The production method was then changed to flame cutting of the wrench blanks. In addition, some of the finish machining was done by the oxyacetylene process, wherever possible.

An instance in which an alternate method has become permanent is the substitution of flame cutting for a giant hydraulic press in cropping off the ends of corrugated ingots measuring up to 36 inches diameter. The operation formerly was performed by slowly forcing a

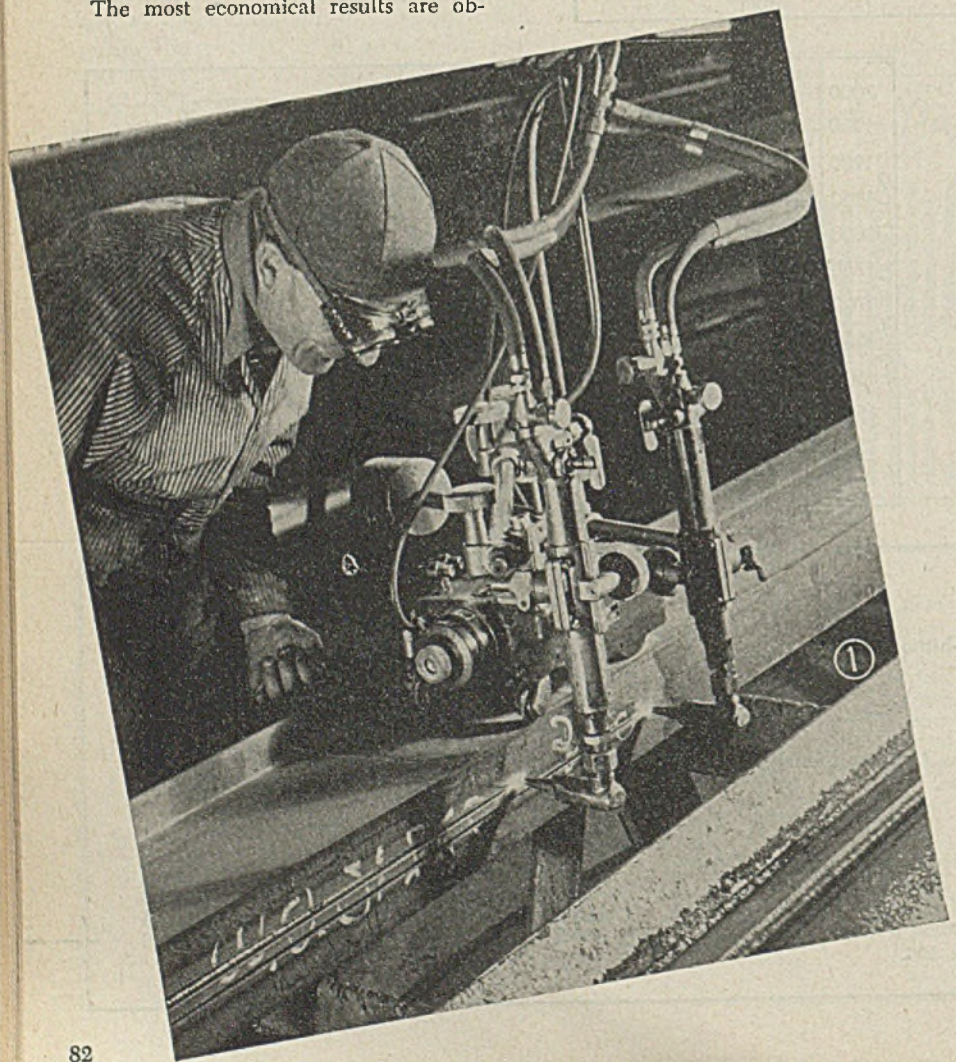

Fig. 1—T-shapes are easily made by trimming the flanges from standard I-beams with twin torches. Two Tees can be made by splitting the web down the center

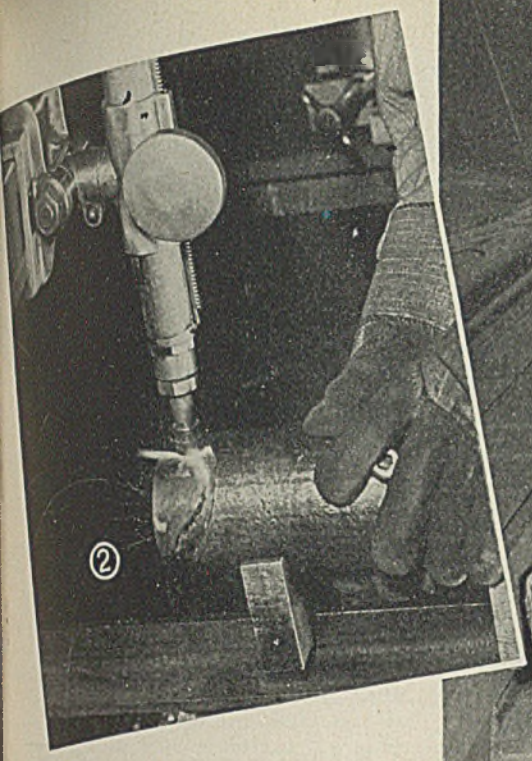

Fig. 2—A simple sleeved template or cam, as shown here, facilitates cutting curved profile on tube end. A steel ring slipped over the copper cutting tip prevents gouging of the soft metal

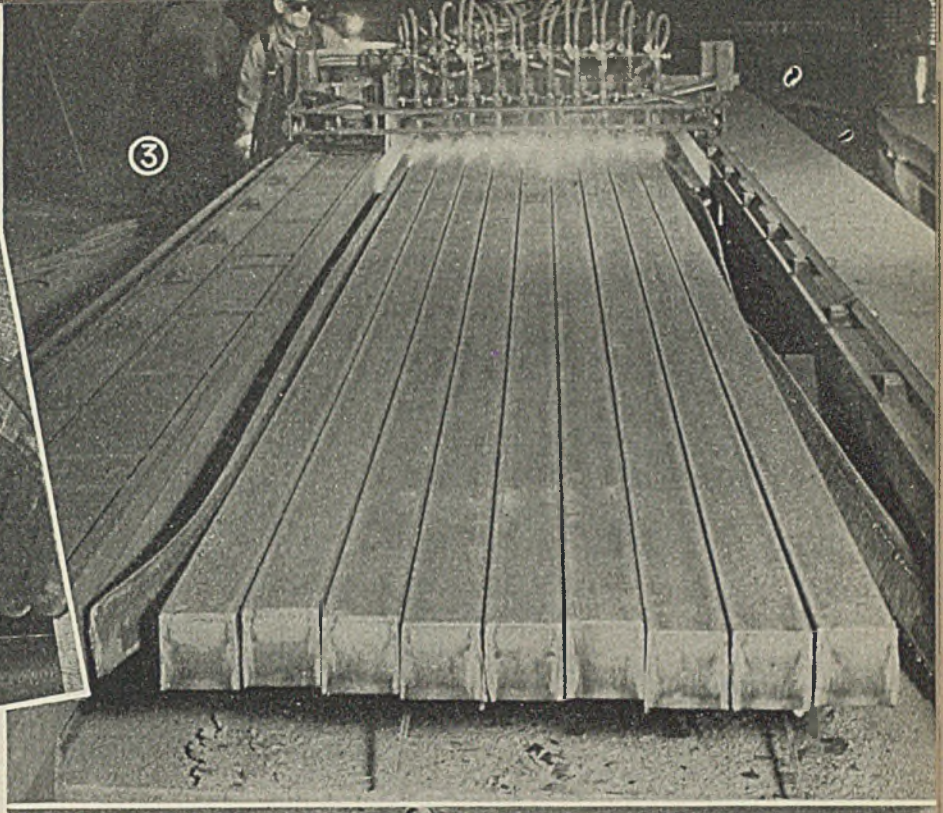

Fig. 3—Flame-cutting improvisation substitutes for a billet mill in this instance. Ten torches in tandem cut 26-foot slabs into nine billets in single pass

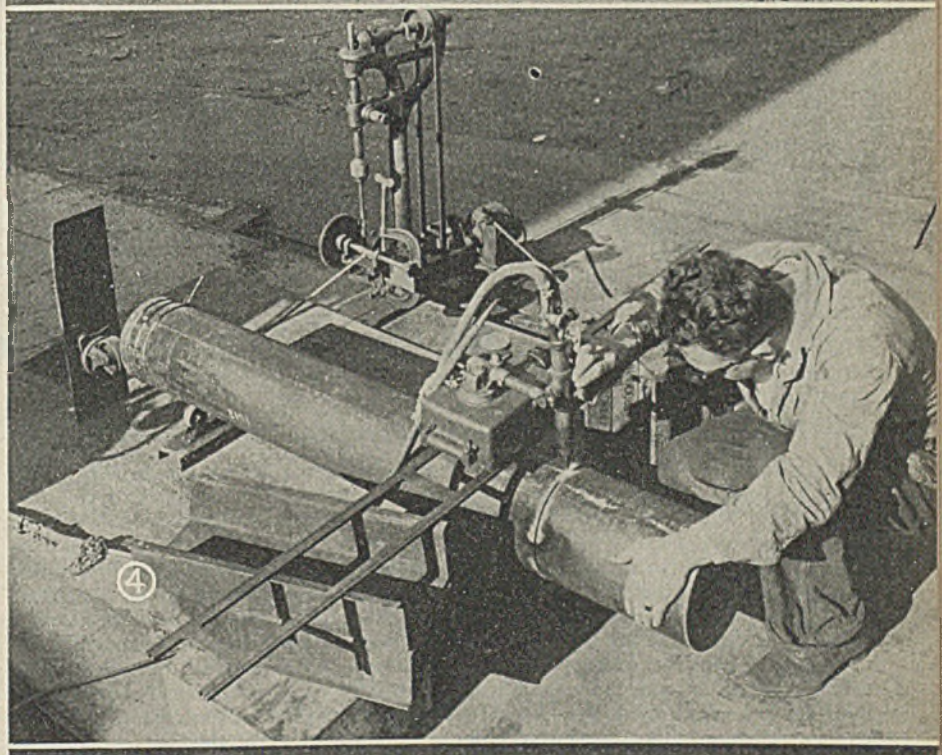

Fig. 4—This setup for cutting heavy walled tubing employs an old drill press to reel in the wire wrapped around the tube, thus rotating it under a stationary torch

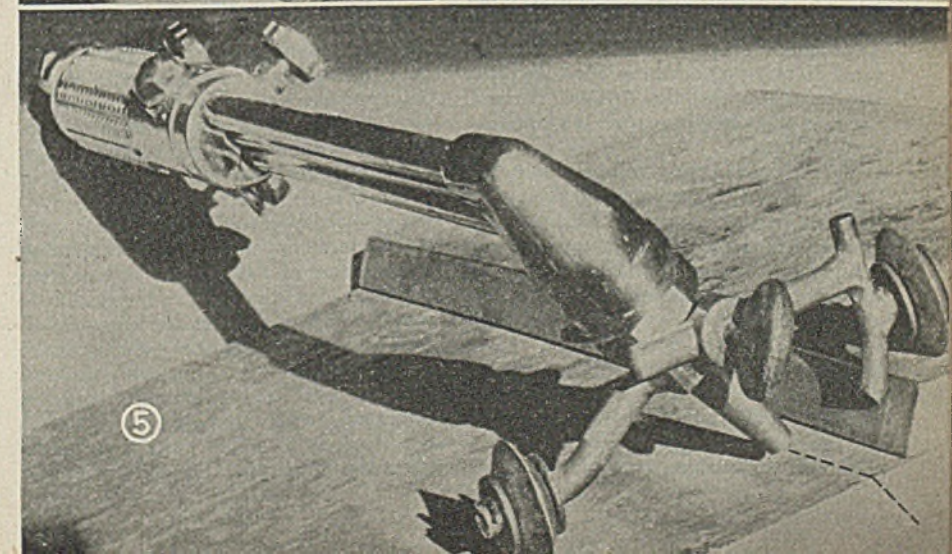

Fig. 5—This simple guide for a cutting torch makes it possible to bevel the lower plate so it closely matches an edge already cut on upper plate, resulting in savings of both time and welding electrodes

wedge shaped cutter bar through the ingots. A special flame-cutting machine now crops both ends simultaneously in as little as 8 minutes, one fifth the time formerly required. The ingots are heated to only 900 degrees Fahr., against 1800 degrees previously.

Certain steel mills have also adopted gas machines for "hot cutting" of billets. In some cases adequate mechanical shear equipment has not been available to cut heavy sections. In others, oxy-acetylene cutting replaced shears which failed when operated beyond rated capacity. One mill keeps such equipment on stand-by service, ready to take over

(*Please turn to Page* 121)

By ARTHUR A. SCHWARTZ
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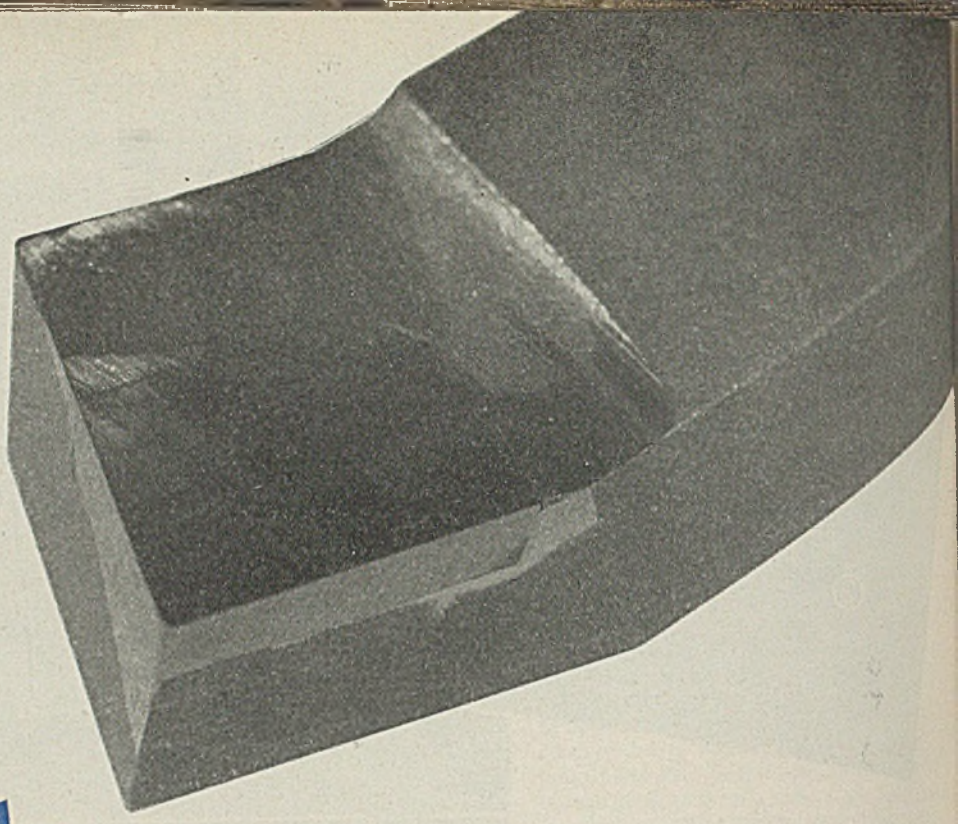


Carbides

. . . . the "Royalty" of Cutting-Tool Materials

A tool engineer with 40 years' experience describes characteristics of carbides and takes special care to point out how to overcome their deficiencies

CARBIDES in their various forms are the "royalty," the "last word" and the "prima donnas" of cutting tools. The "royalty" because, when properly fitted to the particular job and properly taken care of, they will produce more and faster than any other cutting tool now on the market. They are the "last word" because they are the hardest commercially produced substance in the world. We need look no further for anything harder. They are the "prima donnas" because they can be capricious and unpredictable.

There is of course a wide gap between "old fashioned" steel-cutting tools and carbides in the matter of hardness and wear resistance, and only now is this gap being narrowed slowly by the use of various nonferrous alloys and some new high-speed steels.

About 25 years ago, carbides as we know them today were produced for the purpose of making a better die for some difficult wire-drawing operations and even today they are being widely used for these same jobs. Many more pounds of carbides are now being used to make various kinds of dies than are made into cutting tools. They are also largely used as abrasion resistant linings, pressure p'ates and the like. It was the curiosity of a workman which induced him to take the broken pieces of a drawing die and make the first carbide cutting tool.

At first only tungsten carbides were used. Cobalt soon emerged as an almost universal binder and still is most commonly used. Many other carbides were tried and some of them, notably tantalum, titanium and zirconium, are in common use today.

Present day carbides for cutting tools are made from some mixture containing one or more of the carbides of tungsten, tantalum and titanium, all reduced to particles of the smallest size commercially feasible. Of these, tungsten seems to be the hardest—which probably explains why it also has the largest particles. Tantalum, while perhaps not quite so hard, grinds to much smaller sizes. Its peculiar "slipperiness" helps to reduce the coefficient of friction of the finished tool. A good many of the grains of tantalum carbide find their places in the voids left by the larger tungsten grains.

Titanium carbides are softer than either of the above but they also are the smallest of all three and, therefore, are very good for filling voids. They are of a distinct brownish color.

Cobalt, and to a very small extent other metals, may also be reduced to a powder. The various grades and makes of carbides are made by varying the proportions of these powders, in particular, the amount of cobalt used. After mixing, these powders are pressed into molds of the desired shape under quite high pressure. Then they are heated until the cobalt forms a bond with the carbides and so transforms the whole mass into a more-or-less homogeneous piece of carbide-cutting material.

Cobalt melts around 2700 degrees Fahr. This is the operating limit or top in red hardness, as at that temperature the material becomes a soft pasty mass. It is doubtful if anybody actually knows the hardness of the individual grains because of the many difficulties experienced in measuring it. It is also extremely difficult to measure the hardness of the conglomerate with our present sys-

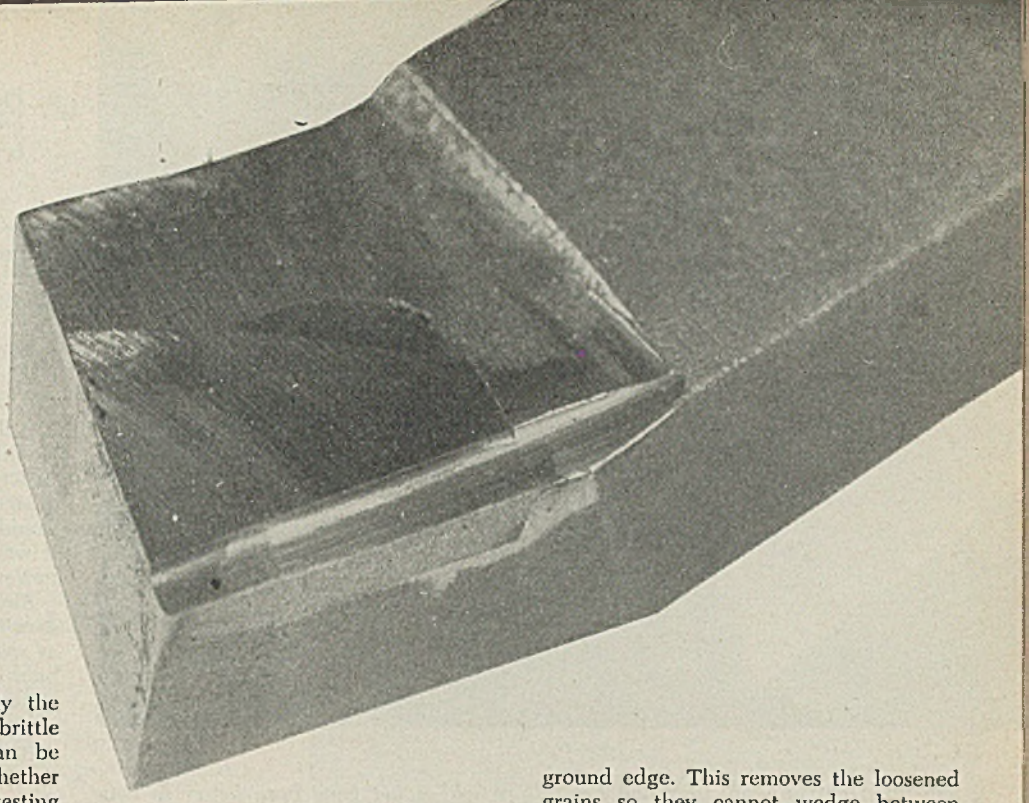


Fig. 1. (Opposite page)—Carbide-tipped cutting tool as it comes from the manufacturer

Fig. 2. (Right)—Look at what is left of the tip after a heavy chip breaker has been ground into it

tems of testing, as it is so nearly the hardness of a diamond and yet so brittle that practically no depression can be made in it. We do not know whether the point of the diamond on our testing machine rests on a grain of carbide or between two grains. This is true on various types of hardness testers regardless of the shape of the contact point, with the possible exception of the scleroscope. Even here we are likely to measure the hardness of the bouncing ball rather than the hardness of the carbides.

Fortunately, we do not need this information as all carbides are hard enough. Also, all carbides are sufficiently abrasion resistant to make excellent cutting tools. There is, however, one important quality of these tools that is important to know; that is tensile strength, and here information is sadly lacking. The writer has asked many carbide men and usually answers have been evasive or a flat, "I do not know."

Tensile Strength In Doubt

This unknown and never-high-enough tensile strength constitutes the essential difference between the various grades made by every manufacturer of carbides. The writer believes that the makers of carbides might do better to freely admit this weakness and let us know why we should use a negative rake. *It would be so much easier to intelligently design and use carbide tools if we knew ALL about them.*

Carbide tools have had such wide acceptance that we do not need to apologize for them, or hide their single weakness. I will deal with this point later.

Low tensile strength is the weak spot in carbides. If we take care to use them with this in mind, we will have little trouble with them.

Low tensile strength means high brittleness and low edge strength, so above all we must avoid rough usage either on the job or in the crib. This should be so self-evident that we should have a separate container or shelf for each tool. If the cutting edge of the tool strikes metal or another tool, a nick is likely to result even if it be so small as to be invisible to the naked eye. But that tiny nick really ruins the tool. The same can be said of installation on the machine. *The cutting edge must be guarded at all times.*

Low tensile also means low edge strength. That is why we must never attempt to grind a lip on carbides like the old machinist used to grind on his tools to make them cut easier. We also must watch the lines of pressure. We must never let them lie across the lip. We must pay attention to this factor and set the tool on a lathe, say, at the height of the center and never below it. Also, we must keep the top rake at nearly 90 degrees or even use a negative value. Keep all the pressure lines *in the tool* and never across it.

For the same reason, we must take care of impact, such as encountered on interrupted cuts. We must use care to guide the direction of impact, so that the pressure lines lie within the tool, and thereby make use of shear angles to take the impact, if possible, on the heel of the tool rather than on the nose or point.

As this is written to clarify the "why" rather than the "how," it is deemed necessary to repeat what every carbide manufacturer freely distributes—that is advice on the design and shape of tools.

Another "why" is related to the structure of carbides. Because they are made from very hard grains cemented together by cobalt, they resemble a slab of concrete. If we attempted to grind a sharp edge on concrete we would find ourselves limited to the size of the largest stones in the aggregate. These stones will break away when the cement that holds them in place is ground away. Likewise, the carbide grains tend to break away as the edge narrows. We are sometimes advised to draw a hone over the freshly ground edge. This removes the loosened grains so they cannot wedge between the tool and the work and so damage the tool.

This sums up the fact that carbides are never really sharp, as can readily be seen through a low power microscope. It is for this reason, too, that we must run carbide tools at certain minimum speeds to keep the work from tearing. This can be demonstrated easily by turning down a long part where we start slow and build up the speed. At first the work is rough and torn in appearance and the tool would soon fail if kept at this speed. But as the proper speed is reached, the finish improves until we pass the optimum speed, after which the same tearing action will begin again.

Strong Shanks Check Springiness

Because of the low angles of the rake or negative rake mentioned above and, because of the nature of the cutting edge, carbides consume more power than other cutting materials and it becomes necessary to have strong shanks on the tools to avoid springiness. Also necessary are rigid, powerful machines as well as rugged jigs and fixtures.

Now for materials we can work. These are really unlimited if we take care of the above mentioned weaknesses. All materials which tend to form a short fractured chip, such as experienced when working with cast iron, cast stainless steel, some brasses, etc., are "natural" for carbides.

While we must still observe the above rules, little trouble need be anticipated and production will go up at once when we change from, say high-speed steel, to a suitable carbide on such work. But when we come to the long curling chip, such as most steels and some coppers and bronzes produce, we find the truth of the opening of this paper, for then we encounter the "prima donna," capricious and unpredictable.

Surely we can use carbides on these materials with few exceptions, but each

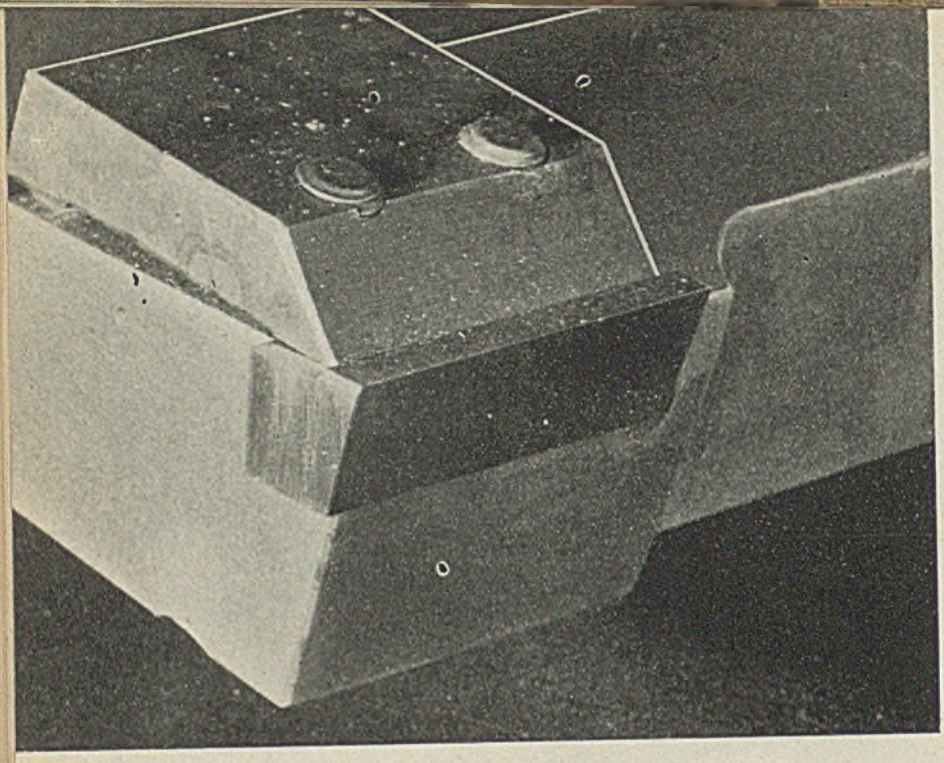


Fig. 3—Here a separate chip breaker has been applied. Grind is reversed to leave the useful portion or carbide tip intact

individual cut on each operation has to be engineered and tested if carbides are to be profitable. The first question should be—how many? Only when the quantity per run is high enough to absorb the full cost of tools, extra work on fixtures and first setup time (which is likely to include a little experimentation) should the carbides be put to work. If the run is big enough, we can expect to realize a nice profit on the job. In that case the utmost care will be used—first in design, second in grinding and setup.

If there is any likelihood of the same job coming up again for another run, the tools should be carefully sharpened and kept in separate boxes clearly labeled for the particular operation. In no case should any of the tools be used for another operation. The reason for this is self-evident. Because these necessary precautions weren't taken, many shops have thrown out carbides entirely.

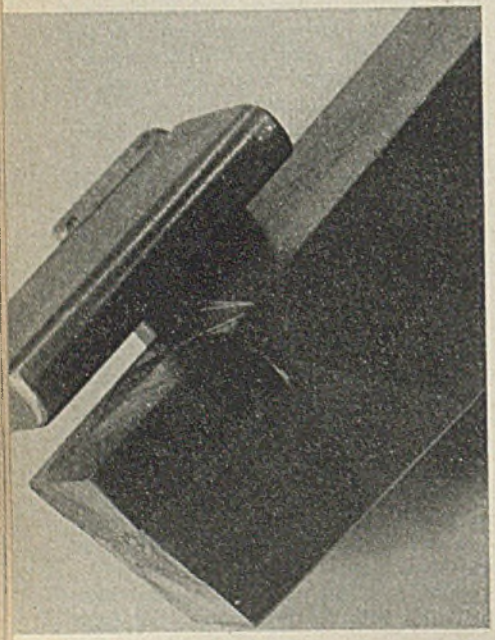


Fig. 4—A "floating" chip breaker works well when correct height is found. This is a type recommended by Mr. Schwartz

Would it not have been better to have used carbides only on those jobs obviously suitable for them?

Carbides in their present state are by no means universal tools and the shop that tries to use them as such is likely soon to throw them all out.

To grind a carbide tool properly takes time, as does a careful setup of them. Would anybody say they would replace all the high-speed steel used in, say, a jobbing shop or a tool room? Yet to many such shops come jobs where carbides would make a real saving if the "know how" were available.

Another problem which should be solved immediately is the future of chip breakers. I recently saw a carbide tool turning out a section about 70 degrees of a circle with, of all things, a chip breaker ground into it. There was nothing it could get caught on, yet just because it was a carbide tool, it had to have a chip breaker on it.

We must find some way to completely abolish the chip breaker. We recognize that the chip must be broken up for disposal, but we should do away with the present day practice of spoiling the tool before we use it. See Figs. 1 and 2. I have a few thoughts on the matter which are the results of experiments conducted at Bell Aircraft. I pass them on for what they may be worth, but not necessarily as finished accomplishments.

In one case we have an applied chip breaker, Fig. 3. We had to grind a recess in the carbide tip to keep the chip from sliding underneath the chip breaker, but this time we ground away the unused part of the carbide tip and left our cutting edge whole. Contrast with Fig. 2.

In another case we tried an old stunt, a chip breaker entirely separate from the cutting portion of the tool. As shown in Fig. 4, it was what you might call "floating" above the tool, but so placed as to prevent the chip from curling. This is fine if we can find the right place for it, but that varies with different shapes and cuts.

A floating chip breaker can be attached to either the tool, tool holder or to the turret itself. A movable floating chip breaker might be developed which would find the proper position, and only it would have to be moved. At present, however, none of this type is in existence.

Any manufacturer or salesman who does not state the limitations of carbides, as well as their advantages, is doing carbides harm and also misleading his customers.

All the above is only one man's opinion, and the only justification of airing it is the fact that the writer has had more than 40 years' experience in the machine shop.

Before turning off the faucet that controls the flow of words, I wish to call attention to a few facts more or less related. One is that three carbides vary slightly from most others. First, the all-tungsten extra-dense carbides are somewhat higher priced but will probably last longer. Second, the carbides designed for steel which do have a slightly higher tensile strength also have a better edge strength. Third, the 90 per cent tantalum carbides really have a lower co-efficient of friction.

Today many men of prominent concerns are working on the problem of attaining better tensile strength by means of binders other than cobalt. High-speed steel in powder form has been suggested. To have carbides with their only weak spot removed would result in an exceptionally outstanding cutting tool.

New Extinguisher Seal Warns of Tampering

A new type Safety Seal to prevent fire extinguisher tampering is being offered by General Detroit Corp., 2272 East Jefferson, Detroit 7, to fit all standard type extinguishers. Constructed of heavy water-repellent stock, the seal is made in three standard designs.

Foam and soda-acid extinguishers are protected by a stitched envelope which slips snugly over the hose and fastens around the control valve. Vaporizing-liquid extinguishers are fitted with two caps, one covering the pump end and the other protecting the nozzle. Carbon-dioxide extinguishers are guarded by a cup-type envelope which fastens tightly over the nozzle horn. All protective envelopes or caps are held securely in place by a tamper-proof wired seal. The envelope cannot be removed or the extinguisher used without breaking the seal.

How to get

TOOLS THAT OPEN THE DOOR

to Increased Output Per Machine . . .

IN MOST PLANTS, machine and press speeds are continually checked. But still another way to get more output is to *make a study of machine shutdown time caused by premature tool failure.*

And your tool room is the place to *start* the job of eliminating much of the time spent repairing, regrinding or replacing tools.

In thousands of plants, Carpenter is helping to get at the *causes* of these delays. Through the Carpenter Matched Set Method a definite *system* is provided for picking the proper tool steel for each job.

But Carpenter's aid to tool steel users includes more than help in the selection of the proper tool steel. For example, the Tool Steel Manual shown here can be used to simplify heat treatment and do a trouble-shooting job in your tool room. And of course, your nearby Carpenter representative is ready to give you the benefit of his diversified experience with tool steel problems. Get in touch with him.

Put this Printed Help to Work on Your Problems!

This 167-page Manual contains an 80-page Tool Index and Steel Selector, alphabetically indexed by kinds of tools. A flip of the pages guides you to the proper steel for each tool—and then you find simple and complete heat treating instructions. Free to tool steel users in the U. S. A.

The Carpenter Steel Co., 139 W. Bern St. Reading, Pa.

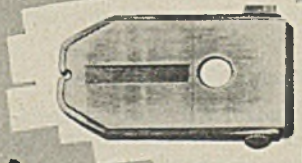
HOW THE MATCHED SET METHOD WORKS

For Greater Toughness He Followed the Diagram

THE JOB: Piercing slots in 14 gauge hot-rolled steel—at 1,200 pieces per hour.

PROBLEM: The piercing die would break after about 2,500 pieces. Heat treatment and hardness were OK, so the Superintendent checked the Carpenter Matched Set Diagram for a steel with greater toughness. He found that *Carpenter R. D. S.* was the steel best suited for the job. And here are the results:

1. Tool life increased from 2,500 to 1,000,000 pieces.
2. Production up 39,400 pieces per month, by eliminating 33 hours of tool-caused idle press time.



Better Wear Resistance Gave Longer Tool Life!

THE TOOL: A cut-off blade for shearing ball bearing slugs.

PROBLEM: Tool life was too short, causing frequent replacement and much wasted time. A tool steel with maximum wear resistance was indicated.

SOLUTION: The solution was easy with the Matched Set Diagram on the job. The Tool Room Superintendent selected *Carpenter Hampden* for the job. And with *Hampden*, shutdown time decreased and production per tool was increased 30%.

Carpenter MATCHED TOOL STEELS

How Do You Specify Steel.....

PET ANALYSIS or PERFORMANCE

By GRESWOLD VAN DYKE
Manager, Special Steels Department
Joseph T. Ryerson & Son Inc.
Chicago

FOR MANY YEARS, steel users have been endeavoring to specify alloy steels on ever narrowing analysis ranges. Steel producers have constantly improved their manufacturing methods in an effort to meet this demand. In all probability, however, it would be very difficult to operate on a commercially sound basis and produce composition ranges more narrow than those in use today.

The performance of steel is governed in the main by its analysis. Performance may be defined as the behavior of steel in relation to machinability, response to heat treatment, required physicals and other characteristics. Uniformity of performance is a desirable characteristic of any industrially used product. Therefore, the specifying of close analysis control has as its objective the procurement of steel which will be uniform in performance.

The control of steel performance by the analysis method is difficult, because all elements entering into the composition of steel have a plus or minus effect on its performance and therefore, such control involves the accurate manipulation of all these elements by the steel maker.

Steel Within Chemical Limits

In many standard steel analysis specifications, some elements are controlled by top limits, such as phosphorus and sulphur. Other elements are controlled by both top and bottom limits, such as carbon, manganese, silicon, nickel, chromium, molybdenum, etc. This means that the steelmaker's first consideration is to produce steel which is within the chemical limits. Under such a condition he cannot be also restricted by a performance specification because the purchaser of the steel has taken upon himself the responsibility of performance, provided that the steelmaker meets the chemical analysis which he has demanded.

If the steel producer knew the performance requirements of an application and was told the type of steel preferred, then he could work to the performance requirements of the customer, provided that he was given reasonably wide leeway in chemical analysis.

The scarcity of alloying elements caused by war conditions rendered necessary the development of entirely new low alloy content steels to take the place of steels previously used which contained high percentages of alloys.

There was not sufficient time to check these steels by commercial use and therefore a method had to be adopted to evaluate their performance ability by a test that could be quickly and accurately made. This problem was solved by the use of the Jominy end-quench hardenability test, which has been applied in a sufficient number of cases to indicate its reliability in predicting how the steel would perform in standard or commercial applications.

Evaluated on Performance

The work done along these lines in connection with the NE (National Emergency) steels has started the idea of specifying steels on a performance basis rather than on a chemical analysis basis. Purpose of this article is to cover some of the high points of this subject and to suggest how it might be applied to actual commercial practice.

This method of specification of steel is making considerable headway and probably will be an important factor in the selection and purchase of steel in the future.

Most alloy steels are subjected to some form of heat treatment before being put to use. Therefore, it is necessary that such steels be purchased with as accurate knowledge as possible of their ability to respond to heat treatment, or as it is more frequently called, their "hardenability."

The hardenability of steel is principally controlled by its analysis. The surface hardness as developed by quenching is, in the main, controlled by the carbon content and the depth of penetration of hardness is largely controlled by the alloy content of the steel as well as the inherent grain size.

There are other factors, difficult to identify, which have an effect on the hardenability of steel. This is evidenced by the fact that two steels of almost identical composition and grain size will have different hardenabilities. This individuality of a specific heat of steel, which enables it to harden to a greater extent than other heats of similar or almost identical composition, is very hard to define, and impossible to specify in terms of analysis or any other controllable factor.

Usually steel is purchased for certain requirements, and certain degrees of hardenability are necessary to make it suitable for the application for which it is purchased. It would seem, therefore, that the logical way to specify the steel would be on the basis of its hardenability rather than going at this objective by the indirect route of specifying analysis and grain size.

History Repeats: There is nothing new about this method of buying steel to a hardness specification. In the early days of steel and before chemical analysis was understood or used, steel was actually sold on a hardenability basis. The old methods of manufacture were imperfect and not subject to close control.

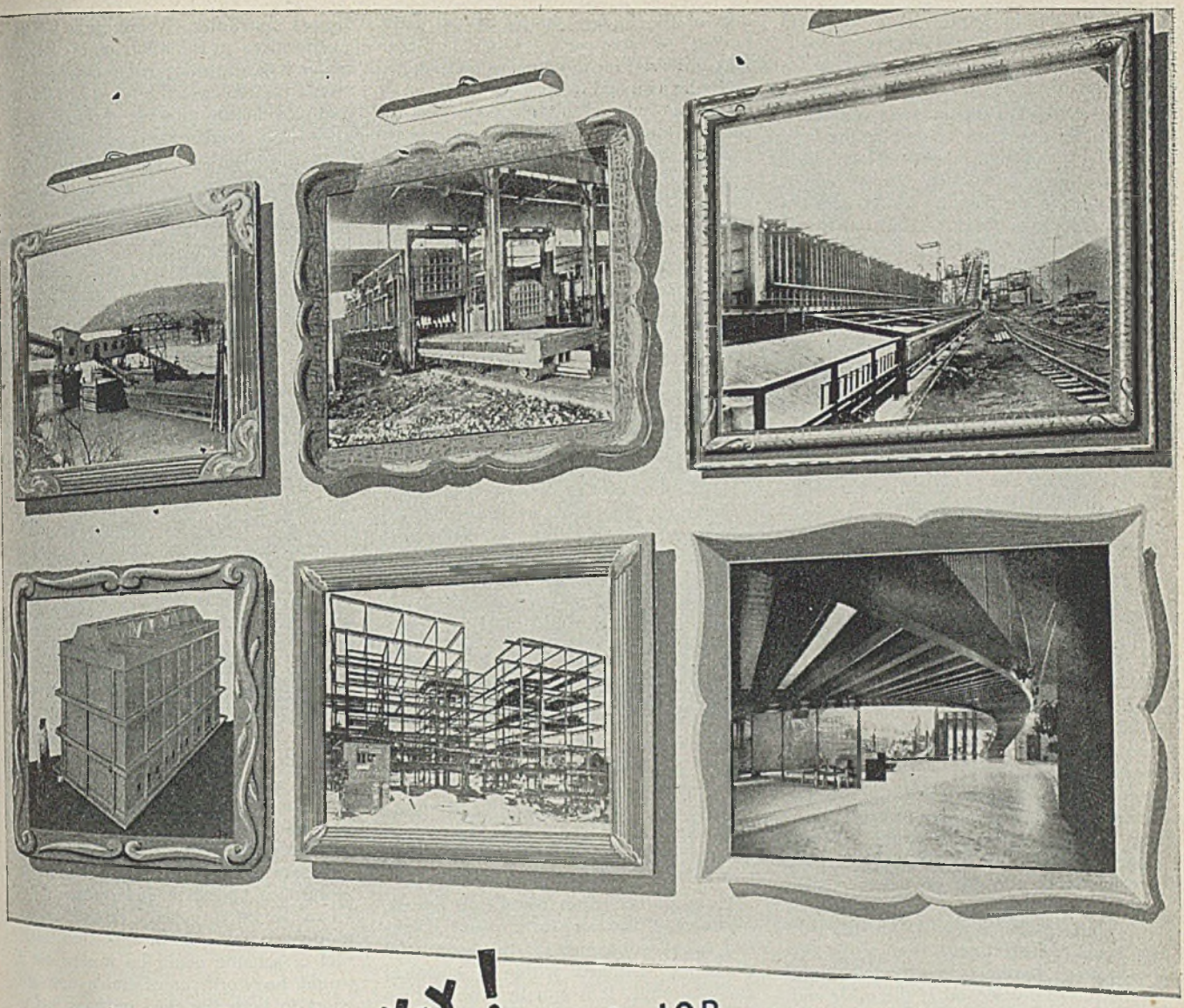
Sold on Hardenability Basis

It was impossible for the steelmaker to predict just how a certain batch of steel would harden before he had actually tested it. For this reason, steel was sold on the basis of hardenability after being tested. Chemical composition, grain size, and the other factors which govern hardenability were not understood, and the final test, therefore, controlled the classification of the product and, in all probability, the price.

Experience Lends a Hand: If the analysis and grain size of a certain heat of steel is submitted to a well posted metallurgist, he can, by calling on his past experience, make a very good guess at the physical properties which will be secured from the steel by a certain type of heat treatment.

If the physical requirements of the job are not too exacting, such a metallurgical prognostication may be satisfactory. If, on the other hand, rather accurate heat treatment is necessary, then the only method of determining the suitability of the steel and heat treatment will be by actual test, which involves considerable time and expense. It is possible that steel bought to a certain chemical specification might prove unsatisfactory for a particular application after the tests had been made.

A more logical method of specifying alloy steels would be to first select a certain *type* of steel; and then instead of specifying the exact chemical com-



Yes, we're meeting war-time emergencies every day. Whether it's fabricating steel for furnaces, coke-ovens, tipples, bridges, buildings, conveyors, chutes, hoppers, washeries, soaking pits, or special welded or riveted construction . . . we can do the job.

By utilizing our own large warehouse stocks we save vital delays . . . perhaps we're just the outfit you're looking for.

THE LEVINSON STEEL CO.

33 PRIDE ST., PITTSBURGH, PA.

position, simply require that the steel have a *certain specified degree of hardenability;* which is, of course, also a measure of strength.

This method of procurement would not necessarily mean any change in the type of alloy steel being used. Thus: If a manufacturer had been using AISI-A 3140 steel in the past, he would continue to specify "AISI Type A-3100" but would specify the hardenability instead of a full analysis range.

Prior to the advent of the Jominy end-quench hardenability method, hardenability tests took considerable time and were expensive and most manufacturing plants lacked the necessary equipment to conduct them properly.

The Jominy Test

The Jominy test is simple, easy to conduct and remarkably accurate in its results. A sample of the steel being tested is machined to approximately 1 inch in diameter and 4 inches long. The sample is heated to the proper quenching temperature for that steel. It is then placed in a fixture and quenched with a jet of water that *only comes in contact with the end of the sample.*

Result is that the sample is cooled very rapidly at one end and very slowly at the other end. In between these two extremes, all practical rates of quenching are applied to the sample. The rate of quenching is the major factor governing the physical properties secured from heat treatment, and by making hardness test along the length of the quenched Jominy sample it is possible to determine how the steel behaves at different quenching rates ranging from about 600 degrees per second at the quenched end to 4 degrees per second at the other end.

Laboratory tests have indicated how rapidly different sized bars cool at the surface, half radius and center in both water quenching and oil quenching. A tabulation of these cooling rates is shown in Table I.

From Table I it is easy to determine how fast any particular part will cool by whatever method of quenching is to be used. In order to check the effect of this quench on the part being heat treated, it is only necessary to observe the hardness of the Jominy sample at the point having the same cooling rate. The hardness observed on the Jominy sample can safely be assumed to very closely approximate that which will be developed on the heat treated work *having the same cooling rate.*

The advantages of such a method of specification can be illustrated by the following example: Assume that based on past experience the steel selected for a certain application was AISI-A 3135. If the quantity involved is sufficient, two heats might be shipped from the producing mill. These two heats might have the analysis listed in Table II as heat A and heat B.

It should be noted that both of these heats fall within the published analysis limit of AISI-A 3135. Obviously there would be considerable difference in the hardenability of the two steels, particularly in the depth of hardness penetration. It is quite possible to imagine that the heat A might be too low or heat B too high in hardenability for the application for which they are purchased, although they both would meet the specification AISI-A 3135, with grain size 5 to 8.

Allow for Production Variation

Had these steels been ordered as Type-A 3100 and specified with reasonable hardenability range known to be suitable for the application, both heats could be applied and satisfactory results secured without change in the heat treatment.

It must be remembered, of course, that no mill can melt to an exact chemical specification and for this reason all steels are specified within a chemical analysis range. It is equally true that no mill could produce steel to an exact hardenability specification. Therefore, a hardenability range must be selected which will allow for normal production variation. If a reasonable hardenability range was specified and if the mill were not confined to a specific analysis range, they would probably have a better chance of furnishing a satisfactory product on the hardenability basis.

In carrying the idea of specification of alloy steel on a hardenability basis to a logical conclusion, it might be possible to speculate on the adoption of about 12 major standard alloy compositions which would be similar to the types in Table III and would apply to most of the structural alloy steel tonnage now produced.

In these 12 suggested steel types the range of alloying elements would be considerably broader than those now used in specifying alloy steel. Carbon, of course, would be eliminated from the specification entirely and a simple system of letters or numbers could be adopted to identify the different analysis types.

If a quick hardenability test could be made on a heat of steel before tapping, then by furnace or ladle additions the steel could be brought to the proper hardenability range and the inconvenience and expense of off heats would be materially reduced.

Testing Cast Sample

This idea may be reaching rather far into the future, but sufficient experimental work has been done to indicate that very interesting results can be secured from a cast sample by the Jominy method and that the results so obtained correspond very closely to those secured from finished bars of the same heat.

The time element required for making the Jominy hardenability test on a cast sample and the rate of loss of oxidizable hardening elements, such as chromium and manganese, would have to be closely coordinated so that the method would introduce some very interesting problems in furnace operation and control. There seems to be a general thought among producers and users of alloy steel that if such a scheme could be worked out it would be worth considerable time and effort to both the steel producer and to the user.

In order to pass on to our customers the advantage of hardenability information, we are now conducting Jominy hardenability tests on each heat of alloy steel as it comes from the producing mill.

From our tests, we prepare a chart showing the Jominy hardenability results of the heat in the "as quenched" condi-

(*Please turn to Page* 125)

TABLE I—COOLING RATE OF ROUND BARS

Quench Media	1" Rd.	2" Rd.	3" Rd.	4" Rd.	Position
	—Degrees Fahrenheit Per Second—				
Water	850	550	400	100	Surface
Oil	120	58	30	15	
Water	135	46	27	14	½ Radius
Oil	53	24	12	6½	
Water	100	32	15	8	Center
Oil	45	18	9	5½	

TABLE II—ANALYSES OF TWO HEATS

	Heat "A"	Heat "B"
Carbon	0.34	0.38
Manganese	0.62	0.76
Silicon	0.22	0.34
Nickel	1.15	1.40
Chromium	0.57	0.74
Grain Size	No. 8	No. 5

TABLE III—SUGGESTED MAJOR ALLOY COMPOSITIONS

Alloy Steel Composition	Suggested Identification
Nickel:	N-1
Type 2300	N-2
Type 2500	
Chromium:	C-1
Type 52000	
Molybdenum:	M-1
Type 4000	
Chromium Nickel:	CN-1
Type 3100	CN-2
Type 3200	
Chromium Molybdenum:	CM-1
Type 4100	
Nickel Molybdenum:	NM-1
Type 4600	NM-2
Type 4800	
Nickel Chromium Molybdenum:	NCM-1
Type 9400	NCM-2
Type 8700	NCM-3
Type 4300	

History relates that when Faraday demonstrated electricity to Gladstone, the great statesman remarked, "But what earthly good is that?" . . When Bell's invention of the telephone was reported to U. S. Grant, the general observed, "But what could it ever be good for?"

GLADSTONE and Grant once went into business together. Combining the happy qualities of diplomacy and aggression, they soon did a right brisk business in such staples as ear trumpets, harness and sundries.

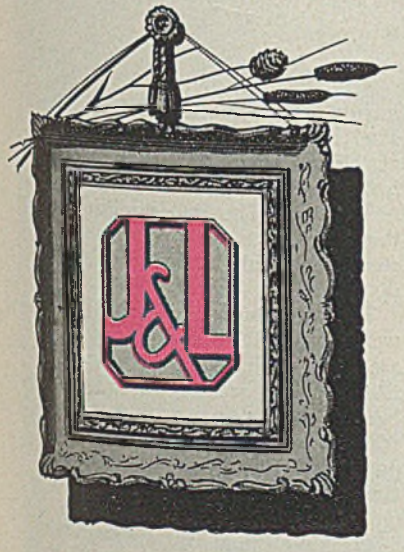
They had two bright young fellows working for them named Mike Faraday and Alex Bell, and if ever a company should have gone to town, it was G. G. & Co. For it seems that Mike had been tinkering with harness for a new kind of horsepower, while Alex had invented a new kind of hearing aid . . . but they couldn't interest the management in the future of these things.

So Mike and Alex left and went into business for themselves, and they've been doing nicely ever since. While Gladstone, Grant & Co. stayed in harness and tin hearing aids, and folded like a tent in a heavy wind.

★ ★ ★ ★ ★

There's a point to this little fable: Today there are many promising businesses — in the hands of capable management — that are also going to fold like tents when the post-war trade winds blow.

The success of many businesses after this war will depend upon the planning that is being done now. On any problems involving the use of precision machine tools, we urge you to call upon our engineers — as many of America's leading companies have been doing for more than a century. Call upon them now!



Universal Turret Lathes . Fay Automatic Lathes . Automatic Thread Grinders . Optical Comparators . Automatic Opening Threading Dies

JONES & LAMSON MACHINE CO., SPRINGFIELD, VERMONT, U.S.A.

Profit-producing Machine Tools

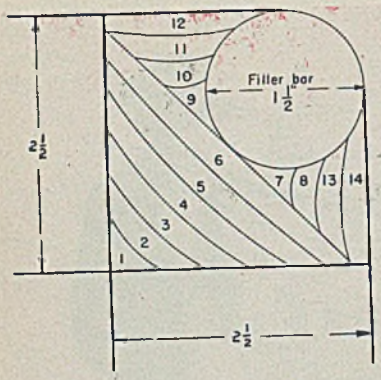
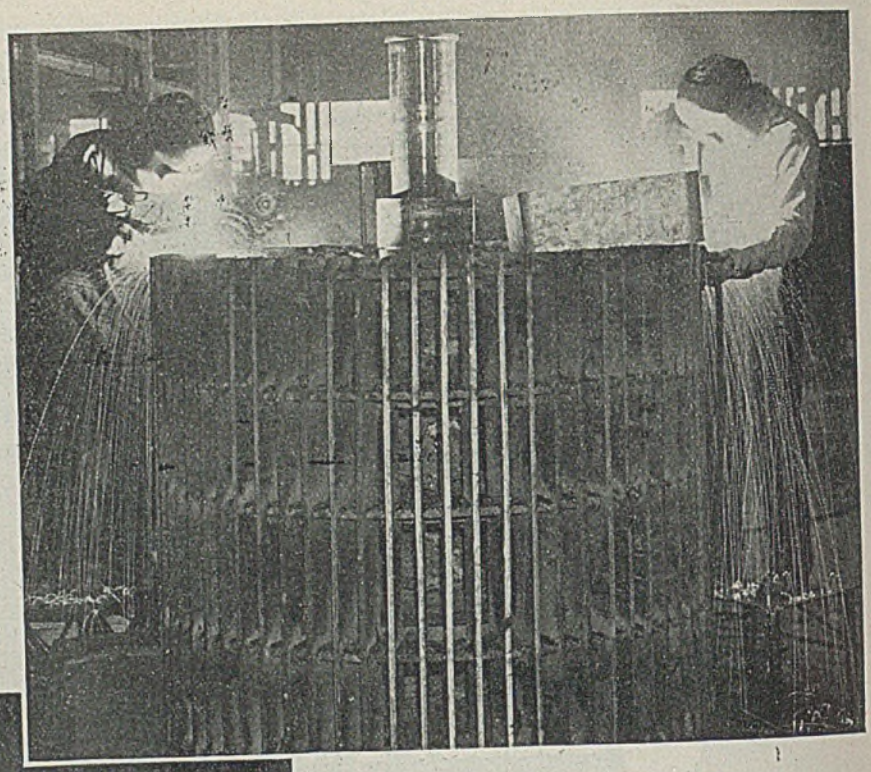


Fig. 1. (Above) — Sketch to show location of filler bar used in large fillet welds to reduce welding time and amount of weld metal needed. Photos from General Electric Co., Schenectady, N. Y.



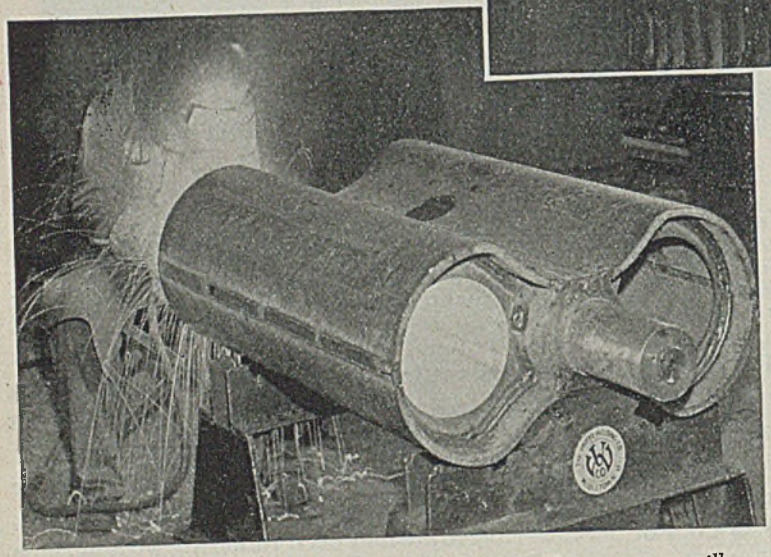


Fig. 2 (Upper right)—Fabricating a beater roll for a paper mill, using alternating-current welding

Fig. 3 (Above)—Welding an impeller for a marine pump, using a home-made jig

COMPLICATED ASSEMBLIES

. . . are welded easily with alternating-current machines

By LOUIS T. KENNEDY
Vice President, General Manager
And
EDWARD WENZEL
Superintendent
United Welding Co.
Middletown, O.

WHEN alternating-current welding machines were first installed in the plant of United Welding Co., Middletown, O., some difficulty was encountered in getting the operators to use them. Now, however, these welders are the only machines the operators want to use because they find that the characteristics of the alternating-current arc eliminate many of the problems formerly encountered with direct-current welding.

Our experience, backed up by production records, shows that the alternating-current welders give us faster, easier welding and better quality work. Ever since they were installed, the alternating-current welders have been operating on a duty factor of better than 50 per cent.

The extensive line of arc welded products made in this plant ranges from small generator parts weighing about 2 pounds each to large press frames weighing many tons. Practically all of our welding is done with 500-ampere alternating-current welders, although some miscellaneous work such as tacking is still done with motor-generator sets.

A large part of our work is based on new developments to take advantage of the light weight and production speed of arc-welded construction. For example, the large beater roll for paper mill service, shown in Fig. 2, is fabricated by arc welding in considerably less time than the former construction using a cast spider. The all-welded assembly provides greater draft and practically eliminates bar maintenance.

The diameter of the beater roll is 61 inches. It is fabricated from 62 mild steel bars welded longitudinally around its circumference. Each of these bars is 54 inches long, 5 inches wide and ⅝-inch thick. The spider which supports the structure is made up of ¾-inch mild steel stock and the hub is 1½ inches in diameter.

The advantages of alternating-current welding with its freedom from arc-blow are particularly noticeable when welding this assembly because of the large number of corners. A total of more than 6200 inches of ⅜-inch fillet welds are required and at no point are the operators troubled by magnetic disturbance of the arc.

We have found that distortion due to heating can be held to a minimum by having two operators work opposite each other at all points in the process of fabrication, as shown in Fig. 2.

Another important use of welded con-

(*Please turn to Page* 124)

What's Behind the Trade Mark?

QUALITY

TRADE MARK

YOUNGSTOWN

SERVICE

Strength for a National Emergency

IN the period of World War I, The Youngstown Sheet and Tube Company "came of age."

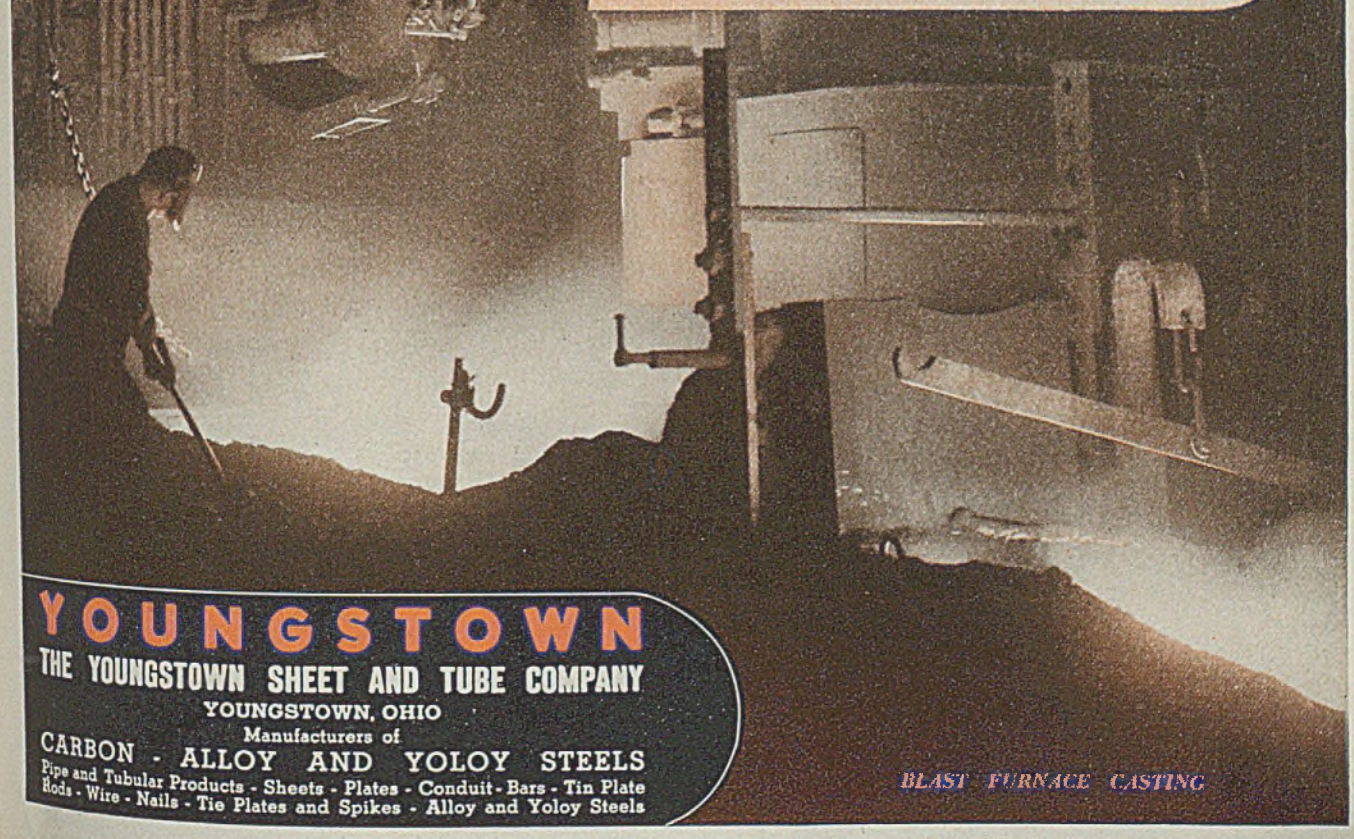
1915 began in depression--with fear and uncertainty at home and abroad. But that courage and vision which built Youngstown into a $20,000,000 corporation in 15 years, now brought a 50% increase in capital stock and a huge construction program. The next three years saw a modern, integrated plant completed--3 new open hearths, another blast furnace, batteries of coke ovens, additional finishing mills, new laboratory, hospital, works office building, hundreds of homes for employees. When war ended, nearly $39,000,000 of stockholders' money had been plowed into plant and facilities.

The decision to expand was timely. French and British orders came with a rush in mid-1916. After April 1917, America and her Allies demanded and received every possible pound of steel to win the war.

In those events we see a familiar pattern--tremendously increased production, labor scarcity, high wages, taxes taking 80% of profits. But fortunately the American system of private enterprise was enabling Youngstown to earn good profits--sufficiently high to pay off all its bonded indebtedness, to pay generous dividends to stockholders and to fortify itself with reserves which enabled it and its employees to survive the lean early '20's.

Free enterprise, which made the steel industry strong, won that war for America and democracy, and built the business system on which we must depend for national survival today

Historical Series - - - No. 7



BLAST FURNACE CASTING

YOUNGSTOWN

THE YOUNGSTOWN SHEET AND TUBE COMPANY

YOUNGSTOWN, OHIO

Manufacturers of

CARBON - ALLOY AND YOLOY STEELS

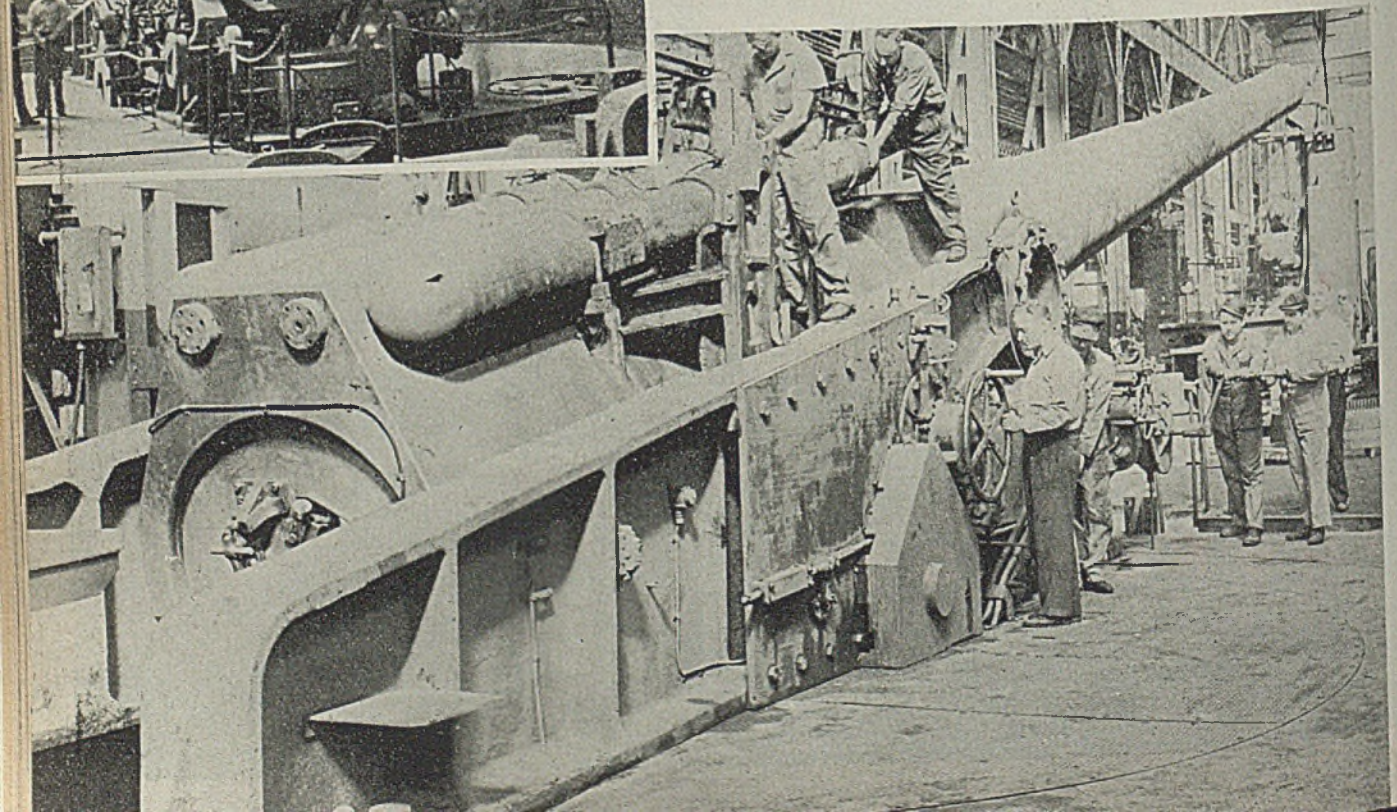
Pipe and Tubular Products - Sheets - Plates - Conduit - Bars - Tin Plate
Rods - Wire - Nails - Tie Plates and Spikes - Alloy and Yoloy Steels

Large Castings SUPPORT 16-INCH GUN

STEEL castings comprise a large part of the huge barbette carriages and stands required to support the barrel of 16-inch guns being built for coast defense purposes. Carriages for these guns—the largest in use by our armed forces—are being built at the Akron, O., plant of Wellman Engineering Co., Cleveland, designers and manufacturers of materials handling machinery, cranes and steelworks equipment.

This type of gun is intended for permanent emplacement in which traverse of the barrel is accomplished by revolving the entire carriage. Heavy ordnance of this sort, able to hurl a 1-ton projectile more than 25 miles, has been employed for a number of years for defense of strategic coastal points and has been made still more effective by latest developments in fire control. Such developments permit a long-range gun to pick out a floating target quickly and accu- (*Please turn to page* 126)

Left—Steel castings comprise large part of 250-ton carriage of huge coast defense guns. (Below)—Principal supporting members of barrel and cradle are two cast steel side frames weighing about 20 tons apiece. Normally power-operated, traversing and elevating mechanism can be operated by hand without difficulty



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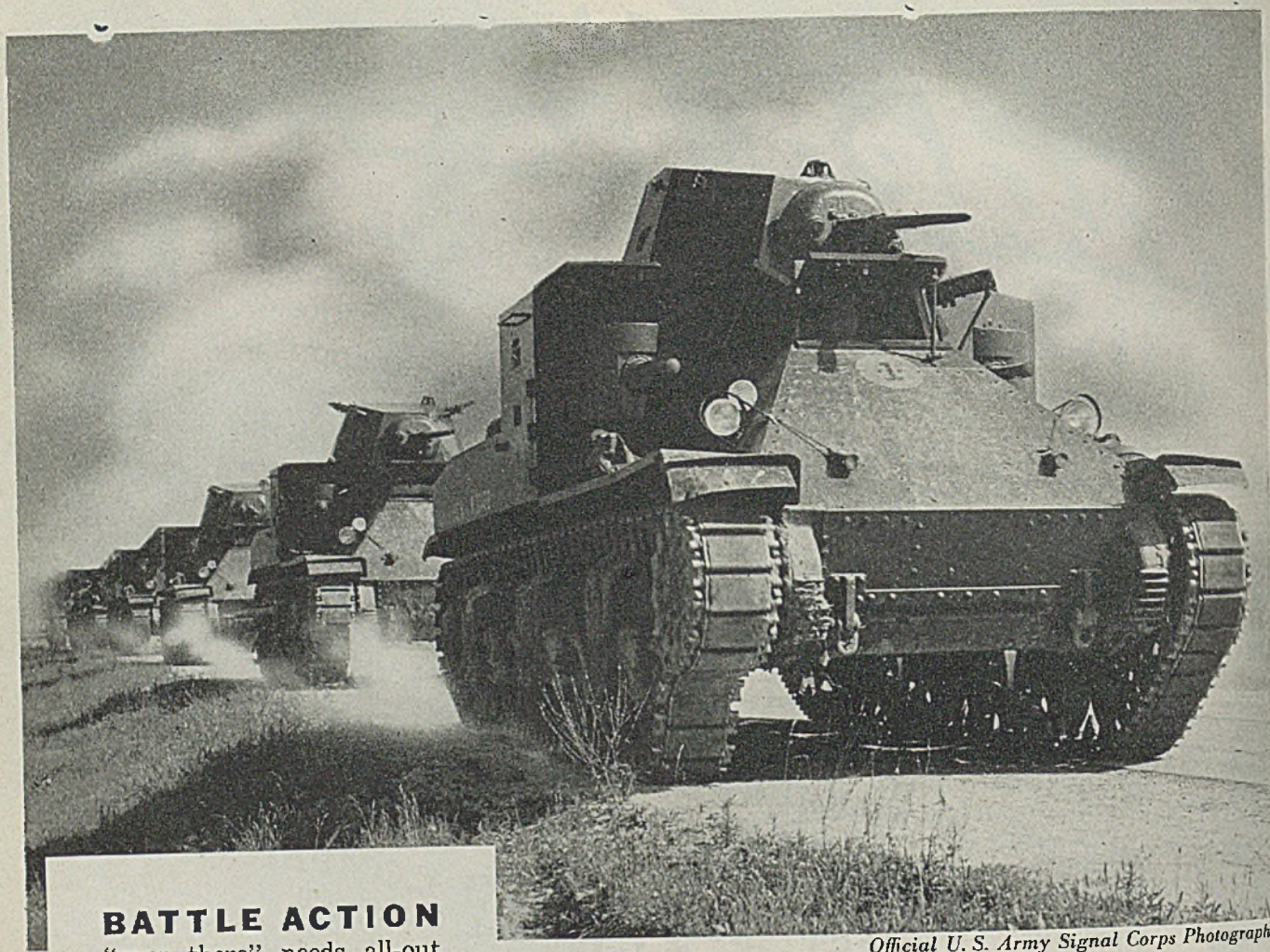
NORTHWEST



Official U. S. Army Signal Corps Photograph

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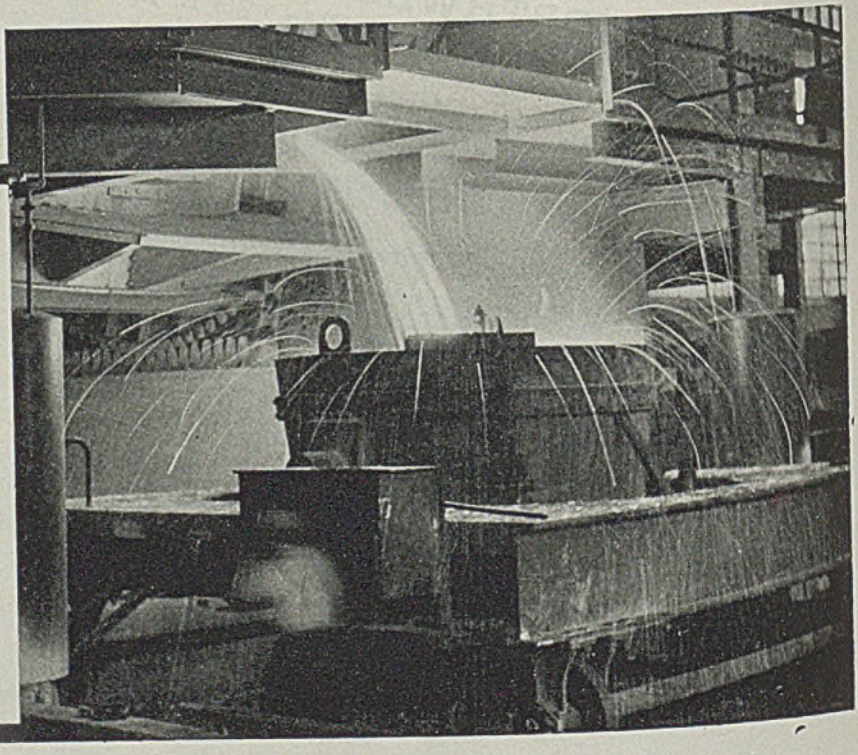

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CARBON-MANGANESE STEELS

	C	Mn	Si
NE-1330	0.28-0.33	1.60-1.90	0.20-0.35
NE-1335	0.33-0.38	1.60-1.90	0.20-0.35
NE-1340	0.38-0.43	1.60-1.90	0.20-0.35
NE-1345	0.43-0.48	1.60-1.90	0.20-0.35
NE-1350	0.48-0.53	1.60-1.90	0.20-0.35

NICKEL-CHROMIUM-MOLYBDENUM STEELS

	C	Mn	Si	Cr	Ni	Mo
NE-8613	0.12-0.17	0.70-0.90	0.20-0.35	0.40-0.60	0.40-0.70	0.15-0.25
NE-8615	0.13-0.18	0.70-0.90	0.20-0.35	0.40-0.60	0.40-0.70	0.15-0.25
NE-8617	0.15-0.20	0.70-0.90	0.20-0.35	0.40-0.60	0.40-0.70	0.15-0.25
NE-8620	0.18-0.23	0.70-0.90	0.20-0.35	0.40-0.60	0.40-0.70	0.15-0.25
NE-8630	0.28-0.33	0.70-0.90	0.20-0.35	0.40-0.60	0.40-0.70	0.15-0.25
NE-8635	0.33-0.38	0.75-1.00	0.20-0.35	0.40-0.60	0.40-0.70	0.15-0.25
NE-8637	0.35-0.40	0.75-1.00	0.20-0.35	0.40-0.60	0.40-0.70	0.15-0.25
NE-8640	0.38-0.43	0.75-1.00	0.20-0.35	0.40-0.60	0.40-0.70	0.15-0.25
NE-8642	0.40-0.45	0.75-1.00	0.20-0.35	0.40-0.60	0.40-0.70	0.15-0.25
NE-8645	0.43-0.48	0.75-1.00	0.20-0.35	0.40-0.60	0.40-0.70	0.15-0.25
NE-8650	0.48-0.53	0.75-1.00	0.20-0.35	0.40-0.60	0.40-0.70	0.15-0.25
NE-8720	0.18-0.23	0.70-0.90	0.20-0.35	0.40-0.60	0.40-0.70	0.20-0.30

SILICON-MANGANESE AND SILICON-MANGANESE-CHROMIUM STEELS

	C	Mn	Si	Cr
NE-9255	0.50-0.60	0.70-0.95	1.80-2.20	.....
NE-9260	0.55-0.65	0.70-1.00	1.80-2.20	.....
NE-9261	0.55-0.65	0.70-1.00	1.80-2.20	0.10-0.25
NE-9262	0.55-0.65	0.70-1.00	1.80-2.20	0.25-0.40

MANGANESE-NICKEL-CHROMIUM-MOLYBDENUM STEELS

	C	Mn	Si	Cr	Ni	Mo
NE-9415	0.13-0.18	0.80-1.10	0.20-0.35	0.30-0.50	0.30-0.60	0.08-0.15
NE-9420	0.18-0.23	0.80-1.10	0.20-0.35	0.30-0.50	0.30-0.60	0.08-0.15
NE-9422	0.20-0.25	0.80-1.10	0.20-0.35	0.30-0.50	0.30-0.60	0.08-0.15
NE-9425	0.23-0.28	0.80-1.10	0.20-0.35	0.30-0.50	0.30-0.60	0.08-0.15
NE-9430	0.28-0.33	0.90-1.20	0.20-0.35	0.30-0.50	0.30-0.60	0.08-0.15
NE-9435	0.33-0.38	0.90-1.20	0.20-0.35	0.30-0.50	0.30-0.60	0.08-0.15
NE-9437	0.35-0.40	0.90-1.20	0.20-0.35	0.30-0.50	0.30-0.60	0.08-0.15
NE-9440	0.38-0.43	0.90-1.20	0.20-0.35	0.30-0.50	0.30-0.60	0.08-0.15
NE-9442	0.40-0.45	1.00-1.30	0.20-0.35	0.30-0.50	0.30-0.60	0.08-0.15
NE-9445	0.43-0.48	1.00-1.30	0.20-0.35	0.30-0.50	0.30-0.60	0.08-0.15
NE-9450	0.48-0.53	1.20-1.50	0.20-0.35	0.30-0.50	0.30-0.60	0.08-0.15
NE-9537	0.35-0.40	1.20-1.50	0.40-0.60	0.40-0.60	0.40-0.70	0.15-0.25
NE-9540	0.38-0.43	1.20-1.50	0.40-0.60	0.40-0.60	0.40-0.70	0.15-0.25
NE-9542	0.40-0.45	1.20-1.50	0.40-0.60	0.40-0.60	0.40-0.70	0.15-0.25
NE-9545	0.43-0.48	1.20-1.50	0.40-0.60	0.40-0.60	0.40-0.70	0.15-0.25
NE-9550	0.48-0.53	1.20-1.50	0.40-0.60	0.40-0.60	0.40-0.70	0.15-0.25

CARBON-CHROMIUM STEELS

	C	Mn	Si	Cr	Ni	Mo
NE-52100A	0.95-1.10	0.25-0.45	0.20-0.35	1.30-1.60	0.35 max.	0.08 max.
NE-52100B	0.95-1.10	0.25-0.45	0.20-0.35	0.90-1.15	0.35 max.	0.08 max.
NE-52100C	0.95-1.10	0.25-0.45	0.20-0.35	0.40-0.60	0.35 max.	0.08 max.

Manganese Content of Three NE Steels Is Changed

Effective Sept. 20, 1943, the American Iron and Steel Institute, New York, announced that the manganese content of NE-9260, NE-9261 and NE-9262 should read 0.70/1.00 per cent instead of 0.75/1.00 per cent as previously listed.

The correct and latest listing of NE steels appears in the accompanying table which supersedes that published in STEEL of Sept. 6, 1943, p. 112.

For information on development of NE steels and data on their properties, see STEEL, Feb. 9, 1942, p. 70; March 16, p. 72; June 8, p. 66; June 15, p. 66; July 13, p. 80; July 20, p. 86; Aug. 3, p. 70; Aug. 17, p. 40; Aug. 31, p. 41 and 76; Sept. 7, p. 78; Oct. 19, p. 66; Nov. 9, p. 96; Dec. 28, p. 27; Jan. 25, 1943, p. 84; Feb. 22, p. 102; March 1, p. 94; March 8, p. 90; March 22, p. 78; March 29, p. 76; April 5, p. 116 and 118; Aug. 2, p. 100; Sept. 6, p. 112.

For reports from users of NE steels see Nov. 16, 1942, p. 106; Nov. 23, p. 90; Nov. 30, p. 62; Dec. 7, p. 112; Dec. 14, p. 99; Dec. 21, p. 70; Jan. 11, 1943, p. 60; Jan. 18, p. 66; Feb. 1, p. 100; March 8, p. 109; March 15, p. 96; March 29, p. 72; April 26, p. 84; June 7, p. 106; June 14, p. 98; June 21, p. 92; July 26, p. 88; Aug. 2, p. 94; Aug. 23, p. 107; Aug. 30, p. 66; Sept. 6, p. 106; Sept. 20, p. 120.

For list of NE CARBON steels, see March 8, 1943, p. 90.

For latest revised listing of AMS (Aeronautical Materials Specification) steels, see Aug. 9, 1943, p. 92. AMS nonferrous alloys are also listed there.

For details of WD (War Department) steels and complete listing, see Feb. 8, 1943, p. 80.

New Approach Used To Teach Stainless Welding

Allegheny Ludlum Steel Corp., Brackenridge, Pa., has covered the subject of welding stainless steels in a unique booklet in which the text is simple, concise and comprehensive, and a technique of illustrations in color come close to the efficiency of an animated cartoon film.

It strikes out along new lines to interpret the techniques commercially employed and the precautions to be observed in welding stainless steels by accepted processes. While these steels are admirably adapted to welding, they are vastly different from carbon steels, and welding methods for carbon steels must be modified to suit individual characteristics.

The net result is to place a premium on the stainless steel welder's knowledge of what to do and how to do it and also the basic reason why. To convey such breadth of information is difficult in words alone and in this booklet illustrations have been employed in an unusual way. Instead of flat photograph and sketches it employs full-color perspective drawings and diagrams of an unusual type to illustrate various work methods as well as physical and chemical phenomena which occur or must be prevented.

As a result unusual heights of clarity and educational value are attained. It is an elementary, practical instruction manual for the student or beginner and at the same time a complete technical explanation helpful to production men, engineers, designers or metallurgists engaged in problems of stainless steel fabrication or in process of becoming acquainted with these alloys.

Copies will be mailed on request to fabricators, students, workers or others interested in the subject.

Develops New Alkaline Aluminum Cleaner

A new alkaline solution which can be used to strip and clean aluminum without injuring its surface is announced by Technical Processes Division, Colonial Alloys Co., Philadelphia. The solution, known as Deox-Aluminum, is used as a dip. Coming in the form of salts, it is mixed with water and used at room or elevated temperatures, the aluminum object being immersed anywhere from 10 seconds to 1 minute.

The bath, according to the company, may serve both as an aluminum anodizing rack stripper and as a general cleaning method.

The procedure in using the solution or bath is to dip the aluminum into the solution until a gray uniform coat is deposited over the metal surfaces. Appearance of the film is a timing indicator to remove work from the bath. The gray coating is then rinsed and dipped into a solution of nitric acid, 30 to 50 per cent, at room temperature. This removes the coating and leaves the metal chemically clean. The attack on the aluminum surface is negligible, and very little metal is removed from the surface.

According to the company, the coating may be left on the aluminum, if desired, for it is galvanically protective to aluminum and acts as a paint base as well. It also prevents oxidation in the unpainted state and, in some cases, acts as a solder base.

PLATED Lead Coatings On Steel

Tests show lead coatings are effective in protecting steel from corrosion. Data presented here will help choose proper type of coating for each individual application. Information is included on corrosion of solid lead as well as corrosion of steel and other metals in contact with lead

By GUSTAF SODERBERG
Technical Director
Udylite Corp.
Detroit

THE MOST complete outdoor tests of lead coatings on steel were made in the industrial atmosphere of Woolwich, England. The lead was deposited in a perchlorate bath on panels of sheet steel. Nothing is said about how the panels were held during exposure, but one suspects a vertical position which is commonly used in England. The results are given in Table I.

This report is interesting for several reasons. While porosity existed in the 0.001-inch thick coating, the pores closed up or became filled and ineffective on continued exposure. Such apparent disappearance of pores did not take place in the thinner coatings. Thickness figures which fall in the neighborhood of 0.001-inch appear again in other references.

At present the author has a number of lead-plated panels exposed at 45-degrees facing south on a roof 200 to 300 feet from a railroad in Detroit. The plating was done in a lead fluoborate bath with glue as addition agent. Some rust appeared on panels with 0.00025-inch lead after 3 months, and after 6 months an average of 6 per cent of the top surfaces and 45 per cent of the bottom surfaces were rusted. After 10½ months the percentage rust was 7 and 73, respectively. Both top and bottom of the panels with 0.0005 and 0.001-inch lead were substantially free from rust after 10½ months.

For comparison it may be noted that a 0.0002-inch zinc coating prevented rust for about 7 to 8 months on another roof close to the one mentioned above.

Two processes take place on the surface of a lead-plated steel article when it is exposed to the weather: One is the corrosion of the lead coating itself; the other is the corrosion of the steel through pores in the coating. It is obvious that as the coating itself weathers away, more pores are opened up to the steel.

One may expect that the rate of weathering of the electroplated lead would be of the same order of magnitude as that of the solid lead. Data on the latter are available from several sources. The weight loss per unit area, all surfaces included, are shown as average decrease in thickness in Tables II and III.

To identify the atmospheres further some data on the dust which settled in the different locations during the time of the tests are given in Table IV.

It is evident that the atmosphere in all the English exposure sites were rather heavily contaminated. The amount of sulfur trioxide appears large enough that the corrosion products formed on the lead were probably always sulfates.

The excellent performance of the lead as compared to that of the zinc is notable in all locations except two of the American sites, Key West and Phoenix, both of which attack the zinc very slowly. Where corrosion is at all severe, the attack on the lead is definitely less than that on copper. Lead corrodes more slowly than nickel only in atmospheres high in sulfur trioxide.

One may conclude that lead coatings have greater tendency to protect the underlying iron electrochemically through pores in the coating in uncontaminated or seacoast atmospheres than in an industrial atmosphere. The presence of chlorides in industrial atmospheres seems to increase the protective ability of the lead (for example in Sandy Hook, N. J. and New York). In a strictly industrial atmosphere lead does not offer much, if any, electrochemical protection and may actually cause acceleration of the corrosion of the steel.

Nickel, copper and zinc also were tested for the sake of comparison. The results showed that while lead is more anodic than either nickel or copper, it is not by any means comparable with zinc in this respect.

It may be noted here that the porosity of the coating depends on the base metal and the structure of the lead deposit. Light burnishing and even scratch brushing assist in making thin lead coatings less porous while coatings as thin as 0.00012-inch have proved pore-free in ferricyanide tests, a thickness of 0.00035-inch may be considered as providing lasting rust protection, according to one investigator. Another investigator on the other hand speaks of 0.003 to 0.005-inch thickness of lead from well-controlled lead fluoborate baths as being necessary for complete freedom from porosity.

Indoor Atmospheric Exposure: With respect to indoor exposure, one worker exposed a number of lead-plated steel panels during the winter months in a small unheated building in Woolwich, England. The window was left partly open to the polluted and dusty outside air. During nights the samples were moved into a closed vessel containing a layer of water. With the overnight drop in temperature this ensured a damp condition on the metal surfaces.

The appearance after 6 months of the lead-coated samples (from perchlorate bath) and, for comparison's sake, of nickel, copper and zinc-coated specimen are given in Table V.

Unfortunately, no strictly comparative tests with solid lead are available. However, some indoor atmospheric tests were made in a basement in South Kensington, England, heated with steam radiators during the winter months while these tests were going on. The dew point was never reached. Results for lead and zinc are summarized in Table VI.

Here again the corrosion products of the lead show protective qualities while those of the zinc have no protective value (note the straight-line relation). The rate of corrosion of the lead is again very small relative to that of the zinc.

Under-Water Tests on Solid Lead: No published tests on the behavior of lead-plated steel under sea water have been formed. However one series of specimens was immersed for 4 years in the rapid tidal currents in the Bristol Channel, the time of immersion being 93½ per cent of the total exposure time. The second series was immersed for 3 years in the quiet, muddy, and oily waters of the Southampton Docks, England. In both cases the specimens were 2 feet long, 1⅛ inches in diameter solid rods, held horizontally in wooden frames. One inch on each end of the specimen was set in an "insulating" material, consisting of putty in the Bristol Channel tests and wax or tar in the Southampton Dock tests. Some rather deep pitting on the zinc specimen in the Bristol channel was ascribed to the action of the putty.

The results of these tests, recalculated to inch average penetration in 3½ years are shown in Table VII.

Considering our general knowledge of the porosity of lead coatings, these results indicate that lead coatings of the thicknesses covered by the new lead-plating specifications probably would not protect steel very long when immersed even in quiet sea water. Much heavier coatings would be required.

Lead-plated Steel in Contact with

From paper presented at meeting of American Society for Testing Materials, Philadelphia, June 28 to July 2, 1943.

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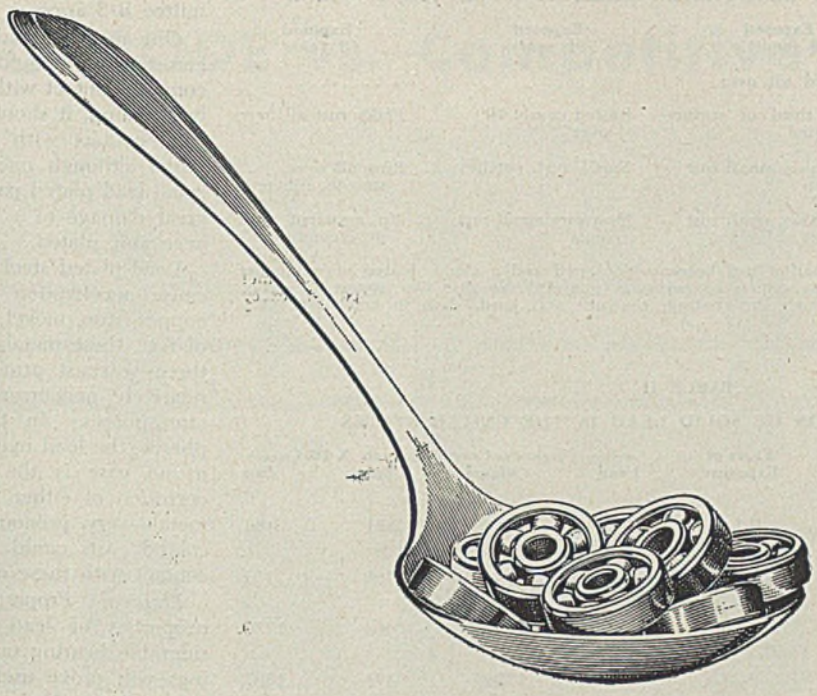

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THE FORGED STEEL BEARING

TABLE I

OUTDOOR CORROSION OF LEAD-PLATED STEEL AT WOOLWICH, ENGLAND

Thickness of Lead, Inch, Ave.	Exposed 6 months	Exposed 1 year	Exposed 3 years
0.0001	Rusted all over	.....	.....
0.00025	One third of surface rusted	Rusted nearly all over	Flaky rust all over
0.0005	Few very small rust spots	Small rust patches	Rust all over, smooth, adherent
0.001	Few very small rust spots	Few very small rust spots	No apparent rust, good conditions*

*Further comments—"The coating had become blackened and a slight degree of roughness had developed due to microscopic nodules of corrosion product. No rust was apparent, except at a scratch originally made through the coating; the rust was hard, dark in color and very localized."

TABLE II

OUTDOOR CORROSION OF SOLID LEAD IN THE UNITED STATES

Test Site Type of Atmosphere	Years of Exposure	Thickness Corroded, Inch X 10^{-6} — Lead	Nickel	Copper	Zinc
LaJolla, Calif. (foggy sea coast)	9.14	162	44	521	480
Key West, Fla. (seacoast)	8.78	217	47	199	151
Altoona, Pa. (industrial)	9.25	267	1520	464	1750
New York, N. Y. (industrial near seacoast)	9.38	167	1290	471	1897
State College, Pa. (rural)	9.27	189	62	228	358
Phoenix, Ariz. (desert)	3.85	95	12	54	46

TABLE III—OUTDOOR CORROSION OF SOLID LEAD IN ENGLAND

Type of Atmosphere	Exposure Site	Years	Thickness Corroded, Inch x 10^{-6} — Lead	Nickel	Copper	Zinc
Rural	Cardington	1	56	45	76	117
Suburban	Bournville	1	77	96	115	197
Urban	Birmingham	1	145	230	158	376
Urban	Birmingham	7	238	1323	644	1512
Industrial	Wakefield	1	74	218	156	261
Marine	Southport	1	70	111	148	199

TABLE IV—AMOUNT AND ANALYSIS OF DUST AT EXPOSURE SITES

Site	Monthly Deposit, grams per 100 square meters — Insolubles	Solubles	SO_3	Cl	NH_3 in Solubles
Cardington	141	274	51	17	2
Bournville	244	307	62	29	1
Birmingham	717	497	163	67	11
Wakefield	222	571	198	93	7
Southport	203	325	66	103	1

TABLE V—SEVERE INDOOR CORROSION OF LEAD-PLATED STEEL AT WOOLWICH, ENGLAND

Coating	0.00005-in. Thick Coating	0.0005-in. Thick Coating	0.002-in. Thick Coating	Effect of Scratch Through 0.00005-in. Coating
Lead	Numerous rust spots	Few faint rust spots	No rust, bluish color	Rusted
Nickel	Completely covered with rust	Numerous rust spots, greenish spots on nickel	Almost free from rust spots, greenish spots on nickel	Rusted
Copper	Almost completely covered with rust	Few faint rust spots	No rust, tarnished	Rusted
Zinc	Almost free from rust	No rust, darkened faint whitish spots	.....	Faint rust

Other Metals: Since the lead plating on steel probably has the same effect as solid lead, the data obtained by committee B-3 appears directly applicable.

One may conclude that under no circumstances should lead-plated steel come in contact with aluminum. Generally speaking, it should also be kept away from contact with zinc and zinc-plated parts, although one may expect that a small lead plated part would not do very great damage to a large part which has been zinc plated.

Lead-plated steel ordinarily would not cause acceleration of the corrosion of copper, iron, nickel, or tin. As a matter of fact, these metals are protected in the three seacoast atmospheres and in the relatively noncorrosive rural and desert atmospheres. In the industrial atmospheres, the lead may act either way, but in no case is the acceleration of the corrosion of either the lead or the four metals very pronounced. Hence, lead-coated parts could probably be used in contact with these metals with impunity.

Physical Properties: The physical properties of lead coatings have considerable bearing on whether such coatings will prove useful in any particular application. A short summary of these properties are, therefore, given here.

The melting point of lead is very low, 327.4 degrees Cent. (621 degrees Fahr.). The boiling point of lead is high, namely, 1613 degrees Cent. (2935 degrees Fahr.). White lead or lead-bearing fumes were not found in certain tests at 520 degrees Cent. (970 degrees Fahr.). Fumes of lead oxide are formed at a bright red heat. Since lead salts are very poisonous, care should be taken to avoid high-temperature applications.

It has been found that while a lead-coated steel sheet can be easily *spot welded* to plain steel, it cannot be spot welded to another lead-coated sheet. One can solder to lead-coated steel but only with some difficulty.

The *electrical conductivity* of lead is about 8.2 per cent of that of silver. Lead is used on certain *electrical contacts*, for example, in connection with storage batteries. While the lead corrosion products are poor conductors, they are fairly easily penetrated because of the softness of the underlying lead, and contact is established by sharp points.

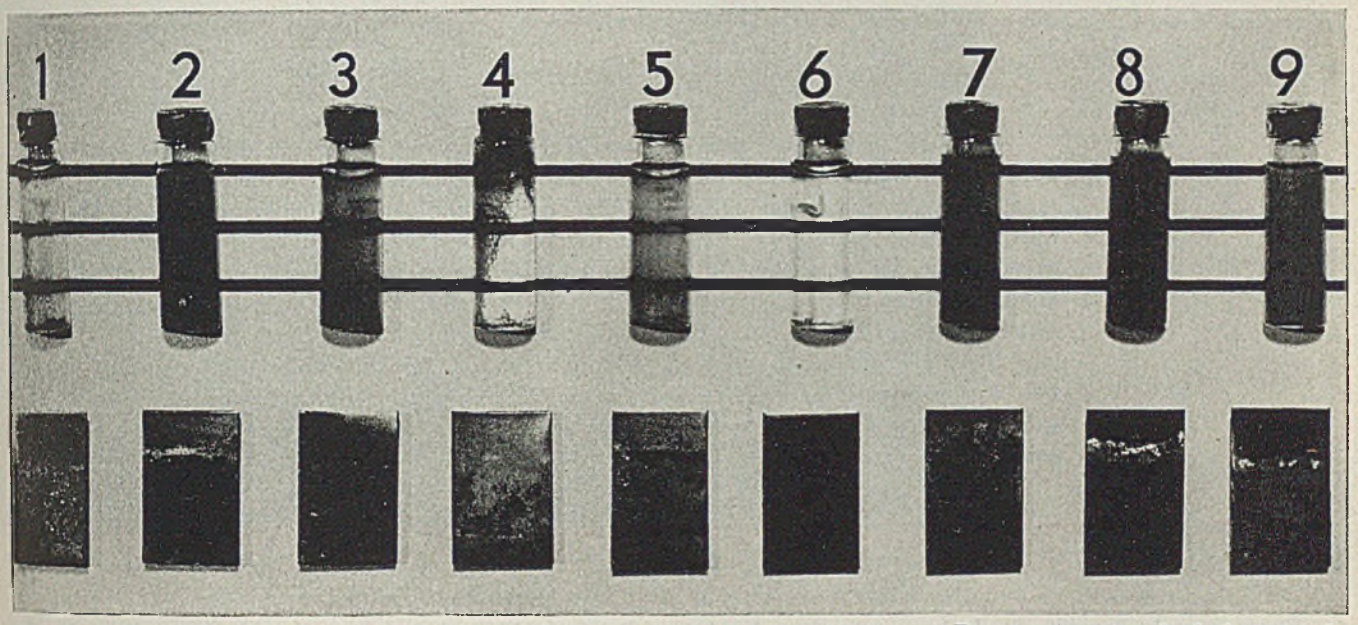
Next to thallium, lead is the softest of all the heavy metals. Brinnel *hardness* as low as 8 kilograms per millimeter has been found at room temperature. The plated coatings are somewhat harder. Lead hardens on *cold working* but self-anneals at room temperature, the rate of softening being extremely rapid after severe cold working. Because of its softness, a lead coating is easily cut through by sharp points. Where lead-plated parts are handled roughly, for example, in the assembly of structural parts, an extra thickness may have to be provided.

The softness of lead, however, has its advantages, for example, in the case of

(*Please turn to Page* 127)

TEST · RESULTS

ANTI-CORRODE vs. Competitive Products



From an unretouched photograph.

To substantiate our convictions that Anti-Corrode is an unexcelled rust-preventive, nine steel strips were cut from a sheet of No. 18 B. & S. deep drawing steel which had been thoroughly cleaned mechanically. One strip, number 6, was dipped in Cities Service Anti-Corrode. Seven others were treated with leading anti-rust compounds according to their manufacturers' directions. One strip, number 8, used as the control, was not treated.

All strips were then partly immersed in small bottles of distilled water containing 3% Sodium Chloride. At the end of 90 hours they appeared as displayed above. Each test strip is shown before its bottle of solution. The rust penetration on each strip is plainly evident. The background lines behind the bottles enable comparison of rust density found in the solutions after test. The superiority of Anti-Corrode—number 6—is obvious.

OUTSTANDING QUALITIES OF ANTI-CORRODE

Anti-Corrode is harmless to metal. It can be applied by brushing, spraying or dipping, and is a reliable safeguard against corrosion of metals in any form or state of finish, whether in storage or in transit. Anti-Corrode forms a tenacious, durable film that is impervious to moisture and the more common gases present in the atmosphere. Since it contains lubricating material, it need not be removed in drawing operations. It can be removed easily with kerosene or any petroleum solvent.

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"Our castings that have been properly dipped in Anti-Corrode show no signs of rusting after a month's exposure to rain and snow."

Assistant Plant Supt.
Large manufacturer of filters.

"We are pleased with the test results of Anti-Corrode on our rust problems and will place a substantial order with you shortly."

Manufacturer of special tools and accessories.

"$8,000 worth of dies were recently ruined by rust. This costly waste of vital materials is now being prevented with Anti-Corrode."

Manufacturer of ballistic dies.

"Condensation of moisture in storage vaults had been rusting our highly-precisioned tools and dies. Anti-Corrode has licked this problem."

Manufacturer of precision instruments.

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Engineers Deal with Vital Plant Problems

PROGRESS made in blast furnace construction and equipment during the past 15 years as well as wide discussion of such problems as firing of heating furnaces, manufacture of electrotinplate, nonmetallic bearing lubrication, blooming and billet mill rolls, industrial engineering, plate mill practice, colloidal fuel, and the distribution of oxyacetylene gas were some of the highlights of the various technical sessions at the annual meeting of the Association of Iron and Steel Engineers, William Penn hotel, Pittsburgh, Sept. 28-30. A report of the addresses by Wilfred Sykes, president, Inland Steel Co., Chicago, and J. T. Whiting, director, Steel Division, WPB, Washington, was presented in the Oct. 4 issue of STEEL, pages 64-65. Important factors brought out by various speakers at the technical sessions are presented in the accompanying abstracts.

Frank Janecek, Republic Steel Corp., Cleveland. "Modern Trend of Blast Furnaces": From 1916 to 1941, pig iron production increased 38 per cent while the loss of stacks was about 43 per cent. In 1916 we produced approximately 135,000 tons from each stack operating, while in 1941 production was 270,000 tons or double the average furnace capacity in 25 years.

Since it requires approximately 500 square feet of stove heating surface per ton of iron, a 1300-ton stack requires 650,000 square feet be provided. The majority of the modern plants fine-clean the gas with electrical precipitators. Clean gas has been responsible for being able to carry straight line hot blast temperatures of 1400 to 1500 degrees Fahr. Prior to 1920 pressure burners were practically unheard of. In the past 12 years about 50 per cent of the blast furnace stoves in this country have been so equipped.

All modern skip hoists are motor driven and are housed under pressure slightly higher than atmospheric pressure, excluding dust and dirt. Modern skip houses are being built with no windows and in lieu of the large doors for making engine repairs there are provided removable floor slabs for servicing the hoist and other equipment. Adequate permanent trolleys have been provided for easy handling of processing repairs.

Today 70 per cent of the blast furnaces are provided with automatic stock-line recorders. Uptake and downcomers no longer are brick lined. Gas volume thus is reduced, due to radiation losses. Reduction in volume affords a reduction in velocity, which in turn deposits more dust particles in the downcomer and reduces the work of the dust catcher. Another advantage of lining uptakes and downcomers with carbon steel plates instead of brick linings is a colder supply of gas for the gas washers, thus requiring less water per thousand cubic feet of gas.

Pug mills beneath the dust catcher condition the flue dust and eliminate one of the dirtiest places around the blast furnace. Sizing of raw materials has been found advantageous. A few plants are sizing ores and fluxes with excellent results.

Modern plants are being built with thickeners for processing the water from wet gas cleaning equipment. These are being installed to recover the flue dust and because laws require that water emptied in most rivers and lakes must be held under 8 grains of solids per gallon. The quantity of recovered material from a thickener serving a 1000-ton stack will be about 45 tons per day.

L. S. Wilcoxson, Babcock & Wilcox Co., New York, "Pulverized Coal Firing of Metallurgical Furnaces": When the necessary conditions as to coal specification relative to the fusing temperature of the coal ash; the ash, sulphur and volatile contents; and, the fineness requirements are met, pulverized coal can be utilized for firing many types of metallurgical furnaces without adversely affecting the product in terms of its specification based on oil or gas firing. In certain respects the operation and the condition of the product can be improved. This is shown in connection with a billet-heating furnace now being fired with pulverized coal where a decrease of more than 50 per cent in the amount of scale formed on the billets is being realized.

In the firing of larger furnaces it frequently is economical to use an independent coal pulverizer for each installation, thus utilizing the direct-firing system. With smaller furnaces a number of them can be fired with one pulverizer, utilizing the direct-fired circulating system, and providing individual control for each of a number of burners. The decision as to the system to be installed is determined by such factors as the rate of coal consumption per unit, the number, size and location of the burners to be fired, frequency of the heating cycle, physical limitations of the installation itself and economical considerations.

C. A. Getz, Cardox Corp.: Often a single low-pressure liquid carbon dioxide storage tank is used to protect many hazards. In the majority of cases, the capacity storage tank chosen is such that there is a sufficient quantity of liquid carbon dioxide available to give double shot protection to the largest hazard requirement. For example, if the largest hazard being protected by this storage tank should happen to require 5 tons of carbide dioxide, at least a 10-ton capacity storage tank could be installed. Thus, if a fire develops in this large hazard after the required amount of carbon dioxide has been discharged, there is enough gas remaining in the tank to immediately reprotect this hazard.

H. P. Munger, Republic Steel Corp., Warren, O.; "Electrotinning Operation": A considerable amount of discussion has centered around the elimination of so-called "fog" or "smog" on electrotinplate. It has a cloudy appearance or may be any factor which prevents the melted tin deposit from having a brilliant color. It may result from almost

Officials who played a prominent part in this year's meeting of Association of Iron and Steel Electrical Engineers. From left to right: J. T. Whiting, director, Steel Division, WPB, Washington; F. E. Flynn, president of AISE; J. A. Clauss, chief, Plant Facilities Branch, WPB, Washington; and Wilfred Sykes, president, Inland Steel Co., Chicago

any operation in the line. If the surface is too rough or has a variation in surface appearance, the melted tin will not be uniform or reflective. If the electrocleaning operation is not complete and there is any oil remaining on the surface of the strip, the oily parts will be dark gray after brightening. In like manner overpickling roughens the surface and causes a dull appearance. Among the most important sources of fog is the plating solution itself. It is believed that more fogging results from improper plating solution control and hydrolyzed tin salts or improper rinsing than from any other factors.

It is important that the rinse tank and the quench tank after flow brightening be provided with clean water. In certain cases the flow brightener itself may be the controlling factor and the strip temperature, quench water temperature, and the time between melting and quenching may have a large effect on the finishing surface.

There are installed or projected 26 electrotinning lines with an estimated total production of between 40,000,000 and 50,000,000 base boxes annually. This is about half of the tin plate used when the industry was at its peak production. After the war when general line cans can again be made, they will undoubtedly be produced from electrotinplate. It is believed that several grades of electrotinplate will be developed until they will be suitable for practically all of the ordinary uses for which coke tin plate formerly was employed.

Equipment is flexible enough to produce light-weight tin coatings (0.5-pound per base box) at high speeds, yet has enough plating capacity to produce the heavier coating weights contemplated at present, at the normal operating speed of the line. With these advantages of quality of product, flexibility of operation, and high tonnage output, it is not unreasonable to assume that low operating costs will be obtainable.

G. E. Reiser, Bethlehem Steel Co., Lackawanna, N. Y. "Lubrication of Nonmetallic Bearings": The roll neck or journal should be free from scratches and pits. Where heavy bearing loads are encountered, the finishing of the necks must be done carefully, because this is one of the important factors in synthetic bearing operation. Good chuck fit is next in importance, and therefore chucks and bearings should be machined to a good fit.

Bearings that are jaw-tight due to changing from roll to roll of different journal diameters will squeal and burn when the mill is first started. Swabbing of the bearings and journals in roll changes will prevent this.

Grease containing synthetic graphite conditions the neck and bearing. The graphite works into the pores of the steel to give it a burnished appearance. After the resin coating is worn away from the bearing surface, the graphite is held in the fabric to give added lubrication.

With proper lubrication and fitting of nonmetallic bearings, a saving as high as 35 per cent in power has been realized. To achieve this saving the following suggestions are presented: (1) roll necks or journals should be polished smooth, (2) chucks for bearing housings should be strong enough to resist maximum bending force and should fit bearings to a point of suction, (3) synthetic bearings should be heavy weight fabric, (4) arc of contact should be just large enough to maintain roll alignment, (5) cooling water should be adequate to remove all heat and should be free from impurities, and (6) grease lubrication with water as a coolant should be used on low-speed, high-pressure installations. Grease film should be capable of resisting maximum pressures.

C. P. Spangler, Jones & Laughlin Steel Corp., Pittsburgh. "Industrial Engineering in War Production": Recently several steel companies have had their industrial engineers make detailed analyses of their open hearths and have learned that scheduled repairs in an orderly rotation, instead of waiting for furnaces to fall in at a time when the operating rate is rapidly declining will increase the furnace availability time, holding up a high average rate and result in a worthwhile annual tonnage increase.

On a blooming mill rolling 200 ingots per turn, a saving of 1 second on the time between ingots or on the manipulating time of each ingot means an additional 1.4 ingots rolled per turn. With 10-ton ingots and assuming 300 operating days in the year, to allow for repairs, etc., the annual production would be increased 12,600 tons, by saving 1 second per ingot.

W. A. White, Kaiser Co. Inc., Fontana, Calif. "Some Developments in Plate Mills": It has been definitely established that a 110-inch 4-high mill using 36-inch or over diameter rolls and backup rolls of 48-inch diameter or over, can be operated with straight work rolls for the first 5000 tons of average plate orders before it is necessary to crown the work rolls. The next 5000 tons will require a 0.010-inch crown in the top roll only, and the following 10,000

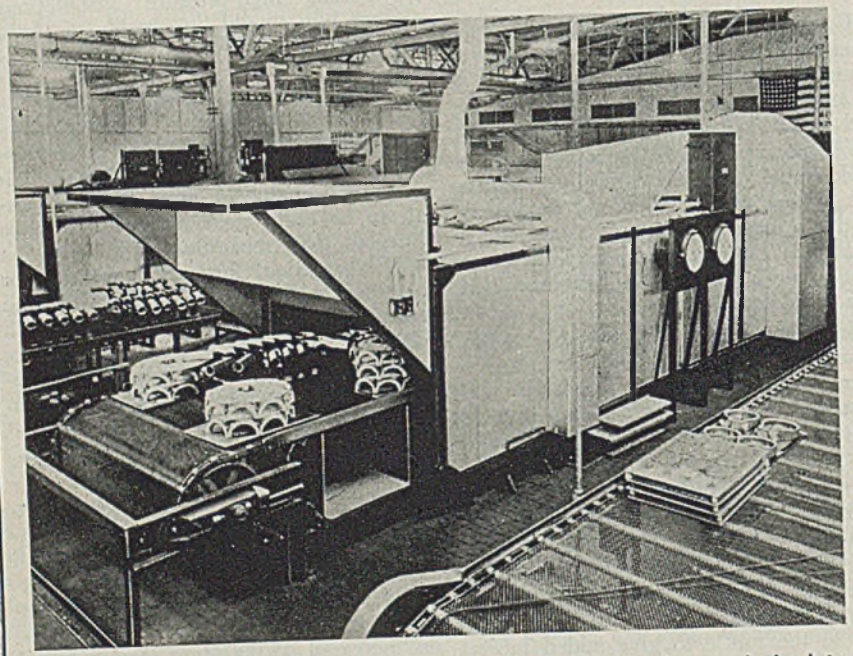
tons a 0.010-inch crown in both top and bottom work rolls. It has been found desirable to change backup rolls after 20,000 tons, and start over.

It is not advantageous to roll plates in lengths longer than 40 feet. The draft should be about 30 per cent in each pass down to the last two finishing passes, which should be left to the judgment of the roller in order to deliver a flat plate. The draft in the next to the last pass is generally 10 to 15 per cent, and the last pass is then backed off to a draft of about 0.040-inch.

A development in finishing equipment is the plate leveler with hydraulic cylinders under the screws controlling the opening of the leveling rolls. These cylinders act as a cushion in case a plate of heavier gage than that for which the machine is set enters the leveler. The hydraulic cushion, operating at 3000 to 3500 pounds per square inch pressure, will compress and allow the over-gage to pass through without stalling or damaging the leveler rolls.

J. G. Coutant, New York: "Colloidal Fuel As a War and Postwar Liquid Fuel". Colloidal fuel is a composite of 40 per cent colloidal coal and 60 per cent oil. It is being suggested widely as a means of extending our fuel oil supplies in those sections of the country where supply is below demand. The present state of development in colloidal oil manufacture has reached a point where engineers and makers of colloid mills are offering machinery and services for the production of guaranteed specification liquid fuels for composites of 40 to 50 per cent coal and 50 to 60 per cent oil. The new liquid fuel can be utilized by existing fuel oil systems and burners. It offers to many plants continuous operation which might otherwise be interrupted if it became necessary to convert to coal firing. This paper presents considerable evidence showing the advantages of colloidal fuel. It also outlines costs of building a plant for the production of such fuel, as well as the estimated cost of manufacturing the material.

Herman Ullmer, Linde Air Products Co., New York, "Plant Distribution Systems for Oxygen and Acetylene": By installing and using distribution piping systems for oxygen and acetylene, a large number of steel plants have demonstrated that all but a relatively small amount of the total usage can be practically supplied by piped service from a central supply unit. The use of this system has the advantage of minimizing the wasteful and inefficient operating practices associated with the use of excessive working pressures, since the line pressure available for use is subject to central control at the supply unit.



PAINT BAKER: Painted parts of different size and weight are baked in continuous succession in the above new type paint baking oven currently being used by several aircraft manufacturers. Designed by Gehnrich Corp., Long Island City, N. Y., the insulated steel oven houses a flat screen belt 40 feet long by 5 feet wide on which the work travels. Baking zone is heated by electrical heating elements to 350 degrees Fahr., and uniform air circulation over the heaters, through the conveyor and over the work is assured by a recirculating fan mounted on the oven roof. Paint solvents are volatilized in the exhaust zone which receives heated air at 150 to 225 degrees Fahr. A wire mesh belt roller conveyor placed at the side of the oven returns work passed through the oven back to the loading end

D. L. Eynon and F. C. T. Daniels, Mackintosh-Hemphill Co., Pittsburgh. "Blooming and Billet Mills and Their Rolls": Main difficulties in the use of blooming mill rolls are fire-cracking, excessive side wear on the collars, slippage, steam-cutting, breakage, or holes and streaks of segregation. Fire-cracking usually is causd by an injudicious use of alloys, improper heat treatment, mill abuse, a sticker, or injudicious use of water.

Side wear on the passes of rolls has been largely reduced by special heat treatments in which the sides of the passes are maintained from 4 to 6 points scleroscope harder than that of the main body of the roll.

Modern slab rolls usually contain a moderate carbon content plus 1.50 per cent nickel, about 0.25 per cent molybdenum and a minimum amount of chromium. They are heat treated to maximum hardness without encountering slippage. Optimum hardness has been found to be about 38 scleroscope; some mills keep it as low as 34, others up to 44.

Blooming mill rolls are about of the same composition as slab rolls but are heat treated so that the collars and sides of the passes are considerably harder than the rest of the roll, thus bringing additional resistance to side wear.

J. F. Wilbur, Bethlehem Steel Co., Johnstown, Pa., "Pitch As An Open-Hearth Fuel": Melting point and viscosity are pertinent data in determining means and precautions necessary in transporting pitch whether in pipe lines or insulated tank cars. A loop recirculating system, well insulated, with steam-heating coils, is needed to deliver pitch to each furnace. Atomizing equipment must be such that small openings will not plug easily with small particles of carbon. High percentage of free carbon in pitch produces a flame of high luminocity. Pitch-fired furnaces are faster melting; one shop reported as much as 10 per cent more tonnage when burning pitch, as compared with production rates for the same furnaces when burning oil. Pitch is the choice of open-hearth fuel because it offers the greatest return.

Lt. R. E. L. Stanforth, Ordnance Department, United States Army, Cincinnati, "Steel for Cartridge Cases": How steel has stepped into the breach to shore up the weak spots in the nonferrous metal industries was related by the author. The best steel ever made just barely meets the severe requirements. Carbon and manganese specifications must be high enough so that the steel will meet the physicals, yet not so high as to prevent drawing. A fine grain is essential, without laminations or segregation. Steel structure should be well spheroidized, with little banding. It is estimated that 0.010 decarburization should be the maximum allowable.

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BORON

. . . . assumes a position of importance as an alloying element in steel

What is the common effect of practically all alloying elements in steel? What is "hardenability"? What factors control it? What is effect of too much boron? How is boron added and protected during the melt? Can residual boron in steel be determined accurately? What are secondary effects of boron additions? Why has boron not been used previously? Learn the answers here

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

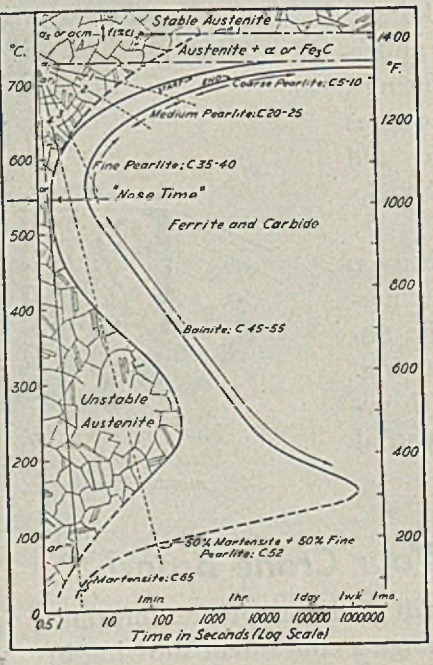
NO MORE fortunate circumstance has attended the rise of man from his dependence on flint, than the readiness with which iron enters into useful association with a variety of other elements among which, carbon, of course, is still supreme. But so important have these newer alloys become that few historians will be found who quarrel with the suggestion that to the long tale of man's progress from the stone age by way of the bronze, iron and steel periods, we now add an alloy age—the one in which we now live.

While steel itself is a malleable alloy of iron and iron carbide, we have become accustomed to restricting the term "alloy steel" to blends in which such special elements as chromium, nickel, molybdenum, vanadium, etc., have been added; but this does not preclude the possibility of including alloys to which relatively large percentages of such elements as manganese and silicon, ordinarily present in plain carbon steel in much smaller proportions, have been added.

First Used in Sixties

The age of the alloy steels is but in its infancy. As compared with the tens of thousands of years antedating our discovery of the metals, and the hundreds of years we have used iron and, later, steel, the earliest notice of the commercial use of alloy steels goes back no farther than the sixties and seventies of last century. It was during these two decades that chromium and nickel made their appearance in the role in which they, and other familiar alloying elements have appeared with accelerating frequency ever since. And here it may be remarked that regardless of other enhancement of physical property all alloying elements (save cobalt) tend to retard the transformation of austenite to pearlite as the temperature falls through the critical range and thereby help us to overcome a purely physical limitation on our ability to deep harden plain carbon steels. To this rule boron is no exception, as little as six ten-thousandths per cent having an appreciable effect on the hardenability.

The term "hardenability" has reference to this characteristic of hardening depth and is in no way related to the hardness finally developed, a property for which the carbon in all ordinary heat-treatable alloy steels is primarily responsible. Control of hardenability rests on our ability to alter the "nose time" in other words, the interval required for initiation of the transformation from austenite to fine pearlite at around 1000 degrees Fahr. Among the factors exercising control are the size of the austenitic grains, fine grains transforming more quickly than coarse and so producing a shallow hardening steel; the homogeneity of the austenite *i. e.* the degree of freedom from carbon rich patches. But the most important influence is the presence of alloying elements which, in addition to the carbon, must diffuse during the formation of pearlite, thus slowing up the rate of its formation and increasing the time necessary for the initiation of the transformation.



This chart shows the so-called "S" curve that exhibits the effect of temperature on the time required for the transformation of eutectoidal austenite and structures obtained in various ranges. From Brick and Phillips' book, "Structure and Properties of Alloys", published by McGraw Hill Book Co.

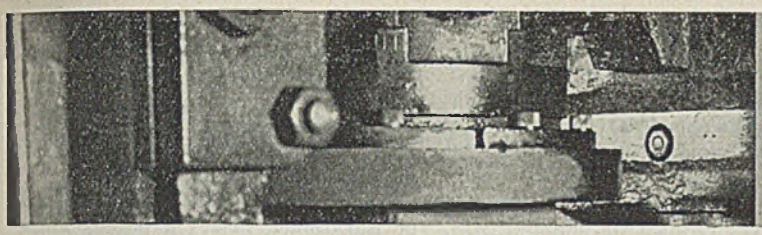
If the intention is merely to delay austenitic transformation with a view to securing hardness with a slower quench, experience shows that the addition of relatively small percentages of several alloying elements is more effective than the additive equivalent of one alone, possibly because of the tendency of larger quantities of individual elements to form sluggish carbides which fail to dissolve fully in the austenite and thus contribute little to the retardation of transformation.

Some concept of the relationship among a number of alloying elements, including boron, insofar as their power of promoting hardenability is concerned, may be gained from the suggestion that if boron be taken as unity, vanadium would be about 1/25; manganese, 1/70; molybdenum, 1/80; chromium, 1/100; silicon, 1/350; and nickel, 1/700.

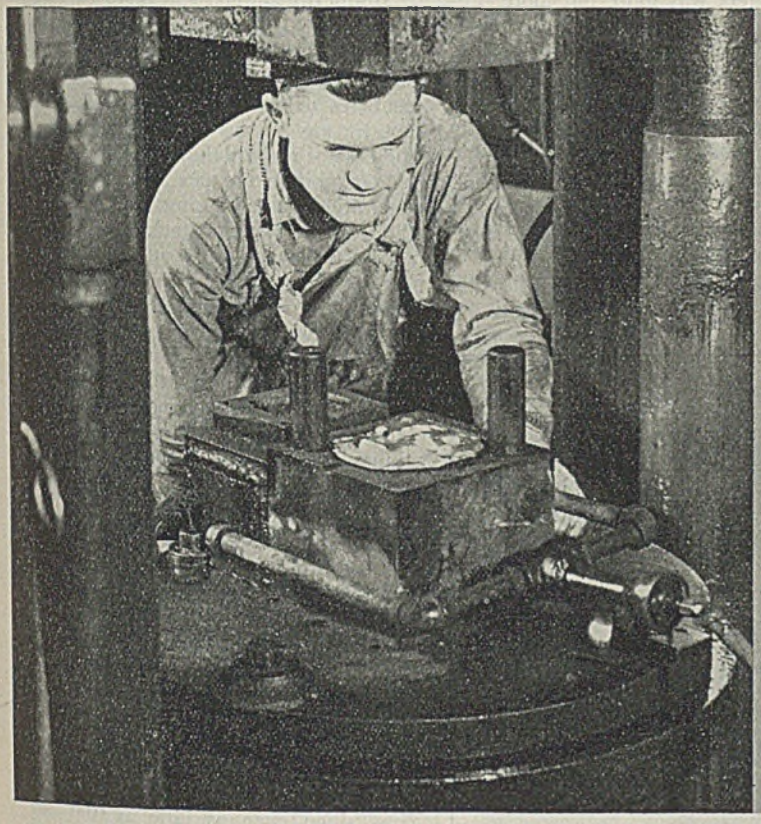
Uniformity of Distribution

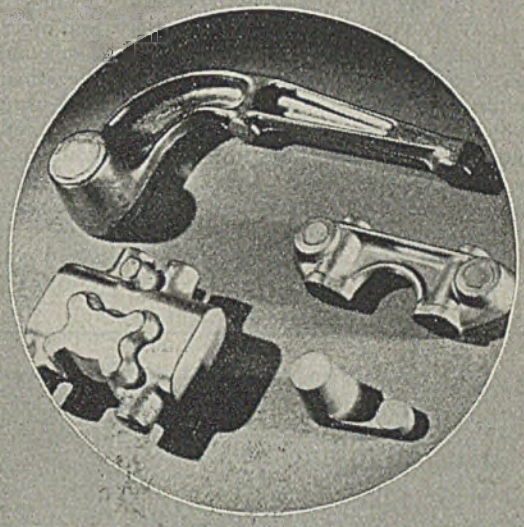
Apart from the advantages to be derived from the association of several alloying elements, boron must be added to the steel in such a way that it is protected from oxidation or other chemical association. Further, since boron is used in such minute quantities, there is an advantage from the standpoint of uniformity of distribution. Reporting on the effect of eight complex deoxidizers on some 0.40 per cent carbon steels to the American Institute of Mining and Metallurgical Engineers, George F. Comstock of the Titanium Alloy Mfg. Co., describes the mode of adding the special deoxidizer to the 17-pound charge of a small experimental, basic-lined induction furnace. These special deoxidizers were used mostly in the form of lumps, of about ½ to ¾-inch, thrown into the molten steel so as to be immediately covered and not stirred very much.

The basic charge for each of the heats consisted of 10 pounds of Armco iron and 6 pounds of clean low-carbon sheet-steel scrap. When melted, this charge was deoxidized with 15 grams of ferrosilicon. Then about 500 grams of pig iron was added to give the desired carbon content. After the pig iron was dissolved, nickel shot and high-carbon ferrochromium were added, if required, and addi-



A DOW MAGNESIUM SERVICE — FORGINGS





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tions of 80 per cent high-carbon ferromanganese and 50 per cent ferrosilicon were made to provide the desired amounts of these elements. Aluminum was added to every heat 2 minutes after the silicon, for grain-size control and preliminary deoxidation. One minute later the special deoxidizer was added to the clean bare surface of the molten steel and the steel was poured 2 minutes later. Incidentally this paper (AIMME technical publication No. 1417) first described the modern use of boron bearing alloys for promoting hardenability in alloy steels.

Another important contribution to the literature of special alloy addition agents, in which boron figures, is a report to the American Iron and Steel Institute under date of November, 1942. Among the general conclusions of this report which embodies data submitted by manufacturers of special alloy addition agents steel manufacturers, and consumers of steel produced with these agents, we note that an increase in hardenability was observed in all cases—an increase which was largely independent of the type of alloy added provided that the correct quantity was used and properly added. Increase in hardenability varied with the type of steel to which the addition was made.

In plain carbon steels under 0.25 per cent, the effect was mild, but more pronounced in the presence of manganese and other alloying elements. In the medium carbon range (0.3 to 0.6 per cent) the effect was marked and varied with the manganese content; while in the higher manganese and alloy steels, these addition alloys appear to be most effective.

We are advised by G. K. Herzog of the Electro Metallurgical Co., who provided much of the information contained in the report referred to above, that there have been no developments since these conclusions were presented to warrant their making any changes in the conclusions reached, except that they now believe that the method of determining small amounts of boron in steel, developed by T. R. Cunningham, also of Electromet, makes it possible to determine accurately the residual boron in boron-treated steels.

While the emphasis in these references above has been upon the increase in hardenability arising from the use of small (not above 0.002 per cent) percentages of boron, secondary effects are not by any means unimportant. As in the case of molybdenum, vanadium, nickel, etc., boron appears to inhibit ferrite separation on tempering, thus increasing the toughness of the steel. Therefore, to secure the maximum results from its use, the steel should be quenched and tempered, the most beneficial effects on mechanical properties being in steels heat treated to high hardness. It has been further claimed that boron, like molybdenum, has a beneficial effect on temper brittleness and that the machinability in the case of fine-grained steels is improved.

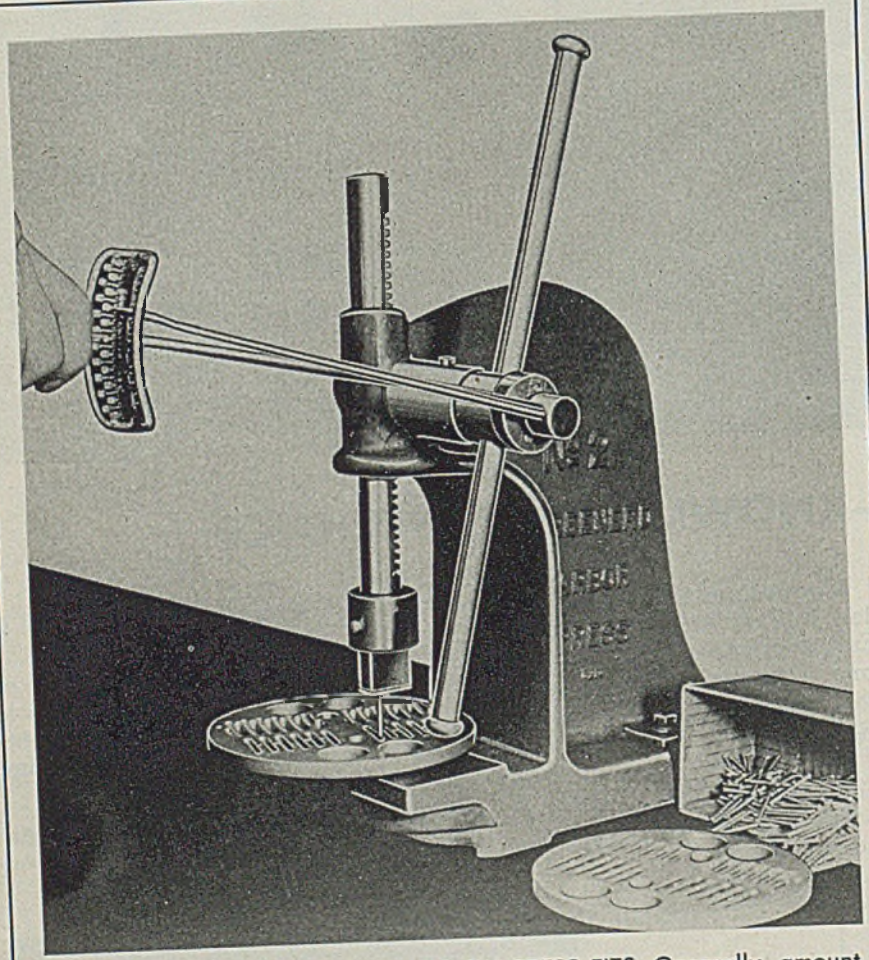
Use Is Comparatively Recent

A natural question arising out of the considerable interest in boron at this time is why, in the case of such a common element, its utility had not already been discovered and its applications well established in practice. In part, at least, the answer would seem to be that up to about 20 years ago, it had not occurred to anyone to employ boron in the minute percentages essential to success, since even as little as 0.003 per cent invites trouble under the hammer or in the press. It was natural enough to experiment with percentages characteristic of many other alloying elements, but all such efforts had proved fruitless because of the deleterious effect on hot ductility.

Coupled with this comparatively recent discovery is the present urge towards the conservation of essential metals, a matter of utmost concern to the war effort and in particular to the United States Army Ordnance Department, which has issued a tentative specification designed to procure relatively small quantities of boron treated steels for development purposes. In a matter of this kind which touches the efficiency and reliability of ordnance *materiel*, it is obvious that caution must be exercised. Thus as a necessary preliminary, standardized types of material and testing procedures must be established in order that there may be correlation among the data obtained from various agencies concerned.

In developing this tentative specification, the procedure followed involved the selection of five (War Department) steels ranging in carbon content from 20 to 40 points, two of which contained low contents of other alloying elements and to require that the hardness intensi

(*Please turn to Page 129*)



ONE WAY TO CONTROL PRESSURE ON PRESS FITS: Generally, amount of pressure applied to press fits is determined by amount of interference between male and female parts. This means that some assemblies are over stressed and some under stressed. According to L. Tatro, foreman inspection, Westinghouse Electric & Mfg. Co., East Springfield, Mass., maximum and minimum pressures in foot pounds can be established and all assemblies falling outside these limits rejected by the above application of a torque wrench in measuring amount of pressure applied to press fits when made in an arbor press. The setup assures that all press fits are subjected to substantially the same stress, resulting in a more uniform product. Guesswork also is eliminated for the graduated scale can be read easily

Special Addition Agents Solve Critical Steelmaking Problem

Buick metallurgist says shortage of critical alloying elements offset by use of certain ferroalloys containing boron. . . . Needled steels held suitable as to hardenability, tensile strength, and machinability

HOW steels of the future may be improved in quality and how any threat of a shortage of such critical alloying elements as nickel, chromium and molybdenum can be safeguarded in the war effort, was described before the National Tractor session of the Society of Automotive Engineers' meeting at Milwaukee recently by R. B. Schenck, chief metallurgist, Buick Motor Division, General Motors Corp.

Discussing "special addition agent steels," or, "needled" steels, Mr. Schenck declared that should our supply of the commonly used alloying agents for any reason be cut off or the demands of war exceed the relatively limited supplies, steels of comparable characteristics fully suitable as to hardenability, tensile strengths, machinability and the like, can be produced by the use of certain ferroalloys containing boron, known as "special addition agents."

These ferroalloys possess the property, he said, of markedly increasing hardenability of many steels when added in relatively small quantities and offer the promise of conserving critical alloying elements by their ability to replace important amounts of nickel, chromium and molybdenum. It now seems quite certain, the speaker declared, that by suitable adjustment of steel chemistry these ferroallovs can be used to replace the necessarily greater quantities of other alloying elements where such replacement becomes desirable due to supply factors or certain performance requirements to which the "needled" steels are particularly adapted.

Although there are records of the experimental use of boron as an alloying agent in steels as early as 1917, the additive treatment of steel from a commercial standpoint is relatively new, having started in 1938. At that time a specially treated heat of basic open hearth steel for the Buick Motor Division produced such unusual results, according to the metallurgist, that immediate steps were taken to verify them. Since then, a great deal of experimental work has been done by this company, by other users and by steel producers; new addition agents have been developed, and thousands of tons of special addition agent steels have been made and used for a great variety of applications.

The general effect of the special addition agents is to increase the hardenability and improve the mechanical properties of steel in the quenched and drawn state, Mr. Schenck said. With respect to hardenability and mechanical properties, he pointed out, a special addition agent can make a carbon steel equivalent to a low alloy steel and a low alloy steel equivalent to a high alloy steel.

The nominal composition of currently available special addition agents consists of various combinations of such elements as aluminum, boron, calcium, manganese, silicon, titanium and zirconium. Other compositions have been used containing vanadium, but the vanadium types have been ruled out, probably for the duration.

No standard specifications now exist for special addition agents, Mr. Schenck said, pointing out that it now has become obvious that chemistry alone will not suffice. He said that it is apparent that hardenability and possibly mechanical properties will be required in addition to chemistry to formulate specifications. Tentative specifications, including chemistry, hardenability and merit index based on tensile strength and reduction of area, have been formulated and are now receiving serious considerations, he said.

He pointed out that in spite of the exacting requirements to be met in melting treated steels, a number of mills have demonstrated their ability to melt heat after heat with as good uniformity as untreated steels. This has been borne out, he said, by the experience of the Buick company and other users with a large number of heats including a number of different compositions.

Test data pertaining to treated steels has been collected and published in an American Iron and Steel Institute report and another survey for additional data is being planned, Mr. Schenck said. In addition, a co-operative test program involving nine heats of treated steel is now in progress and a second program is about to be inaugurated.

Blast Furnace Efficiency Rises

One-third more pig iron produced during 1942 by 230 stacks than was produced by the 351 furnaces in production during the last year of first World War

DURING 1942 one-third more iron was produced by the 230 blast furnaces operating in the United States than by the 351 in production during the World War I year of 1918.

This is just one of the comparisons of production figures in the two World Wars emphasized by C. D. King, chairman, Operating Committee, United States Steel Corp. of Delaware, in his talk recently at a meeting of the American Institute of Mining and Metallurgical Engineers in Washington.

Basing most of his remarks on United States Steel records, Mr. King gave credit for the increased efficiency of present day blast furnaces to "improved methods of charging materials, air blowing, blast heating, gas cleaning, as well as better iron and slag handling systems" which have made it possible to operate larger furnaces.

Increase Blast Furnace Output

Actual figures show that the average blast production per day in 1918 was 349 net tons while today it is well over 700, he said. Similarly, the largest furnace in existence in World War I produced approximately 630 net tons per day while a number of units are now consistently producing 1500 tons daily.

Another contributing factor to high production is the longer life of furnaces between linings, according to Mr. King. In 1918 the average furnace produced approximately 620,000 tons before relining, but now this figure has risen to 1,800,000 tons and in some cases records of as high as 3,000,000 tons have been obtained.

Much the same story applies to steel ingot production. Although approximately the same number of United States Steel subsidiary plant open-hearth furnaces are in operation, they are turning out 80 per cent more steel, the speaker pointed out.

Furnaces are larger, it is true, but many improvements in design, methods of operation and furnace control have been developed since the last war. Speaking of one of the Pittsburgh district plants, Mr. King had this to say:

"In 1918 this plant was considered a modern unit by the old standards and at that time was tapping 110 net ton heats with a daily production of 194 tons per furnace and a fuel consumption of 6,600,000 Btu per net ton of ingots. The plant has since been improved and by present standards is considered a representative modern unit. Today the furnaces are tapping 169 net ton heats, or 53 per cent larger, producing 310 net tons per day per furnace, or 60 per cent more, and consuming 3,700,000 Btu per net ton of ingots, or 44 per cent less."

Even these performances, good as they are, are now being surpassed by the United States Steel and other plants, he said.

Revised Bill Provides Partial Advance Payments to Contractors

(*Concluded from Page 61*)

of principal or interest on loans, discounts or advances, or on commitments in connection therewith, which may be made by such financing institution for the purpose of financing any contractor, subcontractor, supplier or other person who is or has been engaged in the performance of any contract or operation deemed by such department or commission to be connected with or related to the prosecution of the war and who is deemed by such department or commission to have rights in connection with the termination in whole or in part of any one or more such contracts or operations.

"(2) To make, enter into contracts to make, or to participate with any department or agency of the United States, any Federal Reserve Bank, the Reconstruction Finance Corp., or other public or private financing institution in making, loans, discounts or advances, or commitments in connection therewith, for the purpose of financing any such contractor, subcontractor, supplier or other person;

"Any such loan, discount, advance, guarantee or commitment in connection therewith shall be secured, if the department or agency concerned deems it reasonably practicable, by either assignment of or covenants to assign appropriate rights of such contractor, subcontractor, supplier or other person in connection with the termination of such contract or operation.

"(b) Subject to such regulations as the Board of Governors of the Federal Reserve System may prescribe after consultation with the departments and agencies concerned, any Federal Reserve Bank is authorized to act, on behalf of any such department or agency, as fiscal agent of the United States in carrying out the purposes of this section.

"SECTION 3. Allowance of Interest: (a) In connection with the termination, otherwise than for the default of the prime contractor, of any prime contract connected with or related to the prosecution of the war, interest shall be allowed and paid at the rate of 2½ per cent per annum, computed as follows:

"(1) On amounts paid or payable by the prime contractor to subcontractors, up to the amount approved by the department or agency as properly to be included in determining the amount payable to the prime contractor, interest shall be computed from the date of payment by the prime contractor.

"(2) On the remainder of the amount finally determined to be payable to the prime contractor interest shall be computed from the effective date of the notice of termination.

"(3) Any advance or partial payments made pursuant to Section 1 of this act shall be applied, as of the date made (or tendered), to reduce the amounts on which interest is otherwise payable under paragraphs (1) and (2) above.

"(4) If the prime contractor unreasonably delays the final determination of the amount payable to him, interest shall not be payable for the period of such delay.

"(5) If the prime contractor has received a government guaranteed loan or interest bearing advance payments, and interest on such loan or advance payments has been waived, in whole or in part, during the period following the effective date of the notice of termination, by virtue of the terms of the loan or advance payment agreement, such waived interest shall be deducted from the interest otherwise allowable under this subsection (a).

"(b) In determining the amount payable to or for the account of the prime contractor in connection with the termination of a prime contract, a department or agency may recognize interest paid or payable to subcontractors on amounts due them to such extent as it deems proper.

"SECTION 4. Use of Appropriated Funds: For any of the purposes described in this act which it is authorized to carry out, any department or agency may utilize any funds now available to it or hereafter made available to it for the purposes of the contracts terminated or being terminated in connection with which action is authorized to be taken pursuant to this act. For the purposes of Section 2, each department and agency authorized to act under that section may utilize any funds now available to it or hereafter made available to it for purposes of procuring war materials, supplies, and equipment, or expediting the production thereof. The Secretary of the Treasury upon request of the head of any department or agency concerned may make any such transfers of appropriated funds as may be necessary to carry out the provisions of this act.

"SECTION 5. Miscellaneous Provisions: (a) The head of each department or agency is authorized to prescribe for his department or agency such regulations as he deems necessary to carry out the provisions of this act. Such regulations may require such statements, certificates and affidavits for the purposes of Sections 1 and 2 of this act as the department or agency concerned deems necessary to protect the interests of the United States; and any such statement, certificate or affidavit shall be subject to the provisions of Section 35A of the Criminal Code (Title 18, U.S.C. 80). A department or agency may subject any advance or partial payment or any loan, discount, advance or commitment made under this act to such terms and conditions as it deems appropriate to protect the interests of the United States or to effectuate the purposes of this act.

"(b) The head of any department or agency may delegate any authority or discretion conferred by this act upon him or upon his department or agency to such officers or civilian employes within his agency or within any other department or agency of the United States as he may prescribe and may authorize any such officer or civilian employe to make successive delegations of such authority and discretion, with power of redelegation.

May Use Needed Contracts

"(c) Each department or agency shall have authority to make any contract necessary or appropriate to carry out the provisions of this act and any such contract need contain only such provisions as are appropriate to the type of contract involved. Any agreement of a type referred to in this act may be made at any time, whether before or after the giving of a notice of termination of a prime contract which is connected with or related to the prosecution of the war.

"(d) Nothing in this act shall be construed to limit or modify any authority granted by the President to the chairman of the War Production Board or to any other department or agency with respect to procurement by the several federal departments and agencies and to war production.

"(e) As used in this act, the term 'subcontract' means any contract, agreement or purchase order directly or indirectly connected with or related to the performance of any prime contract or any other subcontract; and the term 'subcontractor' means the holder of one or more subcontracts."

The revised bill thus provides for advance and partial payments and continues in general the successful system of guaranteed loans which the armed forces have used and are using, in that it centers the administration of termination financing in those persons who are most familiar with the business and accounting problems of war production contracts.

FURNACE WOMEN

Cleveland office, United States Employment Service, reports receipt of its first request for women to work at a blast furnace. The request came from American Steel & Wire Co., Cleveland, asking for three women to serve as iron samplers.

The job entails the use of an electric drill and the running of routine analyses of iron samples. The work can be learned in three days.

Specifications for the job call for women between 21 and 35 years of age, preferably with high school chemistry, and who are willing to rotate work shifts.

Significant Facts for Steel Users... No. 1

NEW GRANITE CITY STEEL LABORATORY BUILT IN HEART OF MILL!

Believed to be the only laboratory built in the very heart of a steel mill, the up-to-the-minute new laboratory of the Granite City Steel Company is a unique and significant idea in steel production.

Here, surrounded by the fire and heat of open hearth furnaces, the smoke and noise of a mill bristling with activity, the metallurgists of Granite City Steel work in air-conditioned, noiseless comfort within a few short steps of every production operation.

With such on-the-spot control, chance for error has been reduced to a minimum. (A sample from any furnace reaches the laboratory in 8 seconds via vacuum tube!)

Vitally important to manufacturers of war materiel, this Granite City on-the-spot control is equally important to post-war planners looking for a progressive mill with ideas on how to do things better. Granite City's new on-the-spot laboratory is a highly significant fact to remember when the shooting stops.

GRANITE CITY STAINLESS-CLAD

... solves many wartime problems

Used where resistance to corrosion is needed on one side only, Granite City Stainless-Clad has proved versatile, dependable, economical for hundreds of wartime products. 20% stainless, 80% mild steel. Pickled or polished finish.

Investigate what Granite City Stainless-Clad is doing today. See what it can do tomorrow. Contact nearest office for details.

GRANITE CITY STEEL CO.

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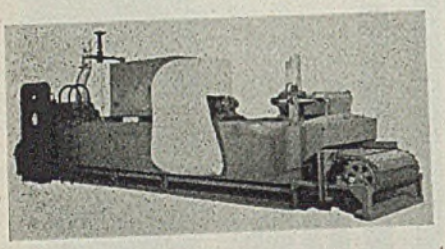
SINCE
GRANITE CITY STEEL
1878

HOT ROLLED SHEETS • COLD ROLLED SHEETS • STRIPLATES • TIN PLATE • TERNE PLATE • ELECTRICAL SHEETS • TIN MILL PRODUCTS • PORCELAIN ENAMELING SHEETS

INDUSTRIAL EQUIPMENT

Stress-Relieving Furnace

Temperature ranges up to 900 degrees Fahr. with absolute temperature uniformity plus or minus 3 degrees through the length, width and height of the work zone are provided by a continuous draw



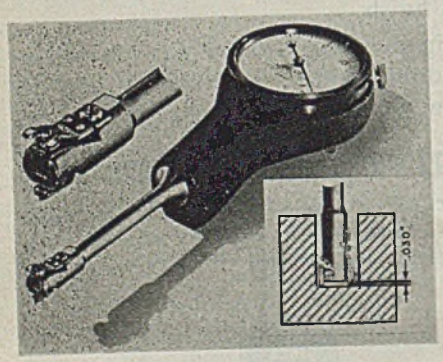
furnace for stress-relieving of armor-piercing shot. It is marketed by Industrial Oven Engineering Co., 11621 Detroit avenue, Cleveland. The same uniformity within the work itself is attained by passing air at extremely high velocities over the work on the conveyor belt, and automatically turning the work as it passes through the furnace.

The unit shown is gas fired, but oil or electric heating equipment can be used. The working mechanism is built over a heavy all-welded structural frame. Controls of the furnace are air operated and arranged for accurate regulation to handle various production loads, steadily or intermittently. The system is protected from pilot, motor, air or current failure by electronic safety controls.

Blind Hole Gage

Inside diameters to the very bottom of blind holes can be checked to within 0.030-inch by means of the latest gage introduced by the Federal Products Corp., 1144 Eddy street, Providence, R. I. As all moving parts in the gaging head are spring suspended, internal operating friction, lost motion and wear are practically eliminated.

The spring feature, together with the fact bushings and bearings are not embodied in the unit, permits the gage to



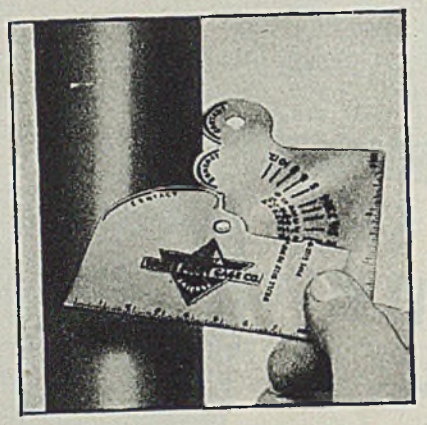
be used under adverse conditions as a reasonable amount of oil, coolant or dirt in the gaging head does not affect its accuracy or sensitivity.

In operation, two auxiliary locating contacts centralize the measuring contacts diametrically across the center of the hole. A slight rocking motion is required to locate the contacts at right angles to the walls of the hole in all positions except at the bottom of the hole. The gage then measures the diameter directly.

Pipe Gage

Instantaneous measurement of all sizes of pipe from ⅛ to 12 inches are made with a new pipe gage announced by Three-Point Gage Co., 3821 Broadway, Chicago. It measures by determining the outside arc of the pipe at three points of contact.

The gage consists of two pivoted steel plates with edges curved at three points for contact with the pipe, together with scale. The latter automatically registers



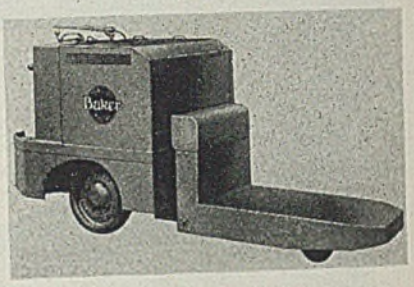
not only the pipe size in terms of inside diameter but the drill size for tapping. Measurement is made by placing the two fixed contact points of one plate against the outer contour of the pipe and sliding the second or moveable plate until it makes the third contact.

An additional advantage of the development is that it is necessary to contact only a small section of the pipe contour and it will measure pipe in any position, even against the wall or in a corner. It can be used to measure a covered pipe if there is a small opening near a union or other fitting where the gage may be slipped in.

Low-Lift Truck

Designed for operation in intersecting aisles as narrow as 67 inches, this new low-lift truck reported by Baker Industrial Truck Division, Baker-Raulang Co., 2168 West Twenty-fifth street, Cleveland 13, has a 6000-pound capacity, overall length of 123¾ inches, overall width of 42¾ inches, overall height of 55 inches. Power compartment in this unit has been increased to 32 x 39½ inches to provide room for additional battery capacity.

The platform, 26½ inches wide and 54 inches long, lifts 6 inches from a low position of 11 inches above the floor, traveling vertically on ball-bearing rollers running in upright channel guides. Platform and load are raised by power from a single hydraulic jack, applied through



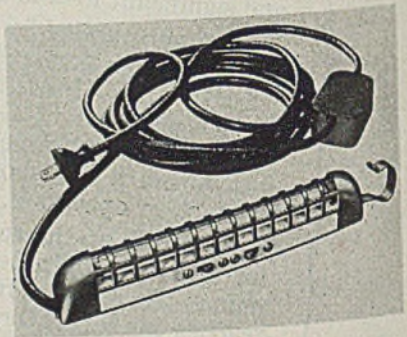
sprockets and roller chains. Lowering by gravity is also controlled by the same lever on the jack.

Truck controls are conveniently grouped, a No-Plug controller providing three speeds forward and in reverse. An electric interlock between controller and brake pedal automatically opens power circuits when brake is set. Power is applied only after brake is released and controller moved to first speed position.

Improved Extension Light

Design changes on its P7 fluorescent extension cord unit are announced by Sylvania Electric Products Inc., Fixture Division, Ipswich, Mass. Changes of the unit itself include rounded ends, rigid hanging hook riveted to the end cap and provisions for making fast lamp changes.

Maximum light output is provided by a white Miracoat reflector. The reflector shields the light source from the user and eliminates eye fatigue. A protecting grill prevents lamp and socket breakage. A small manual starting switch, rubber



covered cord, remotely mounted ballast and light weight of the unit are additional features.

The lamp measures 10¼ inches long by 1 3/16 inches wide. It operates on 110 to 125-volt alternating current only.

Crank-Pin Grinder

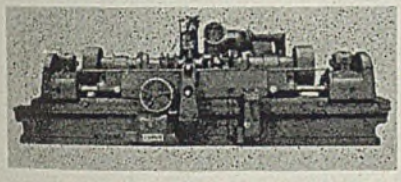
A dual work drive arrangement which eliminates or minimizes objectionable axial deflection in a crankshaft is one of the principal features of the new

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

25-inch type DD hydraulic crankpin grinder developed by Landis Tool Co., Waynesboro, Pa., for use in connection with both single and double-throw radial engine crankshafts and for in-line liquid-cooled engine crankshafts. Because both work heads of the machine may be moved transversely on top of the work table by means of rack and pinion arrangements, shafts of varying lengths may be handled by the same machine.

A unique method is employed to correct any out-of-balance condition in the crankshaft. Two balancing weights are mounted on a circular plate attached to the outer end of each work spindle. As these weights may be moved radially in a T-slot, it is unnecessary to have a large assortment on hand to take care of a variety of shafts because the method used permits one set to take care of most crankshafts.

Speed of the two work drive motors is synchronized electrically. Multiple V-belt drive speed reduction units at each end of the table are coupled by a large diameter drive shaft, the drive



from which is through chains and sprockets to the two work spindles. A rugged shoulder grinding attachment is supplied in order that crankshaft cheeks may be rapidly and efficiently ground.

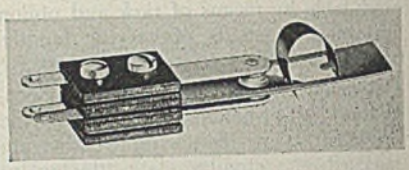
Control is by means of a handwheel close to the feed-up handwheel. Graduations in tenths enable the operator to gage accurately the extent to which he is feeding the wheel sidewise. Total movement is ⅝-inch and the wheel may be fed in either direction. Smoothness of operation is assured by the worm and worm wheel design and the use of an anti-friction type thrust bearing. This attachment is not intended merely for slight truing up of the cheeks but for the rapid removal of as much metal as might be required.

The hydraulic straight infeed mechanism is the same basic design used in connection with much other Landis equipment. Because of the large flanges inherent in the design of many airplane crankshafts, it is necessary to feed the wheel back a considerable distance to obviate the possibility of interference during work traversal. On this machine, the amount of rapid feed is 12 inches. Three controls at the front of the machine permit fast and slow movements. The grinder is being offered by the company in four sizes—25 x 48 inches, 25 x 80 inches, 25 x 96 inches and 25 x 120 inches.

Snap-Action Switch

Designed for a wide variety of applications including machine tool control devices, aircraft landing gear controls

and for construction of various relays and contactors, the new open-blade snap-action switch recently developed by Acro Electric Co., 1323 Superior avenue, Cleveland, provides better contact pressure and greater speed of operation. It features a unique rolling



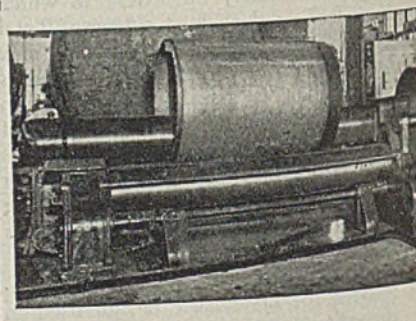
spring that produces a positive snap action with less than 6 ounces operating pressure.

Design of the rolling spring switch minimizes contact burning because of its extremely fast action. The switch also is designed to permit both pre-travel and over-travel. It has a rating of 15 amperes on 125-volt alternating current. Its overall size is 3 1/16 x 11/16 x ½-inch. The unit is offered in single pole, single or double throw, set and return types.

Plate-Bending Roll

One-and-one-quarter-inch plate 10 feet 2 inches long can be handled and subsequently rolled into circles 30 inches in diameter by a new type Initian model 16-L plate-bending roll recently marketed by Webb Corp., Webb City, Mo.

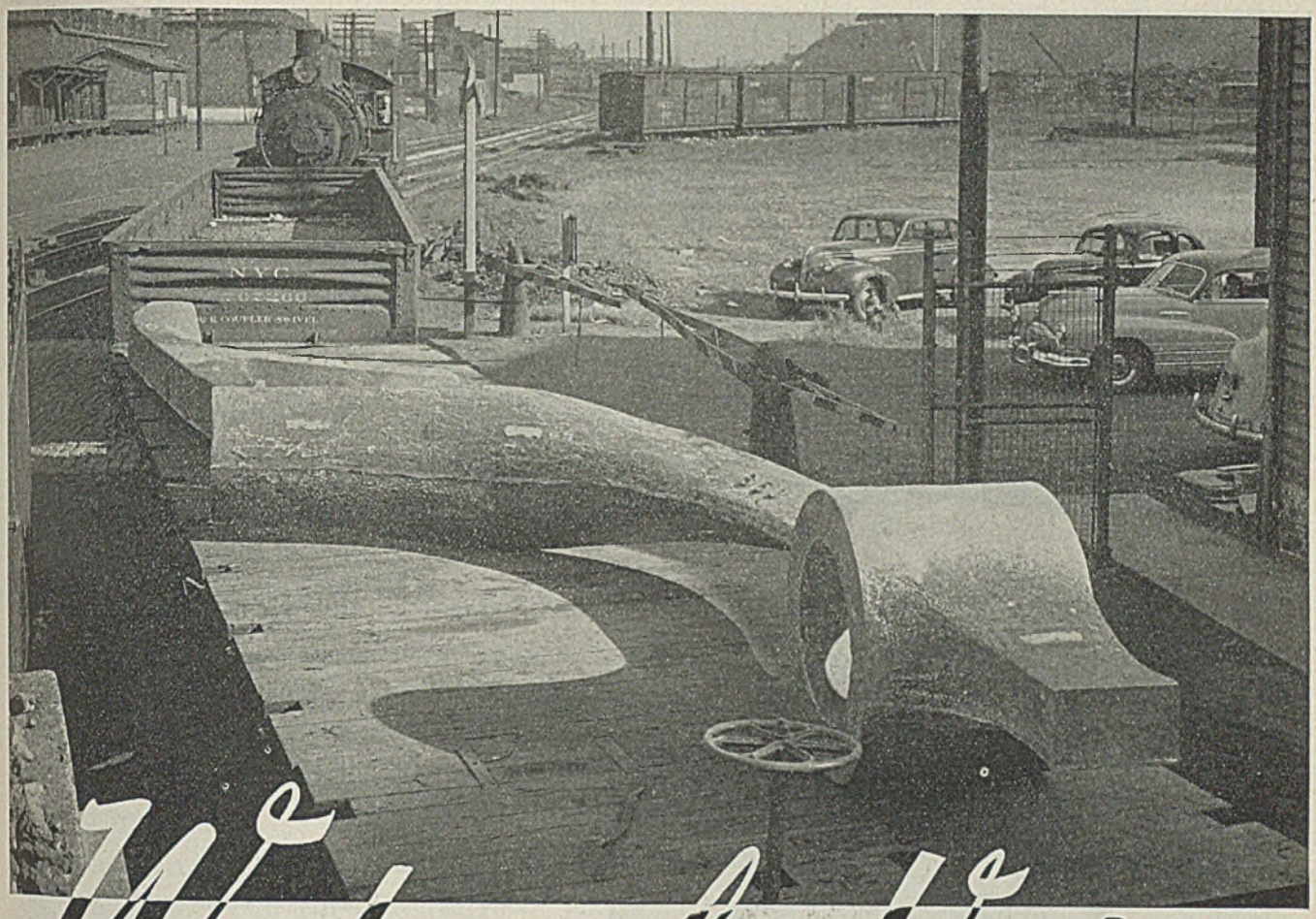
Equipped with a 3-roll drive, the machine features an air cylinder for operating the drop end, thereby automatically raising the top shaft to facilitate removal of completed circles. Shaft diameter of the new model is 17½ inches. Of steel construction, the new



roll is a compact unit equipped with bronze bearings. It also has a speed reducer for direct motor-drive hook up. Its reduction unit is totally enclosed with all gears running in oil.

Toggle-Clamp Controller

A new device for activating toggle clamps introduced by Airop Inc., Dearborn, Mich., facilitates holding down large parts or assemblies where clamps are required to encircle the work. It eliminates the necessity of the operator repeatedly walking around the work to manipulate the many clamps. One central control valve can be used to control simultaneously or at staggered intervals a gang of Airops as the device is called,



We Working for Victory

The above photograph shows a two-piece stern frame produced by us for the United States Maritime Commission for use on Liberty Ships. We are proud of our efforts for victory through these ship castings, as well as rolling mill and miscellaneous work produced in our foundry.

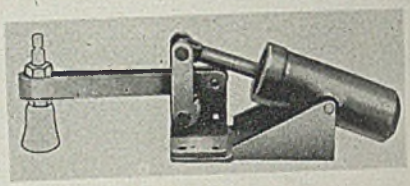
MARITIME "M" AWARD
FOR OUTSTANDING
PRODUCTION ACHIEVEMENT

STERLING STEEL FOUNDRY CO.

800 WASHINGTON AVE. BRADDOCK, PA.

placed around an extensive perimeter. The units also may be set up for foot operation.

The device consists of a cast metal cylinder housing a plunger connected with a toggle clamp. Pivoted to the base, the cylinder can rock freely to con-



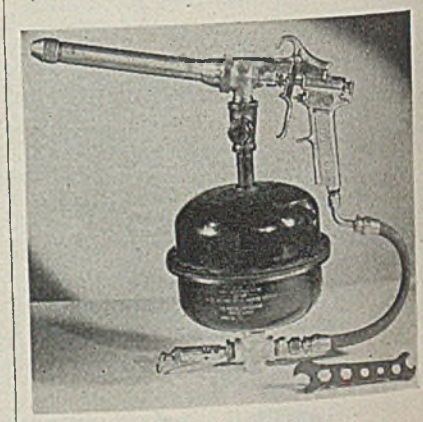
form with the changing angle of the plunger as it moves back and forth activated by air pressure.

The unit operates on the regular shop air line pressure of 40 to 150 pounds. In locked position it is capable of exerting a constant pressure of 325 pounds at the end of the clamping bar. The air itself does not exert the pressure on the work; it is used only to actuate the clamp. It is the toggle that locks the clamp and holds the work firmly.

A 90-degree swing of the clamping bar from closed to opened position facilitates placing and removing parts in the fixture.

Spray Unit

A new light-weight portable spray unit for lubricating press, table and shear gears, cams, slides or hard-to-reach spots is announced by Hodson Corp., 5301 West Sixty-sixth street, Chicago 38. To provide a controlled, even coating in any thickness desired, the unit employs a special type spray gun with an 8-inch



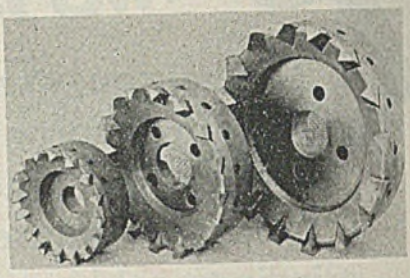
extension, mounted in connection with a diaphragm-operated air cylinder. It operates on the average plant air line. Weighing less than 10 pounds, the spray outfit has a capacity of 5 pounds.

Cutter Blade

Weddell Tools Inc., Rochester, N. Y., announces a new type of cutter blade, known as the Tri-Bit, for application to face milling cutters. Its triangular shape offers good chip clearance as there is no heel on the blade to catch or clog chips. Also the face of the cutter body is dished, which in combination with the

triangular blade forms a chip space that expands in size away from the cutting edge in direction of chip flow.

Each of the bits is securely locked home in a V-shaped hole in the cutter body by a lock screw. The cutter body



is tied together all around the blade. Each bit is further backed up by a single adjusting screw, permitting minute adjustment of the cutter blade for 60 per cent of its length.

Tri-Bit face mills are being offered by the company with three different sizes of bits for medium, heavy or extra heavy duty operations. These, respectively, are for cuts up to ¼, ½ and ¾-inch in depth. Cutters are furnished with high-speed steel, cast alloys or carbide-tipped bits.

Current Converters

For changing direct current into alternating current, Kato Engineering Co., Mankato, Minn., is offering a new line of 2-pole ball-bearing continuous-duty converters. Units in the line are offered in 225 and 350 volt-ampere capacities at 3600 revolutions per minute. They

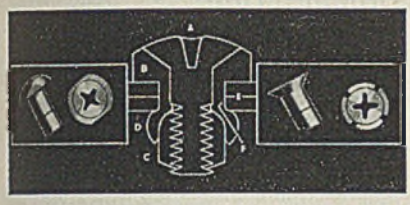
are suitable for changing 32, 110 or 220-volt direct current to standard 110-volt 60-cycle alternating current. When used for operating sensitive radio and electronic equipment, the converters can be supplied with a special filtering device.

Blind Rivet

No special handling is required in using the new Preco blind rivet developed recently by Pacific Railway Equipment Co., 960 East Sixty-first street, Los Angeles 5. Applicable almost any place where riveting is used, it can be tightened with an ordinary hand ratchet or power screw driver.

The rivet consists of a combination of three parts, a steel cadmium-plated re-

cessed-head screw inserted into the hollow stem of a high strength aluminum alloy rivet and a knurled nut threaded on



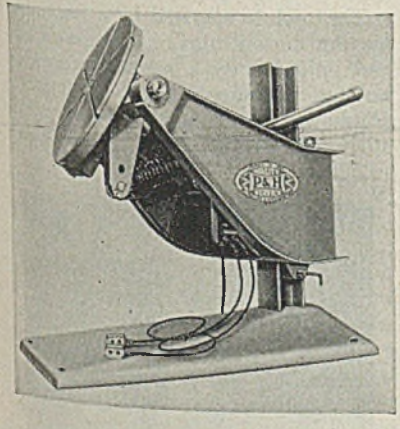
the end of the screw. Both rivet sleeve and nut are anodized. The rivet has a positive mechanical self-locking action—sheets are gripped together tightly and the expansion of the rivet sleeve fills the hole compactly and completely.

Two types of rivets are being offered by the company—a raised head and a flush head type. Each comes in three diameters—⅛, 5/32 and 3/16-inch with grip lengths covering the normal range.

Welding Positioner

Greater flexibility and ease of operation are features of the new line of welding positioners introduced recently by the Welder Division, Harnischfeger Corp., Milwaukee 14. Each model in the line has a dual capacity rating. For example, the WP-6 in the 6000-pound class, handles loads up to 6000 pounds maximum and also has a secondary capacity of 9000 pounds maximum. Standard models are being made in dual capacities up to 24,000 pounds.

Construction of the unit is for constant heavy duty service, employing all-welded rolled steel throughout. Table top areas are larger than usual, and placing of the elevator column farther back provides greater clearance for handling large weldments. Self-locking worm gear and spindle drive on tilting motion prevents upsets. Limit switch and adjustable stop brackets give additional safety when extreme tilting is necessary. Table is turned by a pinion from a totally enclosed flood-lubricated gear case. Pinion drives a bull gear to which the table top is bolted. Table also can be



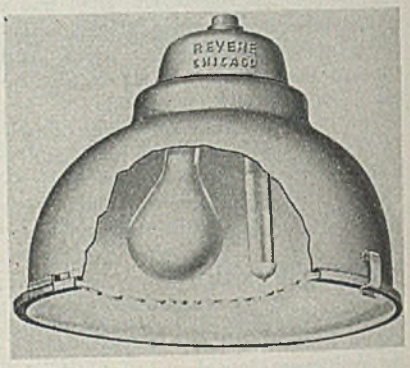
removed quickly for bolting special weldments or fixtures direct to bull gear.

Individual magnetic pushbutton stations operate two separate motors for tilting and turning to provide remote control of table motions. All models are sup-

plied for alternating or direct current and with portable or in-the-floor mounting.

Lighting Unit

A unit designed to fulfill the need for illumination approaching daylight on both flat and vertical surfaces was recently developed by the Revere Mfg. Co., 2949 North Paulina street, Chicago. The unit consists of an incandescent lamp used in combination with a mercury lamp. The reflector is shaped to give



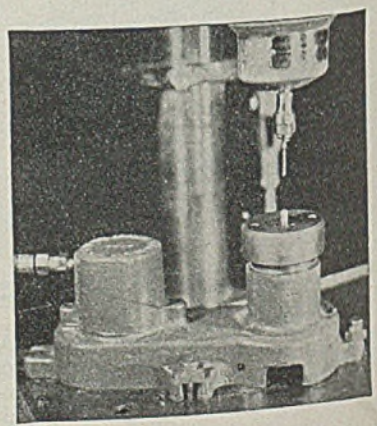
wide and even distribution of light with a minimum of direct glare. Together with the hood, it embodies features which dissipate heat accumulated from the lamps.

Hood and reflector are of heavy gage steel, porcelain enameled white inside and green on the outside. Rating is 250-watt mercury and 300-watt incandescent.

Collet-Holding Fixture

Speed of handling work is greatly increased by using the Red-E-Air chuck, an air-operated collet-holding fixture manufactured by Red-E-Air Chuck Co., 654 West Lake street, Chicago 6. Distributed by Cleveland Airtool Co., 4614 Prospect avenue, Cleveland 3, the chuck's principal use is to accurately chuck screw machine parts for second operation work on drill presses, tapping machines, milling machines, etc.

The tool is operated by a foot valve, leaving the operator's hands free to load and unload. By a leverage action, the holding pressure at the collet is multiplied over the air line pressure more than 10:1.



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when a break down of the shear develops.

Some months ago a steel mill was called upon to convert a continuous strip mill to rolling plates ½ to 1½ inches thick. Since the plates were for ships, squareness and dimensional accuracy was essential. Available machinery capacity was neither large nor accurate enough for shearing the heavier gage material. Accordingly, complete cutting machine tables and roller guide tracks were made up to accommodate straight-line cutting equipment. This plate trimming and squaring setup comprised four separate working positions with transfer tables for cutting parallel edges longitudinally and for cross cutting laterally. Radiagraph machines for cross cutting were mounted on gantrys spanning the work table. The entire installation was so engineered as to use the highest cutting speeds and a minimum of crane handling. Both of these factors were highly essential, due to the crowded conditions, in order to move the large volume of steel through the mill on schedule.

When power saws or friction saws were not available, a small manufacturer in Brooklyn devised an improvised set-up for cutting 9-inch outside diameter heavy walled tubing into short lengths. Resembling a Rube Goldberg invention, it served admirably despite its unimposing appearance.

Used Small Drill Press

As shown in Fig. 4, the device comprised a discarded small drill press adapted to rotate the tubing beneath a stationary torch. Slow rotation was provided by a worm gear arrangement which reeled in a wire wrapped around the tube. Mechanized gas cutting of the tube was desirable because of the heavy thickness, 1¾ inches. The particular method of rotation used here happened to be convenient for this shop. Alternatives such as a slow turning lathe or motorized dollies could be adapted.

Torches also are being used for stripping plate or structural sections down to smaller sizes. Inasmuch as numerous sizes are no longer produced, it becomes necessary for the user to develop efficient ways for providing for his own needs. One such expedient, employed in a shipyard where quantities of strip plate are needed, simply involves a small portable Radiagraph machine fitted with an oversize torch mounting bar, carrying five torches along a straight line. Wide plates are thereby converted into narrow strip material without withdrawing the large multi-torch Travograph machines.

The difficulty of obtaining structural sections in odd sizes is quite easily met in some cases by trimming a standard section down to required dimensions. Thus T-shapes are frequently made by trimming flanges from I-beams as shown in Fig. 1. Likewise two Tees can be made from an H or an I-beam by splitting the web down the center with a

torch mounted on a Radiagraph running alongside the beam. In a more elaborate setup, channels may be split along a serrated line down the center of the web to form stiffeners.

In bending structural shapes a certain amount of objectionable deformation frequently occurs. A method of forestalling the bulging out of corners of channels before forming is to flame chamfer the edges. This simple procedure obviates the need for tedious grinding after the channel is bent to a radius.

There also is fertile field for ingenuity in applying gas cutting to those operations which fall logically into its own field. One application is the cutting of parallel edges on plate sections which must fit accurately into an assembly. Special plate squaring machines are available for torch cutting, but necessity has brought out satisfactory expedients. In one shop wide plates are trimmed parallel by two torches carried on an improvised gantry spanning the plate bed. This setup is fairly elaborate, requiring precise line-up of the gantry rails, and hence it is appropriate only where large quantities of work are handled.

Simpler with Straight Template

A simpler method employs a straight edge steel template laid down on the plate, providing an accurate guide to two portable Radiagraphs fitted with side rollers. The two machines are run simultaneously, riding against the straight edges while trimming the plate. Retractable wheels on the jig aid in jogging it into position. Within limits, such jigs can be made to guide the machine along curved or irregular paths of cut, by acting as a cam to the machine or to a free swinging, spring-supported torch.

Variations of the latter technique are innumerable. In Fig. 2 a tube end is being cut to a curved profile using a simple sleeve template. This cam is slipped over the tube and crabbed against the torch tip while the tube is slowly rotated by hand. A steel ring may be fitted over the copper tip to prevent gouging of the soft metal. In general, this use of cams for direct guidance of the torch is most commonly used in manual torch cutting. Hand cutting may be resorted to in cases where smooth surfaces are not essential, where the top surface of the plate is curved, or where cutting machines are in demand for other work.

The cutting of plate edges for welding imposes a requirement of uniform spacing down the length of the seam. Accurate straightness is not essential, the chief object being to avoid wavering lines of cut which may necessitate excessive weld deposits to fill up gaps between the plates. By one method, a Radiagraph cuts both plates at once with two torches, so that any slight deviation in direction of cut will be complementary in the two plates. When brought together, the edges will fit perfectly regardless of any slight variations.

Another method, shown in Fig. 5, employs a hand torch equipped with a

guide for beveling a plate edge to match a beveled edge already cut. This device accomplishes the same purpose as the first method, and it is reported to have saved both working time and welding electrodes in an Eastern shipyard.

Among the improvisations applying cutting machines in novel ways on essentially flame cutting operations are those in which standard machines are fitted with accessories to accomplish unusual tasks. Usually the machine involved is a portable Radiagraph, which is capable of serving many functions since it is primarily a tractive machine for propelling torches along straight or radial lines of cut.

Two illustrations will demonstrate this point. In one case, a Radiagraph was fitted with a 10-foot bar, supported in cantilever fashion by turnbuckled rods. This bar carries four torches in adjustable positions for trimming parallel edges simultaneously on two plates, one on each side of the machine tracks. On regular production work this "baby Travograph" has produced 1240 linear feet of cutting in 8 hours, compared with an average of 300 feet for a single Radiagraph.

The second example is a trailer attachment designed specifically for cutting square ends on corrugated bulkheads. The Radiagraph with its curved outrigger arm draws a small two-wheeled trailer uphill, across on the level, and downhill. The torch always maintains a position perpendicular to the work surface. This floating torch device is adaptable to a variety of other operations where inclined or irregular surfaces are involved.

The operations described are only a representative few of the great number of ingenious flame cutting jobs which have been developed. It should be pointed out that on a long-term basis important benefits will be derived from these special cutting applications, which are now used chiefly because of immediate necessity. Cutting and fabrication departments should constantly take stock of the experiences gained during these times, evaluate them in terms of overall economy, and learn from their own ingenuity.

Allis-Chalmers Markets Porcelain Bushing Cement

In response to an unsolicited demand, a porcelain bushing cement for years used by Allis-Chalmers Mfg. Co., Milwaukee 1, is now being placed on the market by the company under the trade name of Magna-Bond.

Because the product is not manufactured from critical materials, it is possible to supply it much more readily than many other such cements.

Magna-Bond resists deterioration by air, water and transformer oil, and even corrosive gases have little effect on it. When the cement is coated with enamel as directed, it will give years of service, the company states.

Complicated Assemblies

(*Concluded from Page 92*)

struction here is in the fabrication of impellers for marine pumps, as shown in Fig. 3. Made in a wide range of sizes weighing from 20 pounds to 1300 pounds each, these units are built to very uniform tolerances because all of them are dynamically balanced. When these units were cast, large numbers were rejected when machining disclosed holes and other imperfections. Through the adoption of all-welded construction, rejects have been just about eliminated.

Almost every known type and size of welded joint is used in our operations. The number of passes varies all the way from one to as many as 20 or more, depending upon the amount of metal that must be deposited. Most work is welded with class E-6020 electrodes. Since practically all sizes are used, they are deposited at various current settings throughout the entire range of the welding machines.

In some cases, large joints are partly filled by the inclusion of a mild steel filler bar, as shown in Fig. 1. In such cases great care is exercised to make sure that the filler bar is completely surrounded by deposited metal to insure full-strength joints. It is estimated that this technique saves up to 40 per cent in welding time on the large joints where it can be employed.

As a case in point, the filler bars are used with very satisfactory results in many of the larger joints of all-welded press frames. One such unit is constructed of mild steel stock varying in thickness from 1¾ to 2½ inches, is designed to exert pressure ranging as high as 150 tons.

Most of this work must be held to extremely close tolerances, therefore particular care is taken to assure good fitup and to eliminate excessive distortion during welding. Both large and small parts are machined to the smallest thickness allowable in order to keep the total weight to the minimum. Many parts are annealed after welding to relieve internal stresses.

Many different jigs, fixtures and positioners are used to simplify the welding operations and to make it possible for most of the work to be done in the flat or horizontal positions.

On production jobs of a repetitive nature, such as those illustrated here, operators maintain a welding speed of approximately 15 feet of single-pass welded joint per hour.

We are firmly convinced that alternating-current welding is the most practical and economical fabrication method for our type of work, where both speed and quality must be maintained and where rigid specifications must be followed. Some "proof of the pudding" is the fact that the plant was awarded the Army-Navy "E" earlier this year for its excellent war production record—work where quality as well as quantity is most essential.

Revised Thread Chart Offered by Elemoto Co.

U. S. standard Woodruff keys and American standard thread dimensions are given almost instantly by a new slide chart recently placed on the market by Elemoto Sales Co., Teaneck, N. J. The new chart is similar in appearance to the one introduced last year by the company. Data, however, are revised to correspond with the latest government publication, "Screw-Thread Standards for Federal Services."

The front side of the chart shows U. S. standard dimensions for coarse and fine thread series. When the slide inside the housing is moved to the right or left, the standard dimensions for each size from 0 to 1¼ inches are placed at the windows in the blueprint dimension drawings. All required dimensions such as threads per inch, major and minor diameters, head sizes, etc., are obtained instantly with one reading.

The reverse side of the slide is used to obtain dimensions for U. S. standard (and other commercial sizes) Woodruff keys. The lower section here is used to determine dimensions for American standard pipe threads. The housing on this side also carries a table for changing millimeters to inches and a table of twist drill and steel wire gages.