Use of sectional tubing assemblies in B-24 bomber plant is innovation. Page 74

STEEL

The Magazine of Metalworking and Metalproducing

MAY 15, 1944

Volume 114—Number 20

NEWS

TECHNICAL

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MARKETS

machine ... is an opposed Style 58 two-way machine arranged with six boring spindles at each end for finish boring, counterboring and facing the gear holes in an aluminum supercharger cover. All spindles operate simultaneously, finishing the holes within .0005" at a highly satisfactory production rate. The units have 20 inches of table travel and 15¾ inches between the ways. Each spindle is individually adjustable for quick setting. In this particular application all centers are set to a master gage, which, in effect, is a master for the part itself.

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STEEL
May 15, 1944

This Is Not Funny

Now that the seized plant of Montgomery Ward has been returned by the government to its owners, it is possible to review the circumstances and to try to determine the real meaning of this unusual case.

The root of the trouble, of course, was the dispute over the maintenance of membership clause in the union contract. Sewell Avery believed that the government was on shaky legal ground in demanding that employers accept contracts containing this stipulation. He went out of his way to seek a showdown on this point. One may question his wisdom but no one can doubt his right to seek a court decision on this highly controversial issue.

In due course the government seized the plant, using armed soldiers for the job before it sought action from the court. It is apparent now that many persons high in the government administration believe that this was a blunder. There is evidence that it was distasteful even to some of the government principals involved. Equally as much of a blunder as the initial seizure was the arrest of a company executive for removing a placard from a bulletin board.

These high-handed actions by the government of a democracy naturally raised serious questions in the minds of many people as to how far the President's wartime powers extend. If he could seize Montgomery Ward, escort its president to the street and arrest another officer on the mere suspicion of a trifling offense, why could he not also seize any country store, or home, or business on an equally weak pretext? The implications were alarming.

After the President returned from his rest in the South, Washington newspaper correspondents at a press conference asked him if he cared to comment on the Montgomery Ward case. In characteristic style, he tried to laugh it off as being inconsequential. He charged that the newspapers had distorted the legal aspects of the case and intimated that some persons had been imagining a deliberate misuse of executive power.

This trait of the President to pass off serious blunders as trivial jokes is unfortunate. Too often the government has made serious charges against corporations and then—after putting the defendant corporations to heavy legal expense—has withdrawn the charges. This procedure, which has become notorious in this administration, usually provokes nothing more than an airy wisecrack from the President.

These things no longer are funny to the man in the street.

HOT-HEADED UNIONISTS: Just why there should be a flare-up of strikes on the eve of invasion is difficult to explain. Some authorities say that the recent work stoppages in the Detroit area were due largely to the fact that employes, tired of long hours and with plenty of spending money, welcome any pretext to take a few days away from the job.

Of course the unions always disclaim responsibility for these strikes, yet there are evidences that union representatives are not too well sold on labor's "no strike" pledge. Last Wednesday at the convention of the United Steelworkers of America in Cleveland, the president of a Pennsylvania local started a movement to withdraw the union's "no strike" pledge. A crisis ensued in which confidence in the leadership of President Philip Murray was at stake. Mr. Murray met the challenge head-on. In

(OVER)

an impassioned speech he swung the delegates back into line and rescued the pledge from repudiation.

This was one of the finest things Philip Murray ever did, but it does not erase the fact that a considerable number of union officials are blind to their responsibility to the public. Hot-headed, undisciplined junior union officials, given too much encouragement and license by government labor policy, are responsible for much of today's trouble.

—pp. 62, 71

* * *

NO. 1 STEEL CONSUMER: Unless one has made a thorough study of the subject, he is likely to be surprised at the extent to which the nation's wartime shipbuilding program has altered the pattern of steel production and consumption. In prewar years, the tonnage of rolled steel going into ships was seldom more than 2 or 3 per cent of the total output. In 1943, shipbuilding required 11,433,000 tons of steel, or 19.1 per cent of the total. The automobile industry is the only peacetime consumer which has ever exceeded this percentage in consumption.

The merchant vessel program for 1944 calls for a slightly smaller volume of construction than that for 1943, but backlogs and some projected new construction will maintain the demand for steel and other materials virtually at 1943 levels. At the present rate of shipbuilding, the United States may come out of the war with a merchant fleet of 50,000,000 deadweight tons. —p. 53

* * *

POLICY AND PRACTICE: Concern over government measures affecting the disposal of surplus war materials was evidenced last week at the annual meetings of the American Steel Warehouse Association in Chicago and of the National Association of Sheet Metal Distributors in Philadelphia. At both meetings speakers, while reassured by the avowed intention of government officials to handle the disposal problem intelligently, stressed the difficulties of translating sound policies into actual practice.

Underlying this concern is the certain knowledge that the demand for steel for resuming civilian production will draw heavily upon surplus stocks and will tempt speculators and others to encroach upon established distributing businesses. Apparently government officials, producers and distributors agree that the type of speculator whose office was in his hat and who handled a sizable portion of the surplus material of World War I has no legitimate place in the disposal set-up. —pp. 56, 57

FORMULAS FOR SUCCESS: Two points developed at the inspiring and well attended spring meeting of the National Machine Tool Builders Association have wide application throughout the metalworking industries.

One is the value of constructive criticism of a product by customers. Before the convention General Motors had been host to machine tool builders. In a two-day conference, General Motors engineers had pointed out to machine tool designers certain problems encountered in the operation and maintenance of machine tools. These problems were explained and illustrated at the convention and it is a foregone conclusion that they will influence design in the future. Every manufacturer in the country could profit from a similar bit of constructive criticism by his customers.

The second point is that after the war, when we again work under competitive conditions, the successful salesman will be the one who can show that his product will help the customer to reduce the cost of production. Design, construction, advertising and selling—all must be pointed in the direction of reducing manufacturing costs. —pp. 58, 92

* * *

CUTTING FIRE LOSSES: In view of the extraordinary number of fires which have occurred in manufacturing plants and warehouses during the present war period, it is not surprising that renewed efforts are being made to minimize the fire hazard.

Indicative of one approach to the problem is an unusual built-in fire extinguishing system just installed in a Navy storage depot in Philadelphia in which highly inflammable liquids are stored. A sprinkler system is connected to a battery of 280 steel cylinders each containing 50 pounds of liquefied carbon dioxide. The supply lines, valves, discharge nozzles, etc. are arranged so that a sufficient volume of carbon dioxide gas can be discharged quickly in any given area to reduce the oxygen content of the air to a point below which fire cannot exist.

Highly effective installations of this kind probably can be justified only in buildings or departments where unusual fire risks exist. Nevertheless, the fire record since Pearl Harbor points definitely to a need for more effective fire prevention and control.

—p. 100

E. L. Shaner

EDITOR-IN-CHIEF

Spheroid Floats—
Another Wartime Use of Inland Steel

Guarding America's great harbors is a small Navy within the Navy—the men and tenders who handle the antisubmarine and antitorpedo nets. These nets, often more than two miles long, are supported by spheroid floats. A great number of these floats, which are 58 in. in diameter, are made by welding together preformed segments that are cut from Inland plates.

The plates shipped for this purpose by Inland not only measure up to specifications, but they are delivered on schedule, assuring uninterrupted production, low manufacturing cost, and on-time delivery of floats to the Army and the Navy.

Meeting customers' manufacturing schedules is an Inland tradition, which we have done our best to maintain even in the face of the heavy demands and changing needs of wartime production. This principle of punctuality begins when an order is taken—and follows through the order department, the metallurgical department, Inland's modern mills, and the traffic department. To Inland, every order calls not only for high uniform quality but for cooperative service as well.

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Fig. 1

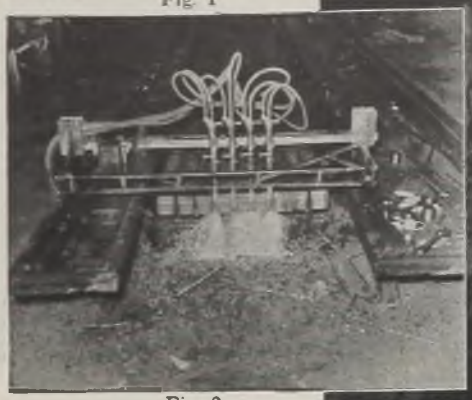

Fig. 2

MAKING BILLETS from SLABS

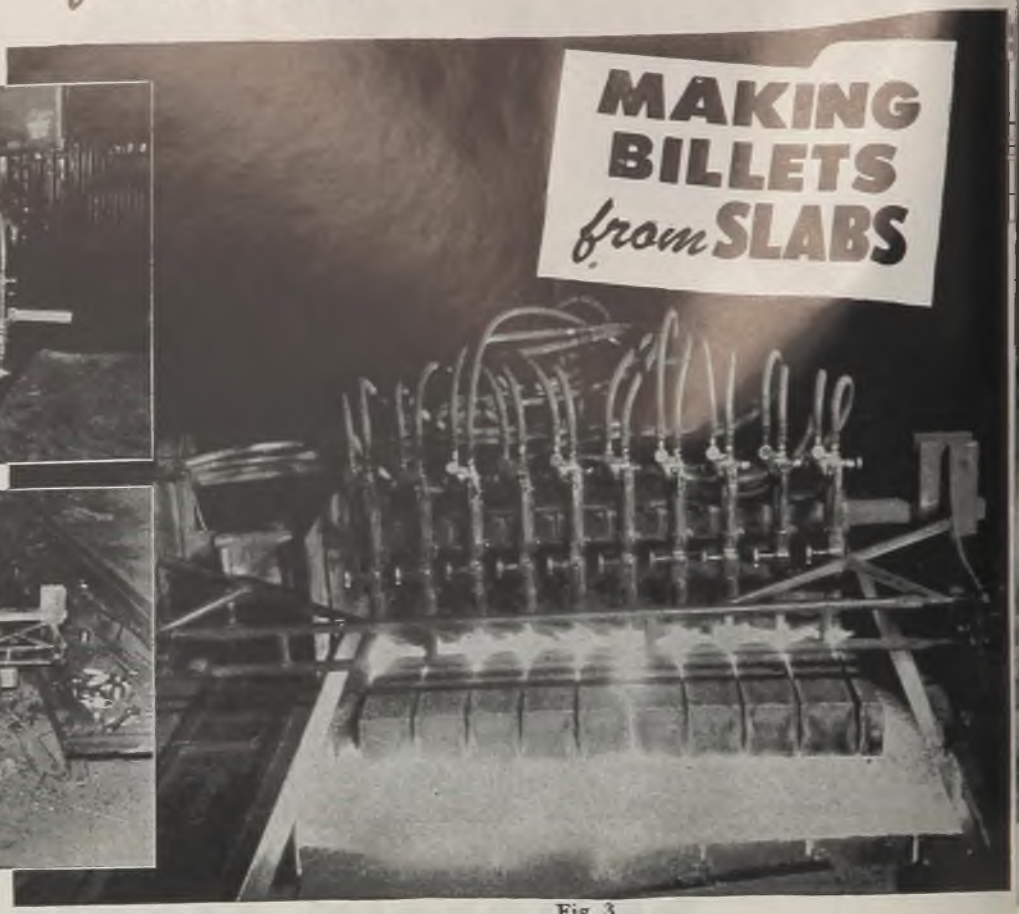

Fig. 3

● A leading flat-rolled producer was called upon to furnish 50 tons of one of his special analyses in billets for rolling into welding wire. There was no billet mill at the plant where the heat was produced so it was decided to flame-cut slabs into billets.

To do the job, four cutting torches were mounted on a five-foot bar which, in turn, was mounted on an Airco Radiagraph (Fig. 1).

Repeat orders made it necessary to develop a more efficient method which would eliminate repositioning of the track and machine set-up to split the center section. Accordingly, a new mounting and carriage, carrying four cutting torches and driven by the Radiagraph was built (Fig. 2). The design permitted repositioning of the torches for making the center cut.

Later, as orders increased, six more cutting torches were added, permitting the complete splitting and trimming of a 37" x 3¾" slab, 24 feet long after end cropping, in approximately 32 minutes.

This is one of many examples of practical help rendered to steel producers by Airco engineers. This helpful service is available to all mills on problems involving use of the oxy-acetylene flame and electric arc.

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Ship Steel Requirements To Continue Heavy Through Year

Merchant vessel program for 1944 slightly smaller than in 1943, but backlogs and some projected new construction will maintain demand for materials. United States expected to have fleet of 50,000,000 deadweight tons at war's end

By B. K. PRICE
Associate Editor, STEEL

WITH shipbuilding, steel's No. 1 customer, now at a production level sufficient for meeting all wartime requirements in sight, speculation grows as to when and how fast its needs are going to subside.

Recently a material easing in new orders was predicted by the end of third quarter. Production of ship steel is expected to continue heavy throughout the year, due to substantial backlogs, and some additional orders. But by the end of the year, these backlogs may become so reduced that, in plates, the principal steel shipbuilding item, for instance, mill shipments would be available within a couple of months, at the most, as against five and six months at present. More recently, however, there has been a disposition to modify these predictions somewhat, or at least hold for certain important new work which now appears in sight—notably a program for 2359 additional merchant ships.

As to the longer range, it is believed that while the United States will have greatly increased its shipping during the war, its postwar needs will be much heavier than its prewar needs. The country also will have the operators and trained personnel to handle the ships, something it did not have a few years ago. Further, it is believed a number of new types of ships will have to be built and that the general decline in ship construction after the war is over will not be as sharp as the increase that has taken place.

Certainly the increase in shipbuilding over the past several years has been most precipitous and the steel industry has been hard pressed to supply the finished steel required, particularly plates. By virtue of diversion of considerable strip mill capacity to plates and by increasing sheared plate capacity, output has been stepped up from around 500,000 tons of plates per month to more than 1,100,000 tons and close to 150,000 tons of sheared capacity a month still remains to be brought in.

Demands Pronounced in 1942

Until four years ago the shipbuilding industry was not even considered important enough to be listed individually as a consumer of steel. In 1940, when it finally was listed, it took approximately 940,000 tons, or 2 per cent of the finished steel total; in 1941, it took 2,733,000 tons, or 4.4 per cent. Then in 1942, the first full year of this country's participation in the war, the acceleration became pronounced, with ship requirements rocketing to 9,425,000 tons and placing shipbuilding at the top among steel consuming industries, where it has remained ever since. Last year, according to the American Iron and Steel Institute, which now compiles the annual distribution figures for the steel industry, approximately 11,433,000 tons went into ships or 19.1 per cent of all steel delivered.

Only one other industry, since STEEL first originated the annual steel distribution series in 1922, ever exceeded this performance percentage-wise, and none ever equaled it tonnage-wise. The automotive industry from 1933 to 1937, inclusive, surpassed the 19.1 percentage figure, and in 1935 actually reached 24.04 per cent, but in making that peak, consumed less than 6,000,000 tons.

As to when ship steel requirements will subside, there already are indications that this is in process. Shipments of steel are still moving at a high rate—in fact, at the moment at an accelerated rate, as invasion preparations are being stepped up and the prospects of a manpower shortage in steel loom more menacingly for this summer. However, the merchant ship program for this year is scheduled for slightly less than for 1943 (around 18,000,000 deadweight

Left, workmen prefabricate ship sections in front of ways. Right, general view of an East Coast shipyard. Photos, courtesy, United States Maritime Commission

tons as compared with 19,500,000 deadweight tons last year), due largely to plans for shifting over from the simple type Liberty ship to the faster, more complicated Victory ship, and to standard C-type cargo ships and tankers.

This transformation has been proceeding slowly, so as to not unduly disrupt shipyard operations, and about 300 Liberty ships remain on the present schedule, with completion to take place this year. But the change is easing steel requirements somewhat, as are also certain important conversion programs, which require considerable skilled help and facilities, but less material than new construction.

An important consideration is the fact that ship steel supplies in general have been built up at the yards to a level where it is no longer necessary to provide heavy additional tonnages for stocks as well as meet current construction needs. In fact, stocks are regarded as excessive at some yards.

Meanwhile, new orders have eased, although shortly the new merchant ship program is scheduled to come up, this one involving 2359 additional merchant ships, and this is likely to have a marked effect on shipbuilding operations next year, and in a lesser degree, the year after. Orders for these ships will probably be placed not later than July 1, in the opinion of some shipbuilders, with delivery falling in 1945 and 1946, but mostly in 1945.

These ships will be designed for nine different purposes. They will include principally not only a substantial number of Victory ships, but tankers and C-type ships, which were being placed in increasing number during the few years just before the war, only to give way during the emergency to the Liberty ships, which could be built more rapidly and could be operated by triple expansion steam engines.

It may be interesting to review briefly certain features of the better known types of merchant ships. The Liberty has a deadweight tonnage of 10,500, requires about 3500 tons of hull steel, and has a speed of around 11½ knots. Its overall length is 441.6 feet, beam 57 feet and depth 40 feet.

The Victory ship is slightly larger, with a deadweight tonnage of 10,800, length of 455 feet, beam of 62 feet and depth of 41 feet. It requires around 3700 tons of hull steel and, unlike the Liberty ship, is powered by turbine geared drive steam engines, with auxiliary equipment practically all electric. Her speed is much faster, averaging more than 15½ knots.

The C-1 ship varies in deadweight, either 7500 or 8975 tons. There are two types, the shelter deck type, which has the lighter deadweight, and the full scantling type which has the heavier. These two types have an overall length of 413 feet, a beam of 60 feet and a depth of 37.6 feet. Speed is around 14 knots.

C-2 Is Fast Ship

The C-2 ship has a deadweight of 9758 tons, an overall length of 459 feet, a beam of 63 feet and a depth of 40.6 feet, with a speed of 15½ knots.

The C-3 type has a deadweight of 12,595 tons, an overall length of 492 feet, a beam of 69.6 and a depth of 42.6, with a speed of 16½ knots. Hull steel requirements for these ships are about 3500 tons for the C-1; 4000 for the C-2; and 4500 for the C-3.

That the shipbuilding program may be passing its crest is also indicated by curtailments in the construction of certain types of ships other than the Liberty ship—naval escort ships, for instance, now that Axis submarines are no longer a menace, but merely a problem, as Adm. Ernest J. King recently put it. However, the landing craft program, which had eased recently, is now to be followed by another production program of substantial proportions.

One consideration in the long range outlook is the fact that all major shipbuilding programs are running well ahead of schedule. The time allotted the Liberty ship has been cut from 241.3 days to an average of 39.2, about one-sixth of the original time required. Building time has also been cut on a number of other types of ships, in proportion to the number involved. The Navy program is running well ahead. Before Pearl Harbor, it took about 39 months to build a battleship; now it requires about 32. Aircraft carriers, which originally took 32 months are now being built in 16 months; submarines, 7 against 14 months; and destroyers, 5 against 18 months.

At the beginning of this year the Navy had 2,400,000 deadweight tons of combat ships on hand, as compared with 1,300,000 deadweight tons Jan. 1, 1942, just after Pearl Harbor. Much work still lies ahead, as indicated by the tonnage authorized as of Jan. 1, 1944—about 5,300,000 deadweight tons. As to how much of this and other authorized tonnage eventually will be constructed may depend upon the length and the course of the war, but, admittedly, there is much in prospect.

Since the country's present long range merchant ship program was inaugurated in 1938, 5035 ships have been placed and up to April 1, this year, 3234 have been delivered, with two-thirds of the remainder scheduled to be delivered before next January. The country's merchant marine is now the largest in its history and rivals that of any other country in size and quality and by the end of the war its position will be even still much stronger. The United States is turning out more merchant tonnage in a month than England, normally the world's leader in merchant shipping, is producing in a year, due in part, however, to England's concentration on combat ships.

By the end of this war, it is estimated,

this country will have a merchant fleet of well in excess of 50,000,000 deadweight tons (costing about $16 billion) compared with 11,000,000 to 12,000,000 deadweight tons just before its entry into the war. This leaves little question but what at some future date there will be a drastic curtailment in shipbuilding. Even assuming a substantial expansion in American shipping after the war, which appears reasonable in the light of present prospects and plans, there will be a heavy excess of ships. But is this figure quite as excessive as might at first be adjudged? And will there still not be a fairly substantial amount of ship work, in the matter of replacements and maintenance, for an indefinite period to come?

As one approach, take the estimate in some maritime circles that a modern merchant marine of 15,000,000 to 20,000,000 deadweight tons would cover the country's increasing economic requirements after the war. How would this tonnage be split up? Pointing out that not all of the proposed merchant fleet would be engaged in foreign service (and that critics fail to take this into account in their contention that a merchant fleet of such proposed strength would be entirely out of line and would be responsible for the creation of much international jealousy and discord), Adm. Emory S. Land, chairman, United States Maritime Commission, and War Shipping Administrator, declared recently that during a normal peacetime year less than 4,000,000 deadweight tons of American shipping were engaged in foreign trade, and asked if an increase of approximately 50 per cent in the postwar years would be expecting too much. If such an expectation were reasonable, the country's foreign trade shipping might well be conservatively estimated at 7,500,000 tons.

Commenting in *Ships*, published by the Shipbuilders Council of America, New York, he referred to Great Lakes shipping as having a likely peacetime requirement of 3,500,000 deadweight tons; river shipping, 2,500,000 tons; and coastal and inter-coastal transportation 3,800,000 deadweight tons. This would bring the total well within the range of 15,000,000 to 20,000,000 deadweight tons mentioned above—17,300,000, to be exact.

But this still leaves 32,700,000 deadweight tons. From that figure could be subtracted perhaps 5,000,000 deadweight tons for auxiliaries for servicing the country's greatly expanded naval fleet. This would leave 27,700,000 deadweight tons, including many Liberty ships which have already been marked off as expendable if necessary. However, many of these ships might be kept in condition as an emergency reserve in the somewhat unsettled years to come.

Sifting it all down, it would seem that much in the way of shipbuilding activity after the war would depend upon replacements and maintenance, and that that in turn would depend upon the extent to which this country could develop its foreign trade after the war ends.

Since the beginning of this century the United States has carried in ships under its own flag as little as 8 per cent. In fact, just before the last World War this country was carrying no more than that amount. After that war the United States had something like 2000 slow moving cargo ships for which the country had spent between $4 and $5 billion. But it was not a satisfactory nucleus for a strongly competitive merchant marine and nothing much was done about it until after the passage of the Merchant Marine act of 1936. Just before this country's entry into the war, American flagships were carrying between 30 and 35 per cent of its foreign trade, a peak amount up to that time since 1900—and an amount which compares with 95 per cent back in the days of the Clipper ships a century ago.

Maritime men believe much can and will be done to develop foreign trade in the postwar years.

Present, Past and Pending

■ PLANS EXPANSION OF HEAVY STAMPING FACILITIES

DETROIT—Midland Steel Products Co., Cleveland, is making postwar plans for the expansion of its plant facilities in this area for manufacture of automobile and truck frames, axle housing and other heavy stampings. Arthur G. McKee & Co., Cleveland, have been retained as consulting engineers.

■ RUSSIAN RAIL, STRUCTURAL MILL CONTRACT AWARDED

PITTSBURGH—Contracts for design and critical materials for three furnaces for a rail and structural steel mill for Russia has been awarded to Rust Furnace Co. They will be continuous bloom heating furnaces with rated capacities of 60 tons an hour.

■ YOUNGSTOWN FIRM TO BUILD ELECTRIC WELD TUBE MILL

YOUNGSTOWN—Youngstown Foundry & Machine Co. plans to build complete electric weld tube and pipe mill equipment and to put it into operation with H. G. Blevins, Sewickley, Pa., directing the design, construction and installation.

■ WISCONSIN STEEL WORKERS WIN BACKPAY DECISION

CHICAGO—Back pay, retroactive to Oct. 1, 1942, and totaling about $500,000 for more than 3000 employes of Wisconsin Steel Works, International Harvester Co., has been ordered by the War Labor Board.

■ PREDICTS BRIGHT FUTURE FOR ELECTRONIC CONTROLS

WASHINGTON—Electronic controls, so sensitive they react to the heat of a person's hand, will eliminate cold floors and drafts in postwar homes, John E. Haines, Minneapolis-Honeywell Regulator Co., predicted here last week.

■ DEVELOPS PROCESS FOR RECLAIMING SYNTHETIC RUBBER

NEW YORK—As a result of intensive research, synthetic rubber is now being reclaimed for reuse in the national rubber program. More than one million pounds have been reclaimed thus far and more than five million pounds are now available with more accumulating steadily.

■ INVESTIGATION PENDS ON COMPLIANCE WITH CMP

WASHINGTON—An investigation of seven container producers to see if there has been any violation of the Controlled Materials Plan will be made by the WPB Compliance Division.

■ THIRD QUARTER STEEL ALLOCATIONS TO BE SMALLER

WASHINGTON—Third quarter steel allocations will be about 5 per cent under those for the second quarter.

■ ARMY ENGINEERS SALVAGE CONSTRUCTION MATERIALS

WASHINGTON—Excess construction materials, valued at about $150 million, were salvaged from completed Army projects through distribution to incompleted projects and to other activities in 1944 by the Redistribution and Salvage branch office, Chief of Engineers.

Distributors Told of OPA Price Regulation Covering Excess Steel

Government maximum schedule, effective June 1, designed to prevent speculation. Warehouse operators, at thirty-fifth annual meeting, consider surplus stock problem from various angles. Postwar market prospects discussed

SCHEDULE of maximum prices to apply on the sale of surplus iron and steel products at any stage of distribution will be put into effect on June 1 by the Office of Price Administration, E. L. Wyman, head, Warehouse and Surplus Material Section, Iron and Steel Branch, Office of Price Administration, announced last week addressing the thirty-fifth annual meeting of the American Steel Warehouse Association at the Drake hotel, Chicago, May 9-10. Attendance at the convention was between 350 and 400.

The new schedule, amendment 23 to Revised Price Schedule No. 49, comes at a time when steel holders and distributors are displaying increasing concern with respect to disposal policies which will govern liquidation of the thousands of tons of excess steel now on hand and which are expected to swell steadily over coming months. This concern of the distributing industry was evidenced by the attention given the question in various papers and addresses at the warehouse convention.

Mr. Wyman pointed out there is likely to be spirited bidding for material since manufacturers who resume civilian goods fabrication will find definite advantage in getting into production promptly and shipments from mills may not be available. Under such circumstances, he said, the price control program requires measures which will facilitate disposition of excess stocks of steel without seriously disrupting established maximum price structures. It is the intention of OPA to hold prices of these excess stocks from any speculative activity, the effort being in the direction of assuring consumers they will pay no higher than present basic cost for steel.

The new price schedule recognizes the fact that there will be two groups selling idle and excess stocks. First, the initial sale by the holder to either users or resellers; second, sales by resellers.

For sales by holders, the new provisions establish maximum delivered prices made up of the aggregate of mill base price to a consumer, the rail rate of freight for the quantity sold from governing basing point to the holder's location of the material, and the actual transportation charge for delivery from the location of the material to the place at which the buyer requires the material for his operations. Quantity extras may be charged not to exceed those established by RPS 6 and quantity deductions must not be less than mill quantity deductions. In all cases, quantity differentials are to be determined on the basis of quantities which the holder sells and he may disregard any quantity differentials involved when he bought the material. Extras for size, quality, etc., not in excess of those established by RPS 6, may be added if the extra was paid by the holder to his source of supply and if he can identify the material which he is selling as that upon which the extra was paid.

For sales by resellers, Mr. Wyman said, the new price schedule establishes two ceilings. The maximum delivered prices now applicable for sales of warehoused material apply when the following three conditions are met: 1. The material has been purchased for resale in substantially the same form as received; 2. It has been removed, after such purchase, from the holder's location and has been delivered, before the receipt of any order of acceptance or any offer for the specific lot of material or any portion thereof, to premises regularly maintained and operated by the owner of the material for the assembling of iron or steel products from several sources for resale in substantially the same form as received; and 3. It has been put through the operations commonly known as the warehousing of iron or steel products, as they are defined in the schedule, by a person not connected directly or indirectly with the holder. The schedule places consumers and resellers who compete for excess stock on an equal footing.

Mr. Wyman, in closing his address, emphasized that it is the aim of OPA to

OFFICERS ELECTED

At their annual business meeting in Chicago the directors of the American Steel Warehouse Association Inc., re-elected Walter S. Doxsey, president; G. L. Stewart, Edgar T. Ward's Sons Co., Pittsburgh and P. O. Grammer, Grammer, Dempsey & Hudson Inc., Newark, N. J., vice presidents; and L. B. Worthington, United States Steel Supply Co., Chicago, treasurer.

In addition to these four officers, members of the executive committee are: R. M. Beutel, The Paterson-Leitch Co., Cleveland; C. H. Bradley, W. J. Holliday & Co., Indianapolis, Ind.; Lester Brion, Peter A. Frasse & Co. Inc., New York; F. C. Flosi, A. M. Castle & Co., Chicago; Leslie Edgcomb, Edgcomb Steel Co., Philadelphia; E. D. Graff, Joseph T. Ryerson & Son Inc., Chicago; A. W. Herron Jr., Jones & Laughlin Steel Corp., Pittsburgh; Earle M. Jorgensen, Earle M. Jorgensen Co., Los Angeles, and George A. Putnam, George F. Blake Inc., Worcester, Mass.

R. E. ZIMMERMAN

HERMAN W. STEINKRAUS

J. V. HONEYCUTT

WALTER S. DOXSEY

facilitate disposition of these excess stocks without upsetting established maximum price structures. This objective is to be accomplished by: 1. Establishing maximum prices for excess stock at the levels prevailing for similar material sold in the regular course of business, thereby discouraging speculative buying and selling. 2. Achieving protection for the consumer by enabling him to obtain excess stock at prices no higher than those he would have to pay for similar material. 3. Enabling persons who buy small quantities for use to bid for excess stock on an equal basis with those who buy for resale. 4. Minimizing the loss to holders to the highest extent compatible with full protection to the ultimate consumers. 5. Minimizing the burden on buyers and sellers by adopting established price structures.

OPA has prepared a trade bulletin on excess stocks of steel in which it explains the prices that can be charged as established in the amendment to RPS 49. Copies of the bulletin and the new regulation can be obtained at the nearest OPA office.

Greater Surplus Stocks Expected

In his address opening the convention, Walter S. Doxsey, president of the association, said if history repeats itself surplus stocks of steel will have a very significant influence on the new competition that is making itself evident today and which will blossom into full fruit after the war.

"Many long established warehouses employed the surplus stocks of World War I as foundations for their enterprises," he said. "Just as the present war surpasses the previous war in magnitude and duration, it seems certain that the surpluses arising from this conflict will exceed those of the last war by many times and, undoubtedly, the processes of redistribution will also take longer. And we may hazard the opinion that the number of new competitors and the intensity of their competition likewise will be multiplied. This new competition may come from speculators and brokers, from scrap dealers, from the many outlets for secondary steel mill products which have sprung up since the last war and may expand their activities after this conflict; and it may also come from established warehouses that wish to enlarge their activities by stocking additional products. Not to be overlooked are certain investment interests that are seeking opportunities in the warehouse field."

The speaker declared that the policy of the federal government with respect to surplus materials thus far had been reassuring. But a policy is one thing and practice is another, he said. He declared that although a Surplus Property Administration has been established, policies have not as yet been translated into practices and the three core and ten federal agencies offering surplus materials still seem to go their merry and individual ways with no di-

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Postwar Building Boom Predicted At Sheet Metal Sellers' Meeting

Speaker says minimum of two to three times as many homes to be built in ten years following the war as were erected in like prewar period. Outlook bright for other construction. Surplus materials disposal problem discussed

MINIMUM of two to three times as many homes will be built in the ten years following the war as were constructed in the corresponding period prior to the war, L. M. Cassidy, vice president, Johns-Manville Corp., New York, predicted in Philadelphia last week.

Speaking at the thirty-third annual meeting of the National Association of Sheet Metal Distributors at the Bellevue-Stratford, May 9-10, he looked for "a reasonable amount" of new industrial construction, about one-third less, he thought, than the 20-year average before the war, or approximately $300,000,000 annually.

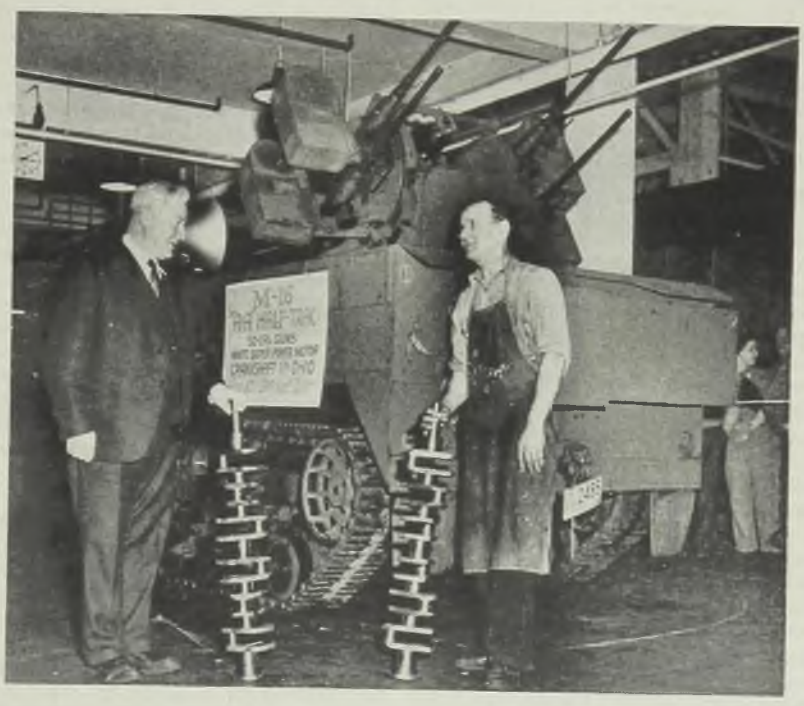
In other classes of nonresidencial building prospects were better. Assuming a healthy national income, Mr. Cassidy believed commercial building might be twice as much as the average for the period from 1920 to 1940. He also anticipated a good volume of institutional construction.

Discussion at the meeting included government plans for disposing of war stocks, an analysis of the situation with respect to such building materials as copper and roofing asphalts, manpower problems, civilian needs, and various wartime regulatory measures affecting distributors.

President Eugene Foley, Bayonne Steel Products Co., Newark, N. J., announced the next semiannual meeting of the association would be held at the Marlborough Blenheim hotel, Atlantic City, N. J., in the week beginning Oct. 15. Officers will be elected at this meeting.

Close co-operation with industry in the disposal of government surpluses after the war was indicated by Albert W. Frey, special assistant to the assistant secretary of the treasury, Washington. He declared there would be no wholesale dumping and that every effort

(*Please turn to Page* 182)



MORALE AID: To stimulate the imagination of their employes as to the importance of their war production efforts, Ohio Crankshaft Co., Cleveland, borrowed an M-16 half-trac built by White Motor Co., Cleveland, which uses crankshafts built by Ohio Crankshaft. Shown are F. S. Denneen, secretary-treasurer of Ohio Crankshaft, and Louis Strauss, veteran employe, displaying the shafts in front of the M-16

Lower Manufacturing Costs Seen Cue in Postwar Tool Designs

Recommendations for engineering improvements and new marketing techniques predominate over economic prognostications at association's spring meeting. Trend seen toward process tools rather than operations tools

By GUY HUBBARD
Machine Tool Editor, STEEL

TWENTY years ago I attended a meeting of machine tool builders in New York, where Ernest F. DuBrul said: "One way to become inoculated with typhoid is to go where typhoid-bearing mosquitos are. You fellows need inoculation with 'production virus.' Go to Detroit—get bitten by automotive 'production mosquitos'!" Last week I attended the spring meeting of the National Machine Tool Builders' Association at Hotel Cleveland in Cleveland where 300 members were bitten by "production mosquitos" from Detroit, personified by H. T. Johnson, director of standards, and G. T. Bates, time and motion study engineer, General Motors Corp.

For some present at the Cleveland meeting this was a second shot of the automotive production virus. Those members already had been exposed to Messrs. Johnson, Bates and associates at the General Motors meeting in Detroit, April 27 and 28 (See page 92 of this issue and pages 85 and 86, May 1, STEEL). Like the fever engendered by an old fashioned mustard plaster—which sometimes takes off some skin while getting at a deep-seated complaint—the treatment was drastic and may have hurt unduly in certain cases. However, the machine tool men proved they can "take it."

Practical Improvements Anticipated

Out of it all certainly will come numerous practical improvements in production machine tools. And by the same token also will come much better overall understanding among the General Motors divisions as to what they can and should expect from the machine tool industry without demanding the impossible.

Admittedly, some of the points raised in Mr. Johnson's machine tool service problem slides and in Mr. Bates' operational motion study movie, are debatable. In casting out one devil, it may be found that seven more vicious than the first are introduced. Such things will be debated and mutual understanding arrived at. However, when Mr. Bates' movie showed continuous foot-work on the part of operators which follows the pattern of an Arthur Murray dance diagram, there isn't much room for debate. The same is true where women operators find it necessary to extend levers with pieces of clothesline and lengths of pipe, and where they must stand on slippery wooden platforms. There will be much activity on the part of machine tool designers "retailoring" new models to fit men and women operators. Incidentally, automobile designers have had to do this very same thing a number of times.

In his address entitled, "More Adventures into the Unknown," James Y. Scott, president of the association and of Van Norman Machine Tool Co., came out with some ideas about postwar machine tools based on his talks with scores of hard-headed planners ranging from master mechanics to presidents of user companies. "The one thing uppermost in the minds of these men," said Mr. Scott, "is cost of production in the postwar period. Many of them have discussed with me machine tools of such radical nature that it makes me shudder to think what is going to happen if they materialize. And yet, they are feasible.

"These men are thinking about process machine tools rather than operational machine tools. A process machine tool carries a part step by step through 20 or 30 different operations, and turns it out in finished form. Watch out for this trend. It definitely is with us and in view of high labor costs which will prevail after this war, I am quite sure that with those who have production, these kinds of machines will be in demand."

Regarding current problems, Mr. Scott mentioned particularly the tough spot in which the machine tool industry now finds itself after shifting in part to other vital war work, having its ranks of skilled workers seriously depleted by the draft and its reserves depleted by renegotiation, then suddenly being faced with $450,000,000 worth of machine tool business this year instead of the $325,000,000 worth predicted by Washington authorities at the beginning of the year.

With further pool orders now denied, Mr. Scott sees one way out of this dilemma would be in permission—as of now—to begin manufacture of machine tools for certain postwar uses. This he believes will permit the industry on immediate notice to meet further sudden and varied demands by the services. It will permit the industry to maintain machine tool operations on a higher level than currently has prevailed, this without a feeling that sudden cessation of hostilities will leave the industry in dire financial straits. At the same time it will give a much more definite idea of what proportion of the facilities can safely be allocated for war work other than machine tools."

Tell Berna, general manager of the association, read a report from Adolph Foerster, Cincinnati Milling Machine Co., who long has been in London with the Foreign Economic Administration. After mentioning that in the United Kingdom the postwar machine tool problem is coming in for active consideration by an unofficial working party consisting of high level representation of the Ministry of Production, the Treasury and the Board of Trade, Mr. Foerster added:

British Plan Postwar Controls

"I feel that the British consider maintenance of a sound, well-balanced machine tool industry to be a very important matter. Therefore, I believe that they will continue their controls into the postwar period, taking their machine tool industry at a prewar pattern and reducing output to whatever volume is considered necessary to maintain the industry. Output at this level probably will be considered as part of the government pool of machine tools already in existence at that time, and allocations will be made from this pool to industry —also to fulfill requirements in liberated areas and in export markets. The United Kingdom now is exporting machine tools, primarily to Russia and British Empire countries, but none to Latin America."

In commenting on this report, in which Mr. Foerster also went into considerable detail as to British machine tool planning in regard to liberated areas and Germany, Mr. Berna remarked: "Whereas Mr. Foerster assumes that government control of the machine tool in-

"Get busy now on designs which will obsolete every current model—then let nature (plus smart salesmanship) take its course with the horde of wartime machine tools." Such is the formula for postwar success recommended to machine tool builders. The peak of machine tool production has been passed but the rush has just begun in those engineering departments wherein machine tools of the future—with superspeeds, micro-accuracy, automatic chip disposal, coolant refrigeration and in many cases electronic control—now are being converted from dreams to drawings. Photo courtesy Warner & Swasey

dustry will be part of the long-term policy of the British government, machine tool builders of the United States undoubtedly will prefer termination of government controls and return to the competitive basis that always has been the foundation of progress in American industrial enterprise."

In his report on "Developments in Renegotiation," Al. G. Bryant, chairman of the association's government relations committee, and vice president, Cleerman Machine Tool Co., said: "This committee currently is driving home to responsible officials in Washington the point that our industry cannot privately shoulder responsibility for continuing production of machine tools in the volume now demanded, without pool order or other protection. Combined inroads of excess profit taxation, renegotiation and reduced gross profits due to higher labor and material costs, have eliminated the possibility of our industry having reserves adequate to support the risks involved. Of the $1,800,000,000 pool orders which were issued—with such unqualified satisfaction both to industry and to our country—there remained as of April 6 only $32,000,000 worth unassigned to actual firm orders.

In dealing with sales and service planning, Walter K. Bailey, vice president, Warner & Swasey Co., made this prediction: "It seems probable that immediate postwar machine tool demands will come chiefly from the endeavor to meet, as soon as possible, the accumulated public desire for products of the type the public has not been able to get during the war. These fall largely in the classification some economists call 'durable consumer goods' such as automobiles and radios.

"Translating this public demand into manufacturing requirements makes it appear that postwar machine tool demands chiefly will spring from the following: 1. Reconversion of plants requiring total re-equipment or re-arrangement. 2. Reconversion of plants requiring partial re-equipment and re-arrangement; 3. New enterprises, either in old or in new plants. 4. Replacement of machines in order to place in a competitive position those plants which have not purchased equipment during the war. 5. Rehabilitation of war-damaged plants in foreign countries. 6. Replacement of machines worn out during the war."

Rolling Mill Group Meets In Pittsburgh

Spring conference attracts more than 800. Discussions devoted to rolling mill practice with emphasis on bar mills

ATTENDANCE at the second spring conference of the Rolling Mill Committee of the Association of Iron and Steel Engineers, held at the William Penn hotel, Pittsburgh, May 8, exceeded 800. Discussions were devoted to rolling mill practice.

B. M. Putich, combustion engineer, A. M. Byers Co., Ambridge, Pa. described an automatic temperature control which his company installed on a continuous furnace fired with either natural gas or No. 6 fuel oil. Burner equipment has a maximum firing capacity of 125,000 cubic feet of natural gas per hour. Once the temperature is established in the three zones, it never has been found necessary to adjust a burner.

Rejects were less than 1 per cent on a run of 1339 slabs when heated in the temperature controlled furnace; when heated in an in-and-out furnace they exceeded 10 per cent. The furnace handles 22 pieces of chrome-moly slabs, 29 x 7½ x 89½ inches and weighing 5500 pounds each, or 62.4 pieces per hour. In other words, it requires 18½ minutes to heat an alloy slab 1-inch thick; and, 1,600,000 B.t.u. per ton.

Mr. Putich stated in conclusion that the control gives an efficient and flexible furnace particularly when changing from one grade of steel to another. No overheating is encountered, furnace refractories give satisfactory life, production is increased and high quality product is obtained.

J. L. McHugh, general foreman, No. 18 mill, Jones & Laughlin Steel Corp., Pittsburgh, described the process of heating and rolling in bar mills. Few changes in basic heating and rolling practice have been made in the past 15 years though equipment has undergone many improvements he stated.

Good results can be obtained from producer gas, oil, tar, by-product coke oven gas, or a combination though the most economical operation is obtained when the proper burner equipment is employed.

C. P. Hammond, superintendent of mills, Atlas Steel Ltd., Welland, Ont., in describing the bar mills of his company mentioned that 25 per cent more power is required to roll alloy steel than carbon steel. When rolling carbon steels a drop of 100 degrees in the temperature of the material has little effect on power consumption but in the case of alloy steels any slight decrease in the temperature causes the power consumption to turn up.

April Ingot Production Rate Above 1943 Top

April total below March because of shorter month. Revised figures show March set new all-time record

APRIL production of steel ingots totaled 7,568,530 net tons, an average weekly output of 1,764,226 tons, according to the American Iron and Steel Institute. The month's total was less than March production because of the shorter month, but the average per week in April exceeded that of any month in 1943.

The institute, in releasing the April figures, also provided revised figures for production through 1943 and to date in 1944. The revision shows that March output was 7,820,226 tons, an average of 1,765,288 tons per week, 1062 tons greater than the April average. The revised March total indicates a new record was set in that month, exceeding the prior peak set in October, 1943, by about 6000 tons. In April, 1943, production was 7,373,703 tons, or 1,717,812 tons per week, both figures being revised.

Republic Steel's Funded Indebtedness Refinanced

Sale of $50 million first mortgage 3½ per cent series sinking fund bonds, due in 1964, to a group of 11 insurance companies, has been completed by Republic Steel Corp., Cleveland, in a recent move to refinance its outstanding funded indebtedness and bank loans. Sale of the bonds, at the face amount, plus a premium of 1½ per cent, was arranged through Dillon Read & Co., Glore, Forgan & Co. and Lehman Bros.

The company has also consummated serial bank loans aggregating $24.5 million due over a period of seven years with its regular commercial banks. Republic is calling for redemption on June 17, 1944, all of its outstanding General Mortgage 4½ per cent bonds; and June 5 all of the outstanding Gulf States Steel Co. first (closed) mortgage sinking fund 4½ per cent bonds due Oct. 15, 1961, at 103 per cent and accrued interest. All of the company's previously outstanding five year serial notes have also been paid.

Copperweld Earns $242,223 In 1944 First Quarter

Copperweld Steel Co., Glassport, Pa., had first quarter net income of $242,223, equal to 42 cents a common share, compared with $258,284, or 45 cents a share in like 1943 period. Net income last quarter includes $124,230 recoverable excess profits taxes from 1942 because of a carry-back of unused tax credit.

Profit of $155,806 Earned By Continental Steel

Continental Steel Corp., Kokomo, Ind., earned $155,806 last quarter, equal to 78 cents a common share, against $118,159, or 50 cents a share, in like 1943 months.

Crucible Steel Has Net Profit of $1,279,302

First quarter net profit of Crucible Steel Co. of America, New York, totaled $1,279,302, equal to $1.97 per common share, compared with $1,915,905, or $3.39 a share in like 1943 period.

Alan Wood Steel Reports Net Income of $77,829

Net income of Alan Wood Steel Co., Conshohocken, Pa., totaled $77,829 last quarter, compared with $174,786 in same period a year ago. Tax provisions amounted to $127,000.

Steel Corp. Shipments Set Record in First 4 Months

United States Steel Corp. shipments of finished steel in April totaled 1,756,797 net tons, a decrease of 117,998 tons from the 1,874,795 tons shipped in March, a longer month, but an increase of 125,969 tons over April, 1943, shipments of 1,630,828 tons.

For four months ended April 30 total shipments were 7,118,151 tons, compared with 6,780,810 tons in the comparable period in 1943. This four-month aggregate is the highest on record for this period, the previous high being 6,895,312 tons in 1942.

(Inter-company shipments not included)

	Net Tons			
	1944	1943	1942	1941
Jan.	1,730,787	1,685,992	1,738,893	1,682,454
Feb.	1,755,772	1,691,592	1,616,587	1,548,451
Mar.	1,874,795	1,772,397	1,780,938	1,720,366
Apr.	1,756,797	1,630,828	1,758,894	1,687,674
4 mo.	7,118,151	6,780,810	6,895,312	6,638,945
May	.....	1,706,543	1,834,127	1,745,295
June	.....	1,552,663	1,774,068	1,668,637
July	.....	1,660,762	1,765,749	1,666,667
Aug.	.....	1,704,289	1,788,650	1,753,665
Sept.	.....	1,664,577	1,703,570	1,664,227
Oct.	.....	1,794,968	1,787,501	1,851,279
Nov.	.....	1,660,594	1,665,545	1,624,186
Dec.	.....	1,719,624	1,849,635	1,846,036
Total	.....	20,244,830	21,064,157	20,458,937
Adjustment	.....	.....	*449,020	*42,333
Total	.....	.....	20,615,137	20,416,604

*Decrease.

STEEL INGOT PRODUCTION STATISTICS

	Estimated Production—All Companies								Calculated weekly production, all companies Net tons	Number of weeks in mo.
	—Open Hearth—		—Bessemer—		—Electric—		—Total—			
	Net tons	Per cent of capac.	Net tons	Per cent of capac.	Net tons	Per cent of capac.	Net tons	Per cent of capac.		
Based on reports by companies which in 1943 made 98.3% of the open hearth, 100% of the bessemer and 87.9% of the electric ingot and steel for castings production										
1944										
Jan.	6,769,438	97.2	439,551	85.4	377,751	83.3	7,586,740	95.6	1,712,582	4.43
Feb.	6,410,338	98.5	409,781	85.2	368,555	87.0	7,188,674	96.9	1,736,395	4.14
March	6,976,450	100.1	453,368	88.5	388,408	85.7	7,820,226	98.5	1,765,288	4.43
1st qtr.	20,156,226	98.6	1,304,700	86.4	1,134,714	85.3	22,595,640	97.0	1,738,126	13.00
April	6,768,895	100.3	437.517	87.8	362,118	82.5	7,568,530	98.5	1,764,226	4.29
1943										
Jan.	6,576,788	97.8	478,161	85.9	369,573	95.5	7,424,522	96.8	1,675,964	4.43
Feb.	6,031,605	99.3	447,810	89.1	345,189	98.8	6,824,604	98.5	1,706,151	4.00
March	6,787,902	100.9	503,565	90.4	383,111	99.0	7,674,578	100.0	1,732,410	4.43
1st qtr.	19,396,295	99.3	1,429,536	88.4	1,097,873	97.7	21,923,704	98.4	1,704,798	12.86
April	6,510,824	99.9	482,478	89.5	380,401	101.5	7,373,703	99.3	1,718,812	4.29
May	6,669,703	99.1	482,424	86.6	397,564	102.7	7,549,691	98.4	1,704,219	4.43
June	6,202,889	95.2	453,663	84.1	382,801	102.1	7,039,353	94.8	1,640,875	4.29
2nd qtr.	19,383,416	98.1	1,418,565	86.8	1,160,766	102.1	21,962,747	97.5	1,688,144	13.01
1st hlf.	38,779,711	98.7	2,848,101	87.6	2,258,639	99.9	43,886,451	98.0	1,696,423	25.87
July	6,556,794	96.8	466,345	90.6	384,737	91.9	7,407,876	96.2	1,675,990	4.42
Aug.	6,700,118	98.7	484,847	94.0	401,499	95.7	7,586,464	98.3	1,712,520	4.43
Sept.	6,646,968	101.4	480,757	96.4	386,614	95.4	7,514,339	100.7	1,755,687	4.28
3rd qtr.	19,903,880	99.0	1,431,949	93.6	1,172,850	94.4	22,508,679	98.4	1,714,294	13.13
9 mos.	58,683,591	98.8	4,280,050	89.5	3,431,489	98.0	66,395,130	98.1	1,702,439	39.00
Oct.	6,892,029	101.6	513,585	99.5	408,503	97.4	7,814,117	101.2	1,763,909	4.43
Nov.	6,543,204	99.6	440,878	88.2	387,893	95.5	7,371,975	98.6	1,718,409	4.29
Dec.	6,502,980	96.0	390,979	75.9	361,185	86.3	7,255,144	94.2	1,641,435	4.42
4th qtr.	19,938,213	99.1	1,345,442	87.9	1,157,581	93.1	22,441,236	98.0	1,707,857	13.14
2nd hlf.	39,842,093	99.0	2,777,391	90.8	2,330,431	93.7	44,949,915	98.2	1,711,074	26.27
Total	78,621,804	98.9	5,625,492	89.1	4,589,070	96.7	88,836,366	98.1	1,703,804	52.14

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

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

Fairbanks, Morse To Manufacture Locomotives

Company anticipates broad-scale modernization of motive power when peace arrives

ANTICIPATING broad-scale modernization of railroad motive power in the postwar period and an increasing trend toward dieselization, Fairbanks, Morse & Co., Chicago, is preparing to manufacture diesel electric locomotives. This announcement was made by R. H. Morse Jr., general sales manager, May 8, to a group of railroad officials and representatives of the press during a tour of the company's main plant in Beloit, Wis.

The new line of locomotives will employ the company's "OP," or opposed-piston, diesel engines of the type up to now pre-empted by the Navy for submarines and surface craft. The line will include freight, passenger and dual-service locomotives in standardized units, each powered by a single engine. Two or more units may be coupled and operated through multiple-unit control to meet any speed and power requirement within the limits of drawbar and braking capacity.

Switching locomotives also will be built in two capacities. The larger will have characteristics required for operating local freight, as well as passenger, trains.

In the opposed-piston type diesel engine, two pistons move in opposite directions in each cylinder. This radically different engine was developed in the 1930s with locomotive application specifically in view, and the company claims its success in this field already has been proved by the experience of the Southern and other railroads, which for some years have been using rail passenger cars and switching locomotives powered by the engines.

Shortly after the first of the engines were placed in railroad service, the United States Navy found this type of engine so well suited for powering submarines that today it is being used on a substantial proportion of these craft. Hundreds of Navy surface vessels also are propelled by the same engine.

Because the Navy demanded the entire engine production, further locomotive development was necessarily postponed soon after the first units had been completed. For Navy needs alone, a large new plant was built in Beloit and equipped for mass production of the engine. It is in this plant, and with the same equipment and personnel that the engines for the diesel-electric locomotives will be manufactured.

In outlining the new Fairbanks project, Mr. Morse announced that John W. Barriger III, has been appointed manager of the newly created Diesel Locomotive division. Since 1927, he has been engaged in railway financial, corporate, and related work which provided him with "unusual opportunities to study the physical characteristics and the operating and traffic conditions on all the principal railroads of the United States."

Graduating from Massachusetts Institute of Technology in 1921, Mr. Barriger subsequently served with the Pennsylvania railroad in its maintenance of way and transportation departments. From 1933 through 1941, he was in charge of the railroad division of the Reconstruction Finance Corp., during which time he was directly associated with railway financing aggregating in excess of one billion dollars.

Fairbanks-Morse has been manufacturing internal combustion engines since the 1890s, has taken a prominent part in diesel engine development, and for many years has built a line of diesels which embraces many types and a wide range of capacities.

R. H. Morse Jr., seated, discusses with John W. Barriger III, who was recently appointed manager of the Diesel Locomotive division, Fairbanks, Morse & Co., Beloit, Wis., relative to the sales possibilities of the company's latest addition to its extensive machinery line

"Planning" vs. "Wishing"

"Boss" Kettering warns progress will depend on "intelligent imagination that stays within the limits of science"

LEADERS in industry and government must distinguish between "postwar planning" and "postwar wishing," warned Dr. Charles F. Kettering, director, General Motors Research Corp., Detroit, addressing a dinner audience in Chicago, May 9. The dinner, sponsored by the Illinois Manufacturers' Association, Illinois Institute of Technology Alumni Association, Northwestern Technological Institute and Patent Law Association of Chicago, was tendered in honor of the National Inventors' Council, of which Dr. Kettering is chairman.

"We have been hearing a lot about postwar planning," Dr. Kettering said. "You would think we have never planned before. The thing we must be careful about is to separate the postwar planning from the postwar wishing. If we presuppose that human nature will be different after the war, then we have postwar wishing.

"Human nature will be the same after the war," he continued, "and there is no use getting sore about that. We will make progress if we are guided by intelligent imagination that stays within the laws of science.

"Inventions are not overnight flashes of genius, but the products of time and tediousness," Dr. Kettering said. "We may invent something good for tomorrow or for next year, but probably the most important inventions will be ready for the next generation."

Speaking on American patents, Conway P. Coe, United States commissioner of patents, Washington, asserted "Fortunately for us, the patent system which has given us our industrial pre-eminence has at the same time assured our military supremacy and the preservation of our freedom."

In the critical postwar period, we must again depend on the American patent system. Referring to the current study which the National Patent Planning Commission is making of the system with the object of revising it, Mr. Coe warned that "this is not the time for radical innovations and experimentations ignoring fundamentals. Alterations should be demonstrable improvements."

Steelworkers Call For Guaranteed Minimum Wage

Union program seeks greater participation in planning through broadening activities of labor management groups

STEEL wage case, minimum weekly and annual wage contracts, international labor collaboration, greater participation in postwar planning through broadening the activities of labor-management groups, fourth-term candidacy of President Roosevelt and renewal of the no-strike pledge, were the chief topics discussed and passed on at the second international biennial convention of the United Steelworkers of America in Cleveland last week.

President Philip Murray stated that the union "is and plans to continue its efforts to win a formal declaration by Congress favoring the principle of the minimum weekly and annual wage agreements now sought by most unions." He added that the principle already is recognized for industry through the carry-back and carry-forward features available in present excess profits tax legislation, and for farmers through benefits derived from the farm parity principle which protects them against rising living costs.

Considerable sentiment for withdrawal of the "no-strike" pledge was indicated by the many shouted noes to a convention motion to let the record show the delegates as unanimously passing the resolution favoring its renewal, after an original vote had brought victory for President Murray and the no-strike program.

The 2400 delegates present also discussed various legislative proposals dealing with food subsidies, price regulation, taxes, profits, and the War Labor Board's procedures in handling labor disputes.

Audited report of the union's financial position as of Nov. 30 last showed a net worth of $3,313,077, or an increase of $66,844 over that recorded May 31, 1943, and $2,799,360 since its inception in May, 1942. Amount received in the form of dues and initiation fees totaled $3,158,013 in the six months period ended Nov. 30.

Steel Producers Take Case to Public by Air

What the granting of the wage and other demands of the United Steelworkers would mean to the economy of the country and to living costs of all was explained by spokesmen for the steel industry in radio messages last week.

John A. Stephens, vice president, United States Steel Corp., and chairman of the Steel Case Research Committee, cited the inflationary repercussions that would follow the granting of the wage increase demanded. Mr. Stephens quoted Fred M. Vinson, director of the Office of Economic Stabilization, and James F. Byrnes, director of the Office of War Mobilization, as to the effect such an increase would have on the economy.

Dr. Jules Backman, New York University, and director of economic studies for the Steel Case Research Committee, refuted labor's claim that the cost of living has increased 43½ per cent, and explained the fallacies in reasoning by which the unionists arrived at that figure. Dr. Backman cited the Bureau of Labor Statistics estimates that the cost of living has increased only 23.4 per cent, a figure which, he said, was confirmed by other independent studies.

Steel Payrolls, Wages Establish New Record

Steel industry payrolls established a new high record of $145,285,000 in March, according to the American Iron and Steel Institute.

Previous peak payroll was $144,937,000, disbursed by steel companies in October, 1943. The March, 1944, payroll compares with $137,615,000 in February, and with $136,813,000 in March a year ago.

Average number of employes in the industry declined in March, however. During that month an average of 578,000 employes were at work as against 583,000 in February. No comparable figures for average number employed are available for March, 1943, but the total number at work in March of last year was 637,000.

Wage-earning employes worked an average of 47.7 hours per week and earned an average of 115.9 cents per hour in March, 1944. Their indicated average weekly earnings of $55.28 in March stand as a new record.

In February, hourly earnings averaged 116.1 cents and the average work-week was 47.0 hours, bringing weekly earnings to an average of $54.57. In March, 1943, steel industry's wage earners earned an average of 110.3 cents per hour and worked 42.5 hours per week, indicating average weekly earnings of $46.88.

POSTWAR PREVIEWS

SHIPBUILDING—Maritime leaders believe a great deal can be accomplished toward the development of foreign trade after the war. This country's merchant fleet is expected to be well in excess of 50,000,000 deadweight tons by the end of the war. See page 53.

MARKETING—Warehousemen urged to study their market and increase their sales forces for postwar era. They are told about war-inspired achievements which can be adapted to postwar civilian steel production. See page 56.

HOMES—L. M. Cassidy, vice president, Johns-Manville Corp., New York, predicts postwar home construction in the first ten years after the war will be two or three times greater than that of the ten years prior to the war. See page 57.

MACHINE TOOLS—Chief postwar demands for machine tools seen in the need for meeting consumer requirements of durable goods such as automobiles and radios. Trend toward process machine tools, which carry the part step by step through 20 or 30 different operations, is seen. See page 58.

LOCOMOTIVES—Fairbanks, Morse & Co., Chicago, expects an increasing trend toward the dieselization of the railroads' motive power in the postwar era. See page 61.

CONTRACT TERMINATION—War Contracts Termination bill, sponsored by Senators Murray and George and approved by the Senate, reportedly is acceptable to business as well as labor. Legislation provides for rapid settlement of contracts, covering both prime contractors and subcontractors. See page 63.

EQUIPMENT DISPOSAL—Witness before the War Contracts Subcommittee urges that the government-owned surplus equipment be donated to schools, hospitals and other similar institutions. See page 64.

TRANSPORT PLANE—Consolidated Vultee Aircraft Corp. has designed a new 48-passenger commercial transport plane which it intends to produce after the war to replace standard airliners. See page 76.

ORGANIZATION CHARTS

STEEL DIVISION
War Production Board

IRON AND STEEL PRICE BRANCH
NONFERROUS METALS PRICE BRANCH
Office of Price Administration

STEEL presents herewith the first organization chart of the Steel Division, War Production Board, issued since the appointment of Norman W. Foy to its directorship.

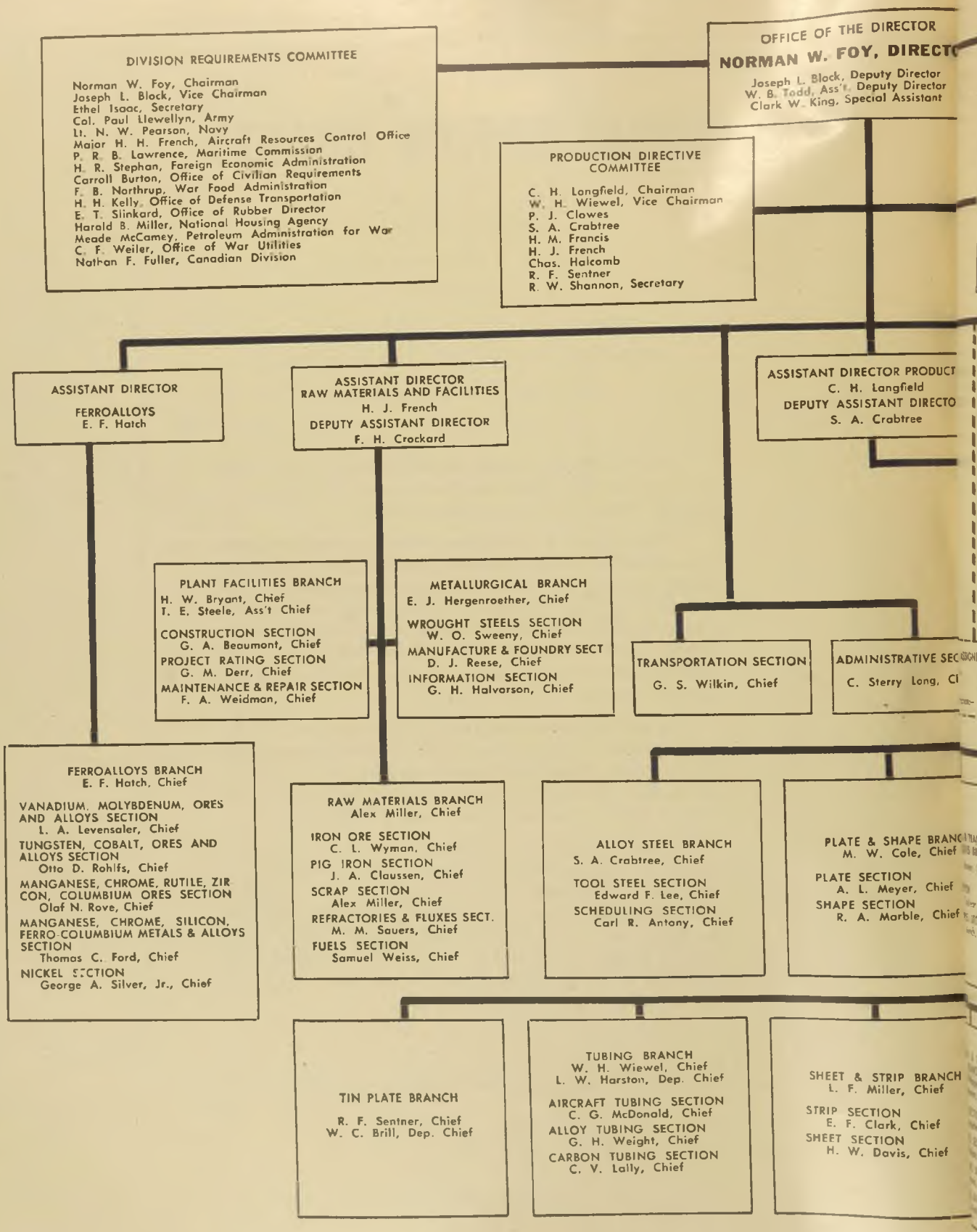
Other important changes have been made recently in the personnel of the division, including Joseph L. Block who is now deputy director; W. B. Todd, assistant deputy director; C. H. Longfield, assistant director in charge of production; P. J. Clowes, assistant director in charge of manpower; E. J. Hergenroether, chief, Metallurgical Branch; Alex Miller, chief, Raw Materials Branch; and H. M. Francis, chief, Wire and Cold Finished Bar Branch.

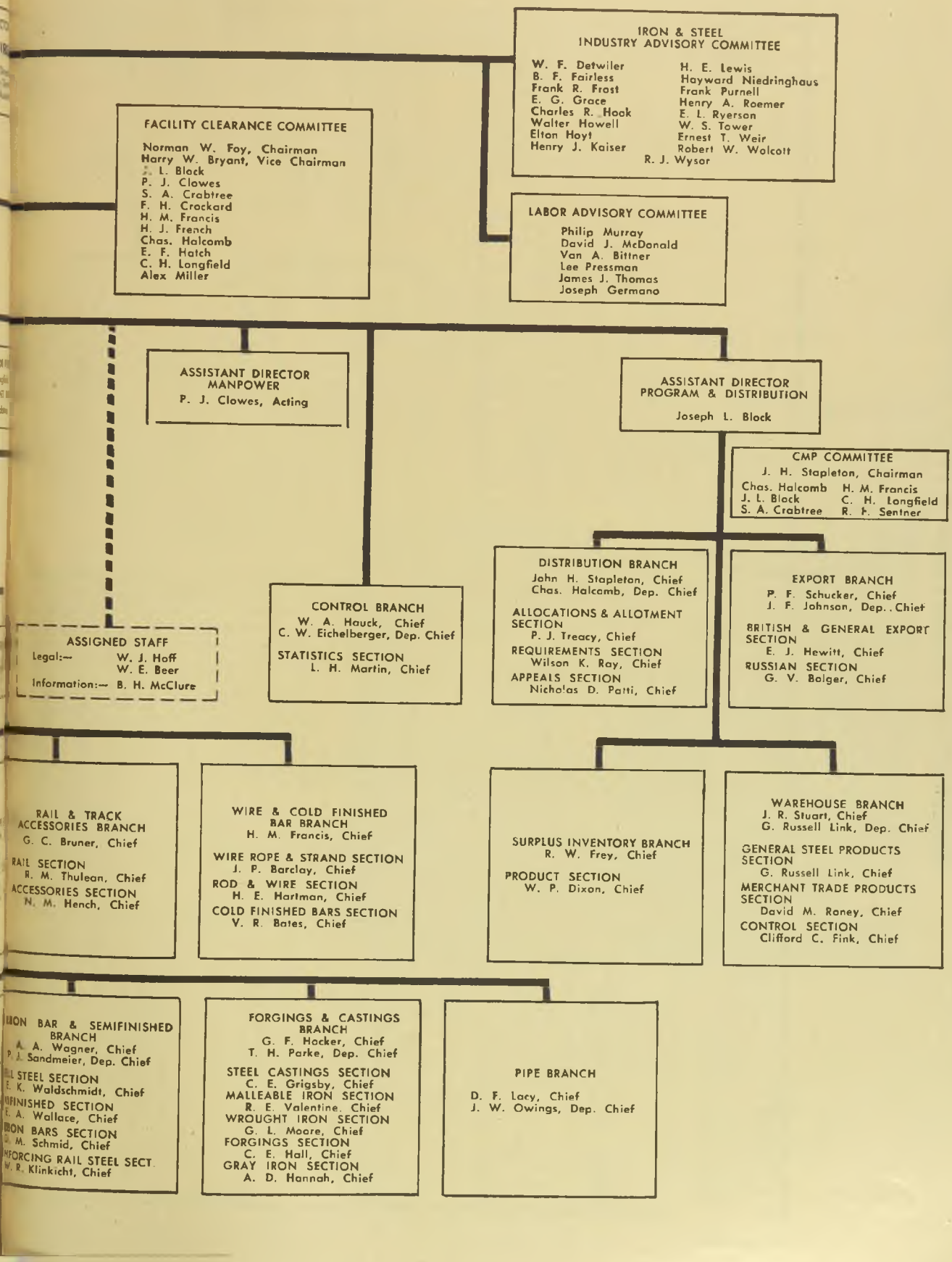
Equally important changes have been made in the Industrial Materials Price Division, Office of Price Administration. Many of these changes were made in compliance with the wishes of Congress which directed that no man should control price-making policies who had not had business experience.

Warren M. Huff was appointed price executive of the Iron and Steel Branch toward the close of last year, continuing governmental administrative work that started in 1933. Although a few important changes have been made in personnel since the first of the year in the Industrial Materials Price Division, changes generally have been in the nature of a regrouping and consolidation of commodities under the supervision of the various sections and units of the division.

WAR PRODUCTION BOARD

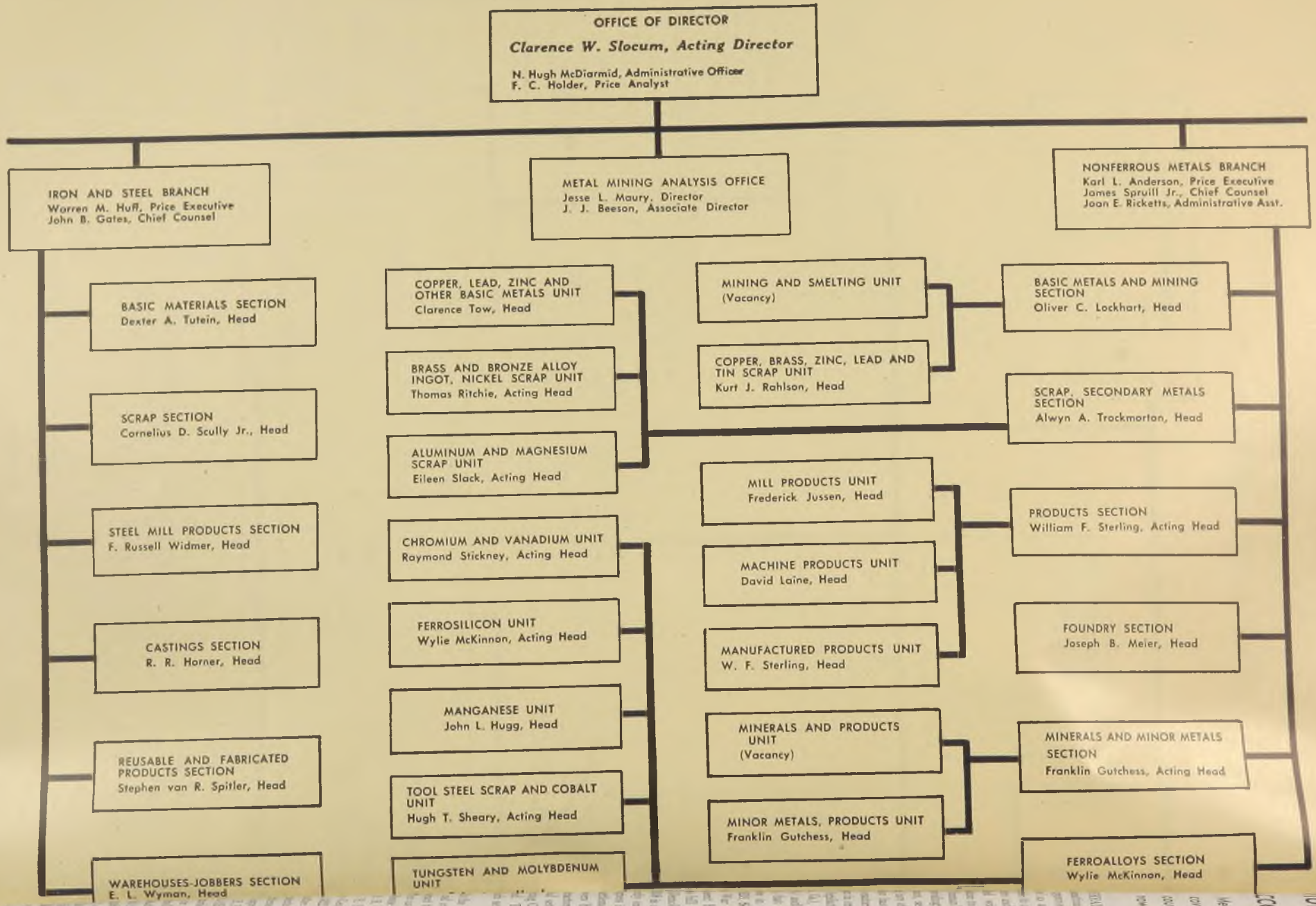
STEEL DIVISION




IRON & STEEL
INDUSTRY ADVISORY COMMITTEE
W. F. Detwiler
B. F. Fairless
Frank R. Frost
E. G. Grace
Charles R. Hook
Walter Howell
Elton Hoyt
Henry J. Kaiser
H. E. Lewis
Hayward Niedringhaus
Frank Purnell
Henry A. Roemer
E. L. Ryerson
W. S. Tower
Ernest T. Weir
Robert W. Wolcott
R. J. Wysor
FACILITY CLEARANCE COMMITTEE
Norman W. Foy, Chairman
Harry W. Bryant, Vice Chairman
J. L. Block
P. J. Clowes
S. A. Crabtree
F. H. Crockard
H. M. Francis
H. J. French
Chas. Halcomb
E. F. Hatch
C. H. Longfield
Alex Miller
LABOR ADVISORY COMMITTEE
Philip Murray
David J. McDonald
Van A. Bittner
Lee Pressman
James J. Thomas
Joseph Germano
ASSISTANT DIRECTOR
MANPOWER
P. J. Clowes, Acting
ASSISTANT DIRECTOR
PROGRAM & DISTRIBUTION
Joseph L. Block
CMP COMMITTEE
J. H. Stapleton, Chairman
Chas. Halcomb
J. L. Block
S. A. Crabtree
H. M. Francis
C. H. Longfield
R. F. Sentner
ASSIGNED STAFF
Legal:— W. J. Hoff
W. E. Beer
Information:— B. H. McClure
CONTROL BRANCH
W. A. Hauck, Chief
C. W. Eichelberger, Dep. Chief
STATISTICS SECTION
L. H. Martin, Chief
DISTRIBUTION BRANCH
John H. Stapleton, Chief
Chas. Halcomb, Dep. Chief
ALLOCATIONS & ALLOTMENT SECTION
P. J. Treacy, Chief
REQUIREMENTS SECTION
Wilson K. Ray, Chief
APPEALS SECTION
Nicholas D. Patti, Chief
EXPORT BRANCH
P. F. Schucker, Chief
J. F. Johnson, Dep. Chief
BRITISH & GENERAL EXPORT SECTION
E. J. Hewitt, Chief
RUSSIAN SECTION
G. V. Balger, Chief
RAIL & TRACK ACCESSORIES BRANCH
G. C. Bruner, Chief
RAIL SECTION
R. M. Thulean, Chief
ACCESSORIES SECTION
N. M. Hench, Chief
WIRE & COLD FINISHED BAR BRANCH
H. M. Francis, Chief
WIRE ROPE & STRAND SECTION
J. P. Barclay, Chief
ROD & WIRE SECTION
H. E. Hartman, Chief
COLD FINISHED BARS SECTION
V. R. Bates, Chief
SURPLUS INVENTORY BRANCH
R. W. Frey, Chief
PRODUCT SECTION
W. P. Dixon, Chief
WAREHOUSE BRANCH
J. R. Stuart, Chief
G. Russell Link, Dep. Chief
GENERAL STEEL PRODUCTS SECTION
G. Russell Link, Chief
MERCHANT TRADE PRODUCTS SECTION
David M. Roney, Chief
CONTROL SECTION
Clifford C. Fink, Chief
IRON BAR & SEMIFINISHED BRANCH
A. A. Wagner, Chief
P. J. Sandmeier, Dep. Chief
STEEL SECTION
E. K. Waldschmidt, Chief
SEMIFINISHED SECTION
E. A. Wallace, Chief
IRON BARS SECTION
O. M. Schmid, Chief
REINFORCING RAIL STEEL SECT.
W. R. Klinkicht, Chief
FORGINGS & CASTINGS BRANCH
G. F. Hacker, Chief
T. H. Parke, Dep. Chief
STEEL CASTINGS SECTION
C. E. Grigsby, Chief
MALLEABLE IRON SECTION
R. E. Valentine, Chief
WROUGHT IRON SECTION
G. L. Moore, Chief
FORGINGS SECTION
C. E. Hall, Chief
GRAY IRON SECTION
A. D. Hannah, Chief
PIPE BRANCH
D. F. Lacy, Chief
J. W. Owings, Dep. Chief

Office of Price Administration

Industrial Materials Price Division



Murray-George War Contracts Bill Acceptable to Business and Labor

Measure, passed by Senate, provides for rapid settlement and covers both prime and subcontractors. Requires General Accounting Office audits only in case of fraud. Action by House, now considering three similar bills, is uncertain

MURRAY-GEORGE War Contracts Termination bill, S. 1718, which the Senate approved May 4, generally is regarded as a streamlined bill. It is acceptable to all the interested government agencies and to business. Labor also is satisfied with it—provided additional legislation to cover reconversion will protect "human" as well as property rights by providing nationalized unemployment insurance, severance pay and otherwise taking care of discharged war workers.

Labor has had assurances from the three senators who have played a leading part in originating and steering postwar legislation, Walter F. George (Dem., Ga.), Harley M. Kilgore (Dem., W. Va.) and James E. Murray (Dem., Mont.), that the human angles would be borne in mind in the final drafting of S. 1823, Senator Kilgore's bill known as the War Mobilization and Postwar Adjustment bill, and S. 1730, Senator George's bill which would create an Office of Demobilization.

S. 1718 is a carefully worked out bill, apparently one of the best to come out of Congress in a long time. It aims at rapid settlement of terminated contracts and covers both prime contractors and subcontractors. It provides for prompt and final settlements, and the General Accounting Office may make audits only for fraud. The latter may not hold up or disturb settlements for any other reason.

While the Senate thus has acted positively and constructively on the subject of contract terminations, there still is no assurance as to what the House will do. The House now has before it three bills, H. R. 4392, H. R. 3022 and H. R. 4469. H. R. 4392 is a revision of the Murray-George contract termination bill. H. R. 3022 is the House Military Affairs Committee bill which would make all settlements subject to GAO audits, so that no settlement could be considered as final until approved by the comptroller general. H. R. 4469 is the bill of the House Naval Affairs Committee which generally is regarded as satisfactory excepting perhaps for one feature. It would give the comptroller general a voice in contract termination and some students fear that should the comptroller general have such recognition any word that he uttered might cause procurement agencies to go slow in making settlements.

A fourth bill now is being prepared by the House Special Committee on Postwar Economic Policy and Planning and it is the hope among representatives of business in the capital that this will be the bill that the House Rules Committee will report out. That there is a good chance of this is indicated by the fact that several members of the postwar committee, including Chairman William M. Colmer (Dem., Miss.), are members of the Rules Committee.

The bill which the Colmer Committee is writing is shaping up very much along the lines of S. 1718. The ideas the postwar committee has in mind were reflected when last March it appointed as head of its study and planning staff Marion B. Folsom, treasurer, Eastman Kodak Co., Rochester, N. Y., chairman, Federal Reserve Bank of Buffalo, trustee, Committee for Economic Development, member, Business Advisory Council, Department of Commerce, and a member of the New York State Council on Unemployment Insurance.

The odds appear rather against House passage of a war contracts termination bill before the adjournment for a recess. No date yet has been agreed on but many congressmen, because of the imminence of the Republican and Democratic conventions, would like to get away no later than June 15. Even should a bill be reported out by the Rules Committee there is the likelihood that the controversy over the place of the comptroller general in contract termination would delay final action.

Steel Roof Deck Industry Elects New Officers

William Gillett, manager, Holorib division, Detroit Steel Products Co., Detroit, has been elected chairman of the technical committee of the Steel Roof Deck Industry.

Other new officers are: R. D. Snodgrass, vice chairman, and C. C. Pennington, secretary-treasurer. Mr. Snodgrass is chief engineer for Truscon Steel Co.; Mr. Pennington is merchandise manager, industrial roofs and fabricated steel division of U. S. Gypsum Co.

ALL-AMERICAN CONFERENCE: These businessmen from North, Central and South America discussed postwar plans at the Waldorf-Astoria in New York at the meeting of the Permanent Council of the American Associations of Commerce and Production. They are, left to right: Leopold H. Palazuelos, president, National Confederation of Chambers of Commerce of Mexico; J. M. Berrocal, businessman from Panama; James S. Kemper, president, Lumbermen's Mutual Casualty Co., Chicago; Adolfo Ibanez, president, Central Chamber of Commerce, heading the Chilean delegation; R. D. Spradling, president, American Rolling Mill Co., Argentina, and chairman of the advisory committee of the United States' delegates to the conference; and Robert Boomer, New York investment banker. NEA photo

Tax Free

UNITED States Supreme Court recently ruled by seven to two that it is unconstitutional for states to assess real property taxes against federally-owned machinery and equipment in war plants. The suit appeared in the nation's highest court after Allegheny County (Pittsburgh) levied a real estate tax of $5137 on $618,000 worth of government-owned machinery at the Mesta Machine Co., West Homestead, Pa. The case first appeared in the Pennsylvania Common Pleas Court which ruled in favor of the federal government only to have the Pennsylvania Supreme Court reverse the decision in favor of the county. Thus, about $2,000,000,000 in federal equipment used by private contractors remains free from state and local taxes. Justice Robert H. Jackson handed down the majority ruling. Justices Owen J. Roberts and Felix Frankfurter dissented.

Limit Too High

Revised renegotiation act's $500,000 limit is not sufficiently low and a survey should be made to determine what the limit should be, George Seedman, president, American Business Congress, New York, testified before a recent hearing of the Complaints Subcommittee of the Senate Small Business Committee. Renegotiation is essential for the recapture of excessive profits, he said, but it is a process that is extremely costly for small companies. He believed that government officials could develop a simpler method of renegotiating small business.

Labor Subcontracting

Special Investigating Subcommittee of the House Military Affairs Committee is preparing a report covering its investigation of the practice of farming out tool and die makers and other skilled workers to war contractors at much higher hourly wage rates than are paid the men themselves, plus all living expenses for these men while they are on these jobs. Additional hearings on this subject had been scheduled but will not be held due to assurances by procurement agencies that they will discourage such practices on the part of contractors.

Television Encouraged

Chairman James Lawrence Fly of the Federal Communications Commission has declared it would be "foolhardy to lock down future television service to the prewar levels." He assumed the FCC will not take any official action changing television standards until the Radio Technical Planning Board completes its study and submits recommendations.

"It has been my view," he said, "that the highest developments which our television technicians are capable of producing should be made available to the public as soon as may be feasible, consistent with the overall economic picture. There should be no . . . artificial restrictions for the sake of temporary profits. It should be remembered that public discussion of television developments in war laboratories is handicapped by the lack of specific information which is, of course, a closely-guarded military secret." Thus, the television industry, in its postwar planning, is encouraged to give the public the best.

MACHINE TOOLS

"Large quantities" of Japan's "idle" spinning machines are being converted into lathes and other types of machine tools in an effort to step up Japan's war production, "especially in aircraft," according to the Japanese Domei agency as reported by the Office of War Information.

The Domei dispatch said that conversion of this type of machinery into other types of tools was "successfully achieved by experts of the Ohmi Aircraft Co. in central Japan after months of experimenting." These experts "found that practically all of the spinning looms, with minor changes, can be used in the construction of machine tools." The Ohmi plants were said to be using frames, rails, gears, roller and ball bearings, nuts, bolts, springs, shaft bearings and other parts of spindles for the construction of machine tools.

Clears Way

Legislation clearing the way for return to private ownership of all Great Lakes vessels and all others of 1000 gross tons or less has been completed and now awaits the President's signature. The War Shipping Administration early in the war requisitioned 14 large Great Lakes vessels and about 2500 small craft, which it is now prepared to release because of the availability of new vessels. The bill would give the vessels' original owners prior repurchase rights on the basis of the price received adjusted for depreciation and cost of reconditioning. If the original owner waived his right, the WSA would sell to the highest bidder.

Foreign Investments

According to a Treasury Department tabulation, American individuals and firms hold interests in foreign countries which aggregate more than $13,300,000,000. About $8,000,000,000 is in United Nations territories and $1,300,000,000 in Germany. Our largest holdings are in Canada—about $4,300,000,000.

Saves Time

Use of the new standard forms for renegotiating war contracts, adopted recently by the various procurement agencies, has reduced by five or six weeks the time usually required to complete the renegotiation process, according to a report by Budget Director Howard D. Smith. In addition, the new forms have made it possible for preliminary negotiations formerly requiring four or five meetings with important company officials to be completed in one meeting. Use of the new forms, says Mr. Smith, offers some measure of protection to small firms which cannot afford to use expert lawyers and accountants experienced in renegotiations, since the forms provide a general outline which will assure satisfactory presentation of their case.

Prisoners Work

Prisoners of war in the United States now number 183,618, the normal equivalent of the working force of a city of between 700,000 and 800,000 persons, the War Department announces. Utilization of these prisoners has resulted in a total of 19,300,321 man-days of useful employment from June, 1943, to the end of March, 1944. There has been a widespread shift in the distribution of prisoners of war to camps in areas of manpower shortage, a trend that is still under way. Harvesting and canning of fruits and vegetables have furnished much employment for these men, as have also the lumbering, pulpwood and allied industries. Many of them are to be employed on farms this summer.

Equipment Disposal Plan

Congressional sentiment for disposing of a large amount of government-owned equipment by donating it to schools, hospitals and other institutions is increasing as representatives of such institutions come to Washington and hold that such a policy would serve the national interest. One such witness was M. P. Moe, Helena, Mont., who appeared before the War Contracts Subcommittee of the Senate Committee on Military Affairs as spokesman for 48 state educational organizations and other groups. Indicative of the types and range of government-owned equipment the vocational and other retraining schools should have, Mr. Moe cited school buses, jeeps, electronic equipment, visual aids such as films and projectors, radio receiving and broadcasting equipment, machine tools, dies and fixtures, engines, trucks, planes, laboratory equipment, miscellaneous books, music and musical instruments, recreation facilities, etc. Mr. Moe estimated that if the schools receive the equipment they need, about $2,400,000,000 to $3,000,000,000 of surplus equipment would be taken off the market. This would help stabilize postwar markets.

Machine tools give meaning to this

jury's verdict!

It wasn't much of a story. By news standards today it was strictly Page 14. The night City Editor slugged it "delinquent—local" and the man in the slot gave it a one-column head. JURY BLAMES SLUMS FOR JUVENILE CRIME.

"Health stations, more hospitals and schools, recreational and training facilities, low-cost housing projects and community centers were recommended by the grand jury, in its final presentment yesterday, as measures to check the rising tide of juvenile delinquency in this etc., etc., etc."

Few people read it. In the midst of war and politics, it was strictly Page 14.

That's why we're running it. Because that story should be a Page 1 MUST in every city in America. Because that jury's verdict is a *national* challenge. Because it gives the lie to every brand of private or political complacency which turns away from one simple, unvarnished truth: Our sons are fighting for a *better* world than they left behind—and total victory is a long way off!

What has the machine tool industry to offer here? One very real contribution: The engineers of the basic machine tool producers have helped the men of government and of industry to plan the most desperate and gigantic production program of all time . . . and they can help those same men in planning today for the peace that must be won after the war is won!

One of these is a Bryant man. We invite you to send for him.

Bryant Chucking Grinder Company

SPRINGFIELD, VERMONT, U.S.A.

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

ALUMINUM: Quarterly limit of 600 pounds that has applied to use of new aluminum in manufacture of new patterns has been removed from provisions of direction No. 1 to Controlled Materials Plan regulation No. 5. A purchaser now may place authorized controlled materials orders for any amount of aluminum patterns with his pattern supplier merely by placing the maintenance, repair and operating supplies symbol on his order, together with the certification that is set forth in CMP regulation No. 7. Foundries now will fill only authorized controlled material orders for patterns. Foundries that do not have AM (aluminum and magnesium) authorization numbers, which have been assigned by WPB, may obtain aluminum ingot for making patterns only by indicating on their order "MRO patterns." Foundries that have been assigned AM authorization numbers will continue to obtain their ingot supplies as in the past.

ANTIFRICTION BEARINGS: Period for reviewing requirements of substantial users of antifriction bearings has been extended through January, 1945. Form WPB-3333 must be filed by June 1, 1944, for requirements for the August, 1944—January, 1945, period. During that period, no person may accept in any one month any antifriction bearings from a manufacturer or distributor in excess of the following amounts without specific authorization: 1500 bearings of any one size where they are being purchased for incorporation by such person in his end products or for shipment with his end products as concurrent spare bearings; 500 bearings of any one size where they are being purchased for reshipment to the Army, Navy, Maritime Commission, or War Shipping Administration subsequent to delivery of the end product. If a person has more than one plant, the amounts specified above shall apply to deliveries to each plant.

Authorization by WPB to accept delivery of bearings does not constitute an allocation to the applicant against the bearing manufacturer, but simply establishes the maximum amounts that the applicant may accept of those sizes of bearings required to be reported under direction No. 1 to table 12 of general scheduling order M-293.

PURCHASE ORDERS: General rules governing status of purchase orders that are changed by persons who originally placed them have been issued in direction No. 1 to priorities regulation No. 1. The general rule is that a change in a customer's order constitutes cancellation of the order and must be considered as a new order received on the date of change, if it will require the manufacturer to interfere with his production.

If a change constitutes a new order, the conditions existing at the time the changes are received govern the acceptance of the order and its sequence in delivery under the regulation. If a customer changes his order so that it constitutes a new order, but finds that as a new order it will not be scheduled for delivery at the time required, he may request reinstatement of his original order within 10 days of cancellation of the original order.

REPAIRMEN: Repairmen are permitted to use up to $25 worth of material purchased under CMP regulation No. 9A for the installation of cooking, plumbing, heating, or used air conditioning or refrigeration equipment only on condition that the use of such material is not otherwise prohibited by WPB rules and orders. If these rules and orders prohibit the use of such items for installation purposes, they may not be obtained or used under direction No. 2 to CMP regulation No. 9A.

WATER HEATERS: Prohibition on use of metal jackets for water heaters has been relaxed to permit use of steel in manufacturers' inventories on May 8, 1944, and such steel as may be obtained from frozen, idle and excess inventories. Because the sheet supply is still tight, use of steel from rolling mill supplies is still prohibited for water heater jackets.

L ORDERS

FIRE APPARATUS: Monthly production and shipping schedules for motorized fire apparatus no longer are subject to WPB authorization, and need not be filed by manufacturers. Restrictions have been relaxed also on the use of certain materials. Copper-base alloy may now be used in fire pump bodies; and aluminum, cadmium and rubber may be used to the extent permitted in the orders controlling these materials. Restrictions on use of alloy steel have been removed from the amended order, but production of alloy steels other than NE triple alloy steel is controlled by the Steel Division. (L-43)

INDEX OF ORDER REVISIONS

INDUSTRIAL INSTRUMENTS: Order L-134, which restricted the use of chromium, nickel, or any alloy of these materials in the manufacture of industrial instruments, control valves and regulators, has been revoked. Use of nickel still is controlled by order M-6-b.

A manufacturer of products which have been subject to the restrictions of order L-134 may, at his option, supply products made in conformity with the order or products made free of the restrictions in filling purchase orders placed before May 3, 1944. If a customer cancels a previous order, and places another order on or after May 3, the latter is a new order even though it is intended to replace the previous order. Furthermore, if a customer on or after May 3 changes an existing purchase order so as to call for specifications previously prohibited by order L-134, or makes a change in his purchase order which would interrupt or disrupt the manufacturer's production in process or planned production, any such change operates as a cancellation of the old order and the placing of a new order. (L-134)

COPPER TUBING: Restrictions on the use of copper in bulk tubing has been eliminated from provisions of the order dealing with production and distribution of automotive replacement parts. (L-158)

MEDICAL, SURGICAL FURNITURE: Restrictions have been deleted from order L-214 on the use of zinc, alloy steel and aluminum in the manufacture of medical and surgical furniture and related equipment. Production of types and grades of alloy steel, other than NE triple alloy, is at present restricted for particular end uses. Schedule 3 of the order states that "it is the intention of WPB to continue to allow the production of alloy steel containing nickel up to 9 per cent by weight for table tops for autopsy tables and operating tables." Aluminum is permitted under M-1-i for medical furniture when CMP 4-B applications have been approved. (L-214)

M ORDERS

TIN, TERNE PLATE: Component parts for air cleaners and closures for steel drums have been added to M-21-e's schedule A, which specifies the extent to which tin and terne plate may be used in the listed products. The permitted coating per base box on long ternes for automotive fuel tanks and from 1.3 to 4 pounds per base box on short ternes for roofing repair. Hot-dipped tin plate, electrolytic plate and terne plate, where total annual consumption of all these grades does not exceed 100 base boxes, have been placed in schedule B, which exempts them in this quantity from controls of the order. (M-21-e)

GRAPHITE: An amendment to the conservation order restricting delivery, acceptance and processing of graphite to quantities authorized by WPB has removed Madagascar fines and has added Ceylon amorphous, over 95 per cent carbon, to the controls of the order. All restrictions have been lifted on delivery of foundry crucibles. A 200-pound per month small order exemption of Madagascar flake graphite has been provided. (M-61)

CHEMICALS: Requirement that customers' certificates be limited to requests for material to fill orders already on hand has been eliminated from the order which governs the sale of miscellaneous chemicals. This permits a manufacturer to obtain his materials on the basis of expected orders. (M-340)

PRIORITIES REGULATIONS

EXCESSIVE MATERIALS: Sale of finished products without preference ratings or special authorization is now permitted if the total amount of all products of the same type and composition which the holder has is worth not more than $100.

List A to the regulation, which indicates the conditions under which materials may be sold, has been changed to permit the sale of aluminum in controlled material form without priorities to wholesale dealers who are regularly engaged in the business of selling aluminum. Aluminum in other than controlled material forms and shapes may be sold without priorities to a user who may use it under WPB orders and regulations. Slide fasteners have been added to list A and special authorization is now required to make a special sale of them to other than persons who produce them. Shellac has been removed from this list.

Used typewriters have been removed from list B, which indicates conditions under which finished products may be sold. This action permits them to be sold freely within the framework of other WPB restrictions and new typewriter restrictions have been modified to permit them to be sold without priorities. (PR No. 13)

CANADIAN PURCHASES: Priorities regulation No. 14, indicating the names of Canadian agencies that correspond to United States agencies mentioned in WPB regulations and orders, has been amended to point out that the Canadian Controller of Ship Repairs and Salvage corresponds to the U. S. War Shipping Administration. Under certain conditions, Canadian agencies are entitled to the same treatment as U. S. agencies under WPB orders. (PR No. 14)

FARM SUPPLIES: List of items which farmers may secure under provisions of priorities regulation No. 19 has been expanded. The rating of their certificates has been raised from AA-5 to AA-2X, with the exception of those involving a few building material items. Certificates for the latter items will be the same as orders rated AA-3. The regulation is also amended to permit dealers to employ farmers' certificates in advance ordering from sup-

pliers. WPB's various industry divisions are given authority to direct shipments to farming agencies in emergencies. (PR No. 19)

PRICE REGULATIONS

MACHINES AND PARTS: Sales by manufacturers, wholesalers and retailers of new house trailers and motorcycles manufactured, on and after Aug. 12, 1943, are now covered by the price regulation applying to sales of machines and parts and machinery services. Although price schedule No. 136 establishes as a base maximum price the price in effect on March 31, 1942, a recomputation of the price is permitted where there is a specification change or material substitution.

In computing prices for machines and parts, and machinery services, the manufacturer now is permitted the addition of markup, overhead, or profit to an amount determined by multiplying straight-time labor costs by a fixed percentage where this was the practice on the base date.

Coverage of the following articles has been transferred from other regulations to schedule No. 136: Marine equipment, tackle blocks and sheaves, certain chains, chain fittings and assemblies, rope fittings, turnbuckles, manually operated winches and windlasses; industrial, technical, and scientific glassware, leather belting; concrete products machinery and equipment; and forged railroad axles and car wheels. Automotive gears, and nonferrous mill products, wire goods and hollow-ware are excluded from coverage of the regulation. (No. 136)

VALVES: Definition of "reconditioned valve" has been revised to provide that defective parts must be replaced with new, reconditioned, or serviceable used parts. It is also provided now that the hydrostatic pressure test be given the reconditioned valve but not in excess of the pressure to which the valve was subjected when tested as a new valve. (GMPR)

OPA Rules of Government's Sales of Surplus Goods

Surplus commodities held by the government and in new condition, except food and commodities originally purchased for resale, may be sold by any government agency at a ceiling price not exceeding cost of acquisition, the Office of Price Administration announced.

This will not apply where specific ceiling prices already are established for the commodities in terms of dollars and cents or through use of published price lists. It will not apply where exemptions already are provided on government sales, nor does it supersede existing methods of determining prices if they are proving satisfactory.

Authority to sell new commodities at prices that do not exceed the cost of acquisition is granted temporarily as the agency shortly will announce a permanent method of determining these ceilings.

Refrigeration Industry Makes Record Shipments

Shipments of combat material from 85 plants that were engaged primarily in the manufacture of refrigeration equipment before the war reached an all-time high of almost $150 million in the last quarter of 1943, the War Production Board has announced. During the same period shipments of other goods, including refrigeration equipment, totaled $50 million.

Minimum Preference Rating on Iron And Steel Products Raised to AA-5

Only exceptions to higher rating are those permitted under priorities regulation No. 13 or specifically authorized in writing by WPB. Modification of orders during first quarter provided generally a relaxation of government controls

AMENDMENT of the basic War Production Board order covering distribution of iron and steel products (M-21) raises from A-10 to AA-5 the minimum preference rating on which iron products and steel forgings may be delivered, the board announced last week. Other minor changes in the order amplify the definition of steel, delete obsolete provisions, make editorial changes and generally bring the order up to date.

The only exceptions to the higher rating on the delivery of iron products and carbon or alloy steel forgings as a result of the amendment are those permitted under priorities regulation No. 13 or specifically authorized in writing by WPB.

The amendment also provides that other steel may not be delivered except as permitted under Controlled Materials Plan regulations Nos. 1 or 4, under priorities regulations Nos. 13 or 19, under order M-21-b-1, or M-21-b-2, or as specifically authorized by WPB.

Purchase orders for iron products and carbon or alloy steel forgings must be accompanied by a certification of the applicable rating in substantially the form provided in priorities regulation No. 7.

In contrast to the general raw materials supply situation, that of copper and steel has tightened recently, due mainly to increased demand for steel for ship and landing craft construction coupled with heavier selective service demands on the lower-age brackets of manpower. By taking action under the priorities system, WPB will be able to direct the flow of available supplies into urgent war work, satisfying those needs but possibly necessitating a curtailment in civilian production.

Compilation of summaries of modifications of orders issued by WPB between Jan. 12 and April 1, 1944, reveals that government controls were being relaxed during that period. Only 27 orders were issued imposing restrictions while 66 were issued easing restrictions.

WPB pointed out, however, that in some instances modifications of orders, although representing relaxation of controls, are not due to any improved situation in respect to supply. In many instances, they have been made to simplify procedure.

Restrictions were tightened over products and materials, including the following: Antifriction bearings, boilers, chromium metal, construction authorizations, container machinery, elevators and elevator parts, industrial equipment, lighting equipment, mica splittings, and shipping containers.

Relaxations of WPB orders affected in part the following products and materials: Alloy steel, aluminum, barbed wire and woven wire fence, bedsprings and box springs, bronze powder, carbon steel bars, caskets, cast iron soil pipe, cast iron ware, chemicals, coal stokers, cold-pack canners, construction machinery, container closures, copper and copper-base alloys, corundum, cutlery, domestic cooking appliances, electric flat irons, files, flatware, food processing machinery, furnaces, house trailers, incandescent lighting fixtures, mercury, metal doors, metal ferrules, metal visible reference panels, motorcycles, office machines, plumbing and heating tanks, refrigeration and air conditioning machinery and equipment, rotary files and burrs, scales, springs for upholstered wood furniture, steel drums, water heaters, and zinc.

Appointments-Resignations

Dr. William Yandell Elliott has been appointed vice chairman for the Office of Civilian Requirements, War Production Board, succeeding Arthur Whiteside. Dr. Elliott assumes responsibility for the planning and programming of civilian goods production. Since October, 1942, he has directed the WPB Stockpiling and Transportation Division.

* * *

Thomas Craig has resigned as chief of the Protective Coating Branch, Chemicals Bureau, WPB. He will be succeeded by Wells Martin, formerly deputy chief of the branch. Benjamin H. Belcher has been appointed deputy chief of the Coatings Branch and will continue to serve as chief of the Coatings Section.

* * *

John B. McTigue has been appointed director of the Facilities Bureau and vice chairman of the Facilities committee of the WPB, succeeding Roy W. Johnson. Richard A. Kimball has been named deputy director of the bureau and Robert A. Irwin as acting deputy director for tax amortization.

* * *

Edward Falck, recently appointed director of the Office of War Utilities, WPB, has been named chairman of the CPRB Public Utilities committee to succeed J. A. Krug, former program vice chairman.

Mass Production Methods Applied In Building All-Metal Craft

ALL METAL, compartmented cockpit life rafts are being made by the hundreds at the Los Angeles plant of Weber Showcase Co. No matter how these rafts hit the water they always float topside up, for bottom and top are alike.

Made of 16 gage and cold-rolled steel, each raft is separated into 19 airtight compartments, plus two air-tight water tanks. Food and equipment are stored in four compartments near the center, reached through large openings in the side of the well deck.

Manufactured for the Maritime Commission the rafts weigh empty 2425 pounds, and carry 20 men weighing 3402 pounds, plus 1055 pounds of equipment. Total weight of raft, occupants and equipment is 6882 pounds.

Speedy construction of the rafts is made possible by a Weber development —"Old Ironsides", a huge hydraulic press. The rafts begin taking shape on this press with the drawing of large sheets of flat steel, 48 inches wide by 162 inches long, to form 57 corrugations. Specially designed dies have been provided for this operation. In two passes, under 1100 tons of pressure on each stroke, a flat plate becomes a stiffened side plating.

As the plates are formed, other units going into the raft's assembly take shape. Seat sections are formed and reinforced with a corrugated stiffening member.

Drain flanges are pressed on by the induction heating method. These normally are pressed on in 31 seconds with 20 kilowatts of heat, on 10,000 cycle electric current. Drain flanges are silver brazed to their seats, the metal-to-metal procedure taking the place of gaskets to make sure of permanent seals against water.

Floor sections are pre-fabricated, the floor going together in pieces. Water tanks, made of 16-gage cold-rolled steel plates 35x45-inches, are seam welded to form a tubular member. Heads, formed by stamping, are securely fastened by a rotary seam welder. After the cover flanges for the openings are bolted on and made water-tight with rubber gaskets, the entire tank is hot dip galvanized.

As the first step in subassembly, the side skin is laid in a welding jig and clamped down. Next, four vertical bulkheads are set into the same jig and gas-welded into the inside of side plating.

Here floor supports are welded in, and the floor set in and welded water-tight. Thwarts, ore locks, and stanchions are fitted and welded. Next clips are fastened, spray curtains, grab rail supports and grab rail attached. The raft then is ready for testing and checking.

Simultaneously, in another department, curved pipe stiffeners are welded into the curved side of the skin, after which the seat sections are welded into position. The entire assembly then moves to a rotary seam welder where the edges are fabricated into a leak-proof seam. The side assembly is then transferred to the master assembly jig.

Use Unique Testing Method

Here 14 vertical bulkheads are securely welded, and tested for leaks. Once assembly welding is completed, the floor frame is welded in the exact center, half way between top and bottom, a double floor being provided to provide smooth footing no matter on which side the raft floats.

This welding must be precise and leak-proof. An unique method of testing quickly reveals whether any liquid will penetrate the weld. A phosphorus paint, which will creep through a crack so narrow not even gasoline can penetrate, is applied to the side opposite the weld. If, under a magnaflux lamp held near the welded side, the brilliant violets of the phosphorus appear, it is obvious that the seam leaks.

The raft is removed from the master jig by a crane and placed in a handler, a jig which revolves around a central axis, so that the structure may be turned to any position and held firmly for the operations that follow.

The government agencies laid down stringent specifications the proposed rafts must meet. Important among them: The rafts, of cockpit or well-deck type, must be either reversible or self-righting, and if reversible the equipment must be available from either side; it must be unusually buoyant; each occupant must have four square feet or more of room; at least 15 airtight compartments must be provided; four men must be able to handle 10-foot oars without interference by other passengers; and the raft must withstand a vertical drop of 45 feet into water without springing leaks.

Testing is accomplished by use of a water column and air pressure under pressure of one pound per square inch. Any leak shows up via a soap solution applied to the welded seams. No component moves to the next operation until the section is tight. When all compartments are demonstrated to be tight, the raft is approved.

Next the raft is rust-proofed by the Parkerizing process after which it is rinsed in cold water. Following a short rinse in chromic acid at 190 degrees and second draining, drying is accomplished in a tunnel under infra-red lamps. Thoroughly dry, the raft is dipped in a tank of zinc chromate primer, and again drained. From here it moves to a spray booth for two coats of Navy gray synthetic baking enamel; the finish is dried, again by infra-red; and then is removed from the handler. As the jig moves back to the assembly line, the raft rests on the floor for outfitting.

Tests demonstrate the sturdiness of the rafts. The raft, above right, crashes into water from a height of 45 feet

Indication of the amount of equipment carried on the rafts is shown, above left. All items are carried in water-proof compartments

Women workers gas-weld the nose section of a raft, lower right, which was previously assembled in a special jig

At the right a naval officer gets an assembly line view of all-metal compartmented life rafts in the Los Angeles plant of Weber Showcase Co.

Made of 16-gage cold-rolled steel, compartmented cockpit rafts weighing 2425 pounds and capable of carrying 20 men, are being turned out by the hundreds in the Los Angeles plant of Weber Showcase Co. for the Maritime Commission

I PREDICT . . .

by George W. Walker

Industrial Designer of Detroit

"The car you will own, in what engineers call the *post* post-war period, will take greater advantage of streamlining for beauty and efficiency. Running boards will disappear, permitting wider bodies and more seating room. There will be foam rubber upholstery, soundproofing, opaque colored plastic panels and plexiglass windshields and tops that will provide greater visibility and safety. The small car sketched here is designed with the engine in the rear and enclosed running gear, permitting an extremely short turning radius. The car your War Bonds will buy will be fully air-conditioned, making window ventilation unnecessary and eliminating the present-day annoyance of draughts, rain and dust."

* * *

Note: The Weatherhead Company, one of the oldest and most important manufacturers of parts for the automotive industry, is prepared for the day when its four plants will again be contributing to the country's peacetime automotive needs.

Flash strikes hampering war production. Foremen gain scant consolation in National Labor Relations Board decision defining their position. Showdown between labor and management predicted after war ends

WHY the sudden wave of strikes and labor unrest which has foamed over a dozen automotive plants in this area? Most of them are ascribed by union officials to trivial complaints on the part of a handful of employes, but the resulting tieups have affected perhaps 30,000 in all, and have slowed production from 10 to 60 per cent in key plants.

Typical example of the ridiculous aspects of these labor disturbances occurred last week at the large Dodge main plant here. One single man out of 100 interplant truck drivers was decided to be physically unfit for further driving by the company's medical department and hence was transferred to another job pumping gasoline, with a 10-cent reduction in his hourly rate. Promptly all 100 drivers walked off the job, and as completed material began to pile up waiting transfer to other plants it became necessary to suspend all operations and 5600 on the day shift were sent home. The striking drivers maintained that the transferred man should have been kept at his same hourly pay rate—that's all.

Striking foremen in other plants, about 3200 in all, took scant consolation from the "yes and no" decision of the NLRB with respect to recognition of their union, the Foremen's Association of America. The "yes" was the interpretation that an employer would be guilty of unfair labor practice if he discharged or discriminated against supervisory employes for activity in an independent union—but no employer has done that. The "no" was the reaffirmation of an earlier ruling refusing to certify units of supervisory employes for collective bargaining.

That leaves the foremen just about where they were in the first place even though the leader of the FAA said the decision opened the way for the NLRB to assume jurisdiction in disputes between management and supervision. Their next move will probably be to go back to work. There is a suspicion that in some plants the absence of foremen has not interrupted production nearly so seriously as had been anticipated, and if you care to stretch your imagination a little, it might be conceivable that foremen could be dispensed with altogether and their supervisory responsibility transferred to union stewards, who have assumed a good share of it anyway.

Threatened walkout of 9000 Ford foremen was forestalled when the company resumed negotiations with the Ford Chapter of the FAA. The association has its roots in the Ford plant when it was accorded recognition in December, 1942. Since that time its activities have not made the headlines, but organizing work was pushed in other plants like Briggs, Hudson, Packard and Murray. It is not believed much progress has been made in either General Motors or Chrysler plants.

All this, however, has little bearing on the continuing series of strikes in widely scattered plants on the part of production workers. Just about the time one group finally decides to return to work, a walkout will develop somewhere else. All are UAW-CIO members, and of course the union disclaims any responsibility for authorizing these walkouts. Various explanations have been advanced for the trouble. One is that the men are just tired of long hours of work and, with their pockets bulging with cash, leave their jobs with the flimsiest of excuses. All the exhortations to keep production moving and all the attempts to kindle patriotic zeal by pointing to boys dying on the battlefront mean little to strikers as a group when they read of the cutbacks in arms production, or military pipelines being filled to overflowing, etc. And as far as the dying soldiers and sailors are concerned, many are the strikers' own sons, who have not died from the lack of wherewithal to fight, or they would not have been sent into battle.

The plain facts are that the war for a lathe hand earning $125 a week in this country is a long way off and the rumble of its guns is faint beside the jingle of coins in his pocket. No amount of "advertising" or "public relations" effort is going to change that much.

A second explanation of current strikes runs to the effect the UAW-CIO wants to show the public its power, on the eve

HEAVING THE ANCHOR: A novel nautical air not usually associated with an automobile assembly line is the result of the conversion of this Chevrolet line at St. Louis to production of amphibian trucks. Photo shows workers "heaving the anchor," one of the final accessories to be added to the land-water vehicle

SIMULATES SANDSTORMS: Desert conditions are produced in a "dust bowl" installed by Studebaker Corp. at South Bend, Ind. The laboratory will accommodate full sized tanks, trucks and other military vehicles, for testing under sandstorm conditions. Here, in preparation for a test run a hooded research worker shovels sand under front wheel of a heavy-duty truck on which paddles are mounted to pour dust and grit over the wheel and suspension assembly as it rotates

of a drive to organize some 300,000 office and clerical workers in automotive plants. While such a drive is to be launched, the show-of-power prelude does not stack up alongside the union's no-strike pledge and its disclaiming of responsibility for the strikes.

Whatever the explanations and the motives, events are pointing to one of the most abortive "showdowns" this country has ever witnessed between management and labor. Naturally it will not come until the war is history, but when industry descends from the dreamy realms of cost-plus-a-fixed-fee to the basis of competitive costs, many believe a knock down and drag out fight is the only answer to the labor headaches of today.

New and important large-caliber high-explosive shell contracts have been awarded some of the leading automotive plants, including Oldsmobile and Pontiac. The former has been awarded a facilities contract for $4,723,500 to alter buildings and install additional machinery for production of 155-millimeter shells; and Pontiac a similar contract for $3,421,000. Meanwhile Chrysler has been authorized to proceed with additions to four plants to increase facilities for production of tanks and antiaircraft cannon, this contract amounting to $3,071,000.

While Michigan has never ranked high in the shipbuilding industry, the war has brought eminence to the state in the shape of the Defoe Shipbuilding Co., Bay City, where since the fall of 1939, over 100 vessels in the subchaser, destroyer-escort and landing craft categories have been delivered to the Navy. W. E. Whitehouse, assistant to president Harry J. Defoe, told the first annual welding conference of the Detroit section of the American Welding Society recently some of the interesting details of the changes war shipping construction has brought to the Bay City company which in its day has built a good many handsome pleasure yachts but has never seen the bustle now stirring in its yards.

First 173-foot subchaser was delivered in August, 1940, and when orders for 86 more were placed subsequently, the company redesigned the riveted and welded construction to an all-welded type, and worked out an ingenious method for fabricating the hulls upside down, then rolling them over on large "wheels" bolted to the hull, onto launching ways or directly into the water.

The company had only 250 men working at the start, and this force gradually has been built up to 4000, indicating the size of the training program involved. Training of welders was facilitated by the upside-down method of construction, since all welding could be of downhand variety, readily assimilated by novices.

The rollover system was worked out initially with small wooden models on the desk of President Defoe, and so effective was its practical application that there has never been a hitch in the 100 rolls made thus far, the average turnover time being an amazing 2½ minutes. The method also brings greater accuracy to construction, since the first step is to lay the deck plate in an accurate cradle, aligned with transits, and then to erect the transverse of longitudinal framing, and finally the hull plates.

Building Time Slashed

The first subchaser took six weeks to frame at the Defoe; later this time was reduced to seven hours. The first hull took 3½ months; this was slashed to 5½ days. The first ship complete took 14 months; ultimately this was cut to five weeks.

When the submarine menace waned, the Defoe yards were switched to the 373-foot, 1600-ton destroyer-escorts; Bethlehem Shipbuilding being the lead yard for these sleek new craft and 15 other yards participating in the program. Rolling weight of this hull is around 700 tons, no mean job to turn over, but larger wheels and a locomotive crane manipulating cables on each side of the hull turned the trick as easily as with the smaller subchasers. Fourteen have been delivered thus far.

Shrinkage in the welded assembly has been reduced from an allowable 4-5 inches to a mere 1/16-inch, attesting to efficiency of the upside-down method.

Furthermore, no cranes or scaffolding are required as in conventional shipbuilding techniques. Actually a little better than half the total amount of welding is done in the upside down position, since most seams are lap joints; the balance is completed when the ship has been righted on the launching ways. Defoe schedules on the destroyer-escort vessels call for about 40 days of welding in the upside down position, 15 days of welding in the righted position, 25 days for further fitting out on the launching ways, and 60 days of fitting out after launching. The finished vessel, with turbo-electric drive, represents an investment of better than $3,000,000, and expenditure of better than half a million man-hours of labor.

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EVERLASTING FASTENINGS

Mass production methods applied to fabrication of aircraft tubing at Ford Willow Run plant. Each Liberator requires more than 3600 feet of stainless steel or aluminum tubing to carry fluids and gases controlling intricate mechanisms

BETTER than 3600 feet of tubing lines carry the fluids and gases controlling the intricate mechanisms of the B-24 bomber, built by the Ford Motor Co. at Willow Run.

Ford is believed to be the first aircraft manufacturer ever to attempt tube bending on a mass production basis. The first tube for production use was bent at Willow Run on Dec. 17, 1941. Since then, more than 3,500,000 tubes have come from this department. Each ship requires 1800 tubes—hydraulic, fuel, oxygen, de-icer, vacuum, air speed, heater, oil, electrical conduit and ventilation systems.

In the B-24 there are three types of tubing. Stainless steel is used principally in high-pressure hydraulic systems involving pressure up to 3000 pounds per square inch. This tubing has high strength, light weight and is corrosion resistant. It needs no heating to soften it for flaring the ends or forming. Stainless steel is used for all lines serving landing gear and brakes because of its resistance to damage from rocks and gravel frequently thrown by the ship's wheels during take-offs and landings.

The second type of tubing used is a soft aluminum—2S half-hard—which goes into the bomber's conduit and ventilating systems.

The third type, of heavier aluminum —52SO—is used most extensively, especially in the low-pressure hydraulic. This tubing, because it is light in weight and softer than stainless steel, is easily flared and formed to template. It also has high corrosion-resistant qualities and resistance to breakage from vibration. The ease with which it can be handled at the time of final installation in the bomber is an important time-saving factor.

The 52SO aluminum tubing is received at Willow Run's tube bending department in rough 12-foot lengths without fittings or flares. The diameters range from ¼-inch to 4 inches. First, it is cleaned in a chemical bath and then it is cut either to approximate or exact length and shaped or formed to the correct template by means of hand benders or an automatic tube bending machine. The ends are squared off, all sharp edges are smoothed to keep the tube from cracking when flared, and all burrs removed.

The tube then is blown out and is ready to be machine flared to the specified angle. If a test is called for on the tube, it is pressure tested. The tube is now plugged or capped on both ends to exclude all moisture, dirt and dust, banded with its identifying colors, and stamped with a part number. It is now ready for the assembly department.

Ford also claims to be the first aircraft manufacturer to make use of sectional tubing assemblies. These are completely assembled sections of various lines or they may be several lines of the same system. They are made up in assemblies which, when joined to the adjoining sections in the wing or fuselage, form a complete circuit of some line or even an entire system.

Assembly jig in which a single sectional tubing assembly is made up. When complete section has been finished, lines are capped or plugged and entire unit sent to proper assembly line position for installation

Install Tubing Lines Sectionally

In tubing assembly at Willow Run, the various tubes in a section are clamped in exact position in an assembly jig or fixture. After all tubes, fittings and functional units have been assembled and all nuts have been tightened to proper torque, the assembly is capped or plugged. It is then removed from the jig and sent to the proper production line position.

The caps or plugs are removed only when ready to hook-up to other lines in the adjoining assembly section. In this way, it is possible to install all lines in a wing and then join them to a fuselage and hook-up all the connecting lines. There are 17 different tubing lines in the B-24.

As soon as all tubing lines are connected in perfect circuits throughout the ship, functional tests are made of each system to see that it operates properly. However, before final installation and hook-up is made with the various systems, all lines, fittings, and units are blown out with clean dry air. Special care is taken with oxygen lines because moisture may be present which will contaminate the system regardless of filters.

After the tubing has been installed in the ship, one of the most important of all operations follows—torquing all the nuts on the lines. Practice and experi-

NEW...

COMPLETE stress-strain values on HIGH TENSILE STAINLESS

To provide designers of stainless equipment with useful compression and tension values of High Tensile Stainless Steel sheets, Armco has prepared a practical handbook of complete stress-strain data. It is the first time that such detailed values for stainless, both *above and below the yield point,* have been compiled.

Construction of aircraft and other light-weight structures demands adequate knowledge of the compressive strengths of structural materials. Ordinary formulas must be modified when used with materials such as stainless steel, which have non-linear stress-strain characteristics. The handbook provides the means of modifying the usual methods.

Data Insure Accuracy

Data in this handbook are invaluable for accurately proportioning *stronger, lighter* structural parts with *less* stainless steel. These are some of the important subjects it covers:

Some fundamental concepts of design theory to be considered when using stainless steels at the high stress levels where they are most effective.

Mechanical properties of the stainless steels and typical design data.

Stress-strain data from tensile and compressive tests on high strength stainless steel sheets, both above and below the yield point. These data are shown in curve form, and pertinent values are tabulated.

Significance of the tangent and secant moduli of elasticity in structural design.

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ence are essential in order to apply the proper torque to each size of tubing. At each joint, the nut is correctly fitted and precision tightened.

Each tube line serving a particular system has its own distinct color identification. For example, tubes in the oxygen distribution line are marked with light green bands; fuel lines carry red bands; tubes in the anti-icing circuit have white and red bands.

When tubing lines are installed in the B-24, they are held in place by clips and line clamps. These supports are placed at specified intervals to reduce line vibrations, and are tightened only enough to hold the lines together. These line supports are in turn bolted or bonded to the ship, in order to prevent the accumulation of static electricity which might interfere with the ship's radio. Bonding is merely the establishing of a contact between a part and the bomber, thus grounding any static charges.

Utilizing Many New Developments

New developments in the Willow Run tube bending department include a gaging device on the bending machine which enables the operator to pre-set the machine for different bends—an aid estimated to have increased production fivefold; a high speed beading machine which utilizes a pneumatic piston to expand a rubber die to form the bead; and a steel die is now used to bend a short section of tubing having but one bend. By its use three operations are eliminated—16 per ship—on the one piece.

Consolidated Vultee Develops New 48-Passenger Transport Plane

DEVELOPMENT of a 48-passenger commercial transport plane was revealed recently by Consolidated Vultee Aircraft Corp. A mockup of this plane (company model 39) was opened for inspection by representatives of the industry and press in New York, while the prototype now is being flight tested in San Diego, Calif.

Designed to replace the standard airliners of today on routes both within continental limits and spanning oceans, model 39 incorporates the Davis wing, power plant and landing gear of the B-24 Liberator bomber, together with a specially designed fuselage aimed to provide maximum safety and operating efficiency as well as speed and comfort.

The new ship is designed for long range operations and will carry 48 passengers with baggage and 1200 pounds of mail on flights up to 2500 miles. As a sleeper plane, it will accommodate 24 passengers, and a cargo version is expected to carry a payload of 12,000 pounds over similar distances.

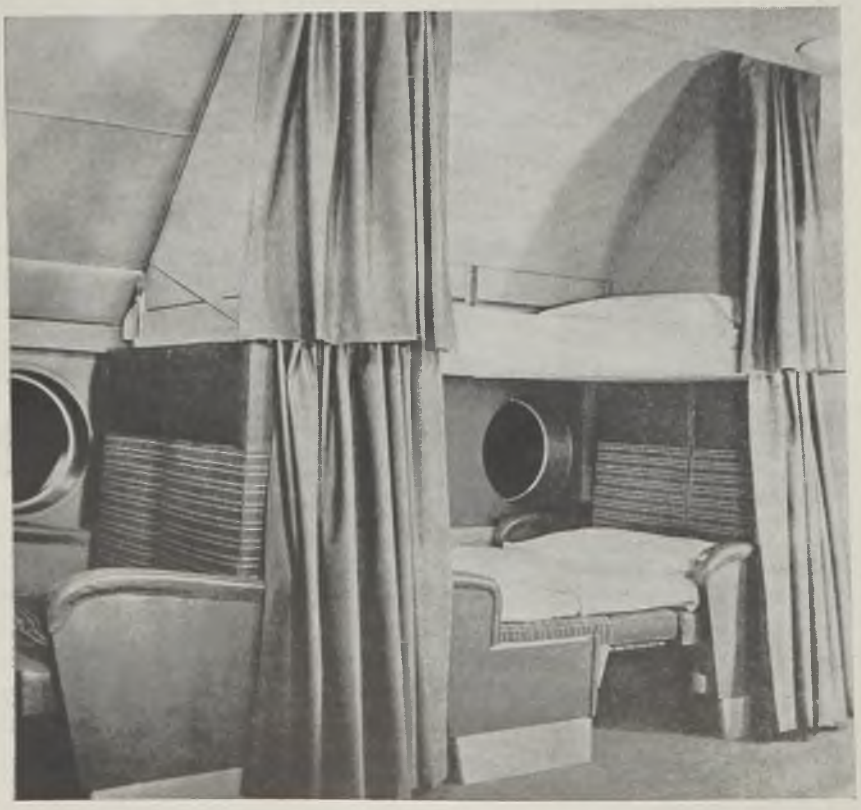
Normal cruising speed for the ship will be 240 miles per hour contrasted with 180 miles per hour for present day planes. Normal gross weight will be 56,000 pounds, although the ship is designed for provisional gross weights up to 64,000 pounds.

A feature of the new transport is the interior arrangement designed by Harry Dreyfuss, industrial designer who developed the Pullman roomette and the interiors of the Twentieth Century Limited.

One Dreyfuss model of the 39 interior exhibited in New York combines specially designed reclining seats with a novel canted arrangement of the seating plan. Other Dreyfuss designs provide for convertible day and night arrangements with comfortable, full-size upper and lower berths and all seats of the reclining type facing forward.

Officials state the ship will not be produced commercially until after the war; however, experience being gained today in producing combat ships, together with the fact that important components of the ship are already in mass production as parts of the B-24, indicate that manufacture of the ship will begin at an early date after the war. Substantial economies in manufacture may be expected.

Of particular interest to potential passengers is the high wing, a feature of the ship's design. This will provide unobstructed visibility from all seats and unusual facility in loading of passengers and cargo.



Interior of Consolidated Vultee's new transport plane showing berths made up. As a sleeper plane, it will accommodate 24 passengers

Fisher Body Attains Volume Output on B-29

Fisher Body Division of General Motors has attained volume production of major parts and assemblies for the B-29 Superfortress. The company is undertaking to produce more than 80 per cent of its original B-29 contract despite an assignment to build and assemble a long-range fighter plane, details of which have not been disclosed by the War Department.

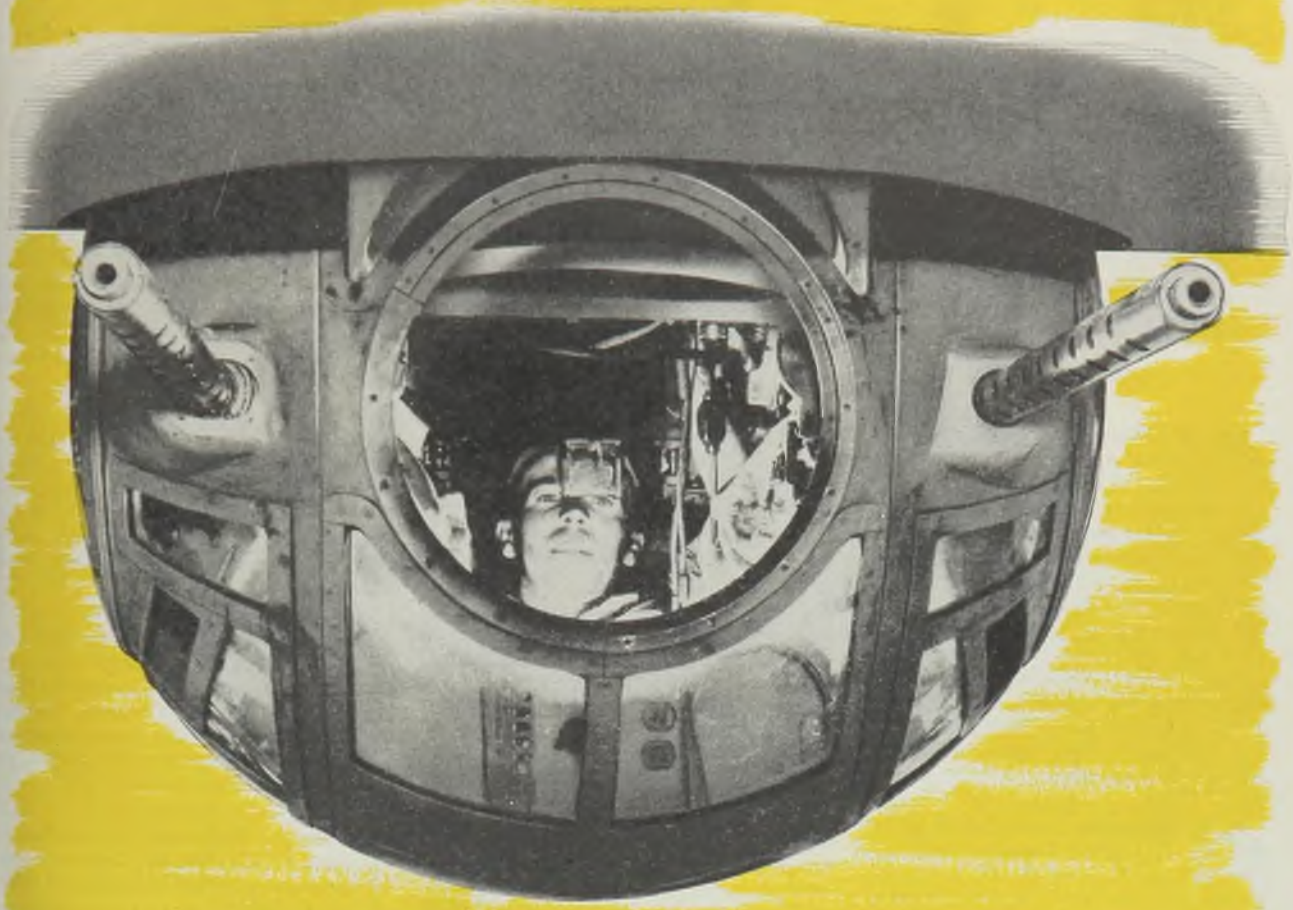
The output of bomber parts and assemblies is ahead of schedule, due to utilization of facilities in eight of the company's 16 armament producing plants. Thousands of B-29 parts are being turned out and there are 12 major assemblies.

Accident Frequency Rate Lowered at Martin Plants

Safety program of the Glenn L. Martin Co., Baltimore, has resulted in lowering the accident frequency rate to 10.4 per million man hours worked during March, 1944, according to E. H. Burhorst, Martin safety director.

This compares to an industry wide frequency rate of 14.4 for those plants engaged in assembly type work and 20.5 for plants engaged in parts manufacture during 1943.

"Turning Points" to Victory



U. S. Army Air Forces photo

FLYING PEPPER POT

There's no "soft underbelly" on American four-motored bombers. Their belly turrets spell double-barreled death for Nazi or Jap. The turret's range is a complete circle. And, since its turning points are frictionless ball bearings, its response is instant and sensitive for "drawing a bead" on rapidly moving targets.

In a mechanized war, friction can be as destructive as enemy bullets. That is why ball bearings are at the "turning points" of practically every piece of fighting equipment.

Millions of Fafnir Ball Bearings are engineered and built to perform efficiently at fighting temperatures which may vary up to 150° in a matter of seconds. They are also resisting sand, water and mud on fighting fronts all over the world.

Applying this service to the coming needs of peace, a broad prospect of usefulness opens to the manufacturer and the user of Fafnir Ball Bearings. The Fafnir Bearing Company, New Britain, Connecticut.

FAFNIR BALL BEARINGS

Buy War Bonds and Stamps

OTTO W. WINTER

FOSTER GUNNISON

Otto W. Winter has been appointed vice president, Acme Pattern & Machine Co., Buffalo. A former president of the American Society of Tool Engineers and currently chairman of the society's education and training committee, Mr. Winter's experience includes affiliation with Sav-Way Industries, Detroit, as president and works manager; Republic Drill & Tool Co., Chicago, as vice president, manufacturing; Columbus McKinnon Chain-Chisholm Moore Hoist Corp., Tonawanda, N. Y., as factory manager and with many other companies in tool engineering capacities.

—o—

H. P. Bigler has been elected executive vice president, Connors Steel Co., Birmingham, Ala., and **L. D. Luey,** who joined Connors Steel Co. as management engineer in 1942, has been appointed comptroller. Mr. Bigler is president of the Rail Steel Bar Association and chairman of the WPB Technical Advisory Committee on Steel Reinforcement.

—o—

E. H. Robinson, until recently consulting engineer on illuminating problems for General Electric Co. at Nela Park, Cleveland, has been appointed eastern sales manager, Fostoria Pressed Steel Corp., Fostoria, O. Mr. Robinson will make Cleveland his headquarters.

—o—

Harold W. Pearcy, since 1931 purchasing agent, Percival Steel & Supply Co., Los Angeles, has been made vice president in charge of purchasing.

—o—

Bert E. Brashares has joined the Product division, Jones & Laughlin Steel Corp. at Cleveland, as steel castings sales engineer. He formerly was sales manager for Commercial Steel Castings Co., Marion, O.

—o—

Howard L. Dawson, for the past year assistant chief engineer, Carnegie-Illinois Steel Corp., Pittsburgh, has been named chief industrial engineer.

—o—

E. F. Vreeland has been named manager of the Albany, N. Y., branch, Mack-International Motor Truck Corp., Long Island City, N. Y. **Cone T. Bass** has taken over duties as division bus manager of Mack's Central division, and other newly appointed district managers are **M. J. Chollet,** St. Louis, and **C. L. McLure,** Louisville, Ky.

—o—

Foster Gunnison, founder and principal stockholder of Gunnison Housing Corp., New Albany, Ind., an interest in which was recently acquired by United States Steel Corp., Pittsburgh, will continue in charge of the company's affairs.

—o—

Robert O. Driver has been made president of the Wilbur B. Driver Co., Newark, N. J., succeeding his father, **Wilbur B. Driver,** who becomes board chairman. **William J. Wind** is vice president in charge of production; **Sidney A. Wood,** vice president, sales, and **Karl R. Tallau,** secretary and treasurer.

—o—

Felix N. Williams has been named general manager, Plastics division, Monsanto Chemical Co., St. Louis, with headquarters at Springfield, Mass., succeeding John C. Brooks, who died April 26. **E. A. O'Neal Jr.** succeeds Mr. Williams as production manager, Phosphate division, Anniston, Ala., and **James A. Wilson** has been appointed plant manager at Trenton, Mich., to succeed Mr. O'Neal.

—o—

L. J. King has been appointed cost planning supervisor, United States Steel Corp., Pittsburgh, and **Edmund S. Davenport** has been named assistant to **R. E. Zimmerman,** vice president, research and technology.

—o—

Harry L. Dunn, Los Angeles attorney, has been elected a director of Lockheed Aircraft Corp., Burbank, Calif., succeeding Frank Russell, who resigned a year ago to devote his full attention to the general managership of the National Aviation War Production Council.

—o—

Godfrey Strelinger has been elected treasurer and assistant secretary, Nash-Kelvinator Corp., Detroit, succeeding the late G. V. Egan. **Charles S. Witherspoon** has been appointed sales manager for the greater New York area, Kelvinator division.

—o—

Henry P. Isham, chief of the purchasing, termination and renegotiation policy unit, and **George Graf,** senior engineer of the small arms branch, Chicago Ordnance District, have been presented with the War Department's award for meritorious civilian service.

—o—

Walter L. Rathmann, a member of the firm of Klipstein & Rathmann, St. Louis, architects, has been elected a director of General Steel Castings Corp., Eddystone, Pa.

—o—

J. B. O'Connor, director, Dresser Mfg. Co., Bradford, Pa., has been elected executive vice president. Mr. O'Connor is vice president and general sales manager of Clark Bros., Olean, N. Y.; chairman of Pacific Pump Works, Huntington Park, Calif., and president of Bovaird &

W. O. EVERLING

Who has been named director of research, American Steel & Wire Co., Cleveland, reported in STEEL, May 8, p. 92.

N. H. BRODELL

Who has been appointed Cleveland district manager, Copperweld Steel Co., Warren, O., noted in STEEL, May 1, p. 93.

EARL A. TANNER

D. M. STEMBEL

H. R. ROWLAND

L. L. FERRALL

Seyfang Mfg. Co., Bradford, all subsidiaries of Dresser Mfg. Co. **Arthur R. Weis,** president of Pacific Pump Works, has been elected a vice president of the parent company, and **Lyle C. Harvey** also has been elected a vice president of Dresser Mfg. Co.

—o—

Earl A. Tanner has been elected president of Inland Steel Container Co., newly-acquired subsidiary of Inland Steel Co., Chicago. He has been president of another Inland subsidiary, Milcor Steel Co., since 1938, and will continue in that capacity.

—o—

I. L. Cantwell, former production manager of the Bristol plant, United States Rubber Co., New York, has been appointed sales manager of battery separators.

—o—

Sterling Alloys Inc., Boston, announces appointment of the following field engineers: **R. B. Steele,** New York City and surrounding territory; **T. Donovan Jr.,** Philadelphia district; **R. H. Garfield** and **H. A. McDonough,** Cleveland; **J. N. Berger,** Pittsburgh; **C. C. Miller,** Detroit; **H. A. Steffen,** Chicago; **E. W. Bock,** Wisconsin, Iowa and Minnesota, and **C. L. Robertson** and **P. E. Johnson,** Indianapolis.

—o—

C. Walter Sanborn, Geoffrey C. Beard and **John L. Young,** vice presidents of United Engineering & Foundry Co., Pittsburgh, have been elected directors.

—o—

G. H. Gaites has been appointed regional sales supervisor of the Cleveland and Pittsburgh territories for Bristol Co., Waterbury, Conn., and **H. C. Clarke** has been named Pittsburgh district manager.

—o—

Alfred P. Darcel of Crane Ltd., Montreal, has been appointed a vice president of the National Industrial Advertisers Association.

—o—

James W. Steel, former works manager, International Harvester Co., Chicago, has been appointed superintendent of American Shipbuilding Co.'s two yards at Buffalo. Mr. Steel succeeds **John Thompson,** who returns to his former post as chief of the company's Superior, Wis., yards.

—o—

D. M. Stembel, formerly manager of hot-rolled sales for A. M. Byers Co., Pittsburgh, has been appointed vice president of Lockhart Iron & Steel Co., Pittsburgh.

—o—

H. R. Rowland has been appointed manager of wrought iron hot-rolled sales, A. M. Byers Co., Pittsburgh. **M. C. Morgan** succeeds Mr. Rowland as manager of the company's Pittsburgh division.

—o—

J. W. Dietz, industrial relations manager, manufacturing department, Western Electric Co. Inc., New York, presently on leave for government service, has been awarded an honorary degree of doctor of engineering by Purdue university.

—o—

Harold A. Anderson has been named eastern district manager of the Austin Co., Cleveland, succeeding **J. K. Gannett,** vice president, whose appointment as the company's director of engineering was recently announced.

—o—

William E. Knox, formerly assistant general manager, Westinghouse Electric International Co., New York, has been elected a vice president. Mr. Knox is a member of the Export Managers Club and vice president and director of the Electrical Export Corp.

—o—

Howard F. Isham, Robert S. Burns, George B. White and **James R. Page** have been elected to the board of directors, Cherry Rivet Co., Los Angeles.

—o—

Jess W. Sweetser has been appointed public relations director of Curtiss-Wright Corp., New York, succeeding **H. E. Lawrence.**

—o—

Walter D. Smith, for the past four years manager of the Tulsa district office, Worthington Pump & Machinery Corp., Harrison, N. J., has been appointed a commercial vice president and will supervise the corporation's business in the Southwest.

—o—

L. L. Ferrall, chief metallurgist, Rotary Electric Steel Co., Detroit, will address the technical session of the fifty-third general meeting of the American Iron and Steel Institute at the Waldorf-Astoria hotel, New York, May 25. His subject will be "Problems Involved in Determining Hardenability Limits for Alloy Steels."

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E. A. Wall has been appointed controller of Winchester Repeating Arms Co. and Bond Electric Co., divisions of Western Cartridge Co., East Alton, Ill.

—o—

Mehmed S. Zia has joined the Export division of American Brake Shoe Co., New York, as foreign representative in the Mediterranean zone and the Near East, with headquarters in Cairo.

—o—

Edward N. Haas has been appointed works manager of the Aurora, Ill., plant of Independent Pneumatic Tool Co., Chicago, succeeding **W. H. Brewer,** who has been named general factory manager. **John P. Bank** succeeds Mr. Haas as assistant works manager.

—o—

Dr. J. T. Rettaliata has been appointed manager of the new Research and Gas Turbine Development division of Allis-Chalmers Mfg. Co., Milwaukee. As chief engineer in gas turbine development, **J. L. Ray** will assist Dr. Rettaliata.

—o—

Henry Ford II, executive vice president of Ford Motor Co., Dearborn, Mich., has been elected to the board of directors of the Automotive Council for War Production, succeeding **Charles E. Sorensen.**

—o—

George M. Rigg has been appointed assistant manager, Weirton Coal Co., Weirton, W. Va. Mr. Rigg will continue as chief engineer of the company.

—o—

H. E. Bauer, formerly with the British Ministry of Supply Mission, Alloy Division, has joined the purchasing depart-

J. K. B. HARE

JOHN H. ASHBAUGH

R. A. NEAL

H. H. ROGGE

ment of A. Milne & Co., New York. Formerly, he was associated with the British Iron & Steel Corp. in New York.

—o—

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., announces the election of four new vice presidents: **J. K. B. Hare,** manager of central district sales activities, Pittsburgh; **John H. Ashbaugh,** manager, Westinghouse Electric Appliance division, Mansfield, O.; **R. A. Neal,** former manager of the Switchgear division, East Pittsburgh, who becomes vice president and sales manager, reporting to B. W. Clark, who is vice president in charge of all company sales activities; and **H. H. Rogge,** manager of the company's Washington government office.

OBITUARIES . . .

John S. Patterson, president and treasurer of the Enameled Metals Co., and secretary of the Pittsburgh Pipe & Coupling Co., both of Pittsburgh, died there recently.

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Michael J. Curtin, 46, general superintendent and assistant works manager, William Sellers Co., Philadelphia, died May 7 in that city.

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Lester P. Lane, 52, district sales manager at Detroit for Weirton Steel Co., Weirton, W. Va., died in Detroit May 6.

—o—

Earl W. Roberts, 62, president, Roberts Brass Co., Detroit, died in that city May 7. Recently he had been associated with the Dresser Mfg. Co., Bradford, Pa., and the Differential Wheel Co., Detroit.

—o—

Samuel A. Hammett, 54, owner of the Mercury Metal Die & Letter Co., Los Angeles, died there recently.

—o—

Joseph N. Kilpatrick, 78, founder and president of the Joseph N. Kilpatrick Machinery Co., St. Louis, died recently in that city.

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Thomas I. Curtin, 63, president and treasurer, Waltham Foundry, Waltham, Mass., until his retirement last January, died in that city May 7.

—o—

Franz Eder, 64, consulting engineer associated with the Robert W. Hunt Co., New York, died recently. Interested in the development, design and manufacture of compressed gas cylinders and various types of pressure vessels, Mr. Eder contributed much to the advancement of the industry through his participation in committee work of numerous technical societies. He was also interested in fusion and gas welding.

—o—

E. D. Dickinson, 66, who at the time of his retirement a year ago was designing engineer, Turbine Engineering division, Lynn River works, General Electric Co., Schenectady, N. Y., died April 28.

—o—

Wilbur S. Locke, 73, for many years Boston district manager of Carnegie-Illinois Steel Corp., Pittsburgh, until his retirement in 1941, died May 1 in Winchester, Mass.

—o—

William Bayes, 58, production engineer at the Cleveland Diesel Engine division of General Motors Corp., Cleveland, died May 6 in Lakewood, O. Affiliated with Cleveland Diesel since 1933, Mr. Bayes had previously been chief of the time study department, White Motor Co., Cleveland, for ten years.

—o—

Paul Marquardt, 58, purchasing agent for the J. E. Gilson Co., Port Washington, Wis., died May 3, in that city.

—o—

John Reece, retired president, International Machine Co., Franklin, Mass., died May 2 in Boston. Mr. Reece invented a mechanism during the last war that enabled submarines to surface within five minutes instead of the then usual 15 minutes.

—o—

August Rosenthal, 76, the last of four inventor brothers who established the Rosenthal Corn Husker Co., West Allis, Wis., died May 1 in Wauwatosa, Wis. He was serving as president of the company at the time of his death.

—o—

Daniel R. Davies, 77, former president of Acme Machinery division of Hill Acme Co., Cleveland, died there May 4. Mr. Davies entered the employ of Acme Machinery division 49 years ago, rising steadily until elected president about 17 years ago. He retired in 1939.

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Henry A. Zwierlein, 55, for the past 20 years chief engineer, Ajax Mfg. Co., Cleveland, died there May 7.

—o—

Carl H. Klaustermeyer, 64, manager of the Metal and Ore division, E. I. du Pont de Nemours & Co. Inc., Wilmington, Del., died May 5 in that city. He had held a similar post with Grasselli Chemical Co., Cleveland, until du Pont absorbed the Cleveland company in 1928 and he was transferred to Wilmington.

—o—

John F. Hazen, who retired last December as manager of sales, Wire and Wire Products division, Bethlehem Steel Co., Bethlehem, Pa., died recently. Prior to joining the Bethlehem company in 1926, Mr. Hazen had been associated with Pittsburgh Steel Co., Pittsburgh, for 24 years, serving as general manager of sales from 1919 to 1926.

—o—

Henry M. Johnson, 64, formerly production manager, A. O. Smith Corp., Milwaukee, a director of Badger Meter Mfg. Co., Milwaukee, and a partner in the Griffith-Hope Co., West Allis, Wis., until ill health forced his retirement in 1940, died April 30 in Milwaukee.

—o—

Jones W. Garrison, 41, sales engineer in Milwaukee for National Machine Products Co., Detroit; Twentieth Century Brass Works, Minneapolis, and Accurate Screw Co., Chicago, died May 3 in West Bend, Wis.

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Charles M. Hendry, 49, general engineer, Crucible Steel Co., Harrison, N. J., died May 3 in Bronxville, N. Y.

Dominion Cancels Contract for Molybdenum; Supply Sufficient

Two to three years' stocks now on hand. Defense Industries Ltd. will take over management of shell-filling plant at Cherrier, Quebec, now operated by Canadian Car & Foundry Co. Russia may buy $25 million of electrical equipment

TORONTO, ONT.

THE Canadian government has canceled its contract with Indian Molybdenum Ltd., subsidiary of Dome Mines Ltd., for the supply of molybdenum, the Department of Munitions and Supply announced. Contract with the company called for the purchase by the government of 2,000,000 pounds of molybdenite concentrates. In view of the decreasing demand for molybdenum for war purposes, the Department of Munitions and Supply considers it unnecessary to add further to stockpiles. The Indian Molybdenum property, located in the Cadillac area of Quebec, went into production last year.

Canada now has between two and three years' supply of molybdenum on hand. Consumption of the metal dropped as production of certain types of munitions was curtailed in the last year.

Consideration was given by Dome to the finding of another market, but it was decided against because it would be necessary to operate at the 650 tons a day milling rate of March and April to keep costs under the world price of 45 cents a pound, and to do this regularly a great deal of development work would have to be done first.

The venture of Dome Mines into molybdenite mining followed urging of the Canadian government that the metal be produced domestically. United States production was not then ample to meet all Allied requirements so Canada set a price of 85 cents as an inducement. Not only was Canadian production obtained beyond domestic requirements, but the United States output was also increased.

At the request of the Canadian government, Defense Industries Ltd. will take over management of the shell-filling plant at Cherrier, Quebec, now being operated by Canadian Car Munitions Ltd., a subsidiary of Canadian Car & Foundry Co.

"The necessity for a large increase in shell production in Canada will entail the reopening of the shell manufacturing facilities of the Canadian Car & Foundry Co.," Mr. Howe, Minister of Munitions and Supply, said. "Because of the pressure of other war contracts, Canadian Car & Foundry Co. asked the department to be relieved of the management of the Cherrier shell-filling plant. We have asked Defense Industries Ltd., which now operates our other major shell-filling works at Bouchard and Pickering, to take over management of the Cherrier plant on June 1."

The Cherrier plant, one of the largest in the dominion, was built on behalf of the government by the Canadian Car & Foundry Co. Ltd. Operations began in December, 1940. The plant is engaged in filling shells, cartridge cases, torpedo heads, mines, depth charges, grenades, fuses and detonators. It is also engaged in the manufacture of several of the most powerful explosives.

Russia may buy upwards of $25,000,000 of hydroelectric generating equipment from Canada to replace some of the Dnieper dam machinery destroyed to keep it from falling into the hands of the Germans in 1941. Negotiations are now under way through the commercial department of the Soviet embassy here.

If the deal is consummated, the sale would be financed under the export aid plan announced by the federal government in the speech from the throne in January. It is understood the machinery would be manufactured in Ontario plants at least part being made in Toronto. It is likely the manufacturers would be extended credit at a low interest rate by Canadian banks and that the loans would be guaranteed by the federal government.

One important aspect of the transaction would be the beginning of a large volume of peacetime trade between Canada and the Soviet. If a contract is worked out it will be one of the largest orders for electrical equipment ever placed in Canada from outside the dominion.

Construction Program for 1944 Cut to $3.5 Billion

Total volume of construction this year is not expected to exceed $3.5 billion, as compared with the $3.9 billion estimate made last fall, indicating success in cutting back construction projects to a larger degree than had been anticipated.

The 10 per cent reduction in expected construction, the War Production Board said, will materially help to conserve scarce lumber as well as supplies of steel and copper, which are becoming increasingly tight.

Total volume of construction activity in the first quarter was under $900 million, which is less than 40 per cent of the total for the like 1943 period. The cumulative program was about 64 per cent complete at the end of March.

They Say:

"Industrial apprentice training programs are destined to raise living standards of American communities to a new high in the postwar era. The community is benefited when training programs lift the average of general ability, technical skill, and earnings of its citizens. Broader information and the confidence that comes from training makes men show initiative and become more co-operative and useful citizens."—**Joseph M. Schappert**, director of industrial education, National Metal Trades Association.

* * *

"The growing tendencies toward arbitrary limits on production and toward even higher labor costs through the enforcement of unreasonable demands, offer serious threats to future jobs. We built the American standards on the principle of higher efficiency and lower selling costs—not on the principle of getting more for less. Prices, wages, and profits must be brought back into proper balance and relationship if we are to preserve American standards and opportunities in the years to come. We'll succeed only in making a sorry mess of it if we ignore or seek to dodge these basic rules, for these rules make jobs."—**P. W. Litchfield**, chairman, Goodyear Tire & Rubber Co., Akron, O.

* * *

"The greatest lesson of the war is to prove that what is physically possible is financially possible. For this reason, soldiers and citizens are asking and will continue to ask why comfortable homes and necessities of life cannot be provided in peace with the same plenty as tanks and other weapons in time of war."—**Stuart Chase**, economist.

* * *

"Cash balances held by individuals and business will be held as a backlog and their effect will be to encourage a high rate of spending out of current income. The prospect is for a high level of consumption, fed by large-scale production and financed from current income."—**Emil Schram**, president, New York Stock Exchange.

Camouflage makes this Whitcomb diesel-electric locomotive, above, look like a continental box car, right. The unit is built by a subsidiary of Baldwin Locomotive Works, Philadelphia, to transport men and materials on foreign battle fronts. The camouflage is said to be successful in deceiving enemy airmen

BRIEFS . . . .

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

Climax Molybdenum Co., New York, opened offices at 624 Fisher building, Detroit, on April 1, to handle the company's sales and service work in Michigan, Indiana and Toledo district.

—o—

Cleveland Automatic Machine Co., Cleveland, recently appointed Tool Engineering Service, Birmingham, Ala., as its representative in Alabama, Georgia, Florida, Tennessee and the Carolinas.

—o—

American Metal Co. Ltd., New York, has sold its entire holdings of Minas de Matahambre, S. A., consisting of 54,228 shares, to a group of Cuban citizens.

—o—

Continental Can Co. Inc., New York, will soon extend its interests to include Mexico, with the formation of a Mexican corporation.

—o—

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has published for the iron and steel industry two new volumes of simplified motor and control buying data.

—o—

Doyle Machine & Tool Co., Syracuse, N. Y., recently changed its name to Doyle Mfg. Co.

—o—

National Metal Products Corp., Chicago, is a new plant engaged in manufacturing precision products for the aircraft industry.

—o—

Department of Interior, Washington, has available a preliminary report on lead and zinc deposits of part of the Rico dome, Dolores county, Colo.

—o—

National Bureau of Standards, Washington, now has available printed copies of simplified practice recommendation R204-44, bronze pop safety valves, and bronze, iron and steel relief valves.

—o—

Radio Corp. of America, Camden, N. J., announces development of an electron microscope, which it claims is 50 times more sensitive than the finest optical microscope.

—o—

Selas Corp. of America, Philadelphia, is the new name of the Selas Co. No change in the company's organization, service, personnel or objectives has occurred.

National Metal Fabricators, Chicago, was organized recently to engage in fabrication of sheet metal, plate and light structural shapes.

—o—

Griswold News Service, New York, announces *Public Relations News,* the first weekly newsletter devoted entirely to reporting and interpreting the news in the field of public relations and publicity.

—o—

Allis-Chalmers Mfg. Co., Milwaukee, recently created a research and gas turbine development division.

—o—

General Electric Co., Schenectady, N. Y., reports that spring steel blades of proper size are being used instead of fixture clamping fingers to assure proper tool clearance at its plants.

—o—

B. F. McDonald Co., Los Angeles, now is in its new home, occupying an entire block between Fifty-first street and Fifty-second street in Los Angeles.

—o—

Marmon-Herrington Co. Inc., Indianapolis, has received a new contract for a large number of specially designed trucks and is resuming full-scale production.

—o—

Allen-Bradley Co., Milwaukee, announced the removal of their Cleveland offices to 4506 Prospect road, Cleveland 3.

Fontana Plant Gets Large Shell Contract

Kaiser steel plant to produce 8-inch and 155-millimeter artillery shells for Army. Plan extension to plant

THE KAISER steel plant at Fontana, Calif., has received a $25,000,000 contract for the production of 8-inch and 155-millimeter artillery shells, according to Maj. Walter C. Main, Army Ordnance procurement officer, Los Angeles.

Steel billets will be used. Forging and rough machining operations will take place in a new extension of the Fontana plant which will be constructed by the Army, while finishing of the shells will be completed at Denver, Colo., in order to utilize the surplus of labor in the Denver area.

Extension to the Fontana plant will be equipped with government-owned machine tools with the extension costing about $8,000,000. The Kaiser plant has a rated capacity of 833 tons daily in the rolling mill and is reported to be exceeding its scheduled output by 127 tons per day.

Receives $1,000,000 Order for Shell Lathes

An order involving more than $1,000,000 for making lathes for producing 155-millimeter shells has been given the Youngstown Foundry & Machine Co., Youngstown, by the Henry J. Kaiser Co., Bertram G. Parker, president of company, announced.

The order is the largest individual one ever received by the Ohio concern, although it has been manufacturing shell lathes and bomb spinning machines ever since the war began. The machinery will be used to equip the Kaiser company's Fontana, Calif., and Denver, Colo., shell plants.

Youngstown Foundry will greatly expand its working force and will begin shipments within the next 60 days and complete the order within five months.

War Department Commends Steel Cartridge Cases

War Department has just announced that the 3-inch steel cartridge cases which are produced by the Norris Stamping & Mfg. Co., Los Angeles, have been standardized for unlimited use in all theatres of war.

In designing, developing and processing the 3-inch antiaircraft and antitank cartridge cases, the War Department says "the Norris company has surmounted all setbacks and difficulties and has produced a dependable steel cartridge in large quantities and at reasonable cost. Reports from the battlefronts, where they have been used, indicate these shell cases from Norris are performing equally well, and in some cases better than the brass cases."

Norris was the first company to install heat treating equipment and the first of more than 15 producers to be given permission by the inspection section to ship steel cases before ballistics tests, the War Department added.

Technical Division of Metal Lath Group Re-established

Arthur J. Tuscany, commissioner, Metal Lath Manufacturers Association, Cleveland, announces that effective immediately it has re-established its Technical Division.

This division gives attention to developing specifications and methods as well as assisting architects, designers, contractors and others.

Gray Iron Founders' Moves to New Offices

Gray Iron Founders' Society, national association of manufacturers of castings in gray irons, moved its Washington offices May 1 to 1201 Nineteenth street, N. W., from 1341 Connecticut avenue, N. W.

Opened in September, 1941, to assist government agencies and the industry to map and spread castings production for war, the society's Washington office, in the scope of its liaison, interpretative, technical and research services, has virtually become the trade group's headquarters for the duration, although the "home office" address remains 1010 Public Square building, Cleveland.

Rheem Mfg. Co. To Produce Artillery Shells

Receives $16,000,000 contract from Army Ordnance to manufacture 1,000,000 heavy shells at Danville, Pa., plant

AS A PART of the Army's drive to step up its heavy artillery program, Rheem Mfg. Co., Washington, has received a contract from Army Ordnance totaling approximately $16,000,000 for the manufacture of more than 1,000,000 heavy artillery shells.

The order, placed by the Philadelphia Ordnance district, will be filled by the company's Danville, Pa., plant. This plant has been operated by Rheem under lease from the Navy and has been machining propulsion shafting for combat and landing craft at a record rate. As soon as the Navy released the plant to the Army and agreed to its conversion, engineers from the company's plants in Birmingham, Ala., and New Orleans, where the company has been forging and finishing artillery and mortar shells for more than two years, started the installation work.

The company is not permitted to disclose figures on the planned rate of production.

Navy Reports Urgent Need For Electronic Equipment

An urgent need for electronic test equipment was revealed recently by the Navy's radio department, Bureau of Ships, in an effort to boost production of vitally needed electrical components.

Rear Adm. George F. Hussey Jr., chief of the Bureau of Ordnance, Navy Department, left, and Rear Adm. J. R. DeFrees, naval inspector, inspect the four millionth seamless cartridge container made by the Norris Stamping & Mfg. Co., Los Angeles. Comm. J. C. Arnold and K. T. Norris look on

Further Gain in War Production Scheduled

INDUSTRIAL activity is well sustained at near record levels, bolstered by a steady influx of new orders resulting from exceptionally high daily rate of war expenditures. Despite additional adjustments in projected war program scheduling, the overall production tempo appears to be tending upward. New orders continue in excess of shipments in some important industries, with consequent lengthening in order backlogs in such lines as steel, artillery, heavy trucks, shells, most types of naval combatant vessels, and heavy aircraft engines.

During the latest week gains were recorded in bituminous coal production, petroleum output, automobile and truck assemblies, and engineering construction awards. Steel production tapered slightly, as also revenue freight carloadings and electric power consumption.

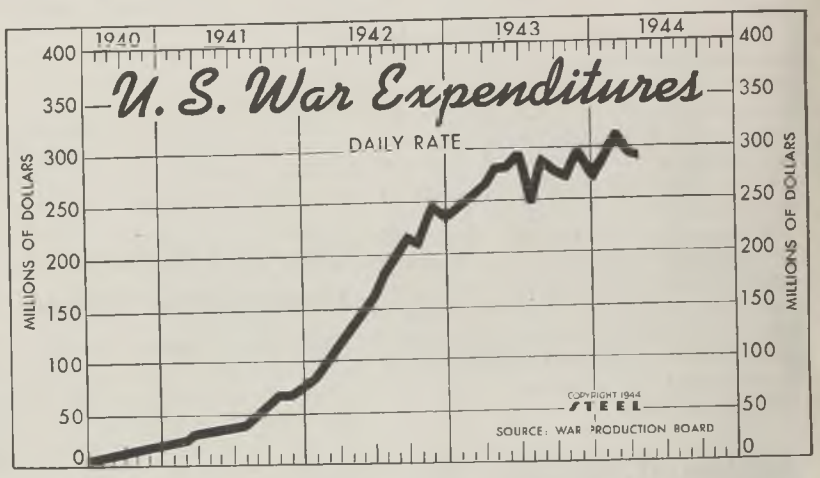
WAR OUTPUT TREND—Breakdown of scheduled percentage proportions of key war materiel items to total munitions output by the close of this year, made March 1 and based on the theory that Germany would not be defeated in 1944, show a steady upward trend through October. Charts prepared by the War Production Board indicate that by the end of this year aircraft output will represent 36 per cent of total output; shipbuilding, 22; guns and fire control equipment, 5; ammunition, 7; combat vehicles, 8; communication and electronic equipment, 4; and other equipment and supplies, 18.

CONSTRUCTION—Total volume of construction this year is not expected to exceed $3.5 billion, compared with $3.9 billion estimated last fall, the War Production Board states. The 10 per cent reduction will materially help conserve scarce supplies of steel, copper and lumber.

Building activity declined to $900 million during the first quarter, or 40 per cent below comparable 1943 period. However, April construction equaled or slightly exceeded the March volume, interrupting the downward trend in progress since August, 1942. The March construction rate is expected to be slightly exceeded in the second and third quarters as seasonal increases will more than make up for declines in military and war plant expansion.

Government-financed war plant construction program had reached the following percentages of completion as of March 31: Raw material plants, 92 per cent; shipways, 94; synthetic rubber, 95; and aviation gasoline refining facilities, 82.

WAR EXPENDITURES—Daily rate of war expenditures during April recorded a moderate decline, but held well above the monthly 1943 average. Preliminary report for April shows total outlays of $7,346 million, compared with $7,948 million in the preceding month and $7,290 million for comparable 1943 period. Daily rate of expenditures last month amounted to $293 million, contrasted with peak of $312.3 million recorded in February.



War Expenditures
(millions)

	1944 Monthly Expenditures	1944 Daily Rate	1943 Monthly Expenditures	1943 Daily Rate	1942 Monthly Expenditures	1942 Daily Rate
January	$7,416	$285.2	$6,254	$240.5	$2,193	$ 81.2
February	7,808	312.3	6,081	253.4	2,401	100.0
March	7,948	294.4	7,112	263.4	3,025	116.3
April	7,346	293.0	7,290	280.4	3,461	133.1
May			7,373	283.6	3,824	147.1
June			7,688	295.7	4,213	162.0
July			6,746	249.9	4,708	181.1
August			7,529	289.6	5,163	198.6
September			7,212	277.4	5,459	218.4
October			7,105	273.3	5,722	211.9
November			7,794	299.8	6,112	244.5
December			6,951	267.3	6,125	235.6
Total		Av.	Tt'l. 85,135	Av. 272.9	Tt'l. 52,406	Av. 169.1

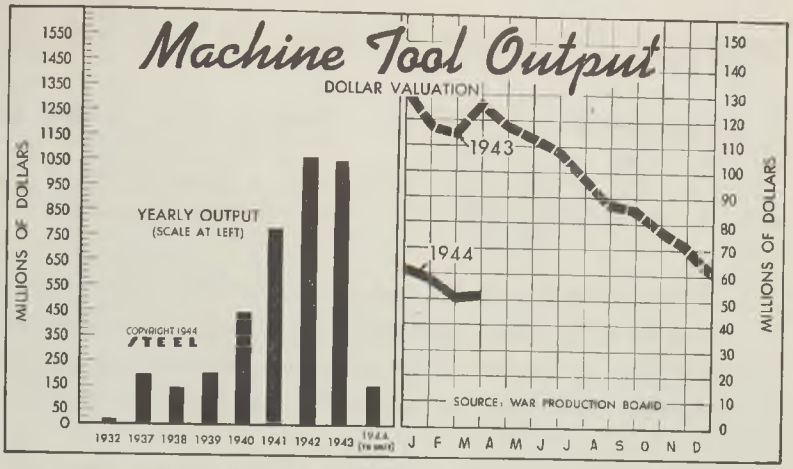
FIGURES THIS WEEK

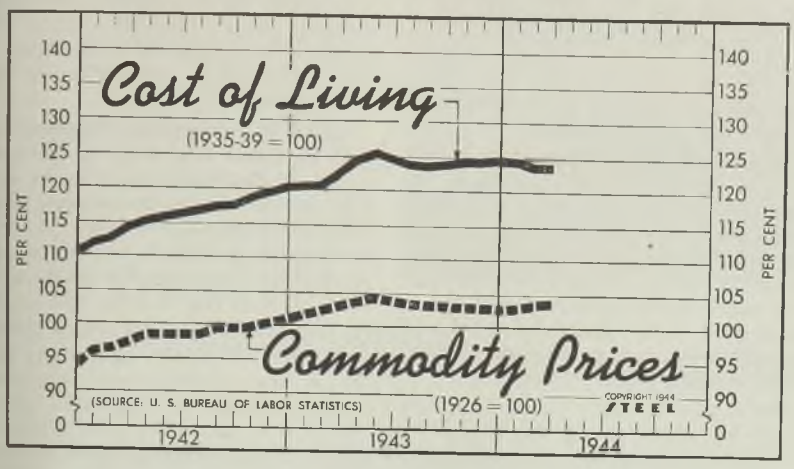
INDUSTRY	Latest Period°	Prior Week	Month Ago	Year Ago
Steel Ingot Output (per cent of capacity)	99.0	99.5	99.5	98.5
Electric Power Distributed (million kilowatt hours)	4,234	4,336	4,361	3,904
Bituminous Coal Production (daily av.—1000 tons)	2,058	2,038	1,917	1,569
Petroleum Production (daily av.—1000 bbls.)	4,529	4,436	4,416	4,021
Construction Volume (ENR—unit $1,000,000)	$72.2	$26.7	$34.0	$41.9
Automobile and Truck Output (Ward's—number units)	17,935	16,345	18,175	18,405
°Dates on request.				
TRADE				
Freight Carloadings (unit—1000 cars)	850†	852	789	789
Business Failures (Dun & Bradstreet, number)	42	41	37	64
Money in Circulation (in millions of dollars)‡	$21,614	$21,396	$21,191	$16,683
Department Store Sales (change from like week a year ago)‡	−11%	−11%	+17%	+29%
†Preliminary. ‡Federal Reserve Board.				

Machine Tool Output

(000 omitted)

	1944	1943	1942
Jan.	$56,349	$117,384	$ 83,547
Feb.	50,098	114,593	84,432
Mar.	50,799	125,445	98,358
Apr.	.....	118,031	103,364
May	.....	113,710	107,297
June	.....	108,689	111,090
July	.....	97,428	113,596
Aug.	.....	87,405	117,342
Sept.	.....	85,842	119,883
Oct.	.....	78,300	130,008
Nov.	.....	.....	120,871
Dec.	.....	.....	131,960
Year			
1942			1,321,862
1941			812,462
1940			450,000
1939			210,000





Wholesale Commodity Price—Cost of Living Indexes

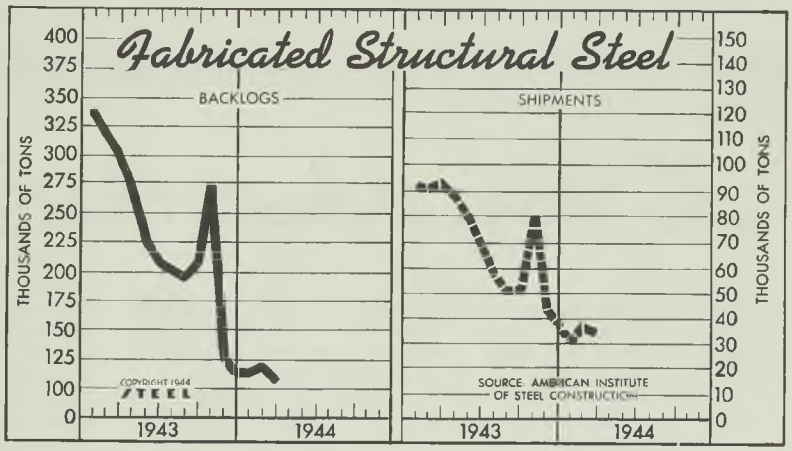
	—Commodities— (1926 = 100)			—Living Costs— (1935-39 = 100)		
	1944	1943	1942	1944	1943	1942
Jan.	103.3	101.9	96.0	124.2	120.6	112.0
Feb.	103.6	102.5	96.7	123.8	120.9	112.9
Mar.	103.8	103.4	97.6	123.8	122.8	114.3
Apr.	....	103.7	98.7	.....	124.1	115.1
May	....	104.1	98.8	.....	125.1	116.0
June	....	103.8	98.6	.....	124.8	116.4
July	....	103.2	98.7	.....	123.8	117.0
Aug.	....	103.1	99.2	.....	123.2	117.5
Sept.	....	103.1	99.6	.....	123.9	117.8
Oct.	....	103.0	100.0	.....	124.4	119.0
Nov.	....	102.9	100.3	.....	124.1	119.8
Dec.	....	103.2	101.0	.....	124.4	120.4
Ave.	.....	103.2	98.8	.....	123.5	116.5

Fabricated Structural Steel

(1000 tons)

	—Shipments—			—Backlogs—		
	1944	1943	1942	1944	1943	1942
Jan.	30.0	91.9	167.8	113.1	339.1	704.4
Feb.	37.6	90.8	164.6	117.6	321.0	706.7
Mar.	34.2	94.0	191.3	106.3	299.8	777.7
Apr.	....	86.6	187.2	.....	272.5	772.4
May	....	78.9	184.2	.....	220.6	843.8
June	....	68.4	182.7	.....	207.1	869.8
July	....	56.8	189.9	.....	201.3	808.6
Aug.	....	50.2	173.9	.....	195.6	783.5
Sept.	....	51.8	169.8	.....	208.1	716.0
Oct.	....	80.1	152.9	.....	274.0	617.7
Nov.	....	42.7	130.4	.....	134.6	566.6
Dec.	....	39.6	145.3	.....	113.0	523.5

Source: American Institute of Steel Construction. Figures for 1943 to date cover members' reports only; for other years they are estimates for entire industry.



FINANCE

	Latest Period*	Prior Week	Month Ago	Year Ago
Bank Clearings (Dun & Bradstreet—millions)	$9,298	$9,001	$9,218	$10,098
Federal Gross Debt (billions)	$187.1	$187.0	$184.5	$135.2
Bond Volume, NYSE (millions)	$42.0	$44.0	$38.4	$126.1
Stocks Sales, NYSE (thousands)	3,398	3,060	3,160	12,915
Loans and Investments (millions)†	$51,064	$51,453	$52,012	$45,772
United States Government Obligations Held (millions)†	$37,834	$38,110	$38,087	$31,909

†Member banks, Federal Reserve System.

PRICES

STEEL's composite finished steel price average	$56.73	$56.73	$56.73	$56.73
Spot Commodity Index (Moody's, 15 items)†	249.6	249.5	250.5	246.7
Industrial Raw Materials (Bureau of Labor index)‡	113.2	113.0	114.0	112.7
Manufactured Products (Bureau of Labor index)‡	101.0	100.9	100.7	100.9

‡1931 = 100; Frdayi series. ‡1926 = 100.

Improved Processing Methods Help Avoid . . .

HEAT-TREAT DISTO

Heat-treating engineers emphasize importance of incremental or step-by-step heating and cooling methods where distortion and warping are factors. New processes discussed include austempering, martempering, and isothermal heat treatment

By G. W. BIRDSALL
Associate Editor, STEEL

BEFORE DESCRIBING some of the newer procedures being employed by heat treaters to reduce or eliminate warping and distortion in complicated tools, dies and other critical parts, it might be well to examine briefly the characteristics of steels and the factors responsible for warping and distortion when heat treating such parts.

In general, distortion effects can be classified under two broad divisions — those resulting during the heating cycle and those occurring upon cooling. However, the effects we are interested in examining here are due to factors common to both. And these factors boil down to just about two:

Uneven Expansion and Contraction: Internal stresses induced by uneven expansion and contraction can cause plastic flow and so produce permanent distortion. Thus it is important that temperatures throughout the work be kept as uniform as possible if all parts are to expand and contract together.

Non-Simultaneous Phase Changes: It is a well known fact that when the structure of steel changes in passing from one phase to another—such as from gamma to alpha iron or vice versa —certain volume changes also occur. If permanent deformation (distortion) is to be avoided, these volume changes should be produced simultaneously in all parts of the work.

Since steel is ductile when heated to hardening temperatures, the change in volume accompanying phase changes leads to distortion and warping because this change seldom occurs simultaneously throughout all portions of the work. Thus one portion of the work may increase in volume while another is not changed or is decreasing.

This is a basic factor causing distortion in both heating and cooling cycles —phase changes (affecting volume) occurring at different times and points throughout the work. Since these phase changes depend upon temperature changes, it is essential to maintain an even temperature distribution for this reason also.

Effect of Temperature Distribution: It will be noted that both of the above causes of distortion stem from the common factor—uneven temperature distribution throughout the work. Thus the problem resolves itself in how to avoid unequal temperature distribution in the work during the heating and cooling cycles.

It would be more accurate to state the problem as being how to minimize unequal temperature distribution, for obviously it is impossible to have perfectly uniform temperatures throughout the work because there must be a temperature gradient (a difference in temperature) from work surface to work center to produce the heat flow wanted in heat-

25 Ways to Avoid Heat-Treat Distortion

TABLE I

This is a check list worked out with A. S. Eves, chief field engineer, Perfection Tool & Metal Heat Treating Co., Chicago. It points out many factors not commonly considered as causes of distortion, as well as the better known ones.

1—CAREFUL PREHEATING: Avoids heat "shock", cuts down temperature gradients, prevents "burning" of corners and sharp edges, contributes to uniform heating so that heavy sections expand with light sections and phase changes occur simultaneously throughout entire piece.

2—"SPOTTY" FURNACE: The larger the furnace, the more likely the existence of "cold" or "hot" spots in it, which make for non-uniform heating with its bad effects of uneven expansion and non-simultaneous phase changes.

3—UNEVEN SUPPORT: Whenever the furnace hearth is not perfectly flat or work supports are not correctly adjusted or adequate, distortion can be expected.

4.—INCORRECT HEATING METHOD: Certain shapes give least distortion when furnace hardened, others when heated in salt bath, still others when electric induction heated or flame hardened.

5—SELECTIVE HEATING: Perhaps only a portion of the work should be heated instead of the entire part, thereby allowing cool sections to control hot ones and so holding down distortion. Flame hardening, electric induction hardening, selective carburizing (and nitriding, etc.) are included in these heating methods.

6—CASE DEPTH: In carburizing, it is usually found th more distortion accompanies the deeper cases. Thus usi lightest possible case can cut distortion.

7—TOO MUCH HEAT: Again in carburizing, increas distortion goes with the higher carburizing temperatures, lower temperatures (with longer time to compensate f slower penetration) can reduce distortion.

8—"RUSHING": Common source of distortion is to rai temperature of work too fast, indicating that the slower a plication of heat may be beneficial.

9—EXCESSIVE SOAK: Some steels warp when soak (held at temperature) too long; others need a good soak maximum temperature for minimum distortion. Find o which is the case with the steel you use.

10—CHILLING: Certain heat-treat cycles now inclu chilling to 100-150 degrees Fahr. below zero for stabilizatio etc. Such treatment can cause slight distortion, producing "set" that is permanent. SLOW cooling may minimize th effect.

11—SEVERE QUENCH: Drastic quench mediums (suc as water) tend to produce more distortion. Oil is less drast than water, air the most preferable for avoiding distortio Speed of heat removal is governing factor as that in tu controls temperature gradients throughout work.

12—QUENCH SEQUENCE: Direction of quench mediu against work can cause severe warping. Certain work mu

RTION

Fig. 1 (Right)—Three salt-bath units mounted together are used as preheat, high heat and "hot" quench for heat treating tungsten, cobalt and molybdenum high-speed steels for machine tools and milling cutters. Ajax Electric photo

Fig. 2 (Right below)—Effect of "hot" quench is clearly evident here. Top knife was quenched in water from 1500 degrees Fahr.; center quenched in oil from 1500 degrees Fahr.; bottom quenched in salt bath from 1500-1600 degrees Fahr., giving a hardness of 56-68 rockwell C and eliminating all distortion. E. F. Houghton photo

be lowered into quench vertically, such as a shaft. Often gears are best quenched centrifugally, applying the quenching medium around the periphery while gear is spun with axis vertical.

13—SURFACE CHARACTER: If 1/16-inch of material is removed from top surface in machining a piece of bar stock and little or nothing is removed from bottom surface, the piece is bound to warp badly because the quenching medium will cool the heavily machined surface faster than the lightly machined or rolled areas. Surface decarburization may be underlying factor. Taking good cut on all surfaces will eliminate distortion from this cause.

14—WRONG STEEL: Certain steels are more susceptible to distortion than others, and what is best for one heat-treat cycle may not be best for another. So perhaps another steel may give less distortion.

15—SURFACE FINISH: Smoothness of surface affects speed of heat removal upon quenching. Thus a piece smooth on one side and machined not so smoothly on the other will invariably warp. See that opposite surfaces have equal degree of smoothness.

16—LONG PIECES: Heat treaters begin to expect warpage on any work that is long and narrow. A high ratio of length to thickness (or diameter) means watch and take every precaution to prevent distortion (heat slowly, etc.).

17—IRREGULAR SECTIONS: Work with thick and thin portions in cross section (such as a knife blade) tend to distort badly. Likewise a piece that combines heavy masses of metal with light masses is sure to cause trouble. Often sections can be equalized by drilling holes at critical points near where change of section occurs, or corrected by making the part as two or more thin and thick pieces instead of as a single piece.

18—THIN, FLAT WORK: Invariably distortion occurs in heat treating thin, flat plates and disks unless extreme precautions are taken in way of gradual and uniform heating with use of centrifugal quenching or die quenching.

19—ODD SHAPES: Certain parts such as dish-shaped items also need every precaution, then can only avoid distortion by some such rigid control as that afforded by die quenching.

20—OVERLOADING WORK: In piled-up work, the bottom pieces are almost sure to be distorted by weight of those above. This applies not only to big objects but even light springs and tiny parts. Heat treating one layer deep on chain conveyor of a continuous furnace avoids this trouble.

21—MACHINING STRAINS: Often strains in the work due to machining or fabrication are released as the part passes through the critical temperature, resulting in distortion. Factor that sets up strain must be run down, eliminated.

22—FORGING SCALE, ETC.—Proper stress relieving of forgings is had only when forging scale has been removed. Recommended procedure is to then rough machine, followed by normalizing and annealing before finishing.

23—IMPACTED METAL: Distortion can result through use of marking stamps that impact metal at a critical point in the part. Remedy is to stamp at noncritical point or use some other identification method.

24—HOGGING CUTS: Another source of trouble has been identified as coming from taking excessively heavy cuts in machining, setting up stresses that cause distortion when relieved during heat treatment.

25—PEENING: Because of its effect on stressed condition of metal surface, this also has been identified as a source of distortion.

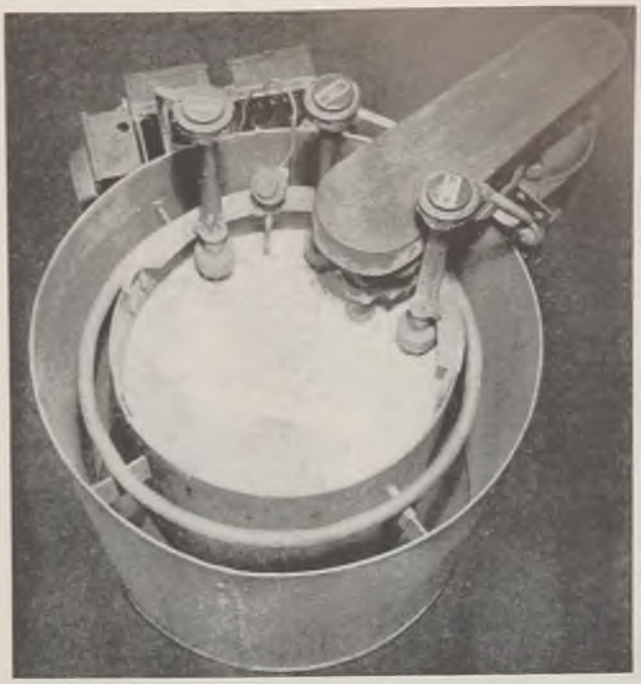


Fig. 3 (Top)—Mar-Temp salt quench unit has water pipe around outside near top, inside the "splash" guard. Water jets from openings in pipe to cool pot when hot work is introduced, thereby making it possible to hold temperature down to desired point. E. F. Houghton photo

Fig. 4 (Center)—Multiple furnace setup at Perfection Tool & Metal Heat Treating Co., Chicago. As many as eight atmosphere furnaces are employed in sequence in certain cycles to hold down distortion

Fig. 5 (Bottom)—Electric salt-bath furnaces for isothermal treatment of SAE-4140 alloy steel parts at Roth Mfg. Co., Chicago. Hardening bath operates at 1550 degrees Fahr.; "hot" quench in center runs at 700 degrees; draw unit held at 1000 degrees. Stresses that produce quench cracks and distortion are eliminated by this process (see "S" curves in Fig. 6). Development of this new equipment is deemed important because until now no production units were available for doing what time-temperature transformation data clearly shows can be done. Ajax Electric photo

ing or cooling. Without a heat flow (from surface to center in heating; from center to surface in cooling), it would not be possible to raise or lower the temperature of the work.

Temperature Gradient: Distortion thus can be minimized by controlling temperature gradients throughout the work during heat treating. What are the factors that determine temperature gradients?

As might be expected, the length of the path through which the heat must flow from the surface to the center of the work is the primary factor that determines temperature gradients. Where the distance from the surface to the deepest point in the work is the same, no matter from which portion of the surface

you start (a solid sphere such as a ball bearing would be the extreme case), the shape of the work would have the least effect on temperature gradients. A cone shape, such as a tapered reamer, is the other extreme for here the shape of the work gives a different value of the distance from surface to center at every cross section throughout its length. Obviously, it is impossible here to maintain uniform temperature gradients throughout the work, and as a result uniform heating and cooling is impossible for the tip will both heat and cool much faster than the wider base sections.

In the sphere, however, we should have uniform temperature gradients, and any two points in the metal at equal distances from the surface should be at the same temperature at any time, provided we assume a perfectly uniform distribution of heat application or removal over the entire surface.

However, it is not possible to assume perfectly uniform application of heat, for furnace design, method of supporting the work and other factors can make considerable difference in the rate at which heat is applied to various portions of the work surface. Likewise in quenching, the order in which work surfaces are immersed in the quench bath, direction and rate of liquid flow, etc. similarly produce nonuniform removal of heat from the various work surfaces.

Distortion Factors: *Thus there are two principal factors to watch in avoiding distortion:*

—*shape of the work, as it involves variations in cross section*

—*design and operation of furnace and quenching equipment, as it influences the uniformity of heat application or removal.*

First of the above two points indicates the importance of considering the effect of shape of the work on distortion. Where the work has already been produced and is simply handed over to the heat treater to process, there is of course nothing that can be done at that stage of the game as far as changing the shape to minimize distortion.

However, in designing parts, tools and dies to be heat treated, consideration of the effect of varying cross sections may often indicate where improvement can be had by slight design changes, greatly reducing the tendency toward distortion from the heat-treating cycle.

Avoiding Sharp Temperature Gradients In Heating: Many an old timer will be found who always hangs intricate and delicate work on the outside of his furnace for considerable periods of time before placing it in the furnace to bring it up to heat. Or if he puts it in the furnace immediately, he will have furnace temperature down considerably and gradually raise it to that desired.

In both cases he is following the principle of slow application of heat in order to avoid sharp temperature gradients between the surface and center of heavy sections, and between light and heavy sections.

Slow or step-by-step heating is an important aid toward reduction of distortion because heating in steps cuts down the maximum temperature differential that can exist in the work. Thin sections or sharp cutting edges cannot overheat if maximum difference between work and furnace temperature is held down to within a few hundred degrees. If work is heated from room to 400 degrees Fahr., then to 800, then to 1200, then to hardening temperature, a temperature differential of more than 400 degrees cannot exist at any time. This automatically reduces maximum temperature gradients that can exist in the work.

The application of this principle to production heat treating of intricate dies, tools and other parts, especially those difficult jobs made from high-speed steel, is found in heat-treating departments using multiple furnace setups.

Multiple Furnace Setups: Long advocated by some authorities but not adapted widely until recently, heat-treating setups can now be found in which as many as six or eight furnaces are employed in sequence. See Fig. 4.

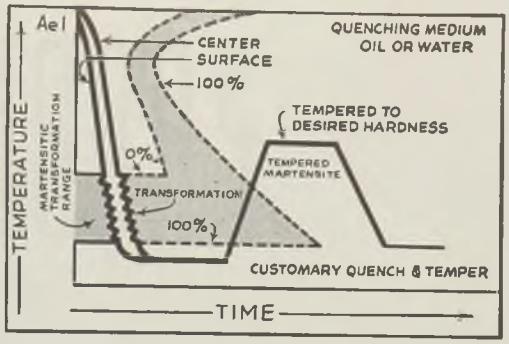
One heat treater employs five controlled-atmosphere furnaces for hardening high-speed steels. Two units are employed at different preheat temperatures, the third is the high-heat unit, the fourth and fifth are draws. In at least one instance this is followed by placing in a chilling unit held at 120 degrees Fahr. below zero, followed by a final draw at about 300 degrees Fahr. in still another furnace.

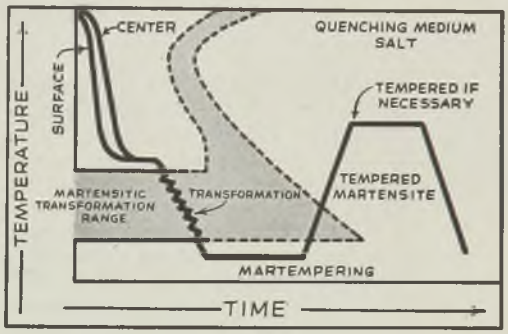
A similar setup preferred by other heat treaters employs a series of salt baths and is especially recommended for heat treating molybdenum high-speed steels. The series may include five to seven furnaces as follows: One or two preheat salt baths, followed by high-heat bath for hardening, two quench baths and one or two draws.

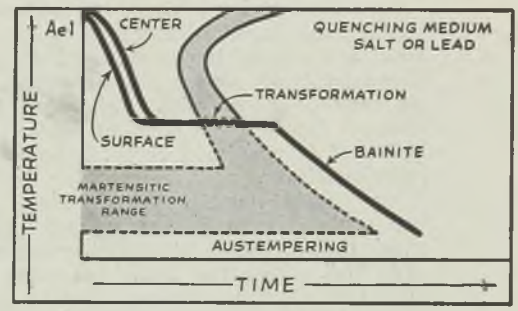
The length of time in each unit is sufficient to assure all parts of the work reaching the bath temperature. Salt baths are regarded by some heat treaters as extremely valuable for avoiding distortion, for they eliminate the possibility of thin sections becoming overheated as no portion of the work can reach a higher temperature than the salt. Certain types of salt bath furnaces such as the closely spaced electrode type hold temperature differentials throughout the bath within 5 degrees or less, it is claimed.

Avoids Thermal Shock: Another and important characteristic of salt baths that helps reduce distortion and warping stems from the fact that most of the salts used for interrupted quenching solidify at temperatures around 300 to 400 degrees Fahr. This means that when the work is first immersed in the bath, some of the salt solidifies on the surfaces of the work. When the salt changes from a liquid to a solid, a certain amount of heat is absorbed by that reaction. The end result is that the

(*Please turn to Page* 134)







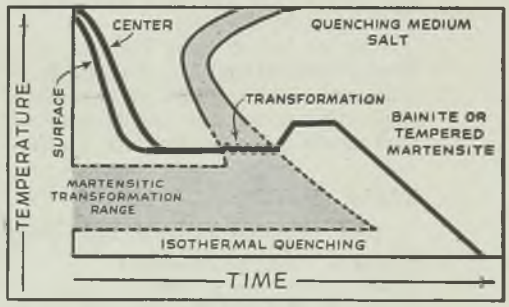


Fig. 6—These four charts graphically explain the functioning of various heat treatments. Here work temperature is plotted against time. Steepness of the curves is a measure of extent and speed of temperature changes. Note how austempering and isothermal processes have "short" temperature drops with gradual final cooling, and how center and surface of work go through temperature changes almost together—important factors in reducing distortion and warping

PRODUCTION PLANNING

. . . . in aircraft plants is an unending job. Setup in Curtiss-Wright's St. Louis plant provides suggestions for engineers facing tough production assignments

ST. LOUIS PLANT of Curtiss-Wright has had to do considerable trouble shooting in aviation construction. Its success is due in good measure to the organization headed by Charles W. France, general manager, recently selected to head up the accelerated production of Commando cargo planes at the Buffalo plant. Other key men include William E. Nickey, test pilot and assistant general manager; J. N. Foster, factory manager; Howard W. Benjamin, production engineer.

Curtiss-Wright has achieved an engineering "know-how" expressed in functional action; that is one reason C-46 Commandos are successfully substituting for the Burma Road. Other evidence is found in the excellent fighter planes it is now producing for both Army and Navy.

Mr. Benjamin organizes his production engineering as charted in Fig. 1, which he calls "Production Engineering and You". Note the breakdown into eight main divisions. Proper liaison between function and engineering, as shown here comes close to expressing the entire Curtiss-Wright philosophy which gets things done.

Everyone has to know function, production and integration. So Mr. Benjamin conceived the idea of production engineering forms, the first Monday of each month being devoted to inside-the-plant considerations, and the third Monday of each month being reserved for some outside specialist who must be, as Benjamin reports it, "an outstanding man who knows his particular business". It is the manner of conducting production eingineering forums that we now discuss.

Perhaps Benjamin's genius in the wedding of logic and showmanship came from his training at Iowa State College as an aeronautical engineer, or perhaps it resulted from extra-curricular college activities. He analytically sets up a show, each of which delivers a pleasant result of instructive nature to the 150 internal personnel who are now attending, the audience having been increased from an original 75.

The structure of the production engineering forum consists of a chairman and three panel members, with a program that lasts for 2 hours, introduces and discusses the subject, makes possible the privilege of floor questions and their answer by the panel. So far, there have been discussed such subjects as resistance and fusion welding, principles of production breakdown, preliminary design, and designing for service, with a long parade of subjects that are to be discussed during the next 2 years.

Such an activity requires promotion within the plant for such a large group as the Curtiss-Wright St. Louis plant maintains in its engineering department. So posters are produced covering this series of production engineering discussions and prominently displayed on the engineering bulletin boards.

In conducting a forum session, the chairman takes about 10 minutes to cover the purpose of the particular night's discussional range. Then, each of the three men of the panel are given 15 minutes to go over their particular portion of the subject. It is required that they submit their comments in writing prior to the forum. This program requires about an hour, which allows the second hour for questions from the floor and answers by the panel. The audience consists of the engineering and factory supervisory personnel.

The activity has the advantages of providing mutual acquaintance between the engineering and shop staffs, permits the provision of objections and suggestions in expression that might otherwise be gripes or remain unattended. The forum goes to the behavioristic limit of having questions answered from the floor, thus giving worthy shop men the opportunity not only to voice their experience but to feel important in front of their confreres.

In disseminating know-how, production engineering has created a series of trenchant bulletins that have much

(*Please turn to Page* 103)

TABLE I—TYPICAL PRODUCTION ENGINEERING FORUM PROGRAM

SUBJECT: *Production Breakdown*
DATE: Monday, Jan. 3, 1944
TIME: 7:30 to 9:00 P.M.
PLACE: Vogt Building, Junior High School Gymnasium, 200 Church street, Ferguson, Mo.
CHAIRMAN: L. Dorman . . . . . Theory & Principles of Production Breakdown
—Master Planning
—Work Distribution
PANEL: O. Oldendorph . . . . . Relationship of Production Breakdown to Design Requirements
—Structural
—Functional
—Arrangement
E. Klein . . . . . Relationship of Production Breakdown to Production Planning
—Production Analysis
—Scheduling & Estimating
—Sequence of Assembly
—Jigs & Fixtures
E. Malley . . . . . Relationship of Production Breakdown to Plant Layout
—Shop Floor Layout
—Assembly Methods
—Material Flow
—Handling Equipment

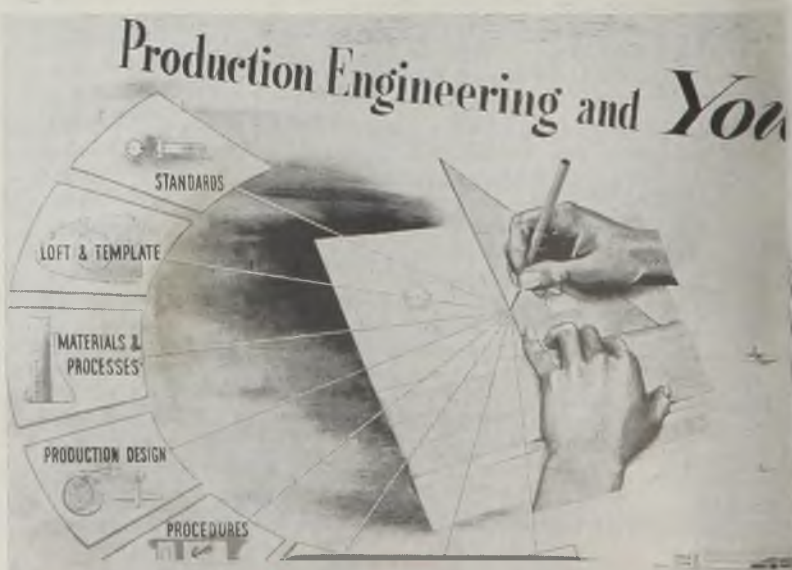


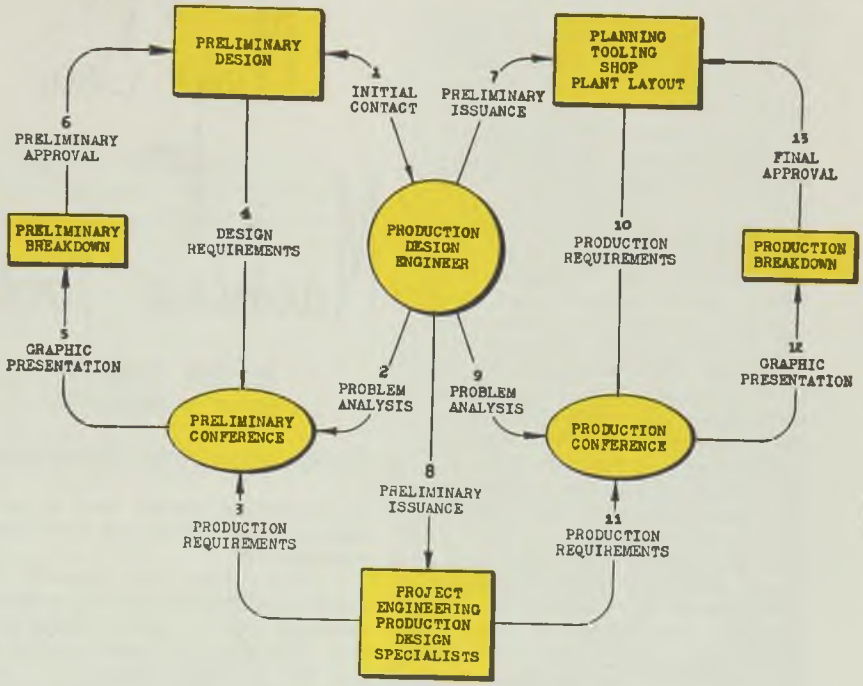
Fig. 1 (Below left, opposite page)—Eight main divisions of production engineering are charted here

Fig. 2 (Below)—Production breakdown of C-46-A Commando, the cargo ship that is replacing the Burma road

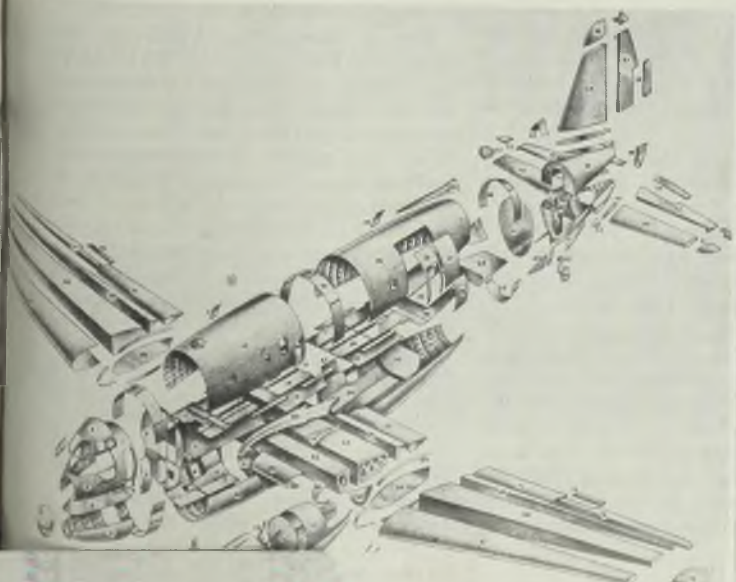
Fig. 3 (Below right)—Typical details drawing, illustrating components and identifying them by part number and sectional views. This is a door assembly

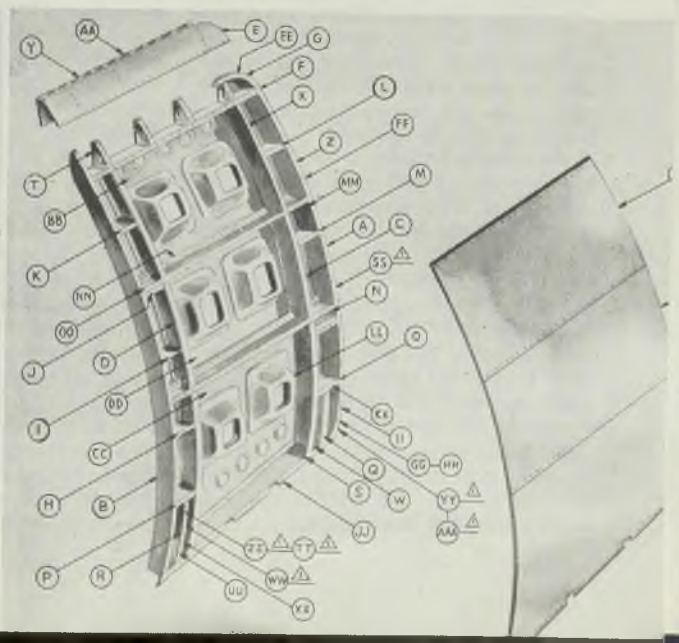
Fig. 4 (Right)—Diagram showing production breakdown procedure at Curtiss-Wright

Fig. 5 (Above) — Curtiss-Wright engineers shown here holding a conference on current shop and production engineering problems include: Left to right, W. S. Evans, materials and process engineer; H. W. Benjamin, chief production engineer; L. F. Dorman, production engineer; C. E. Schmidt, supervisor, production illustrations; E. R. Goodlett, production design engineer; W. J. Forster, service engineer



PRODUCTION BREAKDOWN PROCEDURE





Signs and Portents of New Era for Machine Tools

By GUY HUBBARD
Machine Tool Editor, STEEL

PROBABLY during no equally brief period in the history of their industry have more top-flight machine tool men done more concentrated, constructive "crystal gazing" than was done between April 27 and May 2, 1944 in Detroit, in Cleveland and in Pittsburgh.

This remarkable mass concentration on the engineering future—particularly the postwar future—of American machine tools was made possible through the cooperation of three companies which are users, not builders, of machine tools. These three companies, to whom this writer believes machine tool builders owe a big vote of thanks, are: General Motors Corp.; Reliance Electric & Engineering Co.; and Westinghouse Electric & Mfg. Co., each of which acted as host, adviser and friendly critic during two-day sessions within the period just mentioned.

It was my good fortune to sit in at many of the sessions at all three of these forums. Like the machine tool company representatives I had many cherished old ideas knocked out of my head and quite a lot of new ones knocked into it. If anyone went to the joint conference of machine tool builders, General Motors master mechanics and plant engineers at the Statler Hotel in Detroit with the idea that all present-day machine tools are practically perfect, no one came away with any such idea. "Seeing machine tools as master mechanics and plant engineers see them" was quite some jolt in many cases. However, machine tools of the near future are going to be infinitely improved in many ways as a result of this mass jolt to complacency. The machine tool men proved they can "take it". As a result of listening to some of the "give-and-take" at the Detroit conference, after looking at several hundred photographs illustrating case histories, and after talking things over with Harold T. Johnson, director of standards, General Motors Corp., who had a great deal to do with making the conference the forthright success that it was, I present the following conclusions:

1—Does General Motors recognize need for further standardization of machine tools? Decidedly yes, especially in such elements as leveling devices; bolts and screws in general; and also in model designations of machines of the same type. Let a No. 3 machine by all makers represent a definite size.

2—What about increased speeds and feeds? General Motors recognizes these as major needs and desires that they be fulfilled promptly and in a really adequate manner. Superspeed milling is a case in point.

3—What is the feeling of the company toward full electric control? Favorable, provided that it be made highly accessible and extremely durable.

4—Is the present emergency finish on machine tools desirable? No. It is too difficult to wipe off and so tends toward poor plant housekeeping.

5—How does General Motors feel about the standard color used on machine tools? It should be made lighter, and work areas should be brightened up with a still brighter color which adequately will reflect light.

6—What about accuracy and work finish? The heavier, more powerful machine tools of the near future not only must remove metal four or five times as fast as those of today, but also they must far outperform present ones as far as dimensional accuracies and surface finish are concerned.

7—How about chip disposal? It's highly unsatisfactory on many existing machines and is getting worse every day. Machine tool builders must tear into this problem—and fast. No halfway measures will do. Problem must be tackled directly at its roots in new designs.

8—What has General Motors to say about lubricating facilities on machine tools? On the new designs, builders must strive toward automatic lubrication throughout.

9—Does General Motors favor hardened and ground ways? Yes, but some method must be found to make them so that they can easily be removed, reground and replaced by General Motors service men in General Motors shops, using grinders now in those shops.

10—What about electronic control? General Motors wants it but realizes that a lot of tough problems are involved. Should be standardized right from the start as to tube bases, etc., and machine tool builders right from the start must supply adequate information for the training of General Motors maintenance personnel in machine tool electronics.

The 100 or more of us who went [illegible] Cleveland to the Reliance plant in Cleveland got an impressive preview of what electronics will be doing on postwar machine tools. This was indicated not only in the laboratory but also out in the shop under actual operating conditions. An electronic unit was operating which supplies excitation to an all-electric, adjustable speed drive, the heart of the unit being a single, phase, full wave, fixed voltage rectifier tube.

Also witnessed were demonstrations of an electronic system of adjustable speed drive operating off regular polyphase alternating current lines and providing speed ranges of 20 to 1 or better, up to 5 horsepower. This system, which functions through voltage control, has been "boiled down" so that tubes and transformers require only a small cabinet for their housing, this cabinet being mounted in or on the machine.

Last but by no means least, the group was shown a program control which by electronic controls allows any number of speeds desired—speeds covering the entire range of the unit to which it is applied—to be set on a series of dials and reproduced rapidly, accurately and with complete independence of each other. This unit in effect is a simple electronic grid-controlled rectifier, arranged for conventional control.

During the two-day forum sponsored by the Westinghouse company in Pittsburgh, all of us—and there were over 500 — heard and saw enough of electronics to clinch the conviction that as far as machine tool design is concerned it is with us now and not something somewhere "over the hill".

While the theory is pretty deep stuff, applications to control, automatic actuation, automatic inspection, etc., really are not very difficult to understand. No machine tool designer or electrical engineer should hesitate to undertake a study of the subject. Even without knowing a great deal about *how* the tubes function, *what* they will do can be learned quite easily, and from the practical point-of-view that is what counts as far as machine tools are concerned.

Not all discussion at Pittsburgh was electrical. For instance, E. L. Hemingway, chief metallurgist, International Detrola Corp., advanced an interesting theory as to metallic friction and galling. When two smooth surfaces are rubbed together, mutual molecular attraction at scattered points becomes so intense that something corresponding to actual welding takes place. As these tiny welds are constantly made and broken between rubbing surfaces, the energy consumed in their breaking is what we know of as friction, with its attending heating. Galling is due to minute fragments of metal torn out at these welds, ploughing into the surfaces from which they came.

In tool work, and also for slides and bearings, Mr. Hemingway recommends chromium plating on superfinished surfaces as a means to reduce galling. Good

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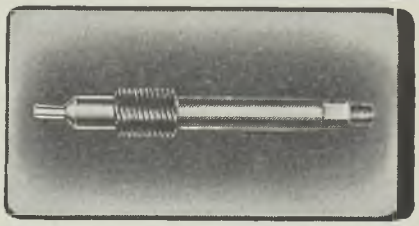
Here are some of the many ways in which Carpenter Stainless Steels are helping other Stainless users lick their specialized problems.

✓ Mass-Production Possible

These aircraft gear segments had to be machined to .0005" tolerances. Mass production of these parts became possible when the manufacturer went to Carpenter Free-Machining Stainless #5 (Type 416).

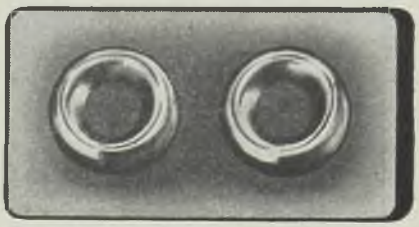
✓ Free-Acting for Life

Here in the valve stem of a heavy gauge valve, Free-Machining Stainless #5 (Type 416) provides the positive corrosion resistance and non-galling properties that assure long, trouble-free service life. Smooth-acting parts like these can be economically produced from Carpenter Stainless #5 and #8 bar stock.



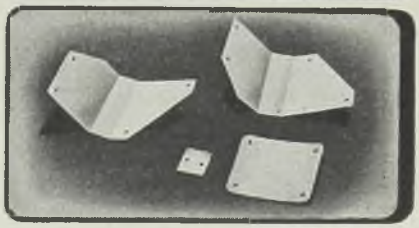
✓ Stops Costly Rejects

The problem of these grommets splitting around the edges of the inside holes was completely eliminated when Carpenter Stainless #6 (Type 430) was used on the job. This is typical of the way easy-working Stainless Steels banish fabrication headaches and help keep production costs in line.



✓ Light and Extra Strong

In these Naval ordnance parts, Carpenter Stainless #6 (Type 430) combines corrosion resistance with strength, rigidity and light weight. And faster fabricating of these parts is possible too, thanks to the uniform temper and high ductility of this Stainless Steel.



If you would like further information on these Stainless Steels write for our 98-page book "Working Data for Carpenter Stainless Steels". For personal assistance in the shop call in your nearby Carpenter representative.

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results are due not only to the hardness of the chromium but also to its low welding affinity for other metals.

Highspeed milling of steel came in for a good going over by Dr. H. A. Frommelt, director of research, Kearney & Trecker Corp., with special attention to applications of tungsten titanium carbide cutters with negative rake and helix angles on the teeth. These negative angle teeth cause cutting pressure to be applied to the carbide tips approximately the thickness of the chip away from the actual cutting edge. This edge is well supported and so crumbling is avoided. Dr. Frommelt finds distinct advantages in reduced friction and abrasion on tools and in surface finish on work, when surface speeds from 500 to 1000 feet per minute when milling untreated steels both carbon and alloy.

Feed should be high, but will depend of course on power available. His experimental tests show that negative angle cutters require from 15 to 20 per cent more power than conventional ones, but this "pays out" in added metal removed. Fly wheels are a "must" with the negative angle cutters—especially those of coarse tooth variety. They not only give better work, but also they increase machine and tool life. Preferably they should be built into the machine. Otherwise they must be mounted on the spindle or on the cutter arbor. In any event, they should be of ample weight.

Regarding inside mounted motors, L. C. Cole, chief engineer, and G. B. Carson, director of research, Cleveland Automatic Machine Co., reported that their tests show single flow ventilation to be slightly better than double flow where enclosures cannot be cross-vented. Air flow should be organized by baffles so that there will be no re-circulation. They have abandoned louvres in favor of expanded metal grills.

Mr. Cole emphasized that space occupied by electrical equipment is becoming a matter of growing concern to machine tool designers. Appearance considerations preclude scattering of this equipment here, there and everywhere on and around a machine. Large users, such as General Motors, demand that apparatus requiring maintenance be centralized at readily accessible locations.

Therefore, Mr. Cole is looking forward to the introduction of smaller switches [illegible] velopments made for the aircraft [illegible] try. Also, he anticipates much smaller motors with high temperature insulation and greatly improved cooling.

In dealing with electrical control assembly factors, D. K. Frost, electrical engineer, Mattison Machine Works, reported that he finds it advantageous to build up panels which require unit assembly of alternating current control items—including electronic devices. He does not attempt to make them up, however, where direct current equipment is involved either completely or in part. If the two types of current can be separated, he makes up the alternating control panel but purchases the direct current control as a complete unit.

On the same subject, E. E. Opel, electrical engineer, National Automatic Tool Co. Inc. had this to say:—"The streamline boys go for built-in control. The utility boys prefer built-on control. My company has tried both on our machines which nearly all are special, duplicates being rare. We find built-on control to be more flexible and we can do a better job with it. We don't like the appearance but we do like the performance."

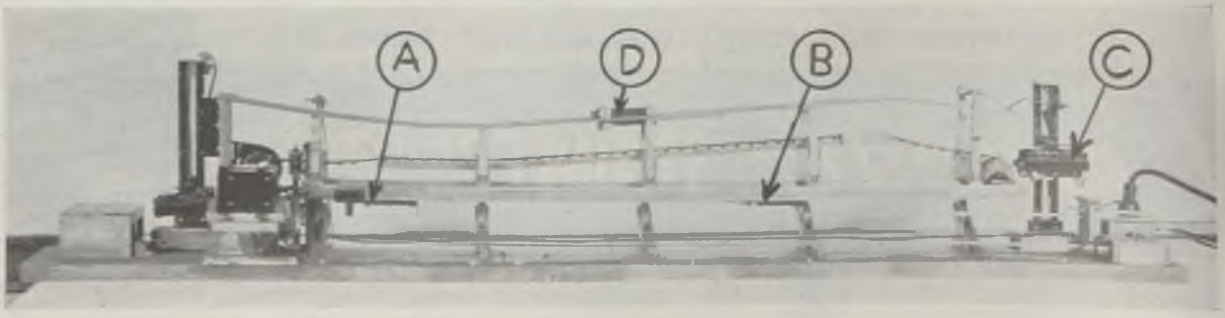
Speeds Cold Drawing

A NEW continuous cold-drawing system for tubes, rods, bar shapes and bus bars has been subjected recently by its developers, United Engineering & Foundry Co., Pittsburgh, to tests duplicating service conditions. The satisfactory results attained—efficiency in operation and quality finish imparted to products—have fulfilled expectations. But the special facility most likely to interest producers of cold-drawn tubing or wire rod is the continuous operation of four draw carriages so disposed that two are always in motion drawing material.

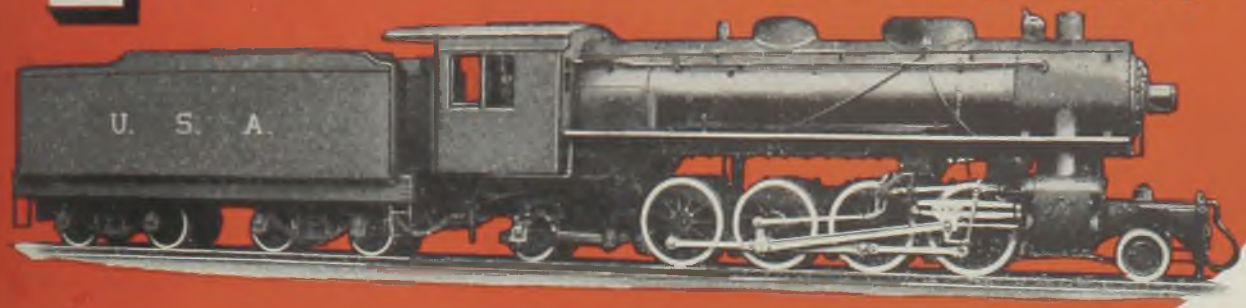
Design and operation of the carriages, shown in accompanying photo of United's scale model, plus the presence and functioning of elevators which raise and lower them to engage or to be disengaged from the work, distinguish this equipment. An elevator may be seen at each end of the bench's long bridge-like frame. Elimination of the usual carriage return motion, where draw carriages are returned light at the end of each pass, is said to afford the means of raising output one and one-half to two times that of the average four-hole die operation, for the same power per hole, and to produce as much as five times the amount of product turned out with a single-hole die. In most of these former methods only one carriage is used, instead of the multiple carriage system developed by United.

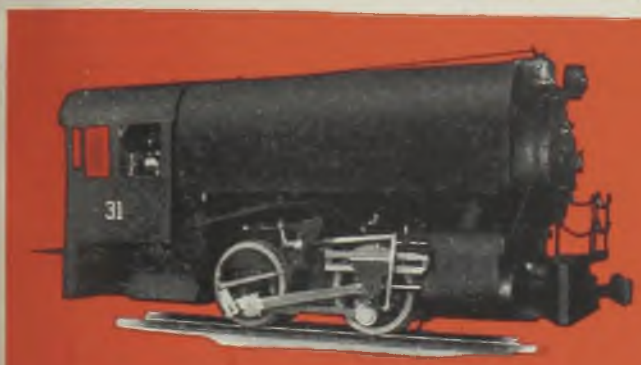
Pointed rods or tubes to be drawn on the new bench are threaded through dies of the die stand two at a time until their pointed ends protrude as far as possible on the inside. On model illustrated, carriage A, after gripping the first two rods in upper dies, has completed a full pass, automatically dropping the drawn rods into the discharge cradle at base of machine. At this time carriage B has drawn two rods through lower dies approximately 40 per cent of the course. As carriage C is lowered by elevator at right to engage another pair of rods in upper dies, carriage D moves toward the same elevator to be in position for its next pass, and carriage B arrives at left-hand elevator for hoisting to the elevated return chain. Thus four tubes are being drawn most of the time, with a minimum of two tubes at any time.

Other advantages claimed by the builders include the need for only one bench operator; handling of a considerably longer work piece; constant feeding of material due to number and arrangement of carriages; fully automatic control of travel cycle; chain providing tractive power is inverted over work, providing free access to work and automatic unloading downward into cradle; and floor space required by unit is the same as that needed for the average drawbench.



PORTER Steam Locomotives

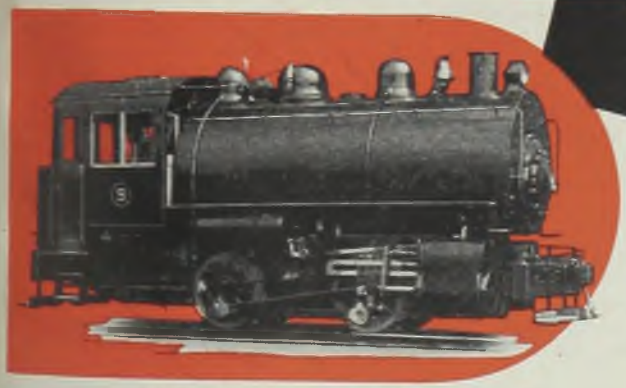




Lower Operating Costs

Less Maintenance

Greater Availability



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Faces Motor Base with Flycutter

Electrical manufacturer reverses cardinal rule of machine shop practice, adapting flycutter attachment which takes tool to the work. Setup simplifies production, utilizes break-in run of motor for power to drive tool

BRINGING the work to the tool is a principle so generally followed in machine shop practice that it has become axiomatic. Yet, under stress of emergencies so common in this war period, anything can happen—and frequently it does. Thus a brilliant bit of improvisation like the setup shown in accompanying photo, born in a cul-de-sac of tool scarcity, moves in to replace a large lathe which failed to arrive and not only does the job equally well but upsets the well-known "applecart" by taking the tool to the work.

Facing the horseshoe-shaped base of a heavy, vertical electric motor in the production department of Reliance Electric & Engineering Co., Cleveland, is a home-made but accurate and extremely efficient flycutter attachment which is driven by the motor itself. Great accuracy is necessary because the base of the motor—intended for use on Victory cargo vessels—is ultimately bolted to the housing of the main centrifugal circulating pump which it will power. For coupling, the motor drive shaft must be in absolute alignment.

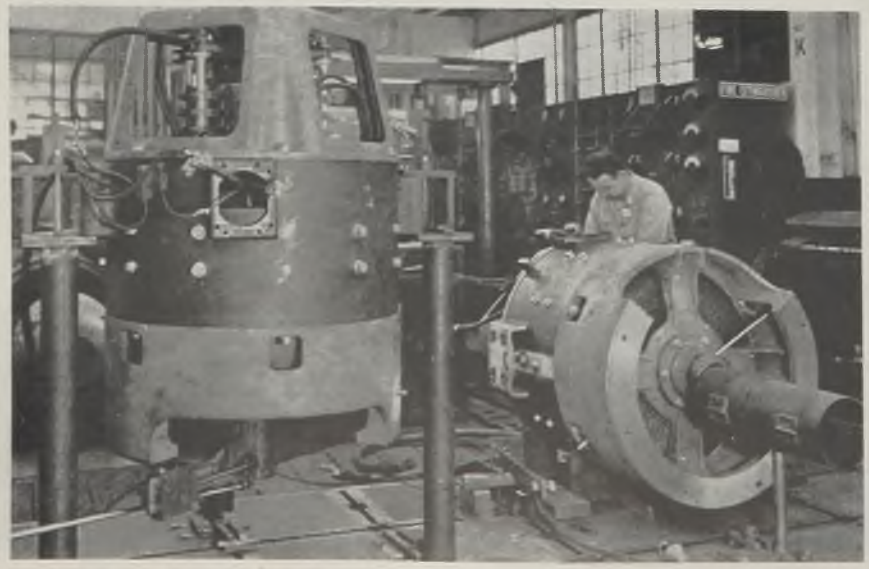
The work is done right on the assembly line. Motor is mounted in its vertical working position on three tubular supports clamped to "sway" brackets on the main housing. Lower sides of the brackets, previously machined, provide accurate positioning. Fabricated steel cutter arm (most of which is visible under the base) is bored to fit the tapered extension of the shaft and keyed to it. Input of 125 volts to the field and 18 volts on the armature are used to drive the 230-volt motor in a range of 475 to 636 revolutions per minute; this unit utilizes a 1400-T (approximately 1050 NEMA) frame, at about 30 to 32 revolutions per minute. Tool slide on the arm is counterbalanced to within about ½-pound per cut at average travel of 5 inches.

A tungsten carbide bit faces the 5-inch surface of the 260-degree base flange, the carriage in which the tool is mounted being fed across it at 0.006-inch per revolution. Feed is accomplished by a lead screw actuated through a gear and worm, and an extension anchors it against rotation of the cutter arm. This extension is shown resting against post at extreme left.

As mounted on the shaft, the cutter arm is accurately located to face the flange at 90 degrees to the motor axis, within 0.005-inch tolerance, and to hold the distance between the flange face and the high point of the extension taper to within 1/32-inch of requirements. In its vertical position, end play of the shaft does not interfere with accuracy. The dimension is easily checked by a block gage inserted between the cutting arm and flange face. A dial indicator, used between the two, checks squareness of the faced flange.

When J. H. Yeager, Reliance design engineer, put the finishing touches to the fly-cutter attachment and it was shown to be practicable, company decided to install the operation right on the assembly line adjacent to the test stand. In this way, run-in of brushes and bearings is well started during the low-speed cutting operation. The idea for the flycutter attachment came to Mr. Yeager from a smaller application of the flycutter principle, working on a diameter of about 14 inches. He adapted it, elaborated upon it and his firm now utilizes it here for machining a base 40 inches in diameter.

Bringing the tool to the work is an innovation in machining but works well for Reliance.



Retooling Saves Time In Machining Parts

The elimination of one milling machine and two grinders from an operation on urgently needed naval ordnance parts, as well as the speeding up of production, was recently accomplished at a United States Naval Ordnance plant by simply changing to Carboloy cemented carbide tipped cutters in the "rough" milling operation. Not only was a sufficiently fine finish obtained in this one milling operation, but cutting time was actually reduced on the machine.

The operation involved the milling of two sides of a breech casing made from SAE-4320 steel.

In retooling the machines, 5-inch diameter milling cutters having ten blades each, tipped with cemented carbide, were used. Optimum machining conditions were obtained at 650 surface feet per minute with a 7½-inch per minute table travel. The cut taken is 9 inches long and 0.125-inch deep. Machining time with this setup with only two minutes for each side. Average life per grind with the carbide cutters also rose to 40 pieces, as against 25 pieces previously.

Revised Textbook on Electric Motor Control

Control of Electric Motors, by Paisley B. Harwood; cloth, 479 pages, 5½ x 8½ inches; published by John Wiley & Sons Inc., New York, for $5.

This is the second edition of this work, made necessary by advance in control devices since the first appeared. Though the first edition still is used as a text in colleges and universities a revised presentation was deemed necessary.

A new chapter has been added on synchronous motor control and one on variable-voltage control. Many new tables giving ratings of motors and controllers have been added. The text and illustrations have been brought up to date to conform to latest practice and to include recently developed devices and methods. Arrangement of the book has been radically changed, controllers now being described in the chapters covering types of motors to which they apply.

WMC Offers Reprint on Use of Women Workers

How management and labor have worked out a plan for the introduction and training of women workers in a steel mill making cold drawn steel is described in a pamphlet entitled, "Women at Work Speed Production at Wyckoff Drawn Steel Co.", reprinted from the March 20, 1944 issue of STEEL. Copies of this reprint may be obtained by writing to Apprentice-Training Service, War Manpower Commission, Room 802, 1778 Pennsylvania avenue, Washington 25.

Designers
DEPEND ON HARDENABILITY DATA

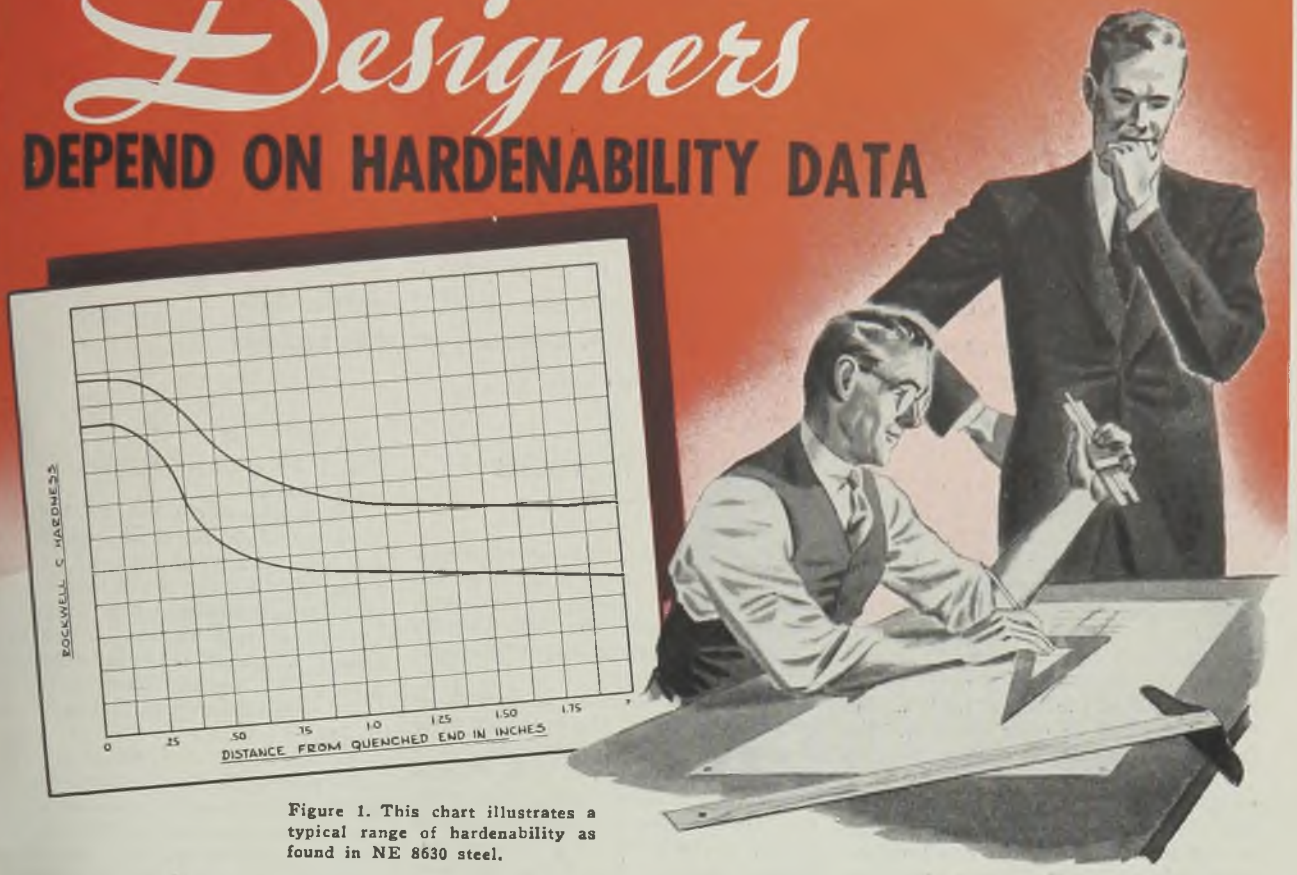


Figure 1. This chart illustrates a typical range of hardenability as found in NE 8630 steel.

Designing engineers are primarily interested in what stresses a steel can withstand and how uniformly the material can be produced. That is why the hardenability of steel is so important to them. Hardenability is a reliable measure of the way a steel responds to heat treatment since it predicts the hardness distribution in the quenched part, which in turn controls the mechanical properties of the tempered steel. Among the engineering steels, chemical composition in itself is not sufficient to reveal these characteristics.

Often two steels in the same analysis range show appreciable differences in hardenability (See Figure 1). Therefore, it is believed that important applications of steels should be made on the basis of minimum hardenability requirements as controlled by restricted chemical composition, grain size, and other factors. This would result in more uniform response to hardening, tempering, and annealing with consequent improvement in mechanical properties and machinability.

The interpretation of hardenability data and their application to both design and production problems has been the subject of considerable study and research by the Timken technical organization. The outstanding quality and uniformity of Timken Electric Furnace and Open Hearth Steels are the results of similar research programs. We invite you to consult with us on your metallurgical problems.

This is number 5 in a series of advertisements on hardenability published to promote a better understanding of this important subject among buyers and fabricators of alloy steels. Steel and Tube Division, The Timken Roller Bearing Company, Canton 6, Ohio.

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Temperature Reading of MOLTEN STEEL

Quick-immersion thermocouple is developed in England for determining bath temperatures of molten steel. Immersion tube is made of either diatomite brick or electrode graphite and has a maximum life of six readings

By ERIC N. SIMONS
London, England

METALLURGISTS in Britain have developed a quick-immersion thermocouple which when immersed in molten steel gives an accurate reading of temperature in 10 to 20 seconds. The thermocouple of this instrument is an alloy of 13 per cent rhodium to platinum, platinum type, measuring 0.5-meter diameter, and lightly sheathed in vitreous silica. It is plunged into molten metal in either the furnace, ladle or other container. The inventor is Dr. F. H. Schofield.

The form of this pyrometer has been varied to meet furnace conditions. On occasion a light instrument is employed, so that it may be inserted into the furnace by hand. Under differing conditions a heavy-type instrument is mounted on wheels, so that it may be maneuvered into position through the furnace door.

Speed Is Important Factor

Precaution is necessary to ensure that the thin silica protecting sheath is not fractured when the instrument is inserted in the furnace. When temperature is to be taken the furnace door is opened, the pyrometer pushed through to the required distance and immersed in the liquid steel to a suitable depth. When a steady temperature reading has been obtained, it is withdrawn.

This means of measuring molten metal temperatures is based fundamentally on speed, the time of response being governed by the thickness of the thermocouple wires and the manner in which they are sheathed. Various temperature indicating arrangements may be used, such as millivoltmeters of the pivoted or suspended types, and various potentiometric devices.

If speed and accuracy are not the most vital points, the pointer millivoltmeter is probably the most satisfactory although it is only exact for certain external resistance of the thermocouple. Wherever the resistance varies by more than approximately 1 ohm, this method is unsuitable.

The potentiometer, on the other hand, is not restricted in its exactitude by the resistance of the thermocouple, and can, therefore, be employed for pyrometers with long thermocouple wires subject to considerable temperature variations. A high-speed pen recorder of this type has a sufficient quick response for molten steel temperature measurement, and produces a written record of the temperature measured.

Theoretical possibilities of error arise from local cooling of the steel as a result of sudden contact with the cold instrument; from contamination of the thermocouple; or from there being an inadequate length of thermocouple immersed. Any or all of these causes would produce a temperature recording lower than the true temperature. In actual working, however, no significant error from these causes occurs.

The instrument cannot indefinitely withstand the exacting conditions it is called upon to meet. There is and must be a limit to the number of immersions that can be made. Experience indicates six immersions as the safe maximum. It is not difficult however, to restore the instrument to its original soundness. The method is to let down approximately 1 inch of wire, cut off an inch from the hot end, and make an entirely new junction.

Various Types in Regular Use

The body of the pyrometer is composed of gas piping, or steam piping of appropriate section, bent over at the end in such a manner that the thermocouple may be dipped into the molten metal. As a rule it is approximately 12 to 16 feet long so that the instrument may be thrust well into the furnace.

The portion of the tube designed to enter the furnace has to be insulated to ensure that it is not overheated or burned. Either diatomite or a suitable refractory cement may be applied to the tube and reinforced with a spiral of iron wire. The wires of the thermocouple normally extend into that portion of the pyrometer external to the furnace, where they are connected to compensating extension leads. The platinum-rhodium-platinum wires are insulated by twin, finely-bored tubes of heat-resisting materials, vitreous silica being employed for the position of greatest heat.

The portion of the instrument actually immersed in the metal may be either of diatomite brick or of electrode graphite. From this the wires of the thermocouple protrude approximately 2 to 3 inches. In advance of each reading, a new silica sheath is placed over the wires and fastened to the diatomite or graphite block with refractory cement or asbestos string.

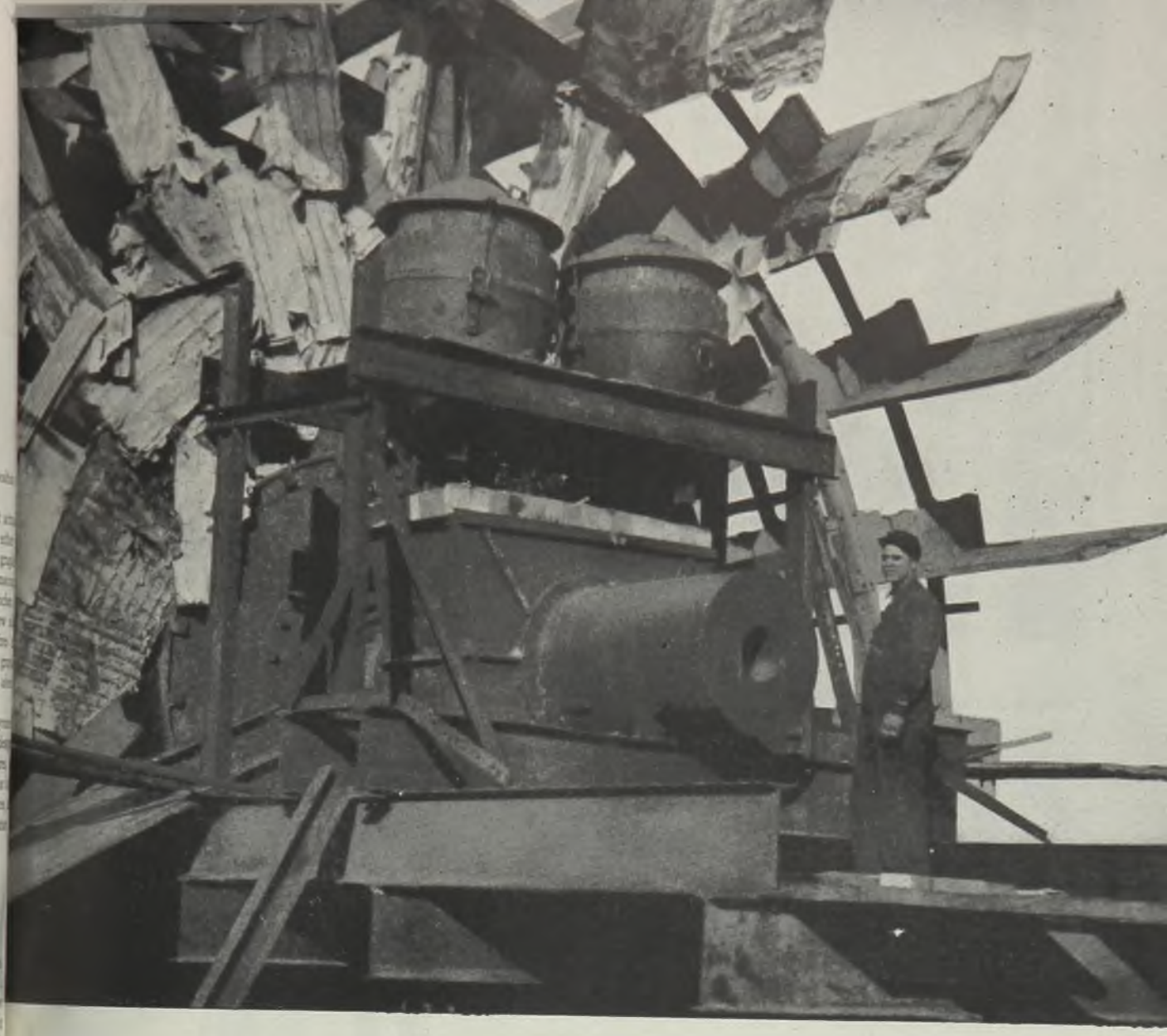
Various forms of Schofield pyrometer are in regular use. One pattern is designed for open-hearth steel temperatures, another for small furnaces, a third for high-frequency electric crucible furnaces, and fourth for measuring the temperature of metal in the ladle.

Gas Injection System Produces "Bonus" in Oil

A successful gas injection operation which recovered an additional 1,623,237 barrels of oil at the Wertz-Dome field of Sinclair Wyoming Co., during the past 2½ years has been reported by the Cooper-Bessemer Corp., Mt. Vernon, O. Type G-MV compressor units manufactured by the latter are being used to supply the power for returning 4,280,000 cubic feet of gas per day to the oil field to aid in recovery each year of about 650,000 barrels of oil that otherwise would not have been produced in the same period.

Although such projects for increasing the withdrawal rate of oil deposits are not entirely new, this operation is somewhat unique. In order to help meet current war needs, pressure maintenance operations have been designed so that a volumetric balance is maintained between oil withdrawn and gas injected.

Gas is injected to the formation through tubing by three Cooper-Bessemer compressors driven by 6-cylinder engines totaling 1800 horsepower. By returning to the deposit 1400 cubic feet of gas required to displace each barrel of oil over the normal daily output of 3300 barrels, recovery theoretically can be sustained at any rate desired without decline of pressure.



HOW WOULD YOU REPAIR A 40 TON SHAFT?

Put yourself in the shoes of the fellow who had this repair job on his hands...a 40-ton shaft of the world's largest stern wheel towboat. The shaft was 31" in diameter and was broken in two places. Replacement was out of the question; repair by ordinary methods would have taken weeks. But by Thermit welding the part was completely repaired in less than 5 days.

If this had been a steel mill roll, pinion gear or any other heavy part, the result would have been the same. In the Thermit process, there's no limit to the size of the weld; nor does it matter whether the unit is cast or forged. Thermit welding will restore it to operation, as good as new, faster, at less cost.

Thermit welding may be done in your plant, by your own crew under supervision of M & T engineers, or at one of the Metal & Thermit plants.

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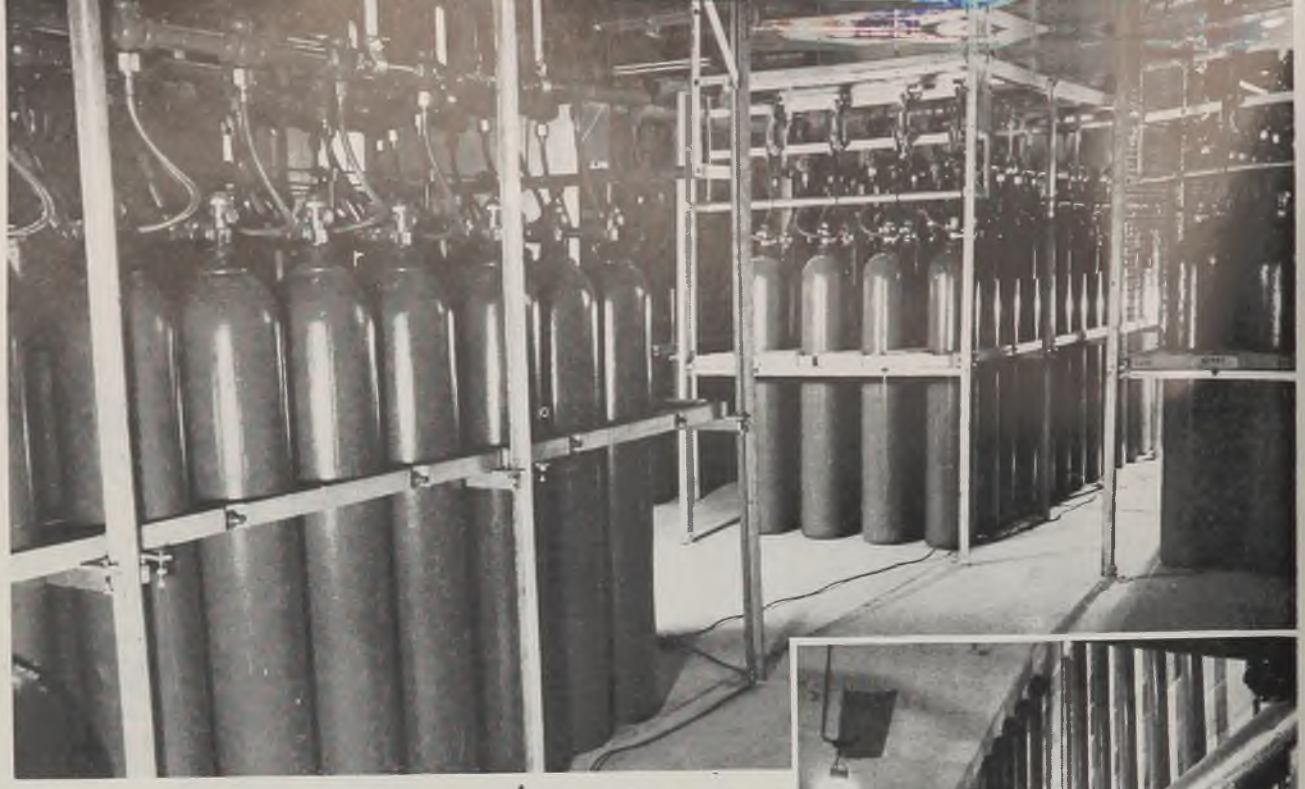

Nearly 7 tons of carbon dioxide gas are distributed within 1 minute to all parts of large building housing inflammable liquids by . . .

Built-in Fire Extinguishing System

THERE was a time when it would have been considered impractical to attempt to extend fire protection in the form of a single carbon-dioxide system over a building 577 feet long, 118 feet 8 inches wide and 16 feet 8 inches high, especially where that structure was used to store highly inflammable liquids requiring very quick extinguishment in order to prevent a disastrous fire.

A sprinkler type system with many unusual features, not the least of which is that it really protects a building of the aforementioned size, has been designed and installed in the aviation material storehouse of the Naval Storage Depot in Philadelphia by Walter Kidde & Co. It was found that the system could be so engineered that the gas is delivered at a rapid rate through multiple nozzles, quickly reducing oxygen content of the air to a point below which fire cannot exist.

The depot is one of a series of supply centers which the Navy has been constructing all over the country in order to keep a constant flow of aeronautical materials moving to the airfields. It includes about a dozen buildings, of which Building No. 5 provides the case in point. Concrete and steel fire walls divide it into four separate spaces, with communicating entrances equipped with self-closing fire doors. In these rooms are stored paints, oils, greases, glues, dopes, lacquer and other inflammable liquids in large quantities.

Fire fighting apparatus consists of a battery of 280 steel cylinders, each containing 50 pounds of liquefied carbon dioxide which upon release will expand about 450 times in volume, with control valves, supply lines and 296 shielded discharge nozzles placed about 5½ feet up from the floor on each concrete column in the storage rooms and at other strategic locations. Cylinders are manifolded in five frames of 56 cylinders each, as shown in Fig. 1, with one acting as a master control frame.

There are four valve frame assemblies, each including five automatically operated directional valves, which in the event of fire direct the gas to the particular space involved. Seven tons of fire-killing gas can be discharged by means of these valves, against which the most vicious fire could not prevail for more than a few seconds. To reduce circulation of air in the presence of fire, each valve frame has two plunger-type switches operated by the valves, one to close a circuit and sound an alarm and the other to open another circuit, stopping ventilating fans and closing the louvers.

Five supply lines (see Fig. 2) lead from valve assemblies to each one of the four protected areas where they terminate at the discharge nozzles which deliver the gas from the piping system. The nozzles are designed to prevent objectionable turbulence in the discharge and control the spreading of gas so that it builds up in a blanket from the floor to provide highest concentration at

Fig. 1 (Top)—Cylinders containing 50 pounds of liquefied carbon dioxide under 850 pounds per square inch pressure at 70 degrees Fahr. are manifolded in five frames of 56 cylinders each. Released in the lines and controlled by directional valves, gas rushes to the burning area and is completely distributed within 1 minute

Fig. 2—A network of piping of unusually large diameter has been built into the building to carry gas from routing valve frames to distributing lines

AFTER 1,000,000 MILES
TOCCO-HARDENED CRANKSHAFT SHOWS ONLY 1/1000-INCH WEAR!

ONLY 1/1000-inch wear on the crankpins after piling up a service of 1,000,000 miles . . . a distance equal to 40 times around the world! That's the record of one veteran TOCCO-hardened crankshaft on one of the country's fastest streamliner trains. Hundreds of thousands of other TOCCO-hardened crankshafts are giving similar performance . . . giving 5 to 10 times normal life . . . avoiding delays for engine overhauls . . . keeping engines of the United Nations on the straight path to Victory.

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A key to better maintenance is *better lubrication.*

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(Write for "The Service Factor" — published periodically and devoted to the solution of lubricating problems.)

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source of flames. Fig. 3 shows nozzles (encircled) in position on posts.

Placed about the ceilings at regular intervals are 48 heat actuators, operating on rate-of-temperature rise in the room. As fire-heated air rises to the ceiling, air within the actuator expands. A wave of pressure passes through the tubing to a release mechanism at the directional valves. Instantly, weights drop, opening the proper directional valves, ringing the alarm gong, shutting off fans and louvers and starting the time-delay mechanism which allows 35 seconds to elapse before seals are cut and gas is discharged. This delay permits workers in the room to leave before gas rushes in. Twenty-four pressure-operated trips are incorporated in the supply lines to control self-closing fire doors. When fire breaks out, passage of carbon dioxide through the piping retracts a pin, releasing the control weight and allowing door to close, thus isolating the burning space.

Two break-glass remote control pull boxes are provided for each space and located at the exterior doors on either side. If a blaze should be detected before the heat actuators operate, a pull at the handle of the control connecting by cable with the respective valve frame for that space will set off the system.

The fire-extinguishing system employs carbon dioxide under high pressure—850 pounds per square inch at 70 degrees Fahr.—which makes for simultaneous distribution of the gas through the piping and all nozzles in a room. It can be understood readily that carbon dioxide, pouring from 80 evenly spaced nozzles at a rate which disposes of the entire 7 tons of gas in approximately 1 minute, would reduce in a few seconds the percentage of oxygen in the air to the point below which fire must die.

Reduction of the normal 21 per cent content to 16 or 15 per cent is sufficient in the case of ordinary inflammable liquids and this high-pressure system effects such a reduction in the shortest possible time. Compact arrangement of cylinders obviates the need for large storage space and their placement is a matter of convenience. In the aviation material storehouse, the cylinders and routing valve frames are housed in a maintenance room about 25 x 33 feet, located approximately midway along one of the long walls of the building.

Fig. 3—One of the storage spaces for highly inflammable materials, showing multiple discharge nozzles (encircled) arranged in sprinkler fashion on columns and against wall. These deliver in less than 30 seconds a concentration of fire-smothering gas throughout the room

Production Planning

(*Continued from Page* 91)

to do with all types of general subjects, such as design factors, service problems, production difficulties, shop practice.

Let us take as a sample a meeting devoted to production engineering and see how it is handled. The type of notice or program shown here as Table I is sent out to all concerned from the engineering or shop standpoint.

Curtiss-Wright breaks down everything, including function. It is *the* problem to make everyone understand it, and that is the purpose of these forums . . . bringing the shop and engineering staff into unity of understanding. Too great for discussion here is the design and fabrication details involved in this one subject of consideration, "The Production Breakdown," *iv* just one ship.

To give an idea of the job involved, Curtiss-Wright at its St. Louis plant has had to tool up for three models in three years; each of which involves 16,000 or more parts, and this does not include such essentials as bolts and rivets. That has meant engineering, tooling, process flow, and all of the attendant considerations. In relation to the C-46 Commando, it has meant 205 separate production breakdown drawings in sequence. So, Curtiss-Wright has the policy and practice of proceeding from the general to the very particular; creating an interchangeability of know-how on a basis of precision as great as the necessity of the interchangeability of parts.

These forums are merely one step in the procedure of getting everyone integrated in the understanding of both the general and the particular.

Making use of the chart technique, Curtiss-Wright's production engineering staff has prepared a graph of "Production Breakdown Procedure", Fig. 4. Explanation that accompanies this chart is as follows:

> During the design study stage of the preliminary design of a new model, it is the dual responsibility of Production Design and Preliminary Design to correlate structural and arrangement studies with the basic requirements of an overall Production Design.
>
> When sufficient design data has been assembled relative to the requirements of structural integrity and arrangement possibilities, the Production Design Engineer should arrange for a preliminary production conference with the Preliminary Design group.
>
> To assist in the formulation of the Preliminary Production Breakdown the Production Design Engineer should arrange to have an assigned project production design engineer, and those production design specialists who may be more competent to handle specific production items, attend the preliminary production conference.
>
> During the preliminary, the Preliminary Design Group should present their structural and arrangement requirements for discussion and consideration. The Production Design Group will in turn present the problems of production design relative to the proposed design requirements. As a result of this combined design and production analysis, a preliminary solution should evolve in the form of a preliminary production breakdown.
>
> Using the preliminary production and design decisions as a basis, the Production Illustrations Group should prepare a graphic preliminary production breakdown, incorporating such explanatory features as may be directed by the Production Design Engineer.
>
> The completed graphic preliminary production breakdown should be approved by Preliminary Design prior to release.
>
> Upon completion, the approved preliminary production breakdown should be released to supervisors of those manufacturing departments as will be concerned with the production of the new model. The Production Design Engineer should issue these breakdowns together with a memorandum requesting that the breakdowns be

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YOU can keep your production moving at an ever faster pace with THOR Air Tools. Basic reasons why THOR tools work harder and faster are shown in these typical examples of major shop and yard jobs. For helpful information on the complete line of THOR Air Tools write for Catalog No. 52B.

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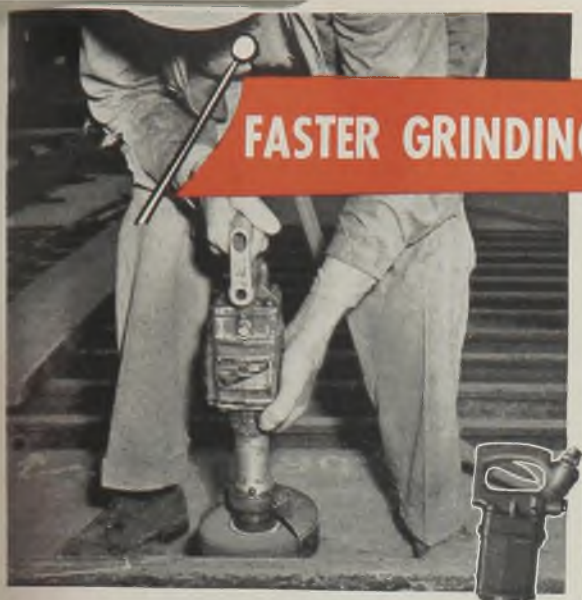
THOR Riveting Hammers give you everything needed for faster, easier riveting. 1. Special inlet ports in the air-tight, balanced poppet valve provide perfect throttle control for easy regulation of speed and blow. 2. The THOR Main Valve, precision-fitted to use effectively *all* the air, gives you hard-hitting, dependable power. Made *without* port holes which plug up or start cracks, it assures longer valve life, lower maintenance costs.

THOR Riveting Hammers are made in Standard and Heavy Duty types, in 4" to 9" strokes; with open, closed and inverted type handles.

Note the thick, substantial walls and the absence of port holes in the Thor Main Valve — to assure less valve breakage and lower maintenance. Inlet and Exhaust ports are separated by three different valve diameters to make air leakage and power-loss impossible.



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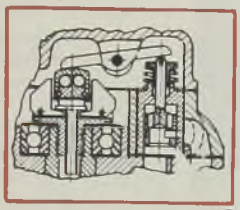
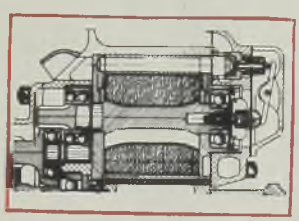
FASTER DRILLING!

Here's why you get top speed grinding with THOR Air Grinders. They *start instantly* . . . thanks to THOR's "Air Behind the Blades" Principle. They remove more metal per hour . . . result of the extra power developed by the wider blades and deeper slots of THOR's one piece rotor. And they maintain spindle speed at top efficiency . . . one function of THOR's Safety Governor (in diagram). There are fifty different models of THOR Air Grinders for grinding, cleaning, buffing, and brushing.

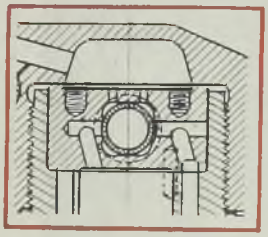




Every THOR Air Drill from the huskiest, big-capacity machines to the tiny, high-speed models, has the speed and stamina for today's three-shift schedules. THOR's compact, one-piece construction of rotor and shaft (in diagram) provides deeper slots and wider blades — to deliver a steady flow of power. For faster handling, size and weight are cut to the minimum. These are but a few of the features you get in seventy-seven sizes of THOR Air Drills for every type of light and heavy duty drilling.

FASTER CHIPPING!

Positive valve action that insures a smooth flow of power . . . completely graduated throttle valve control . . . and vibration kept amazingly low — with these, THOR Chipping Hammers speed your work. You get easy starting with a light blow and complete control right up to full speed and power . . . to handle a full range of chipping. With THOR's Cylinder Rocker Valve (in diagram) measured quantities of live air power both the forward and return strokes for exactly the right combination of speed and smoothness. Available also in Plate and Spool Valve types, THOR Chipping Hammers offer a full range of sizes, with 3/4" to 4" strokes, open or closed style handles — a hammer for every job!



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studied for production recommendations and improvements.

The preliminary breakdowns should also be released to such engineering personnel as may be concerned with the design development of the airplane, in order that through familiarization and study, additional design recommendations or improvements may be made.

The Production Design Engineer should arrange a final production conference for the purpose of correlating engineering and manufacturing requirements. Those people who have been issued preliminary breakdowns for study should be notified of the conference in advance, so that their breakdown study may be completed.

During the final production conference, Planning, Tooling, Shop and Plant Layout should present their particular problems and recommendations which should be balanced by those requirements considered critical by Engineering.

The assigned project Production Engineer and those production design specialists who may be able to contribute to the final production design decisions should be present at the conference.

A final production breakdown should be prepared according to standard practice, incorporating such information as may be directed by the Production Design Engineer.

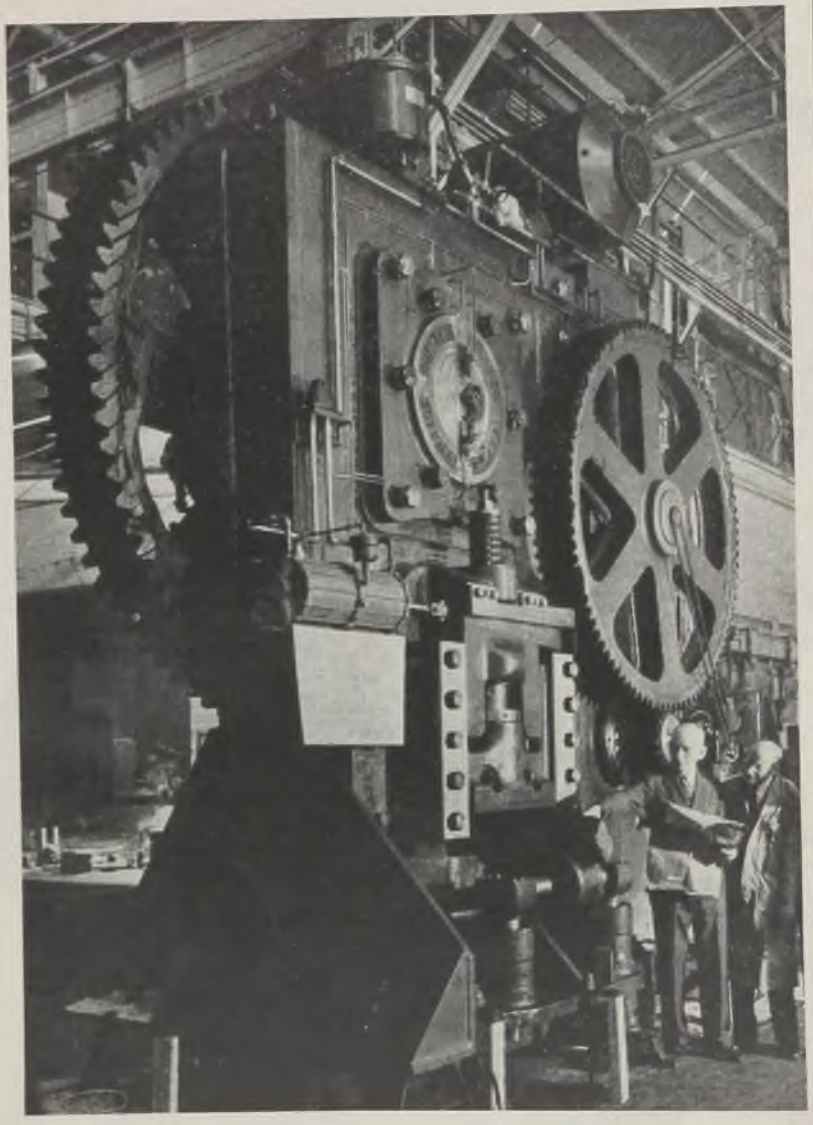
The completed production breakdown should be approved by representatives of the Manufacturing and Engineering Divisions prior to release. Fig. 2 shows production breakdown of the C-46A [illegible] ship we have been talking about. It is graphically expressed in perspective.

Fig. 2 represents a major unit structural breakdown drawing of airplane model, illustrating its subassemblies and parts and identifying these by part number and name. The drawing shows the unit assemblies separated, but arranged in their correct relative positions. Drawings of this type are prepared, using a master perspective projection to insure uniformity.

The information is based on production conferences, project layouts, assembly details and planning procedures such as those described above. The unit breakdown illustrations are used to facilitate production design of the airplane, to co-ordinate design and fabrication, to facilitate production planning, to give advance information, and to acquaint the purchasing department and sub-contractors with advance production information. In addition, they are helpful in general educational and familiarization procedures, in service engineering, and in spare parts follow-up.

Fig. 3 is typical of detail drawings. It is an assembly drawing of a door, illustrating in detail the components of this structural unit. All parts are identified by part and sectional views. The attaching part is also illustrated. Minor unit assembly drawings are prepared in the same manner as the major unit assembly drawings and are a valuable tool in the plant's Engineering Department in co-ordinating design and fabrication, facilitating production planning, etc.

Curtiss-Wright even goes so far as to color the drawings to show which shop has the responsibility for fabrication of each unit part. This is helpful since plants in Buffalo, Columbus, Louisville, as well as in St. Louis, all make parts for each other. The attendant schedule that goes along with the drawings shows details of tools and processing. Thus, each plant manager knows the responsibility of integration.



NEW BILLET SHEAR: This new shear built by the Buffalo Forge Co., Buffalo, for the Timken-Detroit Axle Co. will cut 10-inch steel rounds or 9-inch squares at the rate of six cuts per minute. Pressure between the knives is 4,500,000 pounds. The unit, weighing 80 tons, is driven by a 125 horsepower motor through multiple V-belts. Timken-Detroit will operate the shear at its Melvindale, Mich., plant

Oxy-Acetylene Welding Treated in Handbook

Oxy-Acetylene Handbook, cloth, 587 pages, 6 x 9¼ inches; published by Linde Air Products Co., New York 17, at $1.50.

This handbook is designed as a guide to self-instruction and also as a classroom textbook in vocational and trade schools, technical high schools and engineering colleges. It covers the entire range of the oxy-acetylene process, with instructions for handling all common commercial metals and explanations of fundamental principles of depositing and controlling molten metal. Considerable space is devoted to operating principles of oxy-acetylene equipment, its care and maintenance.

In addition to its use as a textbook it also serves as a guide to managers, engineers, designers, superintendents and foremen. It is well illustrated and has a comprehensive index.

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A complete range of styles, grains and sizes up to 3" in diameter to give you a perfect finish on every job.

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Finish must now be measured in micro inches. That's where the new Chicago FV BOND Wheels excel. They give a precision smoothness so intensified that it passes any surface analyzer test, in many cases eliminating hand lapping and auxiliary finishing operations.

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FV BOND is available in all types of Chicago Mounted and Small Grinding Wheels—in all abrasives, grain and grade combinations.

TEST WHEEL FREE — To prove their superiority in your own shop, send for a Chicago Wheel made with FV BOND. Give us details of the job, material you want to finish and we'll do the rest.

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Salvaging Mandrels

Willys-Overland rebuilds worn equipment by spraying with metal and grinding to proper size, saving 20 cents per shell

Fig. 1—Worn mandrel is being built up by applying sprayed metal. Subsequently it will be finished to proper size by grinding

By G. H. HENSHAW
Conservation Engineer
Willys-Overland Motors Inc.
Toledo, O.

INASMUCH as Willys-Overland Motors Inc. was one of the first companies to convert its facilities entirely to the manufacture of war products such as jeeps and shells, it also was among the first to encounter difficulties resulting from unprecedented demands upon equipment. Therefore, faced with considerable machine down-time while making new parts or awaiting their arrival from outside sources, it was decided to purchase metal spray equipment for the purpose of rebuilding machine element parts.

At the instruction of R. V. Mills, general master mechanic, the writer has been employing this type of equipment wherever possible for the usual run of work such as rebuilding spindles, motor shafts, tail stocks, bearings, etc. All this work was done with uniformly good success.

Having cut our eye teeth on the tried and proven applications we decided to tackle another job, which, while seemingly much more complicated than anything we had yet tried, offered us a greater chance to show a very appreciable saving in money, time and critical material. This application was the rebuilding of undersize draw mandrels used in forging 155 millimeter shell.

In order that one can more readily visualize the punishment we are asking a sprayed surface to take I will briefly outline the various steps of forging a 155 millimeter shell. First, steel billets 15½ x 5½ x 5½ inches are placed in a furnace and brought up to a temperature of approximately 2200 degrees Fahr. A billet is then placed in a press where the shell is shaped and the cavity formed by means of a pierce mandrel, and after that operation the piece is conveyed to the draw bench where the sprayed mandrel, powered by a 265-ton hydraulic press, forces the shell through a series of six draw rings reducing it approximately ½-inch in diameter and elongating it some 6 or 7 inches.

Mandrel Is Water-Cooled

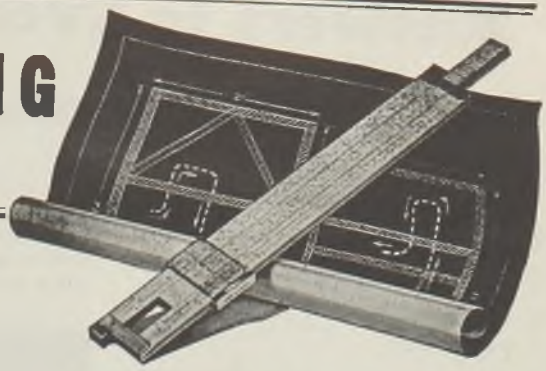
The shell at this point is at approximately 1950 degrees Fahr., the mandrel being kept as cool as possible by means of water circulating in the mandrel and sprayed on the outside as each cycle is completed. The spraying of the water on the outside serves two purposes, namely, to help keep the mandrel temperature down and to knock off the scale formed. Because of this severe use an unsprayed mandrel will only average 500 shell after which it has to be discarded. This means that the draw mandrel cost alone is approximately 35 cents per shell.

Having several hundred of these discarded mandrels on hand with no value other than that of scrap, we felt that if they could successfully be reclaimed through metallizing, the savings involved would be of no small consideration. This has proved to be the case, for our figures show that of the first 50 sprayed mandrels tested mandrel cost was reduced from 35 cents per shell to approximately 15 cents per shell.

The base material of the mandrels being salvaged is of either Kloster steel DC-33 or Braeburn Pressuredie No. 1 and is prepared by undercutting 0.125-inch on a side and then cutting 14 grooves per inch after which the surface is blasted with No. 25 angular steel grit. The mandrels then are ready for spraying. Spraying time is approximately 2 hours using between 14 and 15 pounds of Metcoloy No. 2 per mandrel. The mandrel is then wet ground using either a No. 3746-K5 Norton wheel or a Carborundum 36-N-E Carborundum vitrified wheel. Inasmuch as 0.020 to 0.025-inch of stock is left on a side for grinding, this operation takes about 3½ hours.

Since our first experiments with rebuilding mandrels, some one hundred mandrels have been so treated and as we continue to profit from our experiences I have every reason to believe that we soon will obtain as much life from the sprayed job as we do from the original. I might say that this application has now passed from the experimental stage into a regular salvage process. Work so far has been done with a Type 2-E spray gun made by the Metallizing Engineer-

OVEN ENGINEERING NEWS



Seven-Alley Conveyer Oven Speeds B. F. Goodrich Production Of Self-Sealing Fuel Tanks

Above is shown the curing room of the B. F. Goodrich Company's new aircraft fuel cell dryer, one of the marvels of present day oven engineering. This multi-compartment oven processing system performs three separate functions:

1. The curing of cell materials to form a semi-rigid liquid-tight structure.
2. The preheating of completed cells preparatory to finishing.
3. The baking of paint finishes on the cells.

Curing is accomplished in the five open alleys of the curing room, while single enclosed alleys are devoted to the preheating and baking. Fabricating processes are carried on adjacent to the curing room, between passes, and painting is done in a spray booth at the entering end of the baking alley.

One of the largest ovens ever built, this installation encloses 147,000 cubic feet of insulated volume, the air of which is replaced approximately once a minute. With the temperature of this enormous enclosure guaranteed to ±5°, tests have revealed the actual variation to be only ±3°.

The entire system is built directly into the building and is insulated from it. Seven pusher-type floor conveyers, each extending the full 175-foot length of the oven, are operated by oil immersed mechanical reversing drives which are mounted on the ceiling of the floor beneath.

Ingenious electrical control of all conveyers makes it possible to work out production schedules in advance of actual production runs. Shown in the photograph below is the complete control system for the entire operation, designed, built and field wired by the Industrial Oven Engineering Company.

This unusual processing system is one of many different systems designed and built for a wide variety of industries by Industrial Oven. If you want to know more about this type of processing equipment, or if you have an oven problem of any other nature, just get in touch with us. For possible post-war uses of the installation pictured here, see our advertisement in this magazine next month.

(This is No. 11 of a series. Reprints of previous advertisements will be sent free upon request.)

THE INDUSTRIAL *Oven Engineering* **COMPANY**

11621 Detroit Avenue **Cleveland, Ohio**

IOE ENGINEERING VERSATILITY

Answers to Everyday Questions about PREformed WIRE ROPE

1 *Is PREformed a lay of rope?*

2 *Is PREformed a special construction?*

3 *Just what does PREformed mean?*

4 *How shall I mark my orders to get PREformed?*

These are questions wire rope users are asking. Here are answers to everyday questions we receive.

First, let us be reminded that there are two kinds of rope. One is non-preformed wire rope, the kind that has served users for many years. Then there is PREformed, the kind which is newer, better, and longer lasting. Because it is a newer type rope, because it does a much better job for users, there are many questions asked about it. Let's consider a few.

FIRST . . . *"Is PREformed a lay of rope?"*

No. PREformed does not refer to a lay of rope. Lay refers to the twist or helical form which is characteristic of *all* wire rope. A rope may be Lang Lay, Right Lay, Left Lay, Reverse Lay . . . and each of these lays may be made either PREformed or non-preformed.

Lang Lay ropes should always be PREformed to counteract the tendency towards twisting, because wires and strands are both laid in the same direction in Lang Lay ropes. Further information on Rope Lay is given in the new Macwhyte Wire Rope Catalog, G-15.

SECOND . . . *"Is PREformed a special construction?"*

No, PREformed is not a special construction. Construction refers to the number and arrangement of wires in the rope . . . such as 6 x 17 (six strands of 17 wires each), 8 x 19 (eight strands of nineteen wires each), and so on. These constructions can refer to either PREformed or non-preformed wire rope. (For complete data on constructions, see Catalog G-15.)

THIRD . . . *"Just what is PREformed?"*

Macwhyte PREformed wire rope is the proper size, grade and construction you need, *PLUS*. This *plus* refers to the PREforming, a process which forms the wires and strands into a spiral, so that wires and strands lie naturally in place with a minimum of internal stress.

Illustration above tells the story. Notice how the wire has a special shape? It has been PREformed. When the rope is closed (put together in the closing machine), both wires and strands naturally fall into position in the rope.

Illustration above points to the end of a PREformed rope showing how wires lie naturally in place even though no seizing is there to hold them.

The result is a wire rope that is more flexible and that more quickly adapts itself to the equipment on which it is used. Thus, literally, PREforming means better PER-forming on the job.

A PREformed rope is safer to handle, too, because broken wires (which will happen after *long* usage) do not wicker out as in non-preformed wire rope.

FOURTH . . . *"How should I mark my orders to get PREformed?"*

Just add the words "Macwhyte PREformed" to your specifications. Like this, for example:

1,250 feet 1" 6 x 19 Lang Lay with IWRC, Macwhyte PREformed Monarch Whyte Strand wire rope.

If you leave out "Macwhyte PREformed," the specification then becomes a non-preformed wire rope specification. The reason? When PREformed is not mentioned on the order, it is a standard practice to supply non-preformed.

FIFTH . . . *Internal Lubrication, too!*

And a bonus *Plus* feature of Macwhyte PREformed wire ropes is *internal lubrication*. Not only are wires and strands PREformed, but each wire in the strands is coated with an elastic, non-drying film of lubricant, as explained on pages 10 and 11 of G-15 catalog.

We have been making wire rope for equipment like yours for many, many years. The benefit of that experience is yours for the asking. You can be assured, too, that when you select Macwhyte you are not only getting "the correct rope for your equipment," but also a personal interest in helping you get the *most* out of *your* rope.

MACWHYTE PREformed WIRE ROPE

Plus Internal Lubrication Selected Steels Tested-Proved

The correct rope for your equipment

NO. 741

MACWHYTE COMPANY

Wire Rope Manufacturers

ARMY E NAVY

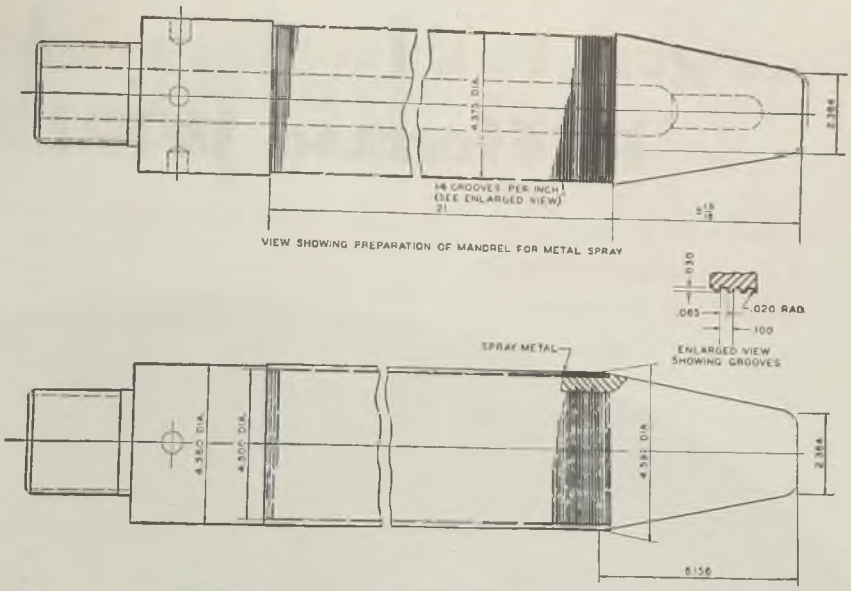
2912 FOURTEENTH AVENUE KENOSHA, WISCONSIN

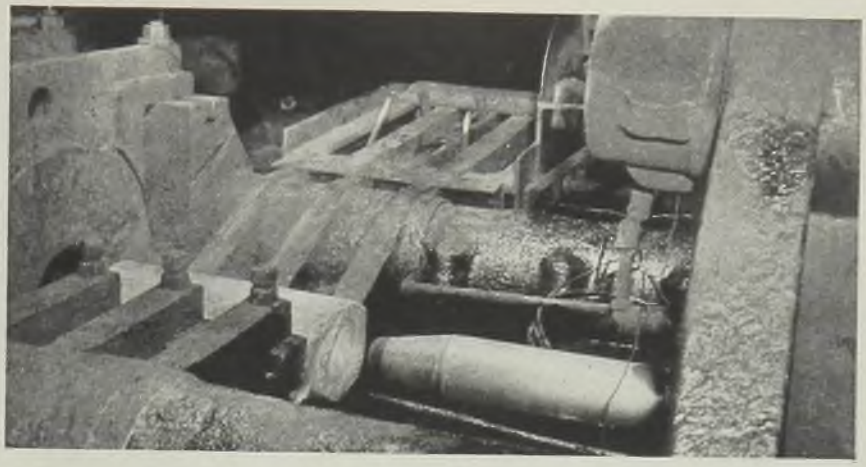
Mill Depots: New York · Pittsburgh · Chicago · Fort Worth · Portland · Seattle · San Francisco. Distributors throughout the U.S.A.

MACWHYTE PREformed and Internally Lubricated Wire Rope · MONARCH WHYTE STRAND Wire Rope · MACWHYTE Special Traction Elevator Rope · MACWHYTE Braided Wire Rope Slings · MACWHYTE Aircraft Cables and Tie-Rods · MACWHYTE Stainless Steel Wire Rope · MACWHYTE Monel Metal Wire Rope

Fig. 2 (Right)—The upper section of this diagram shows a mandrel as prepared for metal spraying. The surface is undercut, grooved and grit blasted. Bottom section shows mandrel after metal has been applied

Fig. 3 (Right, below)—This mandrel has been rebuilt by metal spraying and is shown ready to push a shell through the series of six draw rings to reduce its diameter ½-inch and elongate it approximately 6 to 7 inches





ing Co. Inc., Long Island City, New York. An additional Type 2-E has been purchased to speed up the spraying of these mandrels.

The only skilled operators found necessary are finish grinders. In fact, the actual spraying of the metal is being done by a man who until one year ago had spent his entire working life as a porter in a small southern hotel.

In summing up what metallizing has meant in this particular application, which, I believe, is the only possible economical way to salvage this tool, the following figures are cited:

Original mandrel cost—new	$175.00
Average shells per mandrel	500
Mandrel cost per shell	$ 0.35
Cost to reclaim by metallizing	$ 60.00
Average shells per sprayed mandrel	400
Mandrel cost per shell	$ 0.15

NEW PRODUCTS

Emulsion Cleaner Concentrate — Soluble in water and hydrocarbon solvents and usable as an emulsifier in removing carbonized oils, grease, smut and drawing and buffing compositions and as a pre-cleaner prior to electroplating. Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia 7, Pa. ST 27

—o—

Micrometer Stop Countersink—Countersinks up to 1¼ inches and capable of countersinking ½-inch rivets. Can be instantly and positively locked at each micrometer setting in increments of .001, adjustments made manually and while tool is in operation. Aero Tool Co., Burbank, Calif. ST111.

—o—

Tube Cap Terminals — Designed for adaptations to heavy load, high temperature operation on power tubes, easily applied in confined areas often encountered in electronic tube applications. Available in two types—one for use on insulated wire where an insulation-support type of terminal is required and the other for either insulated or noninsulated wire. Aircraft-Marine Products Inc., 1591J North Fourth street, Harrisburg, Pa. ST106.

—o—

Fluxmeter — Light beam instrument for measuring either flux density or total magnetic flux in magnetic circuits. Applicable wherever permanent magnets or DC electro-magnets are used. General Electric Co., Schenectady, N. Y. ST96.

—o—

Rolling Snack Bar — To serve between-meal refreshments to war workers. Contains shelves for sandwiches, pastry and candy, drawers for soft drinks and juices, a straw bin and refuse bin, as well as space for a coffee container. Mounted on four wheels. Albert Pick Co. Inc., Chicago. ST103.

—o—

Portable Manometer — For use in measuring surface pressures on Republic Aviation Corp.'s P-47 Thunderbolts being tested in their wind tunnel laboratories and designed by Trimount Instrument Co., Chicago. Consists of ten banks of six tubes each with every sixth tube being an atmospheric one. Scales are made of glass with black increments and numbers made opaque by special process. Any type indicating fluid may be used. May also be used for studying intercoolers and after cools and flow conditions across surfaces suspended in the tunnel. ST108.

—o—

Portable Battery Charger — For recharging batteries in railway coaches, this unit is a 300 ampere, 45 volts, DC flat compound wound generator connected directly to a Chrysler T-118 six cylinder self-starting gasoline engine with battery wheeled truck with hand towing tongue. Hobart Brothers Co., Troy, O. ST98.

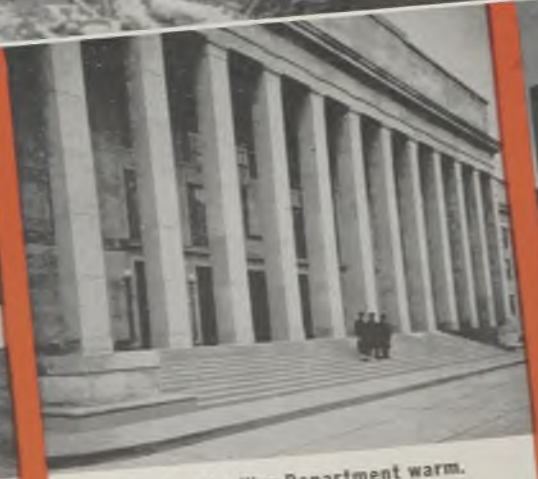
—o—

Micrometer Stop Countersink — Developed for aircraft industry. Features adjustments in increments of 0.001-inch without use of any tool, a positive lock, self-contained knockout pin facilitating the removal of taper shank cutter, and self-lubricating long life bearing. Schrillo Aero Tool Engineering Co., 8715 Melrose avenue, Los Angeles 46. ST104.

Pipe helps American

"There's Victory in them hills." The "Big Inch" shoots 300,000 barrels of oil a day from Texas to the East. 1,100 miles of 24-inch NATIONAL Seamless were used in this world's biggest oil line.

Life on a submarine would be impossible without completely dependable pipe and tubing such as NATIONAL Seamless. Thousands of miles of NATIONAL Pipe have been used for ships.



Keeping the War Department warm. The New Pentagon Building housing the U. S. War Department is warmed in winter, cooled in summer with miles and miles of NATIONAL Pipe.

Power to win. World's largest catalytic cracking refinery for aviation fuel. Most of the pipe and tubing was NATIONAL Seamless.

war production

over the hump

AT Teheran, American Industry made the headlines when Stalin said that without American war production the war could not be won. When the industrial might of a nation receives full recognition along with its military prowess, it is a memorable tribute.

Every worker who is helping to boost production is an important cog in this huge war machine. Our problem, now, is to keep the supplies flowing in an ever increasing stream.

In stepping up production, seamless pipe and tubing have played a tremendously important part. First, our basic steam power industry was built up in capacity so that even today there has been no shortage of power. This took huge amounts of NATIONAL Seamless Piping and Boiler Tubes.

When complete synthetic rubber and high octane gasoline industries had to be built, NATIONAL Tube Company was ready with the right seamless pipe and tubing for these vital jobs.

Most outstanding of all the rush war jobs was the construction of the "Big Inch" Pipe Line in less than a year. Only NATIONAL Tube Company had the capacity and equipment to turn out this 24-inch seamless pipe in quantities big enough to keep up with the contractors.

Shipbuilding, too, took a staggering amount of pipe—about 10 miles for every 10,000 tons of shipping. In less than two years, enough pipe was used to make a pipe line around the world.

Add to this, the seamless pipe and tubing used for millions of bombs, countless machine guns, tanks, trucks, jeeps and thousands of airplanes and you'll begin to see the importance of pipe and tubing in boosting all kinds of war production.

The workers of NATIONAL Tube Company have met the most stringent production schedules with on-time deliveries. The result —more war equipment—faster.

Bombs by the million. Made from NATIONAL Seamless Tubing by a new process of manufacture that increased production many times over previous methods.

NATIONAL TUBE COMPANY

PITTSBURGH, PA.

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
United States Steel Export Company, New York

NATIONAL SEAMLESS

UNITED STATES STEEL

By G. ELDRIDGE STEDMAN

Western Cartridge Co's New Brass Mill features STRAIGHT LIN

STRAIGHT LINE production is featured in Western Cartridge Co.'s new brass mill built about two and a half years ago adjacent to the plant operated by the company for many years at East Alton, Ill.

Western Cartridge was the first in its industry to get under way with the expansion of facilities in recognition of the impending need for large quantities of brass and bronze for ammunition. More than $8,000,000 of Western Cartridge's own money, covered by a letter of necessity, have been invested in the new plant.

The plant was constructed under the direction of M. W. Acker, manager of the Brass Mill Division, assisted by William Yoxall and other members of his staff. Ground was broken June 1, 1941 and the first bar cast Jan. 22, 1942.

By way of background, it may be explained that Western Cartridge was founded about 50 years ago by F. W. Olin at East Alton and its operations now spread across the map of the United States. The company has become one of the largest makers of ammunition in the world and in conjunction with this operation it produces sheet brass not only for its own requirements but for the general manufacturing trade.

The Olin influence, represented not only by the founder and president, but by his two sons, John M. and Spencer T., both vice-presidents, and by members of the executive staff, currently extends itself in the management of the Winchester Repeating Arms Co. Division at New Haven Conn., whose Winchester-developed light carbine is one of the wonder weapons of this war; in the operation, through a subsidiary of Western—the United States Cartridge Co.—of the St. Louis Ordnance Plant, which has processed small arms ammunition in astronomical quantities; and in the production of high-grade aluminum in a Defense Plant Corp. plant

Fig. 4—Prior to hot-rolling, the slabs are heated in gas-fired pusher-type furnaces. Slabs brought up to rolling temperature emerge on the hot mill roller table in the foreground

Fig. 5—Slabs are hot-rolled on this 26 x 42 reversing mill, the operation being controlled by the operator in the pulpit at the right

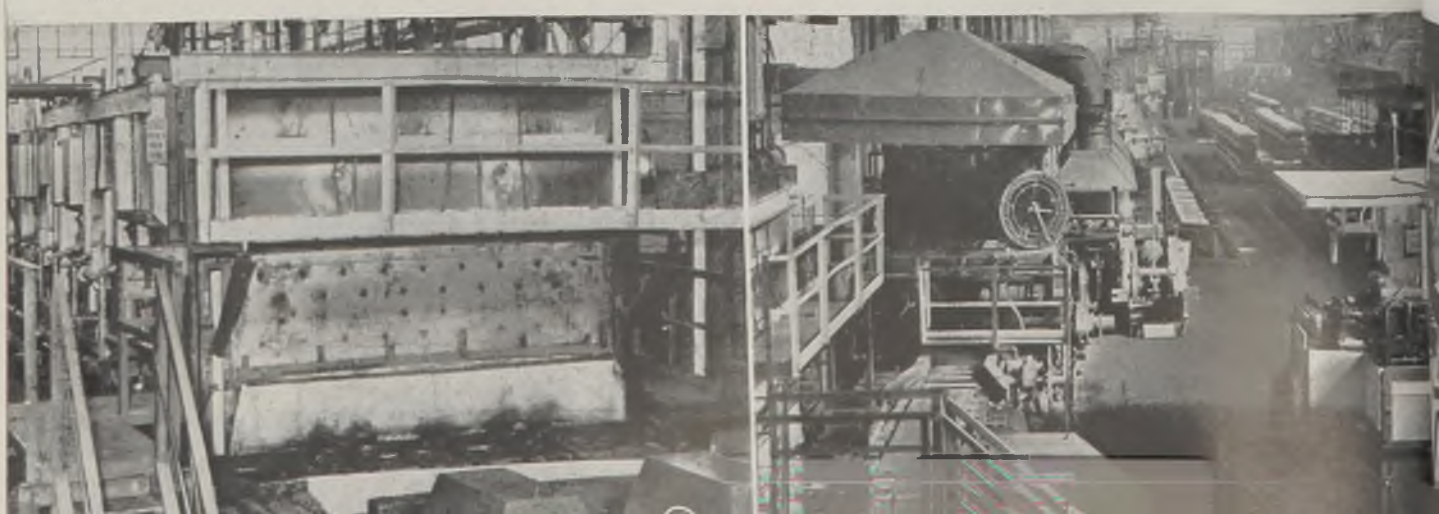


Fig. 1—Virgin copper and zinc are loaded in these pans for transportation by conveyor to the electric furnace charging floor

Fig. 2—Pouring side of a battery of melting furnaces in the Western Cartridge plant. Metal is pouring into water-cooled molds which produce slabs 26 x 3 x 96

Fig. 3—Gate ends of cast slabs are trimmed off on this shear. The scrap drops on the conveyor shown in the foreground and is on its way back to the furnaces for recharging

PRODUCTION

located on outskirts of Tacoma, Wash.

Operations also include a number of explosives manufacturing plants located all over the country—such as Liberty Powder Co., Mt. Braddock, Pa.; Western Powder Mfg. Co., Edwards, Ill.; Columbia Powder Co., Tacoma, Wash., operating a dynamite plant; the parent Equitable Powder Mfg. Co., East Alton, Ill., and many other subsidiaries and affiliates in the dual realms of metals and explosives.

Among other things, Western perfected a process for the manufacture of smokeless "ball powder" as a direct aid to American and British ammunition procurement. To perfect ball powder, stable nitrocellulose first was developed. The company is already exploring the uses of plastic adaptability of nitrocellulose for the postwar period.

The chemical peculiarity of nitrocellulose is that it has a long chain molecule. Individual links in this chain are a unit with the formula $C_6H_7N_3O_{11}$; an indefinite number of such links can be bound together in a single nitrocellulose molecule which has the stated symbol (Imperial) designation of $(C_6H_7N_3O_{11})N$.

What is the No. 1 problem for the plant management today? According to F. A. Schotters, general superintendent, it is: "Maintenance of production schedules which are often being changed to meet changing requirements of our armed forces; increasing and decreasing of schedules on certain items and the conversion of production facilities from the manufacture of one item to another; changes in the scheduling of materials from outside sources; scheduling of production to meet final assembly and shipping schedules; the shifting of employes throughout all divisions to meet the fluctuating labor demands created by changes in production schedules and types of products manufactured."

The fabrication of ammunition components is exceedingly complex, a typical rifle and machine gun cartridge of the "bottle-neck" type involving 46 operations. The cartridge case alone requires 13, without including steps required in producing the metal itself. The primer involves 22 operations exclusive of preparation of the explosive.

Ballistics, with its integrated complexity, shows up in planning, shop practice, and inspection. Each lot of powder and each lot of primers are tested before being assembled with the case, and finally, a certain percentage of the completed rounds are tested for velocity, pressure,

Fig. 6—Cooling bed for the hot mill is equipped with spray quench. Operator is checking the gage of a finished piece

Fig. 7—After hot-rolling, the material is passed through a 9-roll straightener; next through a slab miller to remove possible surface defects; then turned over and passed through a second miller to treat the other side. The material then is ready for the tandem mill

accuracy, and hang-fire qualities. The latter test is made to insure that the ignition and barrel time are constant and will permit firing in aircraft machine guns, governed by the standard mechanism.

When the demand for unprecedented quantities of ammunition arose, plans were immediately initiated in conjunction with the government agencies for additional capacity for the production of sheet brass, primary requisite in the manufacture of cartridge cases and ammunition components. At the same time, additional capacity was needed to take care of increased requirements of customers busy making other types of war materials.

The new plant is laid out for straight line production so that operations may be conducted in proper sequence, thus eliminating unnecessary handling. The handling problem itself has been simplified through the use of specially designed roller conveyor along with supplementary cranes, hoists, trucks and the like.

As shown by Fig. 1, ingot copper and slab zinc are weighed out into pans in the proper proportions and are carried directly to the melting furnaces on the casting shop floor on a conveyor. Method of charging these furnaces is shown by Fig. 10. It will be noted that scrap returned from blanking and forming operations is loaded into bins above and back of the furnaces and is charged directly by means of a chute. The virgin metals shown in the pans on the conveyor under the chute are charged manually. The empty pans are returned to a lower floor by conveyor for refilling.

After the electric furnace charges are brought up to proper heat, they are discharged into pouring boxes and then into double, water-cooled molds measuring 26 x 3 x 96 inches. These flat bars or slabs are removed from the molds by jib crane, later picked up by an overhead crane, delivered to a lower floor, weighed and stacked and then are ready for gate shearing or cropping. Fig. 2 shows a section of the bank of furnaces from the pouring side with a number of cast bars at the lower right.

Bars are delivered to the gate shear by a conveyor where the ends are cut off and each bar inspected. The gate ends drop on the continuous conveyor shown in Fig. 3 from which they are dumped into buckets and returned to the charging floor for remelting. The sheared bars are delivered on a roller conveyor to the slab heating furnace shown in Fig. 4 and located in the rolling mill department.

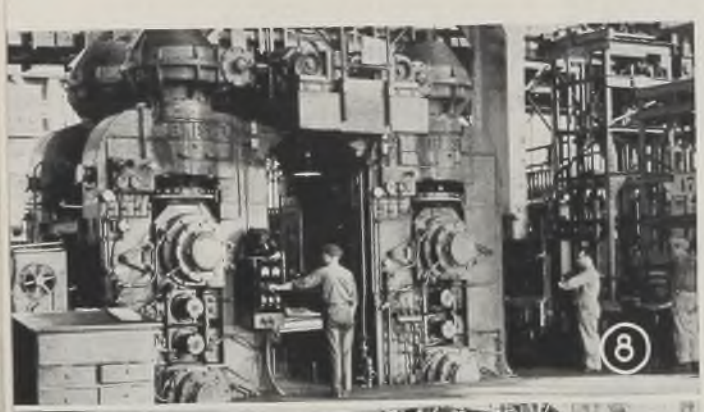


Fig. 8—This 2-stand, 4-high tandem mill cold reduces the semifinished material in two passes. After the first pass, the coils are returned by conveyor to the entrance side.. The elevator at the right conveys the coils to a spiral conveyor which will take them by gravity to the annealing furnaces

Fig. 9—The spiral, gravity conveyor shown here not only carries the coils to the annealing furnaces but serves as a "float" or storage area

Fig. 10—Western Cartridge uses large bins for storing scrap alongside the melting furnaces so that the material may be easily charged by means of a chute. Virgin metals are charged by hand

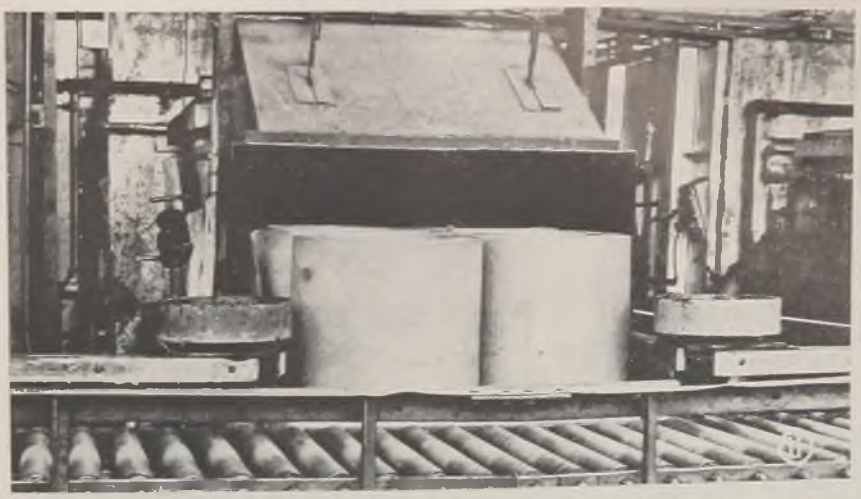


Fig. 11—Fully annealed [illegible] shown here emerging from a roller-hearth, gas-fired furnace. The conveyor will take the coils to a straightener, pickling and cleaning machines and finally to a slitter

The slab heating furnaces are of the pusher type, each fired top and bottom by means of 36 burners using natural gas. The heated bars are delivered to the hot mill roller table, as shown in Fig. 4.

The slabs are rolled to proper thickness on the 26 x 42 inch reversing hot mill from which they emerge to a cooling bed. Fig. 5 shows a slab about to enter the mill and another, after rolling, leaving the cooling bed. Cooling is expedited by a spray quench which is clearly shown in Fig. 6.

The material then is picked up by overhead crane and transported to a straightener (Fig. 7), then to a slab miller to remove possible surface defects and then to a second miller to treat the other side. After inspection, this semifinished material is ready for cold-rolling on the 4-high tandem mill shown in Fig. 8. This mill is of the 2-stand, 4-high type with work rolls 16 x 34 inches and back-up rolls 34 x 34 inches. Material from the slab miller is first given one pass, coiled and returned by conveyor for a finishing pass, again being coiled. Coils are raised on the elevator shown at the right of Fig. 8 to the spiral gravity conveyor shown in Fig. 9 which will carry them to roller-hearth annealing furnaces. This conveyor, incidentally, also serves as a "float" or storage area.

The roller-hearth furnaces, one of which may be seen in Fig. 11, feed the coils to another spiral conveyor which takes them to the cleaning line which includes a flying shear for cropping the ends. The material then proceeds through straightening rolls, pickling and cleaning machines and finally to a slitting machine (Fig. 12) for cutting into narrower strips, such as required for the presses making .50 caliber cartridge case cups.

For the purpose of facilitating handling and storage, the finished coils are loaded on skids in units of eight as shown in Fig. 13 and thus may be easily transported to the presses.

Fig. 12—Brass coils here are being slit to the size, required for presses making .50 caliber cartridge case cups

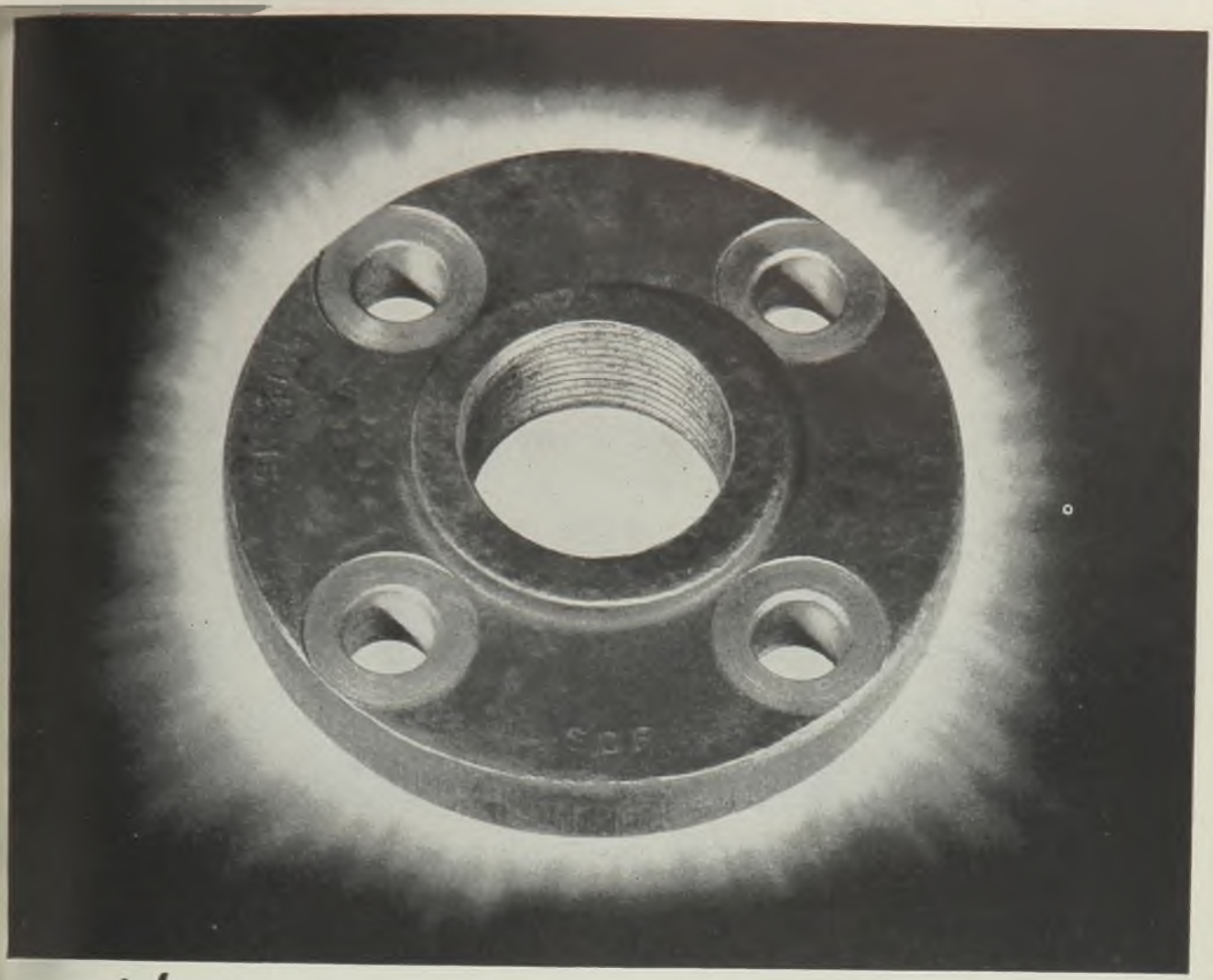
Fig. 13—Efficient handling methods all along the line lessen the load for individual workers. For instance after slitting coils are loaded on pallets for easy transportation by fork truck

"Spins" Filaments for Electron Microscope

Fashioned from tough, flexible steel and mounted on a wooden stock, a crossbow not unlike that used by the medieval archer plays a key role in processing material for one of the most modern scientific instruments, the electron microscope.

Westinghouse research engineers employ the crossbow to shoot an arrow which, with a high initial burst of speed, draws out quartz filaments so fine it would take 60 of them to equal the thickness of a human hair. A very hot flame from an oxy-hydrogen torch is used to heat the quartz attached to the arrow until it is near the melting point. When the trigger is pulled, the arrow darts from the bow trailing behind it gossamer-like threads of quartz which sometimes attain an unbroken length of 20 feet. They are extremely flexible and can be wound around the finger like thread. The high speed is necessary in order to "spin out" the quartz while it is in a hot, fluid state.

Since the electron microscope magnifies objects many thousands of times, scientists need a very minute "measuring stick" by which to gage its power. A human hair seen at its greatest magnification would resemble a cable almost 2 feet thick. After the filament has been sized accurately to 1/30,000th-inch in diameter, it is ready for use in the microscope.



Knit A FLANGE? CERTAINLY!

If you could see inside this drop forged flange you would know what we mean. You'd see that the structure is of a fibrous nature and that these fibres are closely knit together into a tough, sinewy mass of strength and stamina. This structure is peculiar to drop forgings and is the result of a transformation that takes place when the heated metal is forced into the die under the powerful blows of the forging hammer.

That's the reason for the extra long life and high resistance to fatigue that characterize drop forgings. It's one of the reasons why Forgings by Phoenix are being used in many of the implements of war now serving on many battle fronts. And it's a mighty good reason for specifying Forgings by Phoenix when laying plans for your postwar products.

Speaking of postwar plans, now is the time to get them on paper . . . to get the designing and engineering done. And, if there's a drop forging application, our engineers will gladly work with you without any obligation on your part.

Forging Division of

PHOENIX MANUFACTURING COMPANY

CATASAUQUA PENNSYLVANIA

Forgings by **PHOENIX**

A Self-Contained Pneumatic Forging Hammer

The Chambersburg Pneumatic Forging Hammer has a greater forging output than any other hammer of its type. More actual forging per blow is accomplished, due to the heavier anvil construction and the higher impact speeds unique with all Chambersburg Hammers. Added to the advantage of more powerful blows is that of greater rapidity of blows, which permits working the forging at higher temperatures.

The Chambersburg Pneumatic Hammer is of the self-contained type, having a compressor piston cylinder and ram cylinder in which a compressor piston and a ram operates. In operation the ram is driven up and down by a flexible air force, created by the compressor piston. The compressor piston is driven by an electric motor of high speed through two stage speed reduction gearing.

The hammer can be started instantly and strikes a constant number of blows heavy or light at the will of the operator. As soon as the motor is up to speed the hammer is ready to operate.

As the compressed air immediately is replaced from the compressor cylinder to the ram cylinder, air of increased temperature, received during the process of compression, is used in operating the ram. This is the most efficient method and almost perfect expansion of air is attained.

Chambersburg Pneumatic Hammers are made in three types:

1. One Piece, having the anvil integral with the frame for installations such as on shipboard and where deep foundations are impractical. Sizes rated at 200 lbs. and 300 lbs. are so constructed.

2. Solid Frame, having separate anvils and a one-piece frame of rigid, reinforced construction. Sizes 300 lbs. and 500 lbs. are of one-piece, or solid frame construction.

3. Two Piece Frame, having separate anvils, and with the frame scientifically and rigidly mounted on a base plate which encircles the anvil. Sizes 750 lbs. and upward are so constructed.

All are constructed with more generous working space than formerly available.

A new bulletin No. 1275 is now available. Write for your copy.

CHAMBERSBURG ENGINEERING CO., CHAMBERSBURG, PA.

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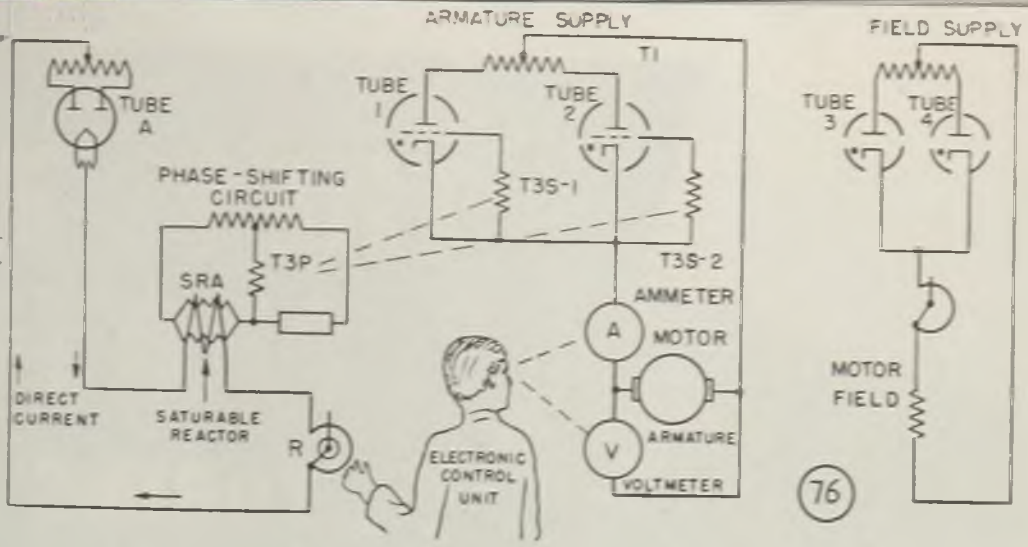


Fig. 76—Simplified arrangement of a thyratron motor control system

Fundamentals of INDUSTRIAL ELECTRONICS

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

Application of electronics in providing stepless control over motor speeds is described by Mr. Chute in the seventh article of his series. Electronic heaters will be discussed in the eighth and concluding article

PRECEDING articles in this series have shown that electron tubes serve as rectifiers and can convert alternating current into direct current; we have seen that we can gradually control or change the current flow through gaseous tubes (thyratrons) by using phase-shift control. In this part we will combine these features to produce the Thy-mo-trol system, (Thyratron motor control). This electronic equipment permits a direct-current motor to operate from alternating-current supply lines. Of greater importance, this system provides the more accurate speed control and versatility of motor operation which is now needed by modern machine-tool drives.

A simplified approach to the thyratron motor control is shown in Fig. 76, which shows several tube rectifiers. The armature of the direct-current motor receives its current through thyratron tubes 1 and 2; later we explain how these tubes are grid-controlled to vary the armature voltage and thereby vary the motor speed. The motor field receives its direct current from tubes 3 and 4; since these tubes have no grids, this simplified control cannot change the motor field current; therefore the motor operates with constant field. The attendant or robot, watching the meters in Fig. 76, represents the "electronic control unit" or "brain-center" of the system, described later.

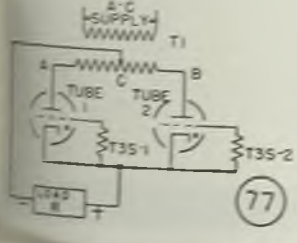
Fig. 77—Circuit for varying direct current output voltage of a rectifier, by phase-shifting of vapor-filled tubes

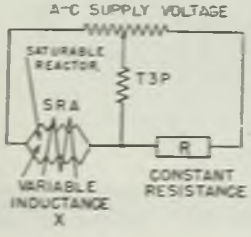
Fig. 78—A saturable reactor used for phase-shifting a transformer voltage

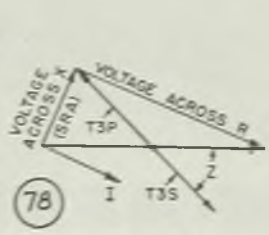
Fig. 79—Arrangement and symbol of a saturable reactor

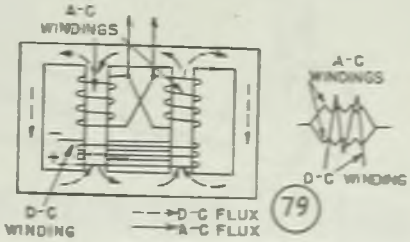
Armature-Voltage Control by Thyratrons

To see how we change the motor armature voltage by means of tubes, let us show tubes 1 and 2 again in Fig. 77. Here we can vary the amount of direct current voltage across load R (similar to a motor armature) if we shift the phase of the alternating-current grid voltage of the tubes. When two tubes are combined in this way to act as a controlled rectifier, each tube has its own separate grid circuit, so each tube operates individually. Tube 1 is being controlled through T3S-1 in its grid circuit, while tube 2 is similarly controlled through T3S-2. Both T3S-1 and









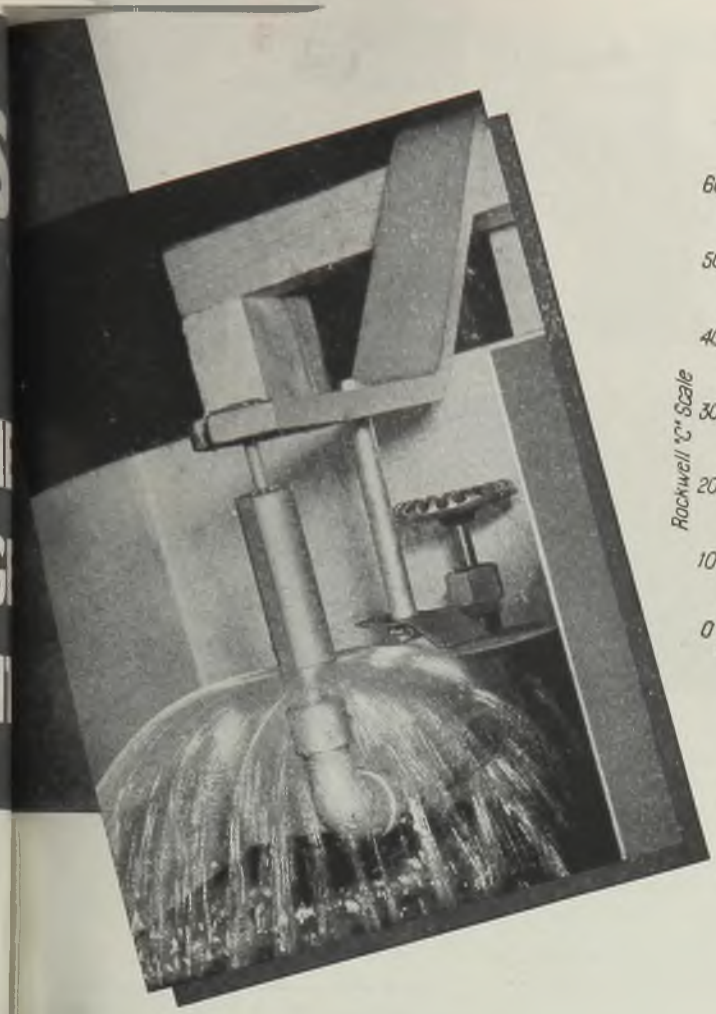
THESE TESTS PROVIDE . . TUBING OF THE HARDNESS RANGE YOU WANT

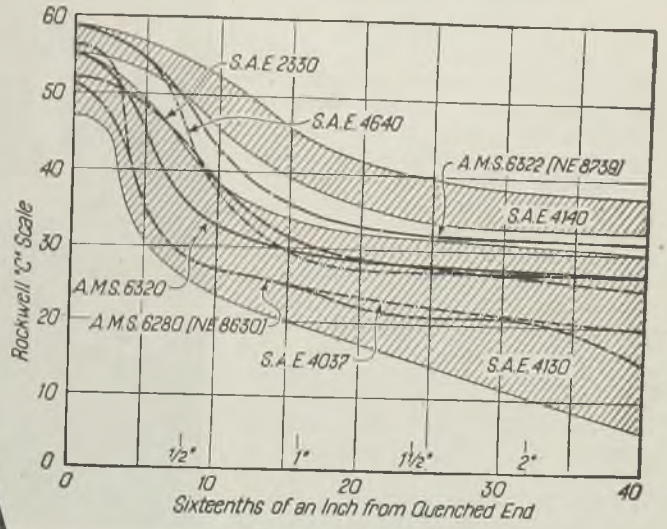
. . . TUBING STEEL OF

The Brinell hardness test shown in the picture at the upper left is only one of several steps taken at Babcock & Wilcox tube mills to give you effective technical control of physical properties in the tubing you use.

This test and others, plus a background of engineering and metallurgical experience that is unusually thorough, enables B&W to meet your tubing needs with a product made to specified hardness ranges—with control of structure for maximum machinability.

B & W MAKES BOTH





PROVED HARDENABILITY

By means of the Jominy End-Quench test, illustrated above, B&W can furnish tubing that exactly meets predetermined hardenability requirements and with grain size control of the steel as desired. These production controls are a distinct advantage when mechanical parts made from alloy steel tubing require heat-treating after machining. It is your assurance that the exact physical properties desired in the finished parts will always be obtained—another reason why it pays to specify B&W tubing for your mechanical requirements.

B&W TUBES

SEAMLESS
Complete range of carbon and alloy steels
Sizes: ½ in. to 8¹₂ in. O.D.

ELECTRIC-RESISTANCE WELDED
Carbon grades
Sizes: ¾ in. to 4 in. O.D.

THE BABCOCK & WILCOX TUBE COMPANY

SEAMLESS TUBE DIVISION
BEAVER FALLS, PA.

WELDED TUBE DIVISION
ALLIANCE, OHIO

TA-1293T

T3S-2 are secondaries of one transformer whose primary T3P we see connected in the phase-shifting circuit of Fig. 78.

Phase-shift of Thyratrons by a Saturable Reactor

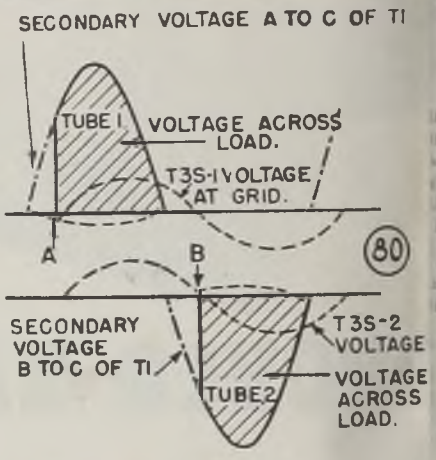
In such a circuit (Fig 78), we vary the phase angle between T3P and the alternating supply voltage merely by changing the amount of inductance X. As used in the thyratron motor control system, this inductance is a saturable reactor, which looks like a small transformer, but has two separate windings as sketched in Fig. 79. When no current flows in the direct current winding, the reactor has large inductance. However, when even a few milliamperes direct current flows through the many turns of this direct current winding, the iron core becomes saturated and loses its inductive effect (like withdrawing the plunger of a solenoid decreases the effect of the plunger iron, so that the solenoid inductance decreases). Briefly, we gradually decrease the inductance of this saturable reactor when we gradually increase the amount of current in the direct current winding.

Let us start with the condition in which the saturable reactor SRA has a small amount of inductance (corresponding to fairly large current in the direct current winding). As shown in Fig. 78, this causes the voltage of the T3S windings to lag a small amount (angle Z) behind the voltage which is applied to the anodes of tubes 1 and 2. The resulting conditions are shown in Fig. 80, the upper portion of which applies to tube 1. Here tube 1 passes current at point A and for the rest of that half cycle; the shaded area indicates the voltage applied through tube 1 to the load R. During the next half cycle we see that the alternating current supply voltage has reversed (as shown in the lower portion of Fig. 80), and now has the correct polarity to force current through tube 2. The grid voltage curve of T3S-2 permits tube 2 to fire at point B, and anode current flows in tube 2 for the rest of that half cycle; voltage appears across the load R as indicated by the shaded area.

Since tubes 1 and 2 are combined (in the rectifier circuit of Fig. 77), so that they pass current in the same direction through the load, the curves of Fig. 80 may be combined as in Fig. 81, which shows the wave shape of the voltage applied to load R. Notice that this voltage fluctuates rapidly—whenever voltage is present, it varies according to parts of a sine-wave pattern. Of course, the pointer of an ordinary direct current voltmeter cannot follow these rapid fluctuations, but gives a reading equal to G which is the average value of this fluctuating voltage.

Thyratron motor control system on this grinder provides a speed range of 160 to 2300 revolutions per minute. Control station providing "start-stop" and speed control is shown adjacent to the operator's left hand. Headstock motor is rated at 1 horsepower

Fig. 80—Alternating voltages applied to thyratrons of Fig. 77



Reduced Armature Voltage and Speed

If we now increase the inductance of SRA (by decreasing the amount of current in its direct current winding) we shift T3S and the phase of the grid voltage so that it lags farther behind the alternating current supply voltage. This phase shift appears at the grids of both tube 1 and tube 2 in Fig 77, and the resulting combined voltage wave is shown in Fig. 82. Notice that each tube is prevented from firing until point C, later in its individual half cycle. The wave of voltage applied to load R still follows the same sine wave as before, but appears during a smaller portion of each half cycle. A direct current voltmeter reads the average value of this new voltage condition, which is the value H. Voltage H is a smaller amount of average voltage than G in Fig. 81, so it is obvious that we have accomplished a decrease in load voltage as a result of a change of inductance of SRA.

Let's get this point straight. By phase-shifting or controlling the thyratrons in

Fig. 81—Large voltage output of thyratron rectifier

Fig. 82—Small voltage output of thyratron rectifier