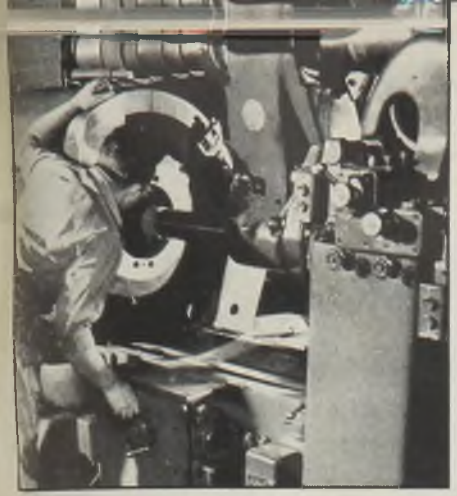

Electronic timer, installed on Bryant grinding machine, stops operation at predetermined moment. Page 100

STEEL

The Magazine of Metalworking and Metalproducing

APRIL 10, 1944

Volume 114—Number 15

NEWS

TECHNICAL

FEATURES

MARKETS

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THE INTERNATIONAL NICKEL COMPANY, INC., 67 Wall St., New York 5, N. Y.

STEEL
April 10, 1944

Taxes and War Bonds Free!

In connection with the attempt of CIO and AFL to break the Little Steel wage formula, N. Arnold Tolles, chief of the Working Conditions and Industrial Relations Branch of the Bureau of Labor Statistics of the Department of Labor, has released some highly significant figures on the "spendable" income of industrial wage earners.

Computations made by Mr. Tolles indicate that "war conditions have not forced a lowering of living standards for average industrial workers. From January, 1941, base month of the Little Steel formula, to October, 1943, the average gross weekly earnings of all factory workers increased 68.4 per cent. After allowing for payroll deductions for taxes and bond purchases, the increase was 44.8 per cent for a worker supporting a wife and two children and 24.2 per cent for a worker without dependents."

In short, summarizes Mr. Tolles, "the average worker with wife and two children had a weekly increase in spendable income of $5.65." The corresponding increase for the average steelworker with wife and two children is $2.64 per week. Note carefully that these weekly increases of $5.65 for the average of all industrial workers and of $2.64 for the average of steelworkers—with wife and two dependents in each case—are increases in spendable income. Spendable income is that portion of the worker's compensation which remains after deductions for income taxes, social security taxes and war bond purchases and after allowing for the increase in the cost of living.

These figures are astounding. If they are correct (coming from the Department of Labor which is committed to the welfare of employes, we have no reason to doubt them), they go a long way toward explaining what is wrong with the internal economy of this nation in this war. They shout to the house tops that the administration is secretly waging a "soft" war for a favored class at the same time it is talking a "tough" war.

According to these figures, the payment of income taxes and social security taxes and the purchase of war bonds has involved no sacrifice for 14,000,000 employes. In fact, the economic system has been thimble-rigged to give the average industrial worker increased income from which he pays taxes, buys bonds and absorbs the increased cost of living and yet has a surplus at the end of each week.

How many citizens, other than industrial wage earners, can pay taxes and buy war bonds without sacrifice?

MANPOWER CONFUSION: Reports from industrial centers and from key industries indicate that if the Selective Service carries out its plan to induct all but a few of the young men from 18 through 25 years of age the result will be a noticeable drop in war production.

In trying to make sense out of the confused manpower situation it is well to realize that until the long-heralded invasion has occurred and its success assured, most agencies in Washington will not challenge too strenuously the demands of Army and Navy officials. If in the present instance these officials feel that fighting men are more essential than production, no other agency is in a strong position to argue with them.

However, there are other angles which are debatable. One is the relative importance of various occupations. Another is the proper utilization of

(OVER)

4-Fs. Still another is the conflict between those who claim the manpower situation is growing more acute and those who think it is easing.

Behind this confusion is the fact that two years ago when public opinion strongly favored a national job allocation bill the administration opposed it. A few months ago, the President reversed himself on this point, but by that time the public thought the time for a national service act had passed.

—pp. 65, 68

* * *

"BRAVE" NEW WORLDS: With comment that is partly facetious and partly serious, the conductor of "Mirrors of Motordom" scans the wonders of the postwar period as envisioned by several authorities. Chemical research engineers see abundance from the byproducts of ordinary vegetables. Enthusiasts for certain synthetic rubber processes foresee a bright future in this field. A labor union leader sees great opportunity in a plan of co-operative enterprise.

These dreams of "brave" new worlds are based upon scientific developments in part accomplished or upon social trends already in evidence. If they are too utopian, it is because the authors have oversimplified the process of converting promising ideas into postwar commercial realities.

We are not worrying about the scientific and technical contributions to the peacetime era; they will be abundant and great. We worry about our ability as individuals to organize governments which will permit the utilization of scientific and engineering progress for the benefit of all. —p. 81

* * *

BARELY GOT FEET WET: Mechanical engineers attending the spring meeting of A.S.M.E. at Birmingham were told by President Robert M. Gates that the war presents extraordinary challenges and the reconstruction offers great opportunities.

He warned that the next 12 months will be the critical period of the war and added that "so far we have hardly got our feet wet in the blood, sweat, tears and debts that victory will require." Pointing to the acceleration in engineering progress, he said that developments in some lines which ordinarily might have required 20 to 30 years for completion have been "telescoped into three."

This speed-up in accumulated engineering knowledge is vital. There still is time for new applications of engineering to play a part in hastening the war's end. There may be need to get our feet really wet before engineering can turn to the job of reconstruction. —p. 71

HORSEPOWER AFLIGHT: Production of aircraft engines now is exceeding 35,000,000 horsepower monthly. In the three years of 1941, 1942 and 1943 American engine builders shipped 414,032 aircraft engines rated at 562,851,000 horsepower.

It is difficult to grasp the full significance of this achievement. In the late twenties the editor of "Power" estimated that the prime-mover capacity actually installed in the United States totaled about 700,000,000 horsepower. More than 90 per cent of this total represented engines in trucks and automobiles, agricultural equipment and on steam and electric railroads. If the estimate for the late twenties was fairly accurate, then it would be reasonable to assume that the total installed prime-mover capacity in the United States at the beginning of 1941 was at least a billion horsepower.

Just think of it! American industry in three years has put into the air horsepower equal to one-half of all the prime-mover capacity on the ground.

—p. 86

* * *

NET DRAWS TIGHTER: J. A. Horton, STEEL's British correspondent, reports that the blockade of Germany by the Allied Nations is beginning to pinch the enemy severely. Hitler is finding it more difficult to obtain supplies from outside —even from neutrals, whether friendly to the axis or otherwise.

Switzerland is issuing fewer licenses for arms. Sweden is reducing her exports of high-grade iron ore and ball bearings. British influence is limiting the flow of chrome ore from Turkey and of tungsten from Spain and Portugal.

The British Minister of Economic Warfare says that new strains on the enemy's economy are becoming apparent. Hitler's synthetic oil plants are lagging. Germany is suffering from shortages in ball bearings, rubber tires, radio equipment, clothing and consumer goods. Evidence from other sources indicates that the manganese shortage in Germany is acute and that the price of ferromanganese has advanced 100 per cent.

These straws point to a steady exhaustion of resources, the result of which will be a vital factor in the timing of the enemy's inevitable decision to accept defeat. —p. 92

E. L. Shaner

EDITOR-IN-CHIEF

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Help the Railroads Handle Growing War Traffic

American railroads are performing a herculean task in handling the country's swollen wartime traffic. In this time of huge jobs and of unusual accomplishments, theirs stand out as almost incredible.

Despite the shortages of manpower, equipment, and materials which beset all industry today, American railroads continue to handle the ever-growing load placed upon them.

Freight traffic in 1943 amounted to 725 billion ton-miles—14 per cent above 1942, and passenger traffic in 1943 increased to 85 billion passenger-miles—58 per cent more than in 1942. Facilities were stretched to what seemed their limit to meet the demands of 1942. Yet in 1943 the increased traffic was handled with less than one per cent more freight cars, and with practically the same number of passenger cars. Remarkable as their past performance is, American railroads will be called upon to excel it in 1944, handling even more men and materials as we go into the critical, invasion phase of the war.

Meeting these huge transportation demands requires the complete cooperation of all shippers—loading cars to capacity, holding car detention time to the minimum, and doing everything possible to boost operating efficiency and car utilization. By careful planning Inland Steel Co. has speeded up car loading and unloading, and has increased the average weight of outgoing carload shipments 30% over prewar shipments. During the past two years Inland has thus saved literally thousands of valuable car-days.

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Production Gives Way to Draft

Interagency committee unable to agree on how many deferments will be granted to various industries. Output loss may be disproportionate to number of men inducted

Under Secretary of War Robert P. Patterson put the Army's support behind proposals to draft 4-Fs and overage men for essential war work before a House Military Affairs subcommittee. Above he is shown with Assistant Secretary of Navy Ralph Bard, left. NEA photo

SCRAMBLE for occupational deferments continued last week amidst protests from many war materiel producers that an indiscriminate draft policy would inevitably result in lowered production of vital war goods.

No clear policy on the extent to which Selective Service would be permitted to drain off irreplaceable workers had been formulated at week's end. The War Manpower Commission's Interagency Committee on Industrial Deferments became deadlocked in arguments over which industries were to be granted deferments and after a stormy session was adjourned to early this week.

During its recess the committee is studying the situation in certain supplying industries—such as the tool and die manufacturers (see page 68) and the Great Lakes shippers—who, because they are seldom prime contractors, have not had an opportunity to submit their cases to the various agencies concerned with manpower.

Strangely, while the newspapers' front pages bristled with stories of the manpower shortage and the topic was a favorite wherever industrialists or government officials met, the April labor market classification of the WMC showed that seven areas formerly classified in group 1—acute labor shortage—had been shifted to group II—one step down. Only one addition was made to the group 1 classification.

Meanwhile, various movements looking toward limited labor service legislation, or administrative orders to accomplish the same objective, were receiving considerable support. These contemplate the drafting of physically deferred or overage men for limited military service or for essential labor battalions.

In the steel producing industry, the stricter draft policy was expected to have an adverse effect on production soon, with finished products suffering more than ingot production.

The iron and steel industry advisory committee in reporting to the War Production Board said the industry already has lost 180,000 men out of a total employment of 600,000, or approximately 30 per cent. By the employment of 50,000 women and the lengthening of working time — in some cases to 16 hours a day, seven days a week, the industry has been able to maintain operations at the 1943 rate. Continuance of this practice over an extended period will be impossible.

In spite of recruitment efforts, the industry has not been able to obtain replacements at a rate approaching separations, with the result that total employment has decreased by 42,000 during the past six months.

With the draft operating from the 18 through 37 age groups, the liability of losses from that source on a 100 per cent acceptability basis is as follows:

18 through 25— 5%, or 30,000
26 through 29—10%, or 60,000
30 through 37—20%, or 120,000

The advisory committee pointed out that the industry is not now producing the maximum possible output, due to an overall shortage of manpower.

The industry has been told by manpower officials that it can expect few deferments in the age group under 26. The same policy apparently will be followed if the new draft policy is extended to the higher age groups. What the probable effects of this will be is presented in the following surveys by STEEL's district editors.

Lake Shippers Face Critical Shortage

Only licensed officers to be deferred by Selective Service. Lack of semiskilled seamen most acute. Steel producers anticipate output drop

CLEVELAND

WITH the exception of 1200 licensed officers, no blanket deferment will be granted some 3200 Great Lakes seamen considered essential by vessel operators. A total of 12,605 men in all classifications are needed to man the vessels, of which 6800 are subject to the draft. Ten per cent of the latter are under 26 years of age.

A. H. Ferbert, president, Pittsburgh Steamship Co. and spokesman for the Lake Vessel Committee, representing 33 shipping companies, states "threatened loss of the 3200 men would have a crippling effect of taking nine essential seamen off each of the 367 vessels used in transporting iron ore, coal, grain and limestone."

With the opening of the iron ore shipping season, some vessel operators are unable to find enough men to operate their ships, while those who have skeleton crews have no assurance that they will be able to keep them.

Requests for deferment, recently made before the interagency committee at Washington, included some 1200 licensed

officers, 1800 skilled seamen and 200 unskilled deckhands. The critical shortage is expected to develop among the semiskilled seamen, classified as wheelsman, oilers, and firemen.

District steel plant officials see little prospect of maintaining present near capacity operations in the event of wholesale induction of key men in the 18 to 26 age group.

One large producer currently is losing some 24,000 tons of ingots monthly directly due to manpower shortage, and estimates that by July 1 this tonnage will total around 113,000 tons, or more than 10 per cent of capacity.

Women now doing work formerly done by men in this producer's plants represent more than 10 per cent of the total employment.

The overall 4 per cent of plant employes in the 18 to 26 age group doesn't give a true picture of the effect the drafting of these men will have on the operations of some departments. In the metallurgical, blast furnace, open hearth and blooming mill departments this percentage ranges anywhere from 6 to 30 per cent.

Youngstown Mills Short 6000-8000 Workers

YOUNGSTOWN, O.

Steel mills here have 6000 to 8000 fewer workers than were employed in 1941 but still are setting new production records as a result of longer working hours and greater efficiency. Some workers are on ten or eleven turns.

Detroit Output Expected To Drop

DETROIT

STEEL ingot production in the Detroit area, in the neighborhood of 40,000 tons weekly, may be affected noticeably within the next 60 days by inroads of Selective Service on an already tight manpower situation. Concurrently, there may be an even more serious effect on rolling mill schedules, since the immediate policy will be to attempt to transfer men into so-called producing departments—blast furnaces, electric furnaces, open hearths—from rolling mills, maintenance departments, etc.

Great Lakes Steel Corp., with total employment approximating 7000, already is about 12 per cent short in manpower required to operate all departments at peak. Several weeks ago a 10-inch mill was closed, releasing about 300 men, but only an estimated 10 per cent of these were retained, the others quitting for jobs in line with their special skills.

One striking fact is evident: While theoretically it is possible to close departments and transfer men to other divisions short of manpower—and the WMC is urging this—actually it does not work, because men cannot be handled like sheep and will naturally prefer to hold jobs where they can make use of their maximum skill and thereby insure maximum income.

A possibility in blast furnace departments is to "pull the wind" sufficiently to slow production 20-25 per cent, thereby easing the pressure on manpower required to handle the iron after it leaves the blast furnace.

Another suggestion to meet the situation is to reduce the working week to four days in some departments to handle the limited output of another department which may be short-handed. This immediately runs contrary to the 48-hour week directive which is in force in Detroit.

Finishing Units To Feel Pinch First

PITTSBURGH

STEEL producers expect the stricter draft deferment policy for steelworkers under 26 years of age will have an adverse effect on production, especially in finished products.

One company is reported to be losing 25,000 tons a month already due to the manpower shortage.

Another company paid for 58,000 mandays of overtime during March; of this overtime, 60 per cent represents 12 to 14-hour days and 30 per cent 14 to 16-hour days. The manager of this plant says it will be impossible to expect the men to work these long hours when the weather becomes warm. On many of the jobs where men now are working 14 to 16 hours, the company has been following the practice of supplying relief for men working only an 8-hour shift, and obviously a job which becomes a two-man job per 8 hour turn in hot weather cannot be done by one man for 14 or 16 hours.

In another plant the finishing units in many departments—such as the annealing and galvanizing department in a wire mill—are idle for lack of manpower. In many instances products requiring a considerable amount of finishing are being by-passed in favor of products which require fewer man-hours per ton.

As more and more men are drained off into the armed services women are called upon to fill new jobs in the nation's steel plants. One of the latest jobs for women at the Homestead works of Carnegie-Illinois Steel Corp. is that of "gang leader". Two of the leaders are shown in the foreground while the "gang," which handles brick masonry, is in the background

Eastern Producers Fairly Optimistic

NEW YORK

Despite the percentage of men that they may lose under the new draft ruling affecting those from 18 to 26 years, eastern steel producers believe they will be able to sustain production reasonably well, provided there are not too many further inductions in the other group classifications.

They estimate employes in this category run around 5 per cent, but assert that while a number are valued specialists, most are not irreplaceable. Rather they are more concerned about men 26 years and older, who have had more ex-

perience and training in the industry. And on this point they have been somewhat encouraged by the recent comment of Maj. Gen. Lewis B. Hershey, director of Selective Service, who said that the Selective Service "will apply somewhat less stringent requirements to those between 26 and 30. As the skill and age increases, the value to industry and agriculture increases. As the age increases, the value to the Army and Navy decreases."

Eastern producers assert that, if they are able to obtain widespread deferments for employes 26 years and older, they probably can, with such new men as they may break in from those not subject to military duty, including ex-servicemen, keep production at fairly sustained pace, despite the wholesale loss of employes under 26 years of age.

Cincinnati Operators Expect Lower Output

CINCINNATI

Within 30 to 60 days district steel producers will feel a serious pinch in manpower which, becoming progressively aggravated, will mean loss in output.

The point has been reached where every man is "essential", or "irreplaceable." Hours of present employes have been boosted to the practical limits.

In most cases, the forces are pretty well cleaned out of men in the 18 to 26-year-old group. Of those remaining, most are technical and research experts.

Alabama To Lose 20,320 Men to Armed Services

BIRMINGHAM, ALA.

With 20,320 men in Alabama to be withdrawn for military service during the next three months, this district is facing a more acute shortage of manpower which must be filled by women and 4-Fs, according to War Manpower Commission officials.

Steel producers are concerned especially over the shortage of coal miners. The mines need 4052 workers at once, while steel mills need 2089 and ordnance and accessories require 1226.

A Tennessee Coal, Iron & Railroad Co. official says no basic steel production has been lost yet, despite waning employment, but would not hazard any predictions for the future.

Buffalo Plants Anticipate Sharp Drop in Production

BUFFALO

Increased alarm is manifested by executives of Niagara Frontier steel mills as a present loss of 10 per cent in ingot production because of insufficient manpower is expected to jump to 20 or 25 per cent in the late spring or early summer when Selective Service inroads and

(*Please turn to Page* 174)

Chicago Mills May Lose 2500 More

CHICAGO

INADEQUATE manpower is a definite threat to steel production in the months ahead. At present, the indicated shortage is about 3000 men, but in spite of this ingot making has suffered comparatively little.

Chicago mills stand to lose approximately 2500 men to the Army and Navy, but since it is not known how rapidly they will be called, executives are unable to translate this into loss of production.

It seems unlikely that ingot output can be maintained with growing manpower deficiency, but the blow probably will fall hardest on finishing capacity where serious difficulty already is being experienced in maintaining full crews. Because production directives for some products are less than full capacity and call for running mills only part time, crews now are frequently shifted from one unit to another.

Repairs to equipment are being lengthened with insufficient men to make them. This applies particularly to open hearths, required time for this having jumped from 10 to 20 days or more.

Up to this time, shortages in manpower have been offset by extending working hours, moving from three 8-hour to two 12-hour shifts, and going from five to six and six to seven day weeks. But somewhere in this upper bracket, a limit is reached on human endurance and lowered efficiency brings diminishing returns.

Present, Past and Pending

■ TO RESUME WORK ON HALTED WAR PROJECTS

CANTON, O.—Word has been received here that Defense Plant Corp. will complete work on three Republic Steel Corp. projects in this area which were halted in January. It is understood work will go ahead on the nearly-completed gun billet forging plant, the electric furnace plant and the continuous furnace for the 18-inch mill at Massillon, O.

■ FIFTY IRON ORE CARRIERS ICE-BOUND IN UPPER LAKES

CLEVELAND—Northwest winds kept around 40 iron ore carriers ice-pocketed in the Straits of Mackinac toward the close of last week. Earlier in the week, nine vessels had entered the ice above the Soo but were reported ice-bound near Whitefish Bay.

■ WAR GOODS OUTPUT MUST RISE 20 PER CENT OVER 1943

NEW YORK—William L. Batt, vice chairman, War Production Board, told the Swedish Chamber of Commerce of the United States last week American production of war materials this year must be at least 20 per cent above that of 1943.

■ RUSSIA PLACES $12 MILLION STEEL MILL FACILITIES

YOUNGSTOWN, O.— United Engineering & Foundry Co. has received a $12,000,000 order for a blooming mill and structural and rail mill for Russia.

■ MARCH PLATE SHIPMENTS RISE TO NEW PEAK

WASHINGTON—Preliminary figures available at the War Production Board show that March plate shipments totaled 1,222,606, an all-time high record. Shipments in March of last year totaled 1,167,679 tons.

■ AIRCRAFT INDUSTRY REPORTS RECORD PRODUCTION

WASHINGTON—Aircraft production rose to 9118 planes in March, a new all-time high, with an airframe weight estimated at 103,400,000 pounds, an increase of more than 9 per cent over the February weight.

■ COLOMBIA SEEN POSTWAR MARKET

SCHENECTADY, N. Y.—Purchases of consumer-durable goods by Colombia, one of the important postwar markets in South America for machinery made in the United States, will be limited, says Ralph Johnson, general sales manager, International General Electric Co. in Colombia.

■ MANGANESE, CHROME ORE PRICE CONTROL MODIFIED

WASHINGTON—Transactions involving 500 pounds or less of metallurgical manganese or chrome ores have been exempted from price control, effective April 15.

■ NEW GROUP TO ADVISE OPA ON CASTINGS PRICES

WASHINGTON—Standing subcommittee on costs, as an adjunct to the Steel Castings Industry Advisory Committee, has been appointed to advise OPA on a proposed cost study of industrial castings.

Tool, Die Leader Charges McNutt Failed in Task

Costello draft deferment committee hears plea for removal of manpower commissioner. Industry members warn indiscriminate drafting will imperil production of vitally needed equipment

M. W. ROWELL
General Manager, National Tool and Die Manufacturers' Association

WAR Manpower Commissioner Paul McNutt has failed dismally in his attempt to solve vital manpower problems and should be relieved of his assignment, M. W. Rowell, general manager of the National Tool and Die Manufacturers Association, told the Costello Draft Deferment Subcommittee of the House Military Affairs Committee which is conducting a study as to the type of legislation required to bring about necessary wartime control of labor.

He commented on the testimony of various witnesses who have appeared before the subcommittee.

"The opinions and the facts presented by all of the witnesses, with the exception of Mr. McNutt," he said, "are to the effect that the manpower situation is now extremely acute and has been critical for a long time in the past. We most certainly concur in the views of those witnesses and most strenuously refute the views presented by Mr. McNutt who, among other things, indicated that he and his organization had solved the problems thus far, that the manpower situation is not now critical but is, in fact, in reasonably good order.

"I listened to the testimony of Mr. McNutt and to the answers which he made to inquiries by members of this subcommittee. I can sum up my reaction briefly, generally, and emphatically by repeating the remark I made immediately following that hearing when I stated that I could fully understand merely from listening to his testimony why the manpower situation is in its present state of confusion and why the manpower problems have not long since been solved. It is my measured opinion that the indefinite and confused operations under the direction of Mr. McNutt have done far more harm than good."

Mr. Rowell complained that no list of critical industries includes the tool and die-making industry, despite the fact that nothing—for peace or war—can be produced in mass production without "tools, dies, gages, jigs and fixtures." Because of this fact, local draft boards do not hesitate to induct draft-age tool and die makers despite the fact there are no available replacements for these highly skilled workers. He estimated that if tool and die makers continue to be inducted at the present rate war production soon will drop as much as 30 per cent.

L. V. Whistler, S. B. Whistler Co., Buffalo, produced letters from a number of his important customers in which the latter expressed fears of their inability to obtain tools and dies in ample quantities.

L. A. SOMMER
President, National Tool and Die Manufacturer' [illegible]

His testimony definitely indicated that if the recent executive order calling for induction of hitherto deferred men under 26 is carried out, it will result in curtailments of as much as 40 to 50 per cent in production at certain airplane, landing ship and radar plants.

"It takes years to train a tool and die maker," said Mr. Whistler. "Men with this aptitude are scarce. Out of every 50 young men we hire we get one good tool and die maker."

"Some 20 to 30 per cent of our tool and die makers are under 26 years of age," said Herbert F. Jahn, president, B. Jahn Mfg. Co., New Britain, Conn. "We were not able to train many young men during the 1929-37 depression period. We were able to increase our force by 26 per cent in 1942 over 1941 but, due to inductions, we have lost all of this increase and now stand to lose more men. We thus are faced with the threat of being unable to keep important war producers like Cuno Engineering Corp. and Fafnir Ball Bearing Co. going."

Frank W. Denning, president, Denning Mfg. Co., Cleveland, said he was confused and discouraged as a result of being pushed around to the extent that he does not now know "what my patriotic duty and responsibility is."

C. W. Neuman, president, Argus Tool Co., Hartford, Conn., produced a letter in which Hamilton Standard Propeller Co. complained of inability to obtain tools and dies in sufficient quantities and in ample time. Mr. Neuman declared that he has lost 19 tool and die makers already to the armed forces, now has 23 left, and of these five men between the ages of 24 and 26, every one a skilled and irreplaceable mechanic, are awaiting induction within the next few weeks.

Others who testified in like vein included R. F. Moore, Moore Special Tool Co., Bridgeport, Conn., R. A. Weiland,

Weiland Tool & Die Co., Chicago; John Barth, Barth Stamping & Machine Works, Cleveland; Casimer Janiszewski, Milwaukee; and L. A. Sommer, president, Sommer & Adams Co., Cleveland, and president, National Tool and Die Manufacturers Association.

"Our big trouble," said Mr. Sommer, "is that we have no prime contracts and hence Donald Nelson and others do not know much about us. They have not heard about us because up to this time we have met requirements of the war contractors. But if more of our men are drained off they will hear a lot about us."

Mr. Rowell reported the situation is rapidly becoming acute because demand for tools and dies is increasing. Not only are they being worn out rapidly because of high production rates, but redesigned weapons and other tools of war call for new tools and dies for delivery "yesterday." Demand for tools and dies now is at a higher level than at any time since the war started.

Mr. Rowell told the subcommittee that his group recommends the plan recently outlined before the Senate Military Affairs Committee by Col. Francis V. Keesling of the Selective Service. Not all of the men under 26 would be withdrawn immediately, said Colonel Keesling; provision has been made which would permit the local boards to consider for deferment those men in whose cases the state director of Selective Service submitted recommendations that "they could not be replaced at least for the present by 4-Fs or others without great detriment to the essential production side of the war program." It was most important, he said, for state directors to be furnished with the best possible information as to the dispensability or indispensability of the individuals concerned.

Because the chairman of the War Manpower Commission has not solved this phase of the manpower problem, Mr. Rowell recommended to the subcommittee, the new Interagency Committee should take over the other functions of the War Manpower Commission.

Government Agencies Seeking To Move Large Excess Steel Stocks

More than quarter of a million tons now listed with regional offices of WPB. Warehouses co-operating with Aircraft Scheduling Unit in disposing of aircraft surplus under sponsorship of newly created committee of eight

ALTHOUGH there are many steel products still in short supply and on which delivery promises are considerably extended, idle and excess stocks of steel of all kinds and descriptions continue to accumulate.

Last week, the War Production Board announced that more than one quarter of a million tons of such idle steel now are listed with its regional offices for redisposal in industry.

These stocks are in addition to the thousands of tons of surplus aircraft steel which have been accumulating in the hands of contractors and subcontractors.

WPB points out that idle and excess steel may be purchased without being charged to allotment totals, with WPB regional office approval.

ASU Plan a Model

With respect to the surplus aircraft steel, the Aircraft Scheduling Unit at Wright Field, Dayton, O., which is responsible for the redistribution of such material, some time ago selected a number of steel warehouses to handle earmarked stocks. This expedient has worked out so well the ASU recently asked representatives of these earmarked warehouses to a meeting at Dayton to obtain their suggestions about practical methods for redistributing these surplus stocks. It was made clear, at this meeting, that the Army and Navy did not wish redistribution to penalize either the distributors of earmarked steels or warehouse distributors in general, and they asked the warehouse men to go into "partnership" with them in developing a program.

At this meeting various phases of the problem were discussed and a committee of eight was appointed to carry out the program. Members of this committee are: Chairman, Walter S. Doxsey, president, American Steel Warehouse Association; Lester Brion, Peter A. Frasse & Co., New York; A. Oram Fulton, Wheelock, Lovejoy & Co., Cambridge, Mass.; A. Y. Sawyer, Joseph T. Ryerson & Son, Chicago; George L. Stewart, Edgar T. Ward's Sons Co., Pittsburgh; George L. Tillson, Edgcomb Steel Corp., Hillside, N. J.; Walter S. Tower, president, American Iron and Steel Institute; A. W. Lohn, Pacific Coast subcommittee chairman, Ducommun Metals & Supply Co., Los Angeles.

"With the idea of doing as much as possible as quickly as possible," states Mr. Doxsey, "the larger items will be selected from the larger inventories. If these cannot be utilized promptly by the holding contractors, it is proposed to move them into steel warehouses.

"These items may range from 10 to 20 to 50 tons. In some instances the steel is coated with paint or shellac and must be cleaned. Some lots may include bars or sheets or tubing that are bent, scratched or corroded. These will have to be sorted out. The analysis of alloy steels will have to be verified. In other words, the steel shipped to warehouses will have to be restored in every way to the standards required of new steel coming from a producer."

Most of this steel is government owned and it is planned that title remain with the government. No investments will be necessary on the part of the warehouses that handle this material. The Aircraft Scheduling Unit will supply accounting officers and inspectors.

Problem of redistribution of inactive and excess stocks of bolts, nuts, rivets, screws and screw machine products is being analyzed by A. Maxwell Jones, chief, Redistribution Unit of the Bolt, Nut, Screw and Screw Machine Products Section of the Building Materials division, WPB.

Objective is to find present uses in the war effort and permitted civilian production for any and all inactive or excess stocks. Certain channels of redistribution are now operative and are available to producers of these products, as well as all consumers and distributors, all within the permissions and restrictions set out in Priority Regulation No. 13.

CONVERTED: The tanker NEW ORLEANS has been converted into an escort aircraft carrier by a Bethlehem Steel Co. shipyard. The conversion job involved removal of the tanker's superstructure and the bulkheads in the tank spaces and installation of carrier equipment, including two platform elevators

OPA Defers Action on Steel Rise

Indications are announcement of advances will be delayed until ruling is made in the current steel wage case before Labor Board

War Labor Board panel members considering the demands of the United Steelworkers of America for a wage increase get an on-the-scene insight into the situation at the Jones & Laughlin Steel Corp. plant in Pittsburgh. Left to right: Stephen Levitsky, labor member; Harry Saxer, plant superintendent; N. P. Feinsinger and David L. Cole, public members. NEA photo

OFFICE of Price Administration, which intended to announce higher ceilings on some carbon steel products last week, has decided to defer such action for the present.

Current indications are that the higher prices may be delayed until after a decision has been reached in the steel wage case which is pending before the National War Labor Board.

OPA has taken the stand that an increase in some steel products at this time might have a bearing on the decision to be made in the wage case. They also realize that any concessions which might be granted to the union would further increase steelmaking costs and invalidate the cost study recently completed by OPA. If the raising of steel price ceilings is deferred until after the wage case is settled, the new prices will be established in accordance with costs then prevailing.

Meanwhile organized labor's campaign to smash the Little Steel wage formula is being pushed both by the Congress of Industrial Organizations and the American Federation of Labor—each working separately.

Both the CIO and the AFL are basing their arguments for the abandonment of the Little Steel formula on the contention that living costs have advanced more than wages. The AFL last week, before a WLB panel in Washington, termed the wage formula "an economic thumbscrew to torment the working people of America and their families." Both the CIO and the AFL contend that living costs have advanced at least 43 per cent, as against a Bureau of Labor Statistics figure of 23.4 per cent.

Refuting the unions' contention that the formula does not maintain a parity with increases in the cost of living, the Bureau of Labor Statistics last week released figures on the "spendable" earnings of industrial workers. "Spendable" earnings are income less deductions for income taxes, social security taxes, war bond purchases and make allowance for the increased cost of living.

The computations, made by N. Arnold Tolles, chief of the bureau's Working Conditions and Industrial Relations Branch, show that war conditions have not forced a lowering of living standards for average industrial workers, who account for almost 14,000,000 out of the 41,000,000 in nonagricultural civilian employment.

Average Earnings Increase 68.4%

From January, 1941, the base month of the Little Steel formula, to October, 1943, the average gross weekly earnings of all factory workers increased 68.4 per cent. After allowing for payroll deductions for taxes and bond purchases, the increase was 44.8 per cent for a worker supporting a wife and two children and 24.2 per cent for a worker without dependents.

In dollars and cents, the average worker with wife and two children had a weekly increase in spendable income of $5.65.

Average gross earnings of steelworkers increased by 57.4 per cent during the period. According to Mr. Tolles, the average steelworker with a wife and two children had a net gain of $2.64 per week in spendable earnings, after paying taxes, buying bonds, and allowing for the increased cost of living.

In the steel wage case before the WLB panel, the union's demands were heard, after which some members of the panel visited Pittsburgh steel mills.

On April 11, the 94 basic steel companies will present their affirmative argument before the panel.

Recent wildcat strikes in the steel industry have served to engender fear in some quarters that further production interruptions may be experienced before the steel wage hearing is completed. This fear exists despite the "no strike" pledge of the union. Even though the union, as such, gives assurances that the decision of the labor board will be accepted, whether it is favorable or unfavorable to the union's demands, the recent wildcat strikes in the industry tend to support the view many union members would be willing to take direct action regardless of the union's official policy.

When the industry presents its case, it is expected to argue that the question of granting the wage increase is not an issue for the WLB to decide inasmuch as a wage increase would directly break through the stabilization program. Abandonment of the stabilization program, they contend, is not within the power of the WLB.

However, it is considered possible that the WLB may grant some of the other demands of the union and thus stall off a showdown on the wage demand. These secondary demands are much less secondary than might be supposed and may be used as a vehicle to grant a hidden wage increase. They include:

1. Guaranteed minimum weekly wage, to be determined on by multiplying an employe's average hourly earnings by 40.
2. Severance pay. Four weeks' wages for employes with from one to three years' service, and eight weeks' pay for employes with more than three years' service.
3. Processing of any claimed rate inequity through regular grievance machinery.
4. Elimination of geographical wage differentials.
5. Dues checkoff.

(Please turn to Page 176)

A.S.M.E. Warned Next 12 Months To Be Most Critical War Period

Group's president, speaking at spring meeting, foresees tremendous demand for engineers in postwar period to rebuild wartorn world. . . Technical developments requiring 20-30 years telescoped into 3 years

ROBERT M. GATES

THE NEXT twelve months will be the critical period of the war and so far "we have hardly got our feet wet in the blood, sweat, tears and debts that victory will require." This warning was given members of the American Society of Mechanical Engineers at the association's spring meeting in Hotel Tutwiler, Birmingham, Ala., April 3 to 5, by R. M. Gates, New York, president of the society.

He added that the big push in Europe and the Orient "will be no parade for us to watch and cheer from distant sidelines."

Praising the part of engineers in war production, he said "even more will the peace be a peace of engineers." After the war more engineers will be needed than ever before, both in the United States and the world over, he predicted.

"In postwar America, in the postwar world, they will have opportunities and responsibilities beyond any they had in the prewar years. The reconstruction of a wartorn world involves not only the restoration of the means of self-support in ravaged countries but also the development of industrial resources in many nonindustrial countries. It involves in America the reorganization of production to provide full employment and to reach markets large enough to maintain a high level of production and employment.

"This war is more than an interlude between periods of peacetime economic activity and engineering progress. We are right now in a period of intense inventive effort and accelerated scientific and engineering developments. The urgency of war has speeded up the clock. In some lines, the probable developments of 20 or 30 years have been telescoped into three. If this war is over by 1945, we shall not start ahead from where we left off in 1940, when we entered our defense program; we shall start ahead from 1945.

"There will not only be a tremendous accumulation of needs for engineers to meet, but also an extraordinary accumulation of new engineering knowledge."

Maj. Gen. G. M. Barnes, chief, technical division, Office of the Chief of Ordnance, explained how the value of research and development work carried out by the Ordnance Department before the war started has been proved by present-day excellence of American weapons.

While funds prior to the beginning of the defense program were limited, a nucleus of experienced ordnance officers, engineers and key personnel, long-established proving grounds and manufacturing arsenals contributed to the development of new weapons.

"As soon as the war started in Europe, by the German invasion of Poland," said General Barnes, "the department redoubled its efforts to accelerate the development of critical weapons and to complete detailed drawings and specifications.

"Fortunately Congress appropriated a large sum of money for munitions and in September, 1940, $1,250 million became available for the purchase of ordnance weapons. It is a matter of record that within two weeks the department was able to spread its orders over the whole country and to tell industry what was wanted through the medium of detailed drawings and specifications for each item of ordnance, together with the quantities required.

Develop New Weapons

The next step was to teach manufacturers of commercial goods how to meet the rigid requirements of the armed services and to get into quantity production.

Second phase of the armament program was the problem of developing new weapons to fill gaps in the equipment required by United States armies and those of the United Nations. An intensive study of enemy weapons was undertaken to establish a basis of comparison. All types of enemy weapons were obtained and returned to proving grounds in this country in the quickest possible manner.

A third phase in the program consisted of developing new weapons for special needs and to cope with special situations. "In this war," said General Barnes, "ordnance must function equally well at the Arctic circle or in the dank jungles of New Guinea. Special weapons help in unusual tactical situations found in amphibious and mountain warfare or in the establishment of a beach head by an invading force. There are many new and outstanding ordnance weapons which have been used effectively in various theatres." A number of these were described by the general and comparisons drawn with those used by the enemy.

Otto de Lorenzi, director of education, Combustion Engineering Co., New York, described the use of "speed up" motion pictures in color for visual study of stoker fuel beds. Because the action in the fuel bed is slow, long periods of observation were required and it often was difficult to remember the various steps. By recording the action on film and then speeding up the motion pictures it is possible to view a long period of action within a few minutes.

How life of cutting tools is lengthened up to 50 times by a new method of chromium plating and soaking in hot oil was described by Axel Lundbye, chief engineer, Crowell-Collier Publishing Co., Springfield, O. This process was described in STEEL, June 14, 1943, p. 100, and June 28, 1943, p. 84.

Cold treatment of metals, ranging from 80 to 130 degrees below zero, was described by G. B. Berlien, chief metallurgist, Lindberg Steel Treating Co., Chicago.

"Ratio and Multiple Fuel Controls in the Steel Industry" was the title of a paper presented by Herbert Ziebolz, vice president, Askania Regulator Co., Chicago. J. G. Morrison, metallurgist, Landis Machine Co., Waynesboro, Pa., presented a paper on "Nitriding of Hardened High Speed Steel Tools," and S. D. Moxley, chief engineer, American Cast Iron Pipe Co., Birmingham, contributed a paper on "Centrifugal Casting of Steel."

MEETINGS CALENDAR

Electrochemical Society Inc.: Spring convention at the Pfister hotel, Milwaukee, April 13-15.

American Zinc Institute Inc.: Twenty-sixth annual meeting, Jefferson hotel, St. Louis, April 17-18.

American Institute of Mining & Metallurgical Engineers: Twenty-seventh annual conference of the Open-Hearth Steel committee and Blast Furnace and Raw Materials committee, Iron and Steel Division, A.I.M.E., William Penn hotel, Pittsburgh, April 20-21.

National Electrical Manufacturers Association: Spring meeting, Palmer House, Chicago, April 24-27.

American Foundrymen's Association: Third war production foundry congress at Buffalo, April 25-28.

American Mining Congress: Coal mine war conference, Netherland Plaza hotel, Cincinnati, O., May 1-2.

Machine Tool Electrification Forum: Ninth annual meeting, William Penn hotel, Pittsburgh, May 1-2.

Association of Iron and Steel Engineers: Annual spring conference under the auspices of the rolling mill committee, William Penn hotel, Pittsburgh, May 8.

Senate Group Speeds Legislation

Prompt passage of termination law to be sought by committee without waiting to work out all of the broader aspects of the overall demobilization program

THE SENATE Special Committee on Postwar Economic Policy and Planning has decided to recommend speedy passage of a contract termination law without waiting to work out all of the broader aspects of an overall demobilization program.

It will ask the Senate Military Affairs Committee to bring out an amended version of the Murray-George bill (S. 1730) so as to create the Office of Director of Contract Settlement within the existing Office of War Mobilization. The original bill would have created an Office of Demobilization with extensive control over postwar plant and property disposal and other functions in addition to contract termination.

"The whole purpose," explained Sen. Walter F. George (Dem., Ga.), "is to center legislative action at this time on contract termination and adjustment. For that reason the recommendation to the Military Affairs Committee will be limited to that subject. Meantime, the overall organization and plant disposal features of the demobilization problem will be before the Military Affairs Committee for further hearings."

The decision was arrived at in a conference with John M. Hancock, chairman of the Joint Contracts Termination Board, and assistant to Bernard M. Baruch.

The Military Affairs Committee is expected to act on this decision immediately after Congress reconvenes, April 12.

Following the announcement by Senator George, Chairman James E. Murray (Dem., Mont.) of the Senate Military Affairs Subcommittee on War Contracts declared that improper planning of war production has resulted in a mishandling of manpower that is profoundly disturbing.

"Our recent investigations of the administration of cost-plus contracts have made this abundantly clear", he said. "In the same manner, improper planning for postwar adjustment would lead us toward an unemployment crisis of unprecedented proportions. The basic task before our Congress is to set up a top co-ordinating agency towards the two objectives of all-out prosecution of the war and full employment after the war."

Pointing out that there are important differences between the George-Murray bill and the Kilgore bill (S. 1823), Senator Murray pointed out that the sponsors of the two bills are agreed on the need for an agency to supplant the present Office of War Mobilization and handle both war mobilization and postwar adjustment. "One of the main purposes of the coming hearings (on S. 1730 and S. 1823) is to discuss in detail the precise powers and responsibilities of this new office."

To achieve better co-operation between the Senate and the House, said Senator Murray, a special subcommittee of the House Judiciary Committee headed by Rep. Francis E. Walter (Dem., Pa.) would participate with the Senate War Contracts Subcommittee in the hearings.

When Senator Murray on March 20 said his subcommittee expected within two weeks to submit final amendments to the Contract Termination Bill (S 1718), he reported, it was on the assumption that the Office of War Mobilization and the procurement agencies within that time would give their final recommendations to the subcommittee.

Postwar Price and Wage Controls Hold Attention at Senate Hearing

ONE of the most important factors still to be worked out in formulating contract termination and reconversion legislation is that of unemployment payments to workers laid off for possibly several months during the immediate postwar transition period to enable them to live, it was revealed at hearings last week before the Murray War Contracts subcommittee of the Senate Military Affairs Committee.

When John Fennelly, executive director, Committee for Economic Development, questioned the wisdom of federalizing unemployment compensation on the ground this now is a state matter and the federal government could not get into this field for several months or a year or two without being in it permanently, Sen. James E. Murray (Dem., Mont.) admitted as much and said in his opinion there are two possible solutions, one of bringing uniformity in the unemployment compensation systems of the various states, and the other a permanent broadening of the federal social security system at this time so as to go into the postwar period with it.

Another urgent problem which requires solution is whether hourly wages should be increased when industry goes back to a normal forty hours a week. This angle was particularly emphasized by Matthew Woll, chairman, American Federation of Labor Postwar Planning committee, who said it would be absolutely necessary to prevent a period of aroused human passions.

Fennelly estimated that in the first postwar decade federal expenses would come to at least eighteen billions annually if not more and that to carry this huge burden industry, and particularly small industry, must be enabled to prosper. He said the Committee for Economic Development has conducted an ex-

Sen. Walter F. George (Dem., Ga.), and Sen. James E. Murray (Dem., Mont.) listen to testimony on demobilization activities during a session of the Senate Military Affairs committee. NEA photo

tensive study as to tax incentives that must be provided to this end and promised to make recommendations to Congress within six weeks.

He said extension of price control is essential after the war for an indefinite period since he foresees more danger of inflation then than now because of removal of the patriotic impulse to obey rules and regulations. And if we have price control we also must have wage control, he declared. This is in contrast to Woll's contention that there should be price but not wage ceilings in the postwar period. Fennelly was very definite in recommending that war production be terminated at the earliest possible date and that disposition of government owned surpluses and property should be disposed of in an orderly way but as soon as possible.

There is a big demand for surplus equipment, he said, in Cuba from which he had just returned. Many industrialists, particularly in the sugar industry, wanted to know how soon they could buy jeeps, cranes, tractors and much other surplus government equipment.

He is disturbed by a provision in S. 1718, known as the contract terminaway of disposing of government-owned plants. These plants, if necessary, should be cut up, but wherever possible they should be turned over to private owners and put to work since we need them in providing a high level of employment.

Senator Taft (Rep., Ohio) told the subcommittee he believed Congress can write a good plant disposal bill now and enact it promptly and warned that if deliberations are not speeded up we will go into 1945 without such a badly needed law.

Senator George (Dem., Ga.) also warned of the necessity of speeding up action and said this committee had approved certain perfecting amendments of S. 1718, known as the contract termination bill.

WLB Reaffirms Increase For River Boatmen

War Labor Board has denied appeals by Carnegie-Illinois Steel Corp. and Jones & Laughlin Steel Corp., both of Pittsburgh, from an order directing a daily wage increase of 66 cents a day for river boatmen.

Jack & Heintz Reduces Work Week to 60 Hours

Jack & Heintz Co. Inc., Cleveland, will reduce its work week from 76 hours to 60 hours beginning May 1 due to the fact its production is in excess of scheduled quotas and the government cannot handle the over-production of the war products, William S. Jack, president of the company, stated last week.

POSTWAR PREVIEWS

CONTRACT TERMINATION— Senate postwar planning committee wants prompt enactment of overall legislation. See page 72.

WAGE, PRICE CONTROLS— Military Affairs subcommittee in Senate hears arguments of extension of controls after hostilities end. See page 72.

RECONVERSION— Industry should have sufficient funds to finance operations through the transition period, pay accrued taxes, and expand facilities, according to findings of study by Department of Commerce economists. See page 76.

"BRAVE NEW WORLD"— Predictions of fabulous developments to come evaluated by Detroit Editor Art Allen. See page 81.

MARKETS— Immediate need for 12,000,000 automobiles and production of 6,500,000 annually for several years predicted by T. M. Girdler, Republic Steel and Consolidated Vultee Aircraft chairman. See page 94.

GAS QUENCHING— Super-fast cooling zone is new feature of continuous bright annealing furnace which makes for simultaneous improvement of surface condition, physical properties and production rate of welded SAE X-4130 steel tubing. See page 98.

PRECISION FIXTURES— Evolution of tooling for airframe production is bringing to the forefront quick methods of assembling jigs with fittings of such radical simplicity that widespread use in similar fabrication appears inevitable. See page 102.

NORTHWEST IRON ORES— Composition of ores in the Pacific Northwest today is known and wild prognostications about integrated steel plants to be built in this region can be safely dismissed, according to one authority. See page 116.

Yards Deliver 152 Ships in March, up 18

Deliveries during first quarter of this year total 410 vessels compared with 379 in like period of 1943

WITH delivery of 152 ships totaling 1,538,357 deadweight tons during March, Maritime Commission shipyards have delivered 410 ships totaling 4,115,951 deadweight tons during the first quarter of 1944, the Commission announced last week. February deliveries totaled 134 ships.

The first quarter of 1943 saw delivery of 379 vessels totaling 3,757,405 deadweight tons.

Liberty ships continued to be the preponderant type, with 83 put into service in March, but the trend toward construction of military and other fast vessels was again evident, as a total of 51 of the fast types was delivered.

Four Victory ships, speedy type now coming into production, were delivered by the Oregon Shipbuilding Corp., Portland, Oreg. Nineteen standard tankers and 16 C-type vessels of the long-range program also were placed in service. In addition, 21 special type vessels were delivered to the armed services.

West Coast shipyards delivered 70 vessels, of 674,019 deadweight tons, which included the four Victory ships and 17 special types, or 43.8 per cent of the total deadweight tonnage for March. The East Coast produced 47 ships, of 533,241 deadweight tons, seven of them special types, which was 34.7 per cent of the total tonnage.

The Gulf Coast delivered 34 vessels of 330,097 deadweight tons, to reach 21.4 per cent of the total tonnage. The other 0.1 per cent was built by the Great Lakes, one ship of 1000 deadweight tons.

Weirton Steel Sets 11 Output Records in March

Eleven new major departmental records were set during March in plants of the Weirton Steel Co., Weirton, W. Va. The records set new highs for net tonnage produced in the blooming mill, galvanizing department, 48-inch hot mill, 48-inch mill No. 3 continuous pickler, 48-inch No. 5 tandem mill, 48-inch mill total 4-high cold rolling, total production of the 10-inch, 16-inch and 48-inch hot mills, total shipments of the 10-inch, 16-inch and 48-inch mills, Weirton tin mill skin rolling, electrolytic tin plate production, and lacquer plate production.

WINDOWS of WASHINGTON

Portable Pillbox

Masters of defensive warfare, the Germans have developed a new weapon which they are using with great effectiveness in the Italian campaign. It is a prefabricated, portable, steel pillbox. Turned upside down and mounted on two wheels, it is drawn by a tractor to its battle location. It is five feet wide and six feet high and, when set in position, only the 6-inch concrete dome and machine gun snout are visible—that is, visible within ten yards, because the pillbox is well camouflaged and the gun fires smokeless powder. A bellows cools the gun between blasts. A steel lid can be drawn over its port, in which case its eyes are a pair of periscopes jutting out of the top. It is manned by two men. One man can destroy it with "Molotov" cocktails after outflanking it, but the hills are so studded with these pillboxes there always is another one behind that just smashed.

Complaints Unjustified

Diligent and careful Rep. Luther A. Johnson (Dem., Tex.) went to considerable trouble to ascertain whether there was justification for recent complaints that large quantities of farm machinery were being shipped abroad when American farmers are unable to get all the machinery they require. He found that the War Production Board has allocated 1,799,573 tons of steel for the production of farm machinery for American farmers for the period July 1, 1944, to July 1, 1945. He found no steel yet has been allocated for farm machinery to be shipped abroad but that the War Production Board has set aside, for the same period, 30,000 tons of steel that may be used in making farm machinery for export to the armed forces, or for cash sale to foreign countries, or in response to demands of the United Nations Relief and Rehabilitation Administration. He pointed out, however, that this is only a tentative allocation, and that possibly none of this steel may be used in making farm machinery to be shipped out of the country.

Preparedness Planners

To prevent future repetitions of our past record of entering wars without being prepared, the House has organized a 23-man Special Committee on Postwar Military Policy. It will study and make recommendations to the House as to the size of our Army and Navy in the postwar period, as to what government-owned plants and war supplies should be preserved and earmarked for future military uses, as to stockpiling of critical materials for protection in future emergencies and as to all other factors having a bearing on our future ability to protect our national security, including future need for military air bases.

Chairman of the committee is Rep. Clifton A. Woodrum (Dem., Va.). Other members are Schuyler O. Bland (Dem., Va.), Patrick H. Drewry (Dem., Va.), Alfred L. Bulwinkle (Dem., N. C.), R. Ewing Thomason (Dem., Tex.), J. Buell Snyder (Dem., Pa.), Matthew J. Merritt (Dem., N. Y.), John M. Costello (Dem., Calif.), Harry R. Sheppard (Dem., Calif.), Warren G. Magnuson (Dem., Wash.), Lyndon B. Johnson (Dem., Tex.), Leo E. Allen (Rep., Ill.), D. Lane Powers (Rep., N. J.), James W. Mott (Rep., Ore.), Dewey Short (Rep., Mo.), Leslie C. Arends (Rep., Ill.), W. Sterling Cole (Rep., N. Y.), and William J. Miller (Rep., Conn.).

"LARGELY POLITICS"

The Baruch proposal that Congress draft a postwar tax law and "put it on the shelf" for immediate use at the war's termination has been rejected as "impracticable" by Chairman Robert L. Doughton (Dem., N. C.) of the House Ways and Means Committee. Doughton said he sympathized with those concerned about future tax burdens and that no Congress would want to impose such high rates on corporations as would kill the goose that lays the golden eggs. He also opposed continuing present taxes any longer than absolutely necessary.

"But this certainly is no time to be talking about a postwar tax bill," he said. "In the first place one Congress cannot bind another. If we passed a postwar tax bill now and put it on the shelf a succeeding Congress could disagree with it and our work would have gone for nothing. All this talk of legislation now to meet postwar problems doesn't mean a thing—it's largely politics."

Set Up Advisory Group

Due to the increasing demand of the War Labor Board for industrial executives to serve on tripartite panels to hear and pass on labor disputes and demands for increased pay rates, and the far-flung complexities and ramifications of many of these cases, the Chamber of Commerce of the United States and the National Association of Manufacturers have set up a special Joint Chamber—NAM Advisory Committee to the industry members of such panels.

Object is to provide staff assistance in Washington not only to industry members of the War Labor Board and its panels, but also to industrial executives whose companies have cases pending before the board. Co-chairmen are: F. C. Crawford for the NAM, and Otto A. Seyferth for the chamber. Co-secretaries are: Thomas W. Howard for the chamber and R. S. Smethurst for the NAM.

Would Extend Protection

H. R. 4491, introduced by Rep. B. Carroll Reece (Rep., Tenn.), would protect the Beryllium Corp. of America against non-exclusive, royalty-free licenses permitting other companies to make use of patents under which the Beryllium corporation now operates. The corporation some ten years ago obtained United States rights to processes patented here by two German firms, Siemens & Halske and the Heraeus-Vacuumschmelze. This contract, which contained an extension clause, expired on March 28. The bill is aimed at staying the hand of the Alien Property Custodian in this case.

Asks Fluorspar Increase

The Kentucky general assembly has memorialized Congress that it, "at the earliest possible date, take such action as may be necessary to increase by 10 per cent the ceiling price of fluorspar, and to take such additional action as may be necessary to authorize and require the approval of such increase, in order to insure a sufficient supply of fluorspar to meet war requirements."

Another Postwar Measure

S. 1823, introduced by Sen. Harley M. Kilgore (Dem., W. Va.), and referred to the Senate Military Affairs Committee, would extend the functions of the Office of War Mobilization.

"The proposed legislation," said Senator Kilgore, "is a minimum program for total mobilization and adjustment. It takes into account the recommendations set forth in the Baruch report and attempts to implement it with a specific legislative program susceptible to immediate adoption."

The bill is another of the measures now before Congress aimed at an orderly transition from war to peacetime production, guided by a single "unifying" government agency. It calls for establishment of a program and planning bureau under the Director of War Mobilization which will "serve as a clearing house for the postwar programing of the government agencies and hundreds of local public and private groups which have been set up in the past year." It covers various phases of the overall reconversion problem.

New Use for Tanks

A new use for tanks has been developed on the Italian front, according to Maj. George Artman, Piqua, O., Army Ground Forces observer who is back in this country. Commenting on the close co-operation between infantry and tanks which he observed during the Fifth Army's crossing of the Rapido river, he reports that tanks were brought up to clear the mine fields. "They went through setting off mines until it looked like the Fourth of July," he said, and the infantry followed right behind them.

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Expect Business To Have Adequate Funds for Transition, Expansion

Thirty-six billions may be required to restore prewar facilities, inventories of receivables and to liquidate increase in tax accruals since 1941. Prompt settlement of war contracts may leave industry with surplus funds

IF THE settlement of war contracts is handled with reasonable promptness, business as a whole will have the funds to finance the transition and a sizable margin for expansion beyond prewar levels of output, S. Morris Livingston and E. T. Weiler, National Economics Unit, Department of Commerce, conclude in a recent report.

After a study of statistical data, they estimate a maximum of $36 billion might be required to restore the prewar facilities, inventories of receivables of American business, and to liquidate the increase in tax accruals since 1941. Between $33 billion and $38 billion have been accumulated by business during 1942 and 1943, plus some $14 billion to $20 billion which will become available during the transition period, thus exceeding the potential reconversion outlays by at least $10 billion to $20 billion.

The two economists conclude that since their figures do not allow for the further accumulation of business funds from the close of 1943 until the end of the war, the surplus funds will not be less than $10 billion and might well be more than $20 billion.

Cash, Bonds Rise $35 Billion

Available data studied by them indicate that during 1942 and 1943 business enterprises, exclusive of banks and insurance companies, increased their holdings of cash and government bonds by somewhere around $35 billion. This figure is regarded as approximate but a range of between $33 billion and $38 billion is considered adequate. Only a portion of this total is in the form of business savings. The balance represents accrued taxes and the reduction of other assets.

During 1942 and 1943, corporate accumulation of cash and government bonds was in the neighborhood of $23 billion of which $15 billion represent the excess of undistributed profits, depreciation, depletion, and other business reserves over net corporate expenditures for construction, equipment and inventory. About $8 billion may be roughly accounted for by the increase in tax accruals in the two years. Net government receivables held by corporations increased by slightly more than $2 billion.

The two economists point out that not all of the $33 billion to $38 billion are available for the switchback to civilian goods production. A portion of these funds may have to be allocated to the retirement of wartime tax accruals and to the re-extension of consumer credit.

Since the transition period will extend over some length of time, a study of the funds which will be realized during that period was made by Mr. Livingston and Mr. Weiler. Current depreciation and other charges to business reserves are expected to provide $5 billion to $6 billion in the first year after the war. Net amount due business, after extinguishing prepayment liabilities for output already delivered to the government, was roughly $2 billion to $3 billion at the end of 1943. And lastly, claims arising from termination of contracts, as of Dec. 1, 1943, total another $7 billion to $11 billion. Magnitude of this last item will be determined largely by that part of the business inventories of war goods which cannot be converted to civilian use.

Thus, the economists estimate that the $33 billion to $38 billion in the hands of business, which was accumulated over the 1942-43 period, plus $5-$6 billion of provisions for depreciation, $2-$3 billion due from the government on output delivered before Jan. 1, 1944, and $7 billion to $11 billion of net claims on uncompleted contracts, will leave a total of between $47 billion and $58 billion in the hands of business for postwar use.

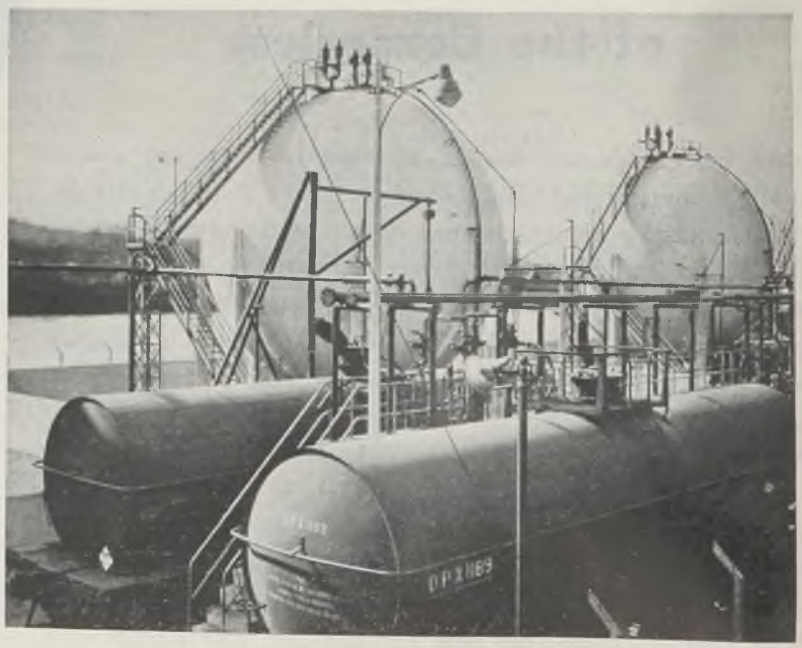
The economists earmark $8 billion of this total to cover business tax accruals during 1942 and 1943. They regard this as the maximum that will be charged, and the actual amount may be considerably less.

Speaking about reconversion, they say: "Only those prewar plants producing a markedly different product during the war are involved. The preponderance of prewar manufacturing facilities are being used to produce normal peacetime products or products so closely related to normal products that no significant reconversion of plant and equipment will be necessary at the end of the war.

"The out-of-pocket costs of reconversion are limited to: 1. Cost of purchasing new and rearranging old equipment; 2. payment of various overhead expenses during the period intervening between the cutback of war production and the receipt of cash civilian goods production; and, 3. payment of special marketing costs involved in rebuilding sales organizations."

Reconversion expenditures, Mr. Livingston and Mr. Weiler estimate, will not exceed $4 billion. About $8 billion will be spent to replenish civilian goods inventories, about $11 billion for equip-

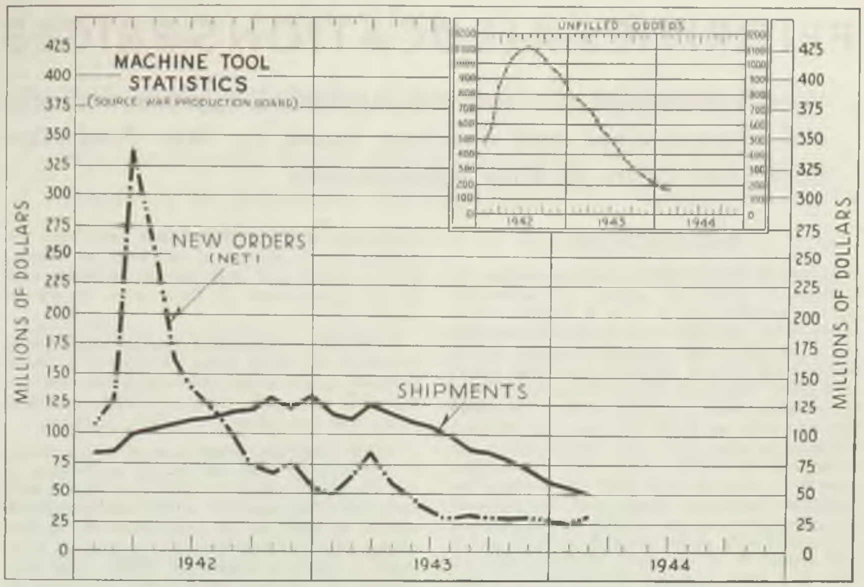
(*Please turn to Page* 176)



RUBBER FOR VICTORY: Butadiene, principal material used in making synthetic rubber, is produced now at a rate of over 100,000 tons a year, substantially over the rated capacity of 80,000 tons at the great plant at Institute, W. Va. It was built for DPC and is operated for Rubber Reserve Co. by Carbide & Chemicals Corp., a unit of Union Carbide & Carbon Corp., New York. In this photo butadiene is being loaded from spherical storage tanks to special tank cars for shipment

Production Of Tools Levels Out

Downtrend in new orders reversed. Cancellations also fewer. Open facilities being diverted to other war work steadily



LEVELING off of the downward trend in machine tool production appears to be developing around the $50 million monthly output mark.

Tool builders report new orders during February and March reversed the steady downward trend, with but two exceptions, recorded since March last year. Procurement for the Navy Air Corps has accounted for most of the tool purchases recently. Many units have recently been purchased by electrical equipment manufacturers and for the machining of propulsion machinery for the landing barge program.

New tool orders booked during February increased 12.5 per cent to $33,512,000, the War Production Board reports. This compares with a monthly peak in new orders of $338,348,000 recorded in March, 1942. Another significant development during February was the decline in order cancellations of 37 per cent to $2,057,000.

February machine tool shipments were valued at $50,150,000, compared with $56,349,000 in January and the peak of $131,960,000 recorded in December, 1942. Unfilled orders at the close of February totaled $162,667,000, or slightly over three months production at the February rate.

The industry is making real headway in utilizing open operating facilities for production of precision parts for numerous military equipment programs. Indicative of the trend in this direction is the statement of Wendell E. Whipp, president, Monarch Machine Tool Co., Sidney, O., to the effect the company's production for the past year not only included the manufacture of lathes but also work on two war contracts, one for geared elevating and training units for the Navy's 40MM twin Bofors gun, a second for the power take-off unit used on the Rolls-Royce Merlin aircraft engine. When output on these contracts reaches maximum, they will require about 50 per cent of the company's manpower and productive facilities and with continued ... keep the company's plant busy for at least the remainder of 1944.

Machine tool builders are experiencing increasing difficulty in maintaining efficient production schedules because of the growing number of key men lost to the armed services. Of particular importance from the machine tool customers' standpoint is the impending loss of highly skilled demonstrators, who have assisted materially in training operators for newly installed units.

The Machine Tools Labor Advisory Committee of WPB recently concluded a two-day meeting at which intensive consideration was given to improving war production and planning postwar adjustments. Their recommendations will be submitted to WPB shortly.

WPB recently delegated authority to OPA to require that dealers, agents, auctioneers, brokers and machinery manufacturers who sell second-hand machines, equipment and parts, file reports as to the available machinery they have on hand. The purpose of this delegation is to consolidate in one agency the right to require, on a mandatory basis, specific information regarding availability of these tools and equipment. By granting this authority to OPA, it becomes possible for both agencies to have access to both price and supply information.

Trend in machine tool output, new orders and order backlogs is presented in the accompanying table.

Machine Tool Statistics

Source: War Production Board
(000 omitted)

1944	Unfilled Orders	Net New Orders	Shipments
Feb.	$162,667	$32,455	$50,150
Jan.	181,548	26,456	56,349
1943			
Dec.	210,606	27,603	60,861
Nov.	246,509	31,726	71,811
Oct.	286,600	30,800	78,300
Sept.	338,119	31,759	85,842
Aug.	386,792	33,378	87,827
July	441,220	28,713	97,541
June	511,478	38,322	108,689
May	578,226	48,241	113,859
April	643,643	57,359	118,031
March	704,922	84,980	125,445
Feb.	893,247	63,865	114,593
Jan.	970,616	48,829	117,384
1942			
Dec.	1,069,672	56,083	131,960
Nov.	1,129,610	76,116	120,371
Oct.	1,168,768	66,474	130,008
Sept.	1,248,965	74,343	119,883
Aug.	1,315,254	96,979	117 342
July	1,374,735	121,156	113,596
June	1,389,363	139,397	111,090
May	1,386,435	166,945	107,297
April	1,367,281	254,274	103,364
March	1,392,803	338,348	98,358
Feb.	1,000,838	127,356	84,432
Jan.	728,708	107,500	83,547
1941			
Dec.	576,568	....	81,435
Nov.	629,926	....	81,320
Oct.	616,542	....	84,178
Sept.	617,677	....	74,906
Aug.	595,000	....	70,069
[illegible]	572,000	....	63,019
[illegible]	525,000	....	69,070

Plan Annual Machine Tool Electrification Forum

The ninth annual machine tool electrification forum, sponsored by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., will be held May 1-2 at the William Penn hotel, Pittsburgh. Requirements of electrical equipment for high speed milling will be explained by prominent machine tool engineers. A portion of the forum time will be turned over to the National Machine Tool Builders' Association for a session on postwar standards for electrical equipment on machine tools.

Steel Warehouse Meeting Set for Chicago May 9-10

American Steel Warehouse Association Inc. will hold its thirty-fifth annual meeting at the Drake hotel, Chicago, May 9 and 10, according to announcement by W. S. Doxsey, president.

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

CLASS B FACILITIES: Rules governing acquisition of preference ratings and allotments for the manufacture of class B facilities by a person who will make such facility for his own use when he is not regularly engaged in the manufacture of such facilities have been issued as follows: Applicant must file an application for priorities assistance with WPB in Washington, generally on WPB-541 (formerly PD-1A), although in some cases other specific forms are designated by WPB orders and regulations; must file a copy on form CMP-4A covering the controlled materials which will be required for manufacture of the facility, but information is required only under items 3, 4, 5, 6, and 7 and section B of the form. However, if such class B facilities are made in the normal course of the applicant's business, he must file form CMP-4B in order to obtain the materials required for its manufacture.

AUTOMOBILE JACKS: Lifting capacity of automobile jacks under order L-270 refers to lifting capacity which shall be measured by load raising ability through the entire jacking range from minimum to maximum height.

CONSTRUCTION: Erection of a portable or prefabricated building, when placed on a foundation constructed on the site or on skids in a spot where it is intended to remain for an undetermined time, is construction and as such is limited by the restrictions of order L-41. It is not construction when it is placed on what is intended to be a temporary site with the purpose of moving it from time to time and without affixing it to the land by plumbing, public utilities connection, or in any other way.

L ORDERS

ENAMELED WARE: Specified enameled pans now may be made in a wider variety of sizes than previously while production of other enameled articles may be resumed. Each manufacturer may make sauce pans in three sizes, within a 1 to 3-quart size range. The number of permitted sizes for sauce pots has been increased to three, between 3½ and 10 quarts. Dippers may be made in one size, to be chosen by the manufacturer. Bedpans and pus basins may be made in two sizes each while instrument trays may be made in four sizes. (L-30-b)

COAL STOKERS: Sales of class A coal stokers to fill orders for the Army and Navy and for approved installation in projects authorized by preference ratings regularly assigned to war housing and other construction projects may now be made without specific authorization from WPB. All other sales must be authorized on form WPB-1319, and applications for such authorization must be filed with the appropriate WPB field office. Approval on WPB-1319 also will constitute authority to begin construction, if the total cost (stoker plus installation) is not more than $5000. If total cost exceeds $5000, applicants should apply for authorization to purchase and install a class A stoker on regular construction application forms GA-1456 or WPB-2896. Appeals from provisions of the order should be filed on form WPB-1477 (formerly PD-500) with WPB field offices. Manufacturers' production and delivery reporting requirements have been eliminated. (L-75)

REFLECTORS: Restrictions have been removed on the use of metal in reflectors of fluorescent lighting fixtures and limitations have been removed on the weight of ferrous metals used in other parts of these fixtures. (L-78)

HAND TRUCKS: Restrictions have been removed on the use of ball bearings and other alloy steel products in swivel bearings and casters of two-wheel hand trucks, platform trucks and dollies. Restrictions have been removed also on the use of cast steel for wheels, and cast iron and steel for certain other uses in the manufacture of these items of equipment. (L-111)

CUTLERY: Nonnickel stainless steel now is permitted for such types of cutlery as were formerly made of this material within the restrictions as to the patterns which manufacturers now are allowed to make. (L-140-a)

TIRE CHAINS: Percentage of metals which a manufacturer may use in the production of tire chains for passenger autos has been raised from 16 to 24 per cent of the total weight of metals he used in the production of all tire chains sold by him during the base period from April 1, 1941, to March 31, 1942. This percentage is effective from April 1, 1944, to March 31, 1945. A producer of farm tractor tire chains may use in the year beginning April 1, 1944, the amount of metal for farm tractor tire chains sold either during the year ended March 31, 1941, or the year ended March 31, 1942, whichever is greater.

Plants in I and II labor shortage areas may not use a greater tonnage for tire chain production under this order than they used last year unless a specific authorization is obtained from WPB. (L-201)

PORTABLE TOOLS: Number of types of open-end, non-adjustable table wrenches, box wrenches, and socket wrenches permitted to be manufactured has been increased. There is no option on the use of carbon or alloy steel in the production of permitted types of wrenches in cases where alloy steel only is specified. In other cases, producers must not make the same type wrench in both carbon and alloy steel unless specifically permitted to do so by appendix A of the schedule. (L-216)

PENS AND PENCILS: Manufacture of metal ferrules for wood-cased lead pencils and metal inserts for pen holders again is permitted. Iron, steel, stainless steel and zinc, specifically prohibited for use in the production of lead pencils and pen holders since Dec. 7, 1942, have been deleted from the list of prohibited metals in order L-227-b. Use of copper and copper-base alloys is still prohibited. (L-227-b)

MOTOR CONTROL: [illegible] been lifted on the use o[illegible] pose and semi-dust tight enclosures for floor mounted electric motor control equipment. Specifications have been removed on bus-bars, connecting straps and terminals of electric controls. Restrictions have been removed on the use of aluminum for data plates on such equipment. (L-250)

STERILIZER EQUIPMENT: Copper and copper-base alloys now may be used without restriction in all types of sterilizer equipment, except nonpressure instrument sterilizers in which they may be used only in electrical circuits and drain-cocks, trays and tray-lifting devices. Copper-base alloy sheet may be used in nonpressure instrument sterilizers 20 inches in length by 10 inches in width by 9 inches in depth, or larger; and brass castings (containing not more than 74 per cent copper or 2 per cent tin) may be used in any part. (L-266)

WELDING EQUIPMENT: Exemptions to the restrictions which prohibit a manufacturer or dealer from accepting orders for or delivering resistance welding equipment on any but WPB form 1319 now permits deliveries of this type of equipment on CMPL-224 and GA-1456 as well as any of the F-19 series. (L-298)

SAFETY EQUIPMENT: All restrictions have been lifted on the gage of steel which may be used by manufacturers in producing enclosing cases, fronts and doors for safety switches, panel boards and service entrance equipment. (L-315)

INDEX OF ORDER REVISIONS

M ORDERS

COPPER: Copper and copper-base alloy now are available for parts in the manufacture of five essential items, where the use of practical substitutes could not be found. Copper-base alloy may be used in the manufacture of wafer thermostats for poultry incubators and brooders; copper and copper-base alloy are permitted for certain working parts in the manufacture of change-making and coin-handling machines and devices, when their production has been authorized under order L-54-c; yellow brass scrap is permitted in cast solder nipples and ferrules; copper for current carrying parts and for essential plating in the manufacture of a limited number of electric irons is permitted; brass in the manufacture of specific parts for safety razors and for straight razors where the use of substitute materials has proven impractical is also permitted, when such manufacture is authorized by WPB. (M-9-c)

IRON AND STEEL: Restrictions have been lifted on the use of steel in making the following articles: Awning frames and supports at the rate of 75 per cent of 1941 production, window and roller type shades for street cars and buses, stencils, cigarette lighters and commercial size mop wringers (but not for household size). Manufacture of steel laundry tags and badges, which otherwise would have been prohibited by revocation of order L-91, may be continued. Low-grade wire may be used in the manufacture of hat brims. (M-126)

PRIORITIES REGULATIONS

SPECIAL SALES: Numerous changes have been made in lists A and B which are attached to priorities regulation No. 13, which governs "special sales" of materials and products. (PR No. 13)

PRICE REGULATIONS

IRON AND STEEL PRODUCTS: Resellers of iron and steel products have been granted permission to use the lowest filed or published rail tariff rate of freight plus 3 per cent of such rate in computing delivered prices. The addition of 3 per cent of the rate of rail freight is permitted in computing delivered prices, no matter whether the tax actually has been paid or not. (No. 49)

CABLE: A new dollars-and-cents price schedule for manufacturers of armored (BX) electrical cable, based on 1941 prices in effect by the industry generally, has been established. They represent an increase of 10 per cent to 8 of the 13 known producers of armored cable.

[illegible] ct for the
w for No

14-2 BX cable is $30.60 per 1000 feet delivered in zone 1-A. (No. 82)

IRON ORE: Sellers of iron ore produced in Minnesota, Wisconsin, or Michigan may enter into adjustable pricing agreements with buyers until the OPA takes final action on an industry request that ceiling prices for iron ore produced in these states be increased. (No. 113)

LOCKS AND LOCK SETS: Specific dollars-and-cents prices for manufacturers' sales of rim locks and steel, porcelain, mineral and jet knob rim lock sets have been established. Maximum prices for two type sets, upright and horizontal, are: For sets with knobs of mineral, jet, or porcelain composition, $4.10 a dozen; and sets with steel knobs, $3.95 a dozen. For the rim locks alone, the price is $2.55 a dozen. Manufacturers' prices to jobbers are the list price, less 5 per cent, and to other classes of buyers must not exceed the list. Other discounts and allowances in effect on Oct. 1, 1941, must also be maintained. Jobbers are permitted a markup of 33 1/3 per cent, before freight, in their sales of the articles. Separate provision is made for the Clinton Lock Co., Clinton, Iowa. (No. 137)

Restrictions Eased on West Coast Tin Plate Stocks

Inventory restrictions on acceptance of tin plate for the manufacture of cans in the states of Washington, Oregon, California, and Utah have been relaxed to permit can manufacturers to accept deliveries of material that will be needed to be put into process within 90 days of acceptance, the War Production Board announced last week.

This action, which is effective until Sept. 30, 1944, is taken because of the seasonal nature of the West Coast packing industry and is similar to an inventory exception that was granted to the same group of can manufacturers last year.

J. L. Block Named Deputy Director, Steel Division

Joseph L. Block has been appointed deputy director of the Steel Division, War Production Board, by Norman W. Foy, recently appointed director of the division. Mr. Block has been associated with the Steel Division for more than two years, being on leave of absence as executive vice president of the Inland Steel Co., Chicago. Since July, 1943, he has served as assistant director of the division.

More Reinforcing Steel Permitted in Buildings

National emergency specifications for reinforced concrete buildings have been amended to increase the amount of reinforcing steel that may be utilized, to exempt from their provisions small projects using less than five tons of steel, and to eliminate some of the paper work requirements for the construction industry.

In reinforced concrete construction, use of about 5 per cent more reinforcing steel is permitted, with a consequent reduction of about 10 per cent in the size of con-

Restrictions on Use of Metals in Civilian Goods Eased Gradually

War Production Board permits manufacturers to resume consumption of previously banned metals for specified articles when such change is warranted by supply situation and when it will result in a better product and a saving of manpower

IMPROVED raw material supply situation has permitted the War Production Board to authorize the use of previously banned metals in the production of certain civilian goods. This action is being taken when warranted by the supply situation and when it will result in a better product and a saving of manpower in manufacture and installation.

In some instances, the amount of metal used is small compared with the total supply; in others, the savings in manpower are more important than the amount of metal which would be saved for more vital war work.

Within the past few days, restrictions have been removed or eased on the use of metals in manufacture of cans, reflectors of fluorescent lighting fixtures, domestic cooking appliances and heating stoves, certain galvanized products, tire chains for passenger automobiles, safety equipment, hand trucks, hand tools, cutlery, electric motor controllers, awning frames and supports, window and roller type shades for street cars and busses, stencils, cigarette lighters, cast iron ware, enameled ware, mop wringers, caskets, and food processing machinery.

Despite these modifications of restrictive orders, the board emphasizes that there can be no immediate general resumption of the manufacture of consumer goods because military programs still have first call on the nation's resources and neither manpower, manufacturing facilities nor component parts for large-scale consumer goods production are now available. The various industry advisory committees are active in formulating plans, however, so that when the proper time comes the transition from a war economy to peacetime production can be as smooth as possible.

Details of a plan are expected to be announced shortly for the production and distribution of some electric alarm clocks during the second quarter. The volume of production for civilian timepieces of all types is dependent directly upon the needs for war material and the supply of labor. Production of 1,200,000 war alarm clocks, many of which must go to fill military requirements, is estimated for the second quarter.

The Flashlight and Battery Industry Advisory committee members expect to maintain production of batteries for civilians at the present rate while increasing production for military purposes 20 per cent to meet 1944 requirements.

Members of the Metal Casket and Burial Vault Industry Advisory committee have been told that it is uncertain when steel can be made available for the production of metal caskets. Even if steel could be made available for this purpose, manufacturers in critical labor areas could not be permitted to use it because they would need to recruit new workers to replace those lost. Members of the committee have reported that they have lost as high as 95 per cent of their skilled metal workers.

Production of construction equipment, such as bulldozers, angledozers, scrapers and crawler wagons, is expected to be sufficient during the remainder of 1944 to meet the most essential requirements. Shipments of crawler wheel assemblies are somewhat delayed, but delivery schedules of winches, and crawler wagons are being maintained. Automotive type components are critical and output of the scarcest type determines the flow of all components. The following components are now scheduled: Axles, transmissions, engines, clutches, wheels, tires, rims, propeller shafts and brake assemblies.

Continued limited production of cast iron bathtubs has been approved for 1944. Sales of these units will be limited to orders for or ultimate delivery to the Army or Navy, for export authorized by the Foreign Economic Administration or for installation in construction projects which have been authorized by preference ratings regularly assigned to war housing and other construction projects for which tubs are essential, such as hospitals and institutions. Production of 50,000 cast iron bathtubs has been authorized during the second quarter.

Program for production of $27,000,000 worth of commercial laundry equipment has been approved for the year beginning April 1. Of this amount, about $10,000,000 worth, or about one-third of a normal year's requirements, will be made available for commercial laundries and the balance for the armed services.

Metal ice cream cans are considered as being under the milk can code in applications for steel, and such applications will be given favorable consideration.

Only minor modifications of the restrictions on the use of copper and brass mill products can be expected for the duration of the war. WPB has pointed out that copper supply and demand are approximately in balance but that unforeseen circumstances could cause a more critical situation. Mill facilities are adequate but cannot be fully utilized because of the manpower shortage.

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the order of the day here at Hyatt is precision ...high precision...*super*-precision! The purpose of this precision is to give machinery greater capacity and greater performance and *greater* service life! With husky Hyatt Roller Bearings carrying the loads you can keep your machines...and your war production... steadily on the go!

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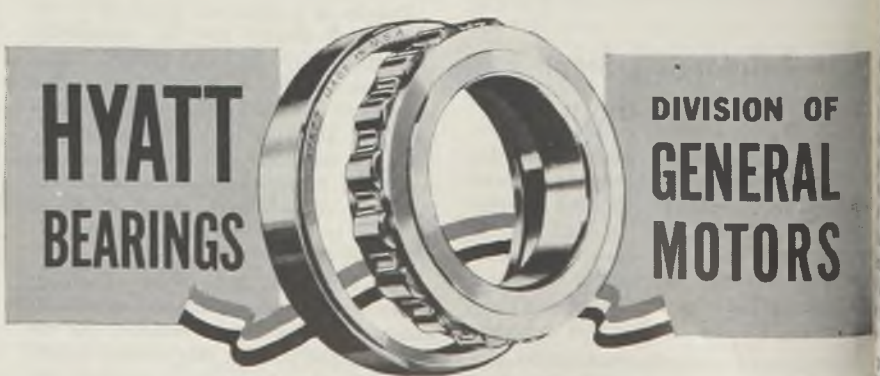


HYATT BEARINGS DIVISION · GENERAL MOTORS [illegible] JERSEY

By A. H. ALLEN Detroit Editor, STEEL

MIRRORS of MOTORDOM

Fabulous developments awaiting "Brave New World". Chemists hear how sugar cane can supply usual amount of sugar, and then, by hydrogenation, residue can be converted into gasoline, kerosene or lubricating oil

BRAVE NEW WORLD—TRANSMUTATION — To a populace already aquiver with visions of making wonderful new plastics out of soybeans, petroleum wastes and whatnot; of making limitless quantities of potable alcohol out of sawdust; of producing finest quality rubber from either alcohol or petroleum, and maybe from dandelions and other assorted weeds; of making pure iron powder at every iron ore mine to do away with the blast furnace; of driving cute new automobiles fashioned of little more than plastics, aluminum and magnesium; and meanwhile of being cured of nearly every ill by the magic of either penicillin or sulfa drugs, last week came a new vision—producing gasoline, oil or coal from sugar cane sorghum, sweet potatoes, cornstalks, grass, leaves, Irish moss, seaweed, algae, wood or sawdust.

The American Chemical Society, meeting in Cleveland, heard Dr. E. Berl, Carnegie Institute of Technology research professor, tell how 110 tons of sugar cane could supply its usual amount of sugar and then be "Berled" up to produce 2550 gallons of gasoline and 4000 gallons of oil. All that is necessary is to telescope into a few hours a process which took nature millions of years, using heat and pressure to convert the carbohydrates of the vegetation to hydro-carbons by "internal combustion in the plant products". This was said to leave a jelly-like substance, suitable, as is, for diesel fuel, but convertible to gasoline, kerosene or lubricating oil by further hydrogenation. Simple ?

Here at last is the full cycle of abundant life. You simply cut down the old pine tree, rip up the timber for plywood, cook up the foliage and bark for plastics and there you have the better part of an automobile. Then hydrogenate the foliage into gasoline and oil, fill up your tank and wait a moment while a batch of sawdust is fermented into a few bottles of Old Forestry. Consume the bottled goods, hop in your car and take off at breakneck pace. Slide off the road and collide with another pine tree, dispensing with yourself and the car, but leaving newly-felled timber which can be converted all over again for the oncoming generation.

Even Henry Ford, one of the most ardent backers of chemurgical wizardry, who has already put to some practical industrial use the produce of the soil, must have gulped when he read of this latest test-tube miracle. Perhaps at the same time he hummed a few bars of the popular song, "Take It Easy".

BRAVE NEW WORLD — ELIXIRS —City officials here charged with responsibility for operating and maintaining fleets of cars, including police vehicles, have been pondering the strange effects induced by adding a mystical fluid known as Powerine to fuel tanks in the ratio of one gallon for every 400 gallons of gasoline. In one test covering 1000 miles of operation, use of the fluid yielded a 25.6 per cent increase in gasoline economy, less carbon in engine cylinders and freer valve action. City-owned automobiles have been testing the material for over a year now and the results appear uniformly good. Supplied by the Motor Fuel Corp., Medina, N. Y., Powerine costs about $2 per gallon.

BRAVE NEW WORLD — POLYMERS—Still in its swaddling clothes, the synthetic rubber industry looks back with satisfaction on the production of 233,000 tons last year, and ahead to output of 840,000 tons this year. Currently it is batting out 50,000 tons monthly. As F. B. Davis Jr., chairman of the board of United States Rubber Co. and revitalizing influence on that company since 1929, told Detroit engineers last week, much of the synthetic thus far produced has been polymerized from butadiene made by the alcohol process, despite the fact original plans were to produce the bulk of the butadiene by the petroleum process. Slowness of the petroleum process to build up in volume is due solely to delays in obtaining equipment, in turn the result of the aviation gasoline program having first call on such equipment. Mr. Davis indicated there was nothing at fault in the process itself and the rubber produced from petroleum would be one-third the cost of material produced from alcohol.

Passenger car tires of synthetic rubber, now estimated to be 87 per cent as good as first-line prewar tires of natural rubber when driven at moderate speeds, still will cost the buyer well over 50 per cent more than prewar tires, and at that the government is reported to be underwriting the price of synthetic to some extent.

In the moderate size bus and truck tire, using 10-30 per cent natural rubber, rayon cord and inlaid tread, synthetic tires show somewhat better service life than prewar tires of natural rubber. In still larger sizes, even with up to 35 per cent natural rubber, the synthetics still are not the equal of natural rubber.

The almost negligible effect of synthetic rubber demands on petroleum supply is obvious from Mr. Davis' statement that the oil industry in 36 hours can furnish enough petroleum to satisfy needs of the synthetic rubber producers for a full year. Likewise, 16 gallons of petroleum will supply sufficient butylene for conversion into a set of five synthetic rubber tires which will provide 20,000 miles of service on an automobile. To meet the fuel requirements of the car over this mileage, 100 times as much petroleum is required.

Expectations point to the availability of 1,115,000 tons of rubber in the Unit-

MOTORIZED MILESTONE: With Ward M. Canaday, president, Willys-Overland Motors, at the wheel, the 200,000th jeep manufactured by his firm since June, 1941, leaves the assembly line on the first line of its journey to a foreign battlefield

AS IT LOOKED IN PEACE: DeSoto car assembly line, above, pictured in peacetime operation, has been converted to turn out big center wing sections for the Navy's Helldiver bomber. Using much of the peacetime plant facilities, DeSoto has been building Helldiver sections for almost a year

ed States in 1944, including synthetic production, small amounts of crude imported from Ceylon, Africa and Latin America, plus the crude and synthetic remaining in the country's stockpile. Against this, essential requirements are scheduled at 932,000 tons, of which 154,000 tons is lend-lease.

The rubber industry will produce about 7,000,000 passenger car tires in the first six months of this year, hopes to add another 15,000,000 in the last six months. Meanwhile enough camelback is being produced to retread 25,000,000 passenger cars and 6,000,000 truck and bus tires this year.

Outlook is not too bright in the bus and truck tire field. Replacement needs for essential civilian trucks and buses for this year have been estimated at 6,000,000, but it is doubtful if more than 4,000,000 will become available.

Encouraging aspect of the synthetic rubber picture is the favorable performance of inner tubes processed from butyl rubber, just now getting into production.

The big question mark in rubber is in respect to the vast plantations in the East Indies, now in the hands of the Japanese. No one knows what is happening there, but rubber company officials doubt there has been any wanton destruction. Rather they guess that inroads of neglect, disease and jungle growth will have reduced their output by 30 per cent when they are recaptured. Estimates of world production of natural rubber in the first year after enemy-held plantations are regained, point to 500,000 tons, followed by a gradual increase to a maximum of 1,200,000 tons.

The matter of price is a ticklish one in the natural rubber outlook, for in the past many artificial props have been erected by cartels and other means. In one respect, a full-scale U. S. synthetic industry may prove to be potent insurance against unreasonable prices for natural rubber, but the present cost of synthetic will have to come down.

BRAVE NEW WORLD — UAW MODEL — Blueprinting the technique for postwar industrial conversion without depression, Walter P. Reuther, vice president of the UAW-CIO, calls for establishment of an overall economic agency known as the Peace Production Board, comprising representatives of government, management, labor, farmers and consumers and authorized to plan, organize and direct the conversion of war economy to peace (it's wonderful) production. The PPB then would establish representative industry councils (and an old CIO dream) in each major industry to develop detailed conversion plans. Further, Reuther recommends immediate establishment of industry and area tooling pools, made up of the total tooling facilities and skilled manpower.

Next, the PPB would establish during the transitional period control of materials on the basis of social priority, allocating to each producer a fixed quota of total production.

As to disposal of government-owned facilities, the UAW would have the government operate, as a yardstick, such plants in monopolistic and semimonopolistic industries or in industries strategic to the national welfare and defense, and make available for lease to private industry facilities for use in civilian production on the basis of guarantees which will protect the interests of government, labor and the consumer. Also, the government would create a central research clearing house (already proposed in Washington and bitterly condemned by all industry, large and small) to make certain patents, technical and scientific knowledge are universally applied for the public welfare.

"Dream" Embodies Several Agencies

Another agency in this dream would be a national agricultural commission to "develop programs to achieve a more balanced national diet", still another a national housing authority with three principal functions: 1. Conversion of excess government-owned aircraft plants to mass production of prefabricated, low-cost homes; 2. conversion of government-owned miscellaneous plants to serve as feeder plants to the main prefabricating plants; 3. organization of a commission of experts on designing, construction and materials to assure full use of advance technology in housing.

Tack on such things as a far-flung public works program, overhauling of the railroads in the light of advantages offered by diesel power and light metals, setting aside corporate funds for "human rehabilitation", universal application of the 30-hour week, a guaranteed annual living wage, and you have the kernels of Reuther's grandiose scheme.

Preposterous, you say? Doubtless, yet there is the concrete thinking of a representative of a large cross-section of the working population in the automotive industry. Reuther's true philosophy on socialized economics perhaps is disclosed best in the concluding portion of a recent radio comment he made. He said: "Pious slogans about free enterprise will not create employment nor will they feed a man's hungry family . . . free enterprise should mean co-operative enterprise, a system which will assign to ownership, management, labor and government certain specific responsibilities. Co-operative enterprise is economic democracy in action."

The OUNCE of PREVENTION that keeps the VEHICLES of WAR ROLLING

The perfect functioning of war vehicles and implements is dependent upon the ability and efficiency of many component parts—some of them relatively small yet none the less vital to keeping them rolling under the brutal punishment they get.

Bearing protection on mechanized war equipment is one of the most important details of construction, yet the protection—preventing dirt, dust, grime, water getting into them, and preventing the life-giving lubricant from seeping out, is accomplished by a relatively small Oil Seal.

Furnishing the tremendous quantities of Milpaco Oil Seals necessary to keep our forces rolling steadily on to victory is our greatest concern at the moment. It must be. Beyond this, we are trying to take care of all of our old customers and will welcome inquiries relative to your oil seal requirements for current as well as post-war applications.

Mechanized Equipment provided with Milpaco Oil Seals for Bearing Protection includes

MILPACO *Oil Seals*

THER PRODUCTS COMPAN

WING TIPS

Timely ordering of aircraft steel forgings is becoming increasingly important. Manufacturers asked not to make unnecessary changes in forge shop schedules. Requirements for 1944 will be 33 per cent higher than in 1943

SATISFACTORY delivery of aircraft forgings will become increasingly difficult unless aircraft manufacturers take steps to avoid unnecessary changes in forge shop schedules, according to Col. E. W. Rawlings, administrator of the Aircraft Scheduling Unit, Wright Field, Dayton, O.

Steel forge shops are being asked to break all existing production records during the coming months. This load is the result of substantial increases in aircraft, landing craft, army truck and farm equipment programs. Aircraft steel forging requirements alone will be 33 per cent higher in 1944 than in 1943.

Manufacturers can take the following steps to forestall time-consuming changes in forge shop schedules:

1. Extend purchase orders to the full extent of all contracts.
2. Indicate, wherever possible, what forgings will be needed beyond present contracts. The accompanying load chart on an actual forge shop shows graphically the scheduling problems engendered by manufacturers' failure fully to extend their purchase requirements.
3. Check—in the case of prime contractors—the ordering procedure of subcontractors.
4. Set up proper inventory and material controls for insurance that clerical errors do not cause changes in requirements.
5. Confirm all verbal instructions by letter.
6. Allow forge shops sufficient flow time.

Since August, 1943, ASU, with the co-operation of the forgings and castings section of WPB, has endeavored to relieve aircraft steel forgings critical shortages by an aggressive program, outlined in STEEL, Nov. 15, p. 100.

A task group from the forging industry including V. F. Braun, Ladish Drop Forge Co.; E. M. Cook, Transue & Williams Co.; W. C. Kress, J. H. Williams & Co.; R. W. Stoddard, Wyman-Gordon Co., and C. E. Stone, Interstate Drop Forge Co., has aided this work and has rendered valuable assistance in bringing to light and solving aircraft forging procurement problems.

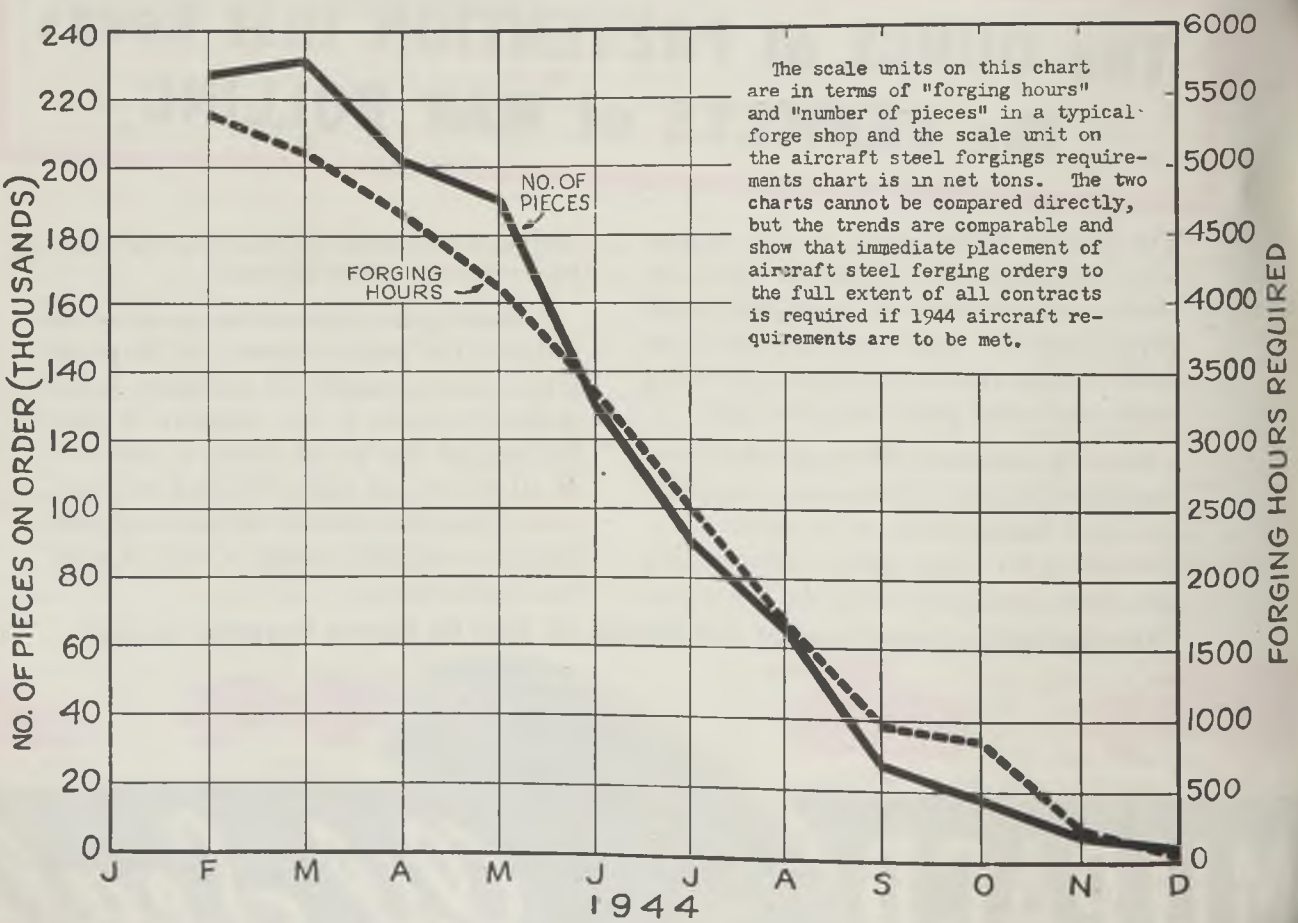
Reduction in critical shortage reports in process at ASU from 210 on Oct. 30, 1943, to 22 on Feb. 12, 1944, testifies to the value of the effort put forth by the above bodies and the co-operation of the forging industry.

Bendix Salvages 800 Tons of Metal Monthly

Segregation of metals by alloy types, throughout all production stages, is the key to the efficiency of a comprehensive salvage program which recovers nearly 800 tons of scrap metals per month at the Bendix Products division, Bendix Aviation Corp., South Bend, Ind.

Steel chips and shavings, which are

Aircraft Steel Forgings Load on a Typical Forge Shop



NOTE—FORGINGS FOR FOLLOWING PLANES:
A-20, A-30, A-35, B-17, B-24, B-25, B-26, B-29, B-32, C-47, F-6-F, F-7-F, J-2-F, P-38, P-40, P-47, P-51, P-61, PBM PV-1, PV-2, PV-4, SB-2D

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classified in six different alloys, represent the biggest item in the plant's metal salvage program. A total of 1,750,000 pounds of steel was salvaged in January.

During an average month the plant salvages 100,000 pounds of cast iron; 160,000 pounds of aluminum in 11 different alloys; 35,000 pounds of magnesium in five alloys and 15,000 pounds of brass in three alloys. Marked containers are used to collect and segregate metals of various alloys—from machines to loading platforms.

To overcome recurrent shortages of zinc, vital in the production of aircraft carburetors, the materials department, with the aid of Bendix distributors, launched a new wrinkle in salvage by buying up used and junked automotive carburetors. From these worn-out parts, the plant now obtains 10,000 pounds of zinc and about 5000 pounds of aluminum per month for use in the corporation's South Bend foundry and die-casting departments.

Willow Run Production of Bombers Totals Over 3000

More than 3000 four-engined B-24 Liberator bombers have been built at the Willow Run bomber plant, Ford Motor Co. has been permitted to announce. Of this total,, 2000 were in completed, fly-away form and the remainder were knocked-down for shipment to final assembly plants in the Southwest. Saturday, March 18, Ford officials said, was the biggest day in the history of Willow Run from the standpoint of Army acceptance. More B-24s completed their test flights and were "bought" by Army inspectors than on any other single day since the plant was opened. Production officials expect Willow Run to far exceed its quota this month.

Survey Shows Most War Workers Like Their Jobs

Most war workers apparently like their jobs and want to keep them after the war, results of a representative survey conducted about four months ago among 68,000 Bendix Aviation Corp. employes from coast to coast, indicate.

In announcing results of an employe questionnaire distributed over his signature, Ernest R. Breech, president of the corporation, emphasized that prewar employment at Bendix totaled less than 10,000, so that the replies may be taken as reflecting the typical attitude of the new worker in plants devoted to war production.

The interest of workers in their new jobs was brought out sharply in the fact that 41.8 per cent of those employes replying do not want to go back to former occupations. Approximately 18 per cent intend to return to former jobs, and nearly 25 per cent are as yet undecided.

Less than 3 per cent said "no" to the question: "Do you feel your job is helping to win the war?" Five per cent were "not sure," and the balance, or 87.6 per cent, said "yes."

Included with the questionnaire was a reprint of an advertisement run in many newspapers during the past year explaining the corporation's policy in making voluntary price reductions on its war production contracts. Employes were asked their opinion of this corporation policy. Of those replying, 83 per cent said they approved it and 7 per cent disapproved. The others did not comment.

An insight into war worker housing conditions was provided by replies to questions on this point. The largest proportion of those replying—a cross-section of workers in 30 different plants—42.3 per cent own their own homes; 26.5 per cent room or board elsewhere; 17 per cent live with parents, and only 12 per cent rent their living quarters.

Dodge Chicago Plant Now Is Shipping Engines

"Chrysler Corp.'s Dodge Chicago plant now is producing and shipping in substantial and increasing quantities each month 2200-horsepower Wright air-cooled engines," K. T. Keller, president of the company, told directors who met in Chicago recently.

Current employment is about 60 per cent of the goal set for the plant this year. At the present rate of production, the plant is using each month: 27 tank cars of fuel oil; 67,000,000 cubic feet of gas; 50,000,000 kilowatt-hours of electricity; 15,000 tons of coal, and 117,000,000 gallons of water, which is 4,500,000 gallons of water each day.

In the two Dodge Chicago foundries are being melted about 125,000 pounds of aluminum and 50,000 pounds of magnesium daily. Since the start of foundry operations, more than 125,000 castings have been supplied.

In the Dodge Chicago forge shops, during January 225,000 forgings involving 2,700,000 pounds of steel were produced. Total deliveries of forgings already exceed 1,000,000 individual pieces.

Curtiss-Wright Increases Cargo Plane Production

An increase of 250 per cent in 1944 output of the C-46 Commando, and "continued production of an improved version of the P-40 fighter plane throughout the remainder of the year" at Curtiss-Wright's Buffalo plants has been announced.

Production facilities of the Airplane Division at Buffalo have increased approximately 55 per cent since 1941 and 996,050 square feet of space have been leased in outside plants.

The new fighter plane will be known as the P-40N. It has a speed of more than 350 miles an hour, a ceiling of 30,000 feet

iles.

HALF BILLION AIRCRAFT HORSEPOWER IN 3 YEARS

FEW figures have hitherto been released on the extent of aircraft engine production. Recently it was reported in this department to be running close to 40,000,000 horsepower per month.

Through the co-operation of the Aircraft Resources Control Office in Washington and its director, T. P. Wright, figures are made available on engine output, showing the monthly total for January to have been 36,098,000 horsepower, and total engines shipped 22,627.

The following tabulation shows shipments and total engine horsepower, including spares, for 1941, 1942 and 1943, monthly for the latter year. Total indicated production for the three years is 414,032 engines, aggregating 562,851,000 horsepower. Also shown is the steady rise in average horsepower per unit, from 1001 for 1941 to about 1600 in January of this year, attesting to the emphasis on larger and more powerful engines.

	Total No. Aircraft Engines Shipped	Total Engine H.P. Incl. Spares (000 omitted)	Average H.P. Unit
1941	50,684	50,747	1001
1942	136,787	172,266	1260
1943	226,561	339,538	1498
January	16,011	21,682	1354
February	15,328	20,608	1344
March	16,930	23,921	1412
April	16,838	24,273	1441
May	17,869	25,903	1449
June	17,735	26,632	1501
July	18,753	28,644	1527
August	19,688	30,900	1568
September	20,585	32,110	1559
October	21,856	33,671	1541
November	22,680	35,433	1562
December	22,288	35,761	1604
1944 January	22,627	36,098	1595

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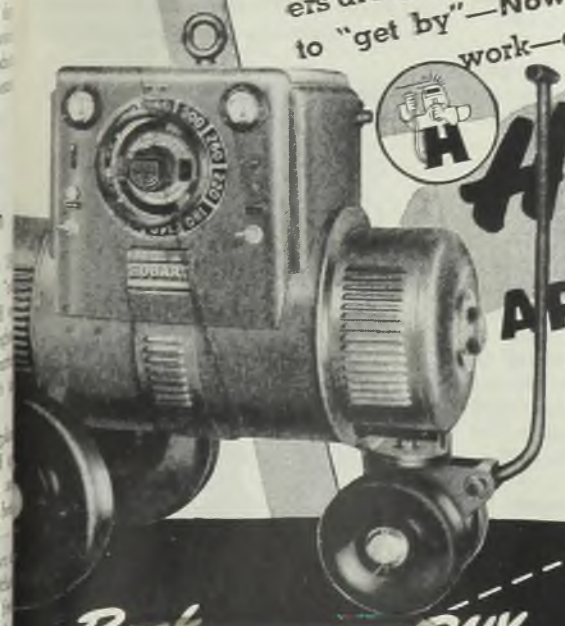

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MEN of INDUSTRY

E. F. BLANK

ERNEST SCHLEUSENER

C. S. BEATTIE

E. F. Blank, director of personnel relations, Jones & Laughlin Steel Corp., Pittsburgh, has been appointed a deputy director of the National War Labor Board.

—o—

Robert S. Durling has been appointed director of industrial relations, Monitor Controller Co., Baltimore, and he has been succeeded as purchasing director by **Robert Jordan.**

—o—

Russell D. Yoder has been appointed engineer in charge of the newly-established sales office in Columbus, O., for Cutler-Hammer Inc., Milwaukee. For the present the Columbus office is operating as a branch of the Cincinnati district sales office, of which **E. C. Bolton** is manager.

—o—

J. K. Gannett, vice president, Austin Co., Cleveland, and eastern district manager for the company since 1928, has been appointed director of engineering. **Albert S. Low,** vice president and manager of the Washington office, and **A. F. Plant,** vice president and Detroit district manager, have been elected directors.

—o—

Knox Ide, president, American Home Products Corp., Jersey City, N. J., has been elected a director of American Machine & Foundry Co., Brooklyn, N. Y., and its subsidiary, International Cigar Machinery Co. Election of Mr. Ide fills the vacancy created by the death last year of Rufus L. Patterson, founder of the company.

—o—

Frank J. Zink, for the past three years director of the research department, Farm Equipment Institute, Chicago, has opened an office in the Board of Trade building, 141 West Jackson boulevard, Chicago, to establish a practice as consulting agricultural engineer and farm market analyst.

—o—

O. L. Davis, formerly purchasing agent for Pemco Corp., Baltimore, has been appointed assistant works manager. **Ralph L. Foraker** has become a member of the corporation's sales staff and will cover the Chicago territory. **George Blumenthal** has been named sales representative in the East Coast region and **S. S. Groglode** represents the corporation in the East Central region. **James Theodore** has been named buyer for Pemco Corp.

—o—

Ernest Schleusener, since May, 1942, assistant vice president in direct charge of engineering and production control, Oliver Iron & Steel Corp., Pittsburgh, has been elected vice president in charge of operations, and **John P. Roche,** recently named Pennsylvania's outstanding "Man of the Year" by the United States Junior Chamber of Commerce, has been elected secretary and assistant to the president of the corporation.

—o—

George A. Chapman, factory manager of the Youngstown, O., plant of Automatic Sprinkler Co. of America, Youngstown, O., has been elected a director to succeed the late Alfred Fritzsche. **William F. Joyce** has been elected senior vice president of Automatic Sprinkler Co., **John J. Power Jr.** has been elected vice president, **J. A. Coakley Jr.,** secretary and treasurer and **Elmer V. Bauman,** assistant secretary.

—o—

Lieut. Commander Charles C. Morgan, U. S. N. R., former industrial engineer at the Pittsburg, Calif., works of Columbia Steel Co., San Francisco, has been awarded the Legion of Merit for gallantry as commanding officer of a destroyer transport in the South Pacific.

—o—

William S. Saylor, formerly manager of the Boston district sales office, Carnegie-Illinois Steel Corp., Pittsburgh, has been appointed assistant manager of sales, New York district. **William G. Crook** succeeds him as Boston district manager, and Mr. Crook is succeeded as manager of sales, Buffalo office, by **James J. Henderson.**

—o—

Heber D. Distelhurst, Howard C. Lunger and **Benjamin W. Dodwell** have been named assistants to the vice president in charge of sales, American Car & Foundry Co., New York. **L. A. Bedard,** formerly associated with Mfg. Co., Mt. Vernon, O., has been appointed sales agent for American Car & Foundry Co., with headquarters in St. Louis.

—o—

C. S. Beattie, formerly manager of engineering, Delta-Star Electric Co., Chicago, has been made vice president in charge of production and engineering. **S. C. Killian,** former development and research engineer, has been named chief engineer. **Thor Fjellstedt** has been named assistant chief engineer, **Manfred Stene** has been appointed electrical engineer for the company, and **R. A. Sternaman** is mechanical engineer.

—o—

Robert H. Beard has been appointed purchasing agent, Empire Steel Corp., Mansfield, O., succeeding **H. O. Simmons,** resigned. Mr. Beard has been affiliated with Empire Steel Corp. for 20 years, having been assistant purchasing agent for the past three years.

—o—

J. P. Wright, general manager of sales, Western Foundry Co., Chicago, has been elected vice president in charge of sales, and **Frank D. O'Neil,** formerly treasurer, has been elected vice president in charge

WILLIAM C. JOHNSON

Who has been elected a vice president of Allis-Chalmers Mfg. Co., Milwaukee, as re-

ERNEST KUEHN

RALPH B. KRAFT

RALPH F. MERRIAM

CASON J. CALLAWAY

of manufacturing. **L. W. Austin** succeeds Mr. O'Neil as treasurer, **J. D. Nigh** succeeds Mr. Austin as secretary and **J. O. A. Johnson** has been named assistant secretary and assistant treasurer.

—o—

Ernest Kuehn, formerly special representative of H. L. Hamilton, vice president, General Motors Corp., Detroit, on assignment to the Electro-Motive division, has been appointed manager, Pacific Coast region, for the Electro-Motive division, with offices at 2913 Russ building, San Francisco. The new offices will be opened April 17.

—o—

Ralph B. Kraft, formerly manager of roll sales, Lewis Foundry & Machine division, Blaw-Knox Co., Pittsburgh, has been appointed vice president in charge of all sales for the division. **F. E. Walling,** previously assistant to the president of Lewis Foundry & Machine division, has been named vice president in charge of operations for the division.

—o—

William R. Daley, president, Otis & Co., Cleveland, has been elected a director of Murray Ohio Mfg. Co., Cleveland.

—o—

William W. Sproul Jr., formerly manager of the Transformer Equipment section, Sharon works, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has been appointed manager of the application department of the Sharon works. **L. A. Selleg** has been named manager of the company's Petroleum, Chemical and Mining section, northwestern district, with headquarters in Chicago. Other appointments include **Frank H. Butt,** supervisor of switchgear and control order service, succeeding the late **N. S. Taylor,** and **Hugh J. Hanbury,** manager of the metropolitan New York area for the Lamp division.

—o—

Newly-elected officers of the Wire Association are the following: President, **D. D. Buchanan,** manager of operations, Union Drawn Steel division, Republic Steel Corp., Massillon, O.; vice president, **R. M. Hussey,** superintendent of the wire department, Jones & Laughlin Steel Corp., Aliquippa, Pa.; vice president, nonferrous division, **E. W. Gundstrom,** assistant plant manager, Rome Cable Co., Rome, N. Y.; executive secretary, **R. E. Brown,** publisher, *Wire and Wire Products,* Stamford, Conn. New directors elected by the association include **Kenneth H. Davis,** president, K. H. Davis Wire & Cable Co., Los Angeles, and **Flint C. Elder,** special research engineer, American Steel & Wire Co., Cleveland.

—o—

Ralph F. Merriam, previously assistant purchasing agent, Grand Home Appliance Co., Cleveland, has been named purchasing agent, Cleveland Co-Operative Stove Co. and its divisions, Grand Home Appliance Co. and Cleveland Foundry Co. Mr. Merriam succeeds **Victor H. Gordon,** now serving in the United States Army.

—o—

S. L. Felton, traffic manager, Acme Steel Co., Chicago, has been elected president of the Traffic Club of Chicago.

—o—

New officers for 1944 elected by the Propeller Fan Manufacturers Association are: President, **E. C. Englert;** vice president, **Wallace Allen;** and secretary and treasurer, **V. C. Shetler.**

—o—

Edward F. Whittemore, formerly associated with C. R. Daniels Inc., New York, has been appointed purchasing agent, American Welding & Mfg. Co., Warren, O.

—o—

A. F. Rucks has been elected president and general manager, C. J. Tagliabue Mfg. Co., Brooklyn, N. Y., succeeding the late **C. D. Waters. J. T. Kottcamp,** vice president, Johns Manville Products Corp., has been elected to the board of directors.

—o—

Norman E. Garman has been appointed technical engineer in the Chicago territory for Cowles Detergent Co., Cleveland.

—o—

R. T. Dunlap, previously assistant to the president, Wickwire Spencer Steel Co., New York, and acting general superintendent of the Buffalo plant, and **E. F. Early,** general superintendent at the company's Morgan plant in Worcester, Mass., have been elected vice presidents. **Harry E. Roulfs** has been appointed labor relations manager for the company, with headquarters at the Buffalo mill.

—o—

Cason Jewell Callaway, former president of Callaway Mills, La Grange, Ga., one of the leading experimental farmers in the United States, and a director of the Nutrition Foundation Inc., has been elected a director of United States Steel Corp., Pittsburgh, to succeed the late James A. Farrell.

—o—

Heywood Fox, formerly assistant to the president, Spencer Lens Co., Buffalo, division of American Optical Co., has been elected president of Spencer Lens Co. **William A. Kerr** has been appointed general sales manager.

—o—

Selden E. Kline, president, First Cleveland Corp., an investment firm, has been elected vice president, Upson-Walton Co., Cleveland, and **L. E. Schaeffer** has been made sales director.

—o—

A. W. Henn, one of the founders of National Acme Co., Cleveland, and for several years its president and later board chairman, has been elected a director for the fiftieth time. Mr. Henn is the only remaining member of the original board of the company.

—o—

David Thomson has been elected president of the Phoenix Iron Co., Phoenixville, Pa., to fill the vacancy caused by the recent death of Samuel J. Reeves.

—o—

Edward V. Creagh who since 1936 has been in charge of sales promotion activities for American Chain & Cable Co. Inc., and associate companies, Bridgeport, Conn., has been appointed advertising and sales promotion manager.

—o—

C. E. Robinson, general sales manager, Mid-West Forging & Mfg. Co., Chicago, has been elected vice president in charge of sales, and **N. J. Bardell,**

general superintendent, vice president in charge of production. Mr. Robinson and Mr. Bardell have been associated with the company 12 and 22 years, respectively.

—o—

Erle R. Merrell has been appointed manager of the Birmingham, Ala., plant of Rheem Mfg. Co., to succeed **R. J. Seltzer,** who has been transferred to the company's plant in Sparrows Point, Md.

—o—

R. M. Edinger, formerly of the R. J. M. Co., Los Angeles, has been named district manager in charge of Finkl Steel Products Corp. of California, newly-formed subsidiary of A. Finkl & Sons Co., Chicago.

—o—

Edward L. Steinle has severed his connection as sales manager, vice president and director, New Britain Gridley division, New Britain Machine Co., New Britain, Conn.

—o—

Dr. William A. Lewis, formerly director of the school of electrical engineering, Cornell university, Ithaca, N. Y., has been appointed consulting electrical engineer, Armour Research Foundation, Chicago.

—o—

Paul L. Goldstrohm, vice president in charge of production, Brown Instrument Co., Philadelphia, and **George M. Muschamp,** vice president in charge of engineering, have been elected directors of the company.

—o—

Lewis Welshans, formerly director of research, Standard Lime & Stone Co., Baltimore, has joined the research department of Diamond Alkali Co., Pittsburgh, to direct the department's activities involving magnesium oxide and magnesium derivatives. He will make his headquarters in Painesville, O.

GEORGE P. TORRENCE

Who has been elected president, Cleveland Pneumatic Tool Co., Cleveland, as announced in STEEL, March 20, p. 66.

DR. V. N. KRIVOBOK

Who has joined the Development and Research division, International Nickel Co. Inc., New York, noted in STEEL, April 3, p. 107.

—o—

John K. McBroom, formerly vice president and general manager, Hydro-Arc Furnace Corp., LaGrange, Ill., which was acquired by the Whiting Corp., Harvey, Ill., last December, has become associated with the latter company as sales manager of the new electric furnace department.

—o—

K. T. Vangsnes, long associated with the aircraft industry on the West Coast, has been named head of the magnesium division of the Los Angeles office of Dow Chemical Co., Midland, Mich. For the past five years Mr. Vangsnes has been vice president of Magnesium Products Inc., Los Angeles.

—o—

Gilbert Butler has been elected president and general manager, Bossert Co. Inc., Utica, N. Y., to succeed the late Francis K. Kernan, who died March 11. **Warnick J. Kernan** is vice president of the company and **Peter Guido** is secretary and treasurer.

—o—

L. S. Egea has been appointed exclusive sales engineering representative on the West Coast for the Selas Co., Philadelphia. His offices are at 1151 South Broadway, Los Angeles.

OBITUARIES . . .

Thomas P. Robbins, 81, chairman of the board, Cleveland Hardware & Forging Co., died March 30 in Cleveland. Mr. Robbins had been identified with the company for nearly 50 years, serving for a number of years as president and treasurer.

—o—

Anthony W. Howe, 67, president and general manager, J. M. & L. A. Osborn Co., Cleveland, died March 29 in Miami Beach, Fla. Mr. Howe, who had been associated with the Osborn company 45 years, was a director of Sharon Steel Corp., Sharon, Pa., and was a former officer of the National Sheet Metal Distributors Association.

—o—

Leon R. Noonan, 50, president, Noonan-Malmstrom Co., Chicago, died April 1 in Hinsdale, Ill. Mr. Noonan founded the company, a gray iron foundry, in 1927.

—o—

James J. Zimmerman, 54, development engineer, Follansbee Steel Corp., Pittsburgh, died March 11. Prior to joining Follansbee Steel Corp. about one year before his death, Mr. Zimmerman had been affiliated with many steel companies, having had wide experience in the foundry and steel industry.

—o—

M. Ralph Carrier, 78, president, Federal Drop Forge Co., Lansing, Mich., died recently in Lansing. Mr. Carrier was one of the organizers of the company in 1920 and had served as its president continuously since that time.

—o—

James S. Nicoll, 52, vice president, Kelly O'Leary Steel Works, Chicago, and for more than 35 years a familiar figure in Chicago industrial circles, died March 29 in that city.

—o—

Edmund D. Monk, 55, consultant on power transformer sales, Central Station division, General Electric Co., Pittsfield, Mass., died March 16.

—o—

Mrs. Maria C. Weck, 77, president and chairman of the board, Edward Weck & Co. Inc., Brooklyn, N. Y., died April 1 in that city. Mrs. Weck was the widow of Edward Weck, who founded the company 54 years ago.

—o—

Jacob M. Faris, 72, retired assistant to William C. Reilly, formerly vice president in charge of operations, Youngstown Sheet & Tube Co., Youngstown, O., died in that city recently. Mr. Faris had been a member of the original group when the company began production in the Youngstown district.

—o—

Kenneth Howard, 55, sales engineer for Giebel Machine Tool Co., New York, died there March 29.

—o—

Wilbur F. Persons, 85, president, Empire Type Foundry Co., Delevan, N. Y., died there several weeks ago. The foundry was founded by Mr. Persons 50 years ago.

—o—

Karl O. Nelson, 63, works manager, Galland-Henning Mfg. Co., Milwaukee, for 25 years, died April 1 in that city. A native of Norway, Mr. Nelson had come to Milwaukee in 1901.

—o—

George R. Gardner, 59, chief clerk, traffic department, Pittsburgh Coal Co., died March 31 in Pittsburgh.

—o—

Hugh W. Spaulding, 59, secretary of Handy & Harman, New York and Bridgeport, Conn., died March 31 in Garden City, N. Y. Mr. Spaulding, who had celebrated his 40th anniversary with the company in November, 1942, was in charge of silver trading and foreign exchange operations.

H. A. Lomason, president, Douglas & Lomason Co., Detroit, makes the acceptance speech upon presentation of the Army-Navy "E" to the company recently at the Detroit Institute of Arts. Lieut. Col. Norman D. Atkins, Detroit Ordnance district, presented the flag and Lieut. H. D. Glass, USNR, read the citation and presented pins

Lieut. Col. L. M. Eek, Sixth Service Command, presents, left, the air medal to Ignatz Halunka, employe of the D. O. James Mfg. Co., Chicago, on behalf of the meritorious service of his son, Staff Sergeant Walter Halunka, now a German prisoner. Also shown in the photo are Mrs. Halunka, her daughter, and Capt. C. H. Riche

Below, returned war veterans and two executives of Jenkins Bros., Bridgeport, Conn., are shown holding the Maritime pennant to which an extra star has been added and the Army-Navy "E" pennant to which another star has been added

Labor Troubles Plague Great Britain As Invasion Plans Near Completion

LONDON

By J. A. HORTON
British Correspondent, STEEL

WITH the Allied invasion forces in Britain waiting for the word "Go", the tremendous part to be played by industry during the next few months cannot be overstressed. Yet the situation presents some disturbing features.

In the last three months stoppages in the coal fields—even before the South Wales affair which is comparable only to that of 1926 in its magnitude and involved 90,000 men—have been responsible for a serious drop in output. Transport difficulties involved part of the loss, while labor disputes were responsible for the remainder.

These difficulties, which include a shortage of freight cars, are not likely to be easily surmounted, but special efforts are being made to ease the pressure on railroads. More coal is being delivered by road, while inland waterways are being used to a greater extent. It is clear that unless the miners' grievances are settled, not only in South Wales but in all parts of the country, output of iron and steel must be sooner or later curtailed to the detriment of the war effort.

Production Needs Shift

A vivid picture of what happened in 1943 and what may be expected in 1944 as far as production programs are concerned was recently given by Oliver Lyttelton, minister of production. During 1943, he said, production shifted more and more, in accordance with strategic needs, to the newest types of aircraft, weapons and devices of every kind. He described as a remarkable achievement the large scale rearrangement of manpower, due to changes in production requirements.

"Though in some cases we have built up abundant stocks and production can still further be reduced, there are many others, such as aircraft of the latest and most efficient types, aircraft accessories and spares, radio and radio equipment, and certain types of naval construction, which are urgently wanted by the armed forces in increasing numbers."

Describing 1944 as a year of challenge, the minister said Britain's outstanding problem was to maintain the present high level of production, and in some directions increase it still further, despite the necessity of calling up more men in the munitions and other industries who have previously been deferred.

In the steel industry it is anticipated that unprecedented calls will be made on producers during the next few months, but changes in production dictated by the Ministry of Supply are reaching completion. In some instances, material has accumulated in the works owing to the difficulty of finding available transport and it is not possible to forecast any easing in this direction for some time. In this connection the stocks of American steel built up some months ago have proved of inestimable value to those works which concentrate on rerolling of material. Some foreign material is still coming in, including iron ore and scrap from North Africa. So far in this war little has been heard of battlefield scrap but it is to be assumed that some at least of this will be forthcoming from Italy and North Africa according to the exigencies of shipping.

Dominating feature in British steel is the demand for plates for shipbuilding and for metals used in the manufacture of aircraft. There has been no relaxation here, although it must be admitted

Coal strikes adversely affect war production. Vast quantities of American material accumulated on island for start of big push. Allied air raids crippling vital war factories in Nazi-occupied Europe

that in the heavy foundries during the last three months there has not been the same pressure for supplies as prevailed in 1943.

In Europe the hammer blows of the RAF by night and the concentrated daylight attacks of the American airplanes are slowly but surely wearing down the enemy's production of vital materials.

The blockade is growing tighter and is playing an ever more important part in the war, with Germany finding it more and more difficult to get the goods which she so badly needs from outside—even from her neutral neighbors. Switzerland has issued fewer licenses for arms in recent months; Sweden is reducing her exports of high-grade iron ore and of ball bearings; and supplies of chrome ore from Turkey and tungsten from Spain and Portugal are limited by such actions as the British government can take.

No better summary of this position can be given than that by Lord Selborne, Minister of Economic Warfare, when he said: "Other strains on the enemy's economy are becoming apparent. Examples are the notably slow production of the synthetic oil plants. Germany is short of ball bearings, of rubber, tires, of radio equipment, clothing and consumer goods. She is facing a rising scale of military operations with a declining rate of military capacity, and that is what we mean when we say that the position is very serious indeed for Germany at the present moment".

Sidelight on the manganese shortage comes from a circular sent to manufacturers in occupied Belgium which contains instructions issued by the "Reichsbeauftragte fur Eisen und Stahl". The works are informed that in addition to an increase of 100 per cent in the price of ferromanganese the consumption must be immediately reduced by 25 per cent from the maximum allowed previously. The instructions also threaten further reductions in the near future. It may be inferred from these instructions that the Germans have not been able to exploit the Russian ferromanganese deposits in the region of Nikopol. Recent German instructions state that steelmakers must de-oxidate the metal, as far as possible without manganese.

Speaking in London recently, M. Victor Bodson, the Luxemburg minister of justice, suggested that renewed aggression by Germany must be prevented. In 1918, he said, German industry was left in the hands of the Germans in its entirety and in full working condition, and it had since grown to huge proportions. After this war, its activities will have to be curtailed and its production cut down and left just enough scope to cover her own non-military requirements. Works like the Hermann Goering plant at Salzgitter which produces a steel whose cost of production is twice that of the world market price and which is produced solely for armament purposes must be erased. The whole steel industry of Germany should be concentrated if possible on the left side of the Rhine or at least not further inland than Bochum so as to remain under the control and close range of the aviation of the Council of Europe.

Russian industrialists are losing no time in seeking to make good the losses caused by the partial occupation of the country. No better example could be quoted than that of the reconstruction at Stalingrad which is taking place in an amazingly rapid manner. New works too are also coming into commission. The Magnitogorsk works in the Urals has just blown in its sixth blast furnace.

Allied warplanes have been "softening up" Nazi war plants and military installations on the continent while invasion material has been accumulating in Britain. Circle at left shows bombs exploding on a vital German ball bearing plant. Below, Sherman tanks and tank destroyers in England await the start of the invasion. NEA photos

England Discussing Postwar Plans

Postwar plans loom largely in the discussions now taking place in Britain, both nationally and locally, and the views of Sir George Nelson, president of the Federation of British Industries, are worth noting. "Let us consider", he said, "the great economic units of the United States, the U.S.S.R., China and perhaps of Europe, where, after the war, there may also be some measure of economic federation. They will not be small single countries like our own but unions of states with great populations and great economic resources. It seems to me therefore that if we are to compete on a reasonable basis, that the British Commonwealth of Nations must also become and develop as one economic unit, speaking with a single voice and thus be able to negotiate and to interchange its resources to the benefit of the world as a whole. If British industry is to compete with and secure its share of the world's markets in the future it must maintain its lead technically and in the quality of its goods; it must also ensure that the efficiency of its production of mass consumer goods is of the highest. In certain fields in Europe, in the U.S.S.R., and in the United States, great manufacturing units have been established, and it would be difficult for us in this country to get down to the same costs of production as of those countries unless units of similar efficiency were established here or in the Commonwealth. This is, it seems to me, a matter that requires urgent attention."

Girdler Visions Huge Postwar Demand for Cars

Tells St. Louis sales group there will be no need for "leaf-raking" economy after the war

THAT there will be immediate need for 12 million automobiles and production of six and a half million cars annually for several years after the war's end was predicted last week by Tom M. Girdler, chairman, Republic Steel Corp., and Consolidated Vultee Aircraft Corp., speaking to a postwar sales training group sponsored by the St. Louis Chamber of Commerce.

In his address he called upon industry to unite in providing peacetime prosperity, declaring the nation has the capacity to continue the war and plan for postwar conversion at the same time.

"It would be a serious mistake," he said, "to suppose that we could put off all thought of postwar problems until the day the shooting stops."

Declaring that there is no need for a leaf-raking economy after the war, Mr. Girdler quoted estimates of employment in the immediate postwar year of 52 million, an increase of seven million over 1937, and he said a vast reservoir of dammed up purchasing power, released after the war, should serve as a great stimulus to business and widespread employment.

With respect to the aircraft industry he did not think "the most potent weapon in our arsenal of defense "would be permitted to return to its prewar status. Maintenance of an ample number of military planes, and a trained flying personnel, supported by a healthy aircraft industry is America's best guarantee of a lasting peace, he said.

Further, he declared electrical and railway equipment volume is expected to double in the postwar period, while building construction will be trebled. The steel industry, however, will be confronted with a problem of great excess producing capacity.

Mr. Girdler insisted that government co-operation is essential in the task of reconversion and he called for enactment of the following three-point program: 1. Removal of all unnecessary governmental restrictions when peace comes; 2. adoption of sound measures for contract cancellation and disposal of surplus war goods; 3. enactment of sound tax legislation.

"Repeal taxes," he urged, "which have the primary objective of social reform and enact taxes which will encourage, not penalize venture capital. There is no occasion for any profiteering hue and cry against industry in this war. Compared with World War 1, the net return on gross sales volume of all industry has been cut from 6.8 per cent in 1917-1918 to 3.6 per cent in 1941-1943."

BRIEFS . . . .

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

Whiting Corp., Harvey, Ill., announces appointment of the William H. Ziegler Co. Inc., Minneapolis, as its exclusive sales representative in the Twin Cities territory.

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Sheffield Corp., Dayton, O. announces the appointment of R. T. Palmer Co., West Hartford, Conn., as its New England representative for the gage and precision instrument division.

—o—

Electric Supply Co. Inc., Shreveport, La., has been appointed distributor for the Crosley Corp., Cincinnati, in northern Louisiana.

—o—

Evans Reamer & Machine Co., Chicago, formerly known as the Evans Reamer Co., has moved to a new and larger plant in New Lexington, O.

—o—

Debevoise Anderson Co., New York, has moved its New York offices from 114 to 55 Liberty street.

—o—

Moline Malleable Iron Co., St. Charles, Ill., has accepted a group insurance program which provides its employes with three kinds of non-occupational benefits.

—o—

Borg-Warner Corp., Chicago, reports that 85 officials and key men from 22 divisions and subsidiaries of the company met recently in Chicago for a postwar planning conference with C. S. Davis, president, and other Borg-Warner executives.

—o—

American Car & Foundry Co., New York, reports that its shipyard at Wilmington, Del., has won for the second consecutive year the Stevenson Safety Award for plants in group 1.

—o—

Allis-Chalmers Mfg. Co., Milwaukee, plans to sponsor the Boston Symphony Orchestra's "pop" concerts over the Blue Network each Saturday at 8 p. m., beginning in May.

—o—

Eclipse-Pioneer division, Bendix Aviation [illegible] using

COLD DRIVEN RIVETING: Members of the Crane Committee of the Association of Iron and Steel Engineers are watching a demonstration of cold riveting as applied to laminated ladle hooks. Demonstration was held recently at the Graham works, Pittsburgh Screw & Bolt Corp., Pittsburgh, by Riveting Apparatus Inc. Cold driving, with correct pressures as determined for the rivet size and material, has been shown to cause the rivet to completely fill the hole, thus giving a tight joint and at the same time increase the rivet strength

GOOD NEIGHBOR: Brazilian iron ore for the United States war program will be discussed by Dr. Louis J. Ensch, general manager of Cia. Siderurgica Belgo Mineira, Brazilian ore producing company, with United States government officials. Ore from Brazil has been made possible by United States' aid in financing railroad construction linking mines in the deep interior of the South American republic

"iron lungs", capable of "inhaling" 30,000 to 45,000 cubic feet of air per minute, to remove smoke and dust from metal pouring operations in its five magnesium and other nonferrous metal casting plants.

—o—

University of Iowa, Iowa City, Iowa, plans to offer a three-week management course on production planning, plant layout, motion and time study, wage incentives, and related subjects from June 12 to 30.

—o—

United States Steel Corp., Pittsburgh, reports that more than 7,000,000 people in all of the nation's 48 states and in 23 foreign countries have seen its two films, "To Each Other" and "Steel for Victory", during 1943.

—o—

Larco Tool Co., New York, has available for distribution a 32-page booklet relating to diamond impregnated grinding wheels.

—o—

National Calibration Service, Brooklyn, N. Y., has been purchased by Foster D. Snell Inc., Brooklyn, N. Y., consulting chemists and engineers, and will be operated as a separate department by the Snell organization. Principal business of National Calibration is verification of vertical compression and tensile testing machines.

—o—

American Steel & Wire Co., Cleveland, in co-operation with the Cleveland of photographs presenting the story of the preparation of steel for war purposes.

—o—

War Department, Washington, reports the Army sends nearly 7,000,000 pounds of "detinnable" scrap to the detinning companies each month.

—o—

Metallizing Co. of America, Chicago, plans to introduce a new unit at the meeting of the American Foundrymen's Association at Buffalo, April 25-28. The new unit, it is claimed, can effectively repair and salvage defective aluminum by cold welding, without setting up stresses or crystallization caused by high temperatures.

—o—

Cordage Inc., Chicago, is the name of a new company operating as a subsidiary of Kellogg Switchboard & Supply Co., Chicago, for manufacturing special aircraft electrical cords.

—o—

U. S. Rubber Co., New York, has taken over the management and operation for the government of the Kankakee Ordnance works, Will county, Ill.

—o—

Auto-Ordnance Corp., Bridgeport, Conn., has changed its name to Maguire Industries Inc.

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American Central Mfg. Corp., Connersville, Ind., has retained the services of Raymond Loewy, internationally known industrial designer, to create the postwar designs of its steel sinks and n cabinets.

New Packaging Trends Shown At Exposition

War leaving its imprint on the industry. Use of steel in form of wire and strip for binding appears due to increase

WAR is leaving its imprint on the packaging industry and bringing about significant changes induced by new trends in food preservation and distribution, shortages of metals for containers, and special requirements for shipping equipment and supplies to the armed services.

This picture and what may be in store in the future was provided by the Packaging Conference and Exposition held recently at the Palmer House, Chicago, under sponsorship of the American Management Association.

The war effort requires supplies of every description to be shipped to all parts of the world under conditions which in many cases have never previously been encountered. Consequently, proper packaging to assure their arrival in usable condition is a necessity.

4000 Attend Meeting of American Chemical Society

Approximately 4000 members of the American Chemical Society attended the spring convention in Cleveland from April 3-6.

Dr. Thomas Midgley, inventor of tetraethyl lead for gasoline, is president of the society which is the largest scientific organization in the world with some 40,000 members. Dr. C. E. Prutton, Case School of Applied Science, Cleveland, was general chairman of the meeting, and Dr. H. S. Booth, Western Reserve University, Cleveland, was honorary chairman.

Magnesium Association Is Organized at Chicago

Formation of the Magnesium Association for the purpose of promoting the magnesium industry recently was effected at an organizational meeting at the Palmer House, Chicago. Edward S. Christiansen, vice president, Apex Smelting Co., Chicago, was elected president of the new organization, C. C. Loomis, president, New England Lime Co., vice president, and C. E. Larson, operations manager, White Metal Rolling & Stamping Co., treasurer.

Offices of the association are at 2537 W. Taylor street, Chicago. Membership in the association is representative of the magnesium industry in all its phases.

Some Key Industries' Order Volume Expands

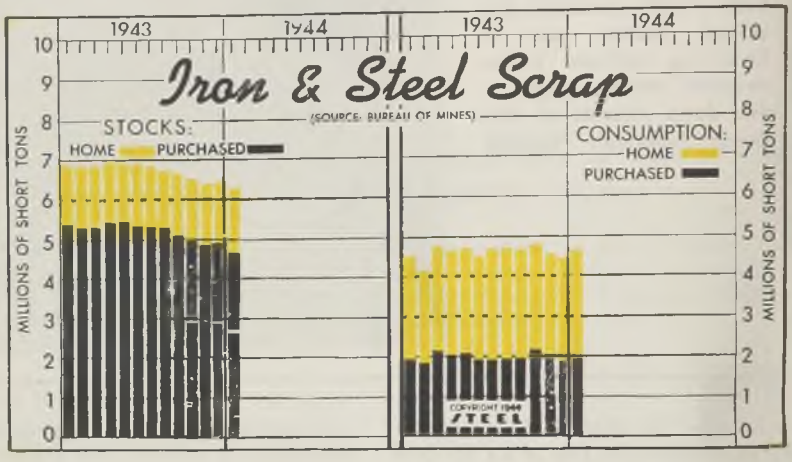
LEVELING off in industrial activity at present near record pace is indicated by the diverse trends of business barometers recently. To meet expanding requirements of certain "must" war programs a steady volume of new orders is being placed with such key industries as steel, radio and radar, shipbuilding, iron and steel foundries, synthetic rubber, lumber, antifriction bearings and heavy trucks. Further curtailment in building construction, certain ordnance mobile equipment, guns and fire control equipment and machine tool output are offsetting factors to the expansion in other lines.

This spotty situation in the overall trend of business activity is reflected in the fluctuations of industrial indicators the past few weeks. Bolstered by an increasing influx of new orders the steel industry's ingot operations have been edging upward lately in contrast with the downward tendency recorded earlier this year. Gains were also registered during the latest week in bituminous coal production, revenue freight carloadings, money in circulation and output of trucks and automobiles. During the same period declines occurred in electric power consumption, petroleum production and engineering construction awards. In the preceding week most of these indicators recorded directly opposite trends.

INDUSTRIAL OUTPUT—Pace of overall industrial activity has held little better than its own in recent months, the Federal Reserve Board's seasonally adjusted index shows. The latest index figure available indicates a one point gain to 243 for February, comparing with the peak of 247 reached in October and November last year.

LABOR TURNOVER—Reports from 26 major war industries reveal that January labor turnover was lower than in the like 1943 month despite lighter employment in some plants. The survey, conducted by the War Manpower Commission with the aid of the Bureau of Labor Statistics, shows that iron and steel production and shipbuilding, with January turnover rates of 7.67 and 9.95 per cent respectively, were the only war industries with rates higher than the "all manufacturing" average. Employment stabilization controls have aided measurably in keeping labor turnover well below that recorded during the first world war, Paul V. McNutt, WMC chairman, states.

FOUNDRY EQUIPMENT—Stepped up requirements for heavy trucks and renewed emphasis on increasing production of spare parts to maintain mobile equipment functioning in battle areas resulted in a sharp upturn in foundry equipment orders during February, the latest month for which official figures are available. The upward trend continued through March, and may have closely matched the peak 1943 month. Gear sales recorded the second consecutive monthly decline during February, to almost 50 per cent below that recorded in the best month last year.



Iron and Steel Scrap

(Gross Tons—000 omitted)

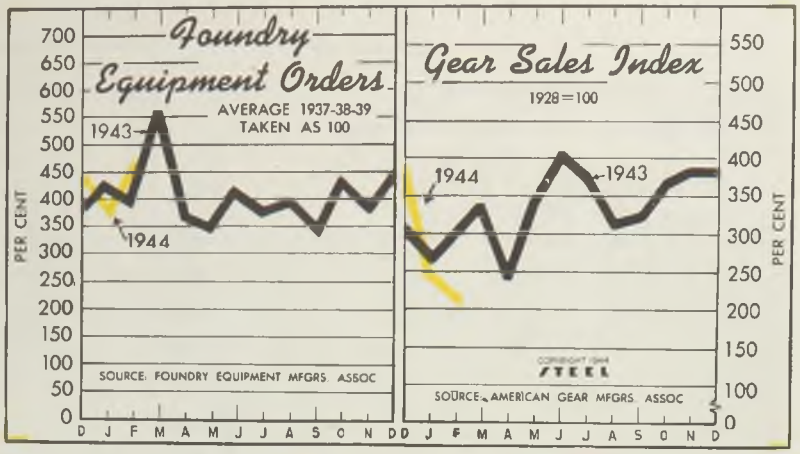
	Consumers' Stocks			Total Consumption		
	1944	1943	1942	1944	1943	1942
Jan.	6,214	6,877	4,100	4,616	4,492	4,425
Feb.	....	6,871	4,073	....	4,178	4,204
Mar.	....	6,850	4,101	....	4,787	4,661
Apr.	....	6,918	4,324	....	4,642	4,603
May	....	6,905	4,602	....	4,723	4,665
June	....	6,916	4,859	....	4,493	4,464
July	....	6,860	5,087	....	4,570	4,470
Aug.	....	6,778	5,279	....	4,686	4,478
Sept.	....	6,613	5,545	....	4,657	4,424
Oct.	....	6,456	6,260	....	4,830	4,770
Nov.	....	6,391	6,742	....	4,581	4,401
Dec.	....	6,458	6,930	....	4,449	4,497
Mo. Av.	....	6,740	5,159	....	4,599	4,505

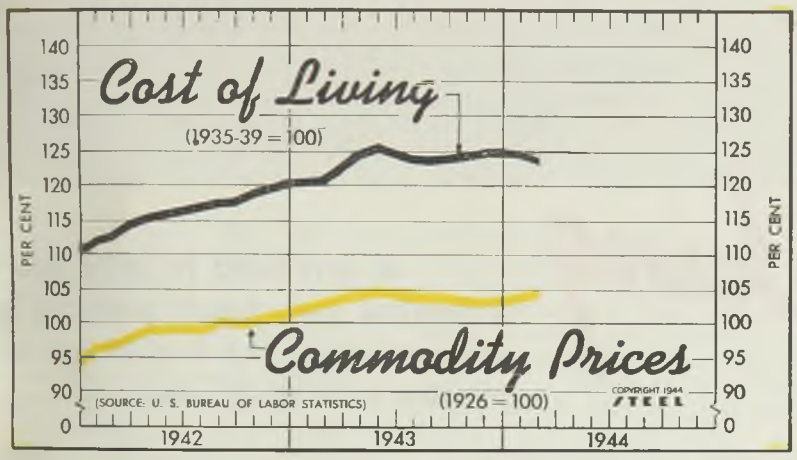
FIGURES THIS WEEK

INDUSTRY	Latest Period*	Prior Week	Month Ago	Year Ago
Steel Ingot Output (per cent of capacity)	99.0	98.5	97.5	99.5
Electric Power Distributed (million kilowatt hours)	4,409	4,409	4,445	3,890
Bituminous Coal Production (daily av.—1000 tons)	2,030	1,987	2,053	2,100
Petroleum Production (daily av.—1000 bbls.)	4,377	4,384	4,423	3,918
Construction Volume (ENR—unit $1,000,000)	$29.4	$32.9	$22.2	$61.4
Automobile and Truck Output (Ward's—number units)	18,085	17,725	17,805	18,555
*Dates on request.				
TRADE				
Freight Carloadings (unit—1000 cars)	787†	779	782	787
Business Failures (Dun & Bradstreet, number)	21	30	36	89
Money in Circulation (in millions of dollars)‡	$21,037	$20,934	$20,696	$16,252
Department Store Sales (change from like week a year ago)†	+17%	+11%	−9%	−2%
†Preliminary. ‡Federal Reserve Board.				

Foundry Equipment and Gear Sales

	Monthly Average (1937-38-39=100)			Index (1928=100)		
	1944	1943	1942	1944	1943	1942
Jan.	378.3	429.8	532.7	246	268	288
Feb.	456.8	399.5	567.9	214	303	353
Mar.	.....	562.7	1122.4	...	334	455
Apr.	.....	362.7	1089.3	...	240	378
May	.....	348.9	653.6	...	342	421
June	.....	413.6	774.0	...	401	373
July	.....	379.4	800.8	...	374	344
Aug.	.....	390.4	510.8	...	312	380
Sept.	.....	346.6	446.4	...	320	351
Oct.	.....	436.6	540.6	...	368	263
Nov.	.....	388.0	338.8	...	387	359
Dec.	.....	442.8	382.5	...	387	300
Avg.	.....	440.3	646.7	...	336	355





Wholesale Commodity Price—Cost of Living Indexes

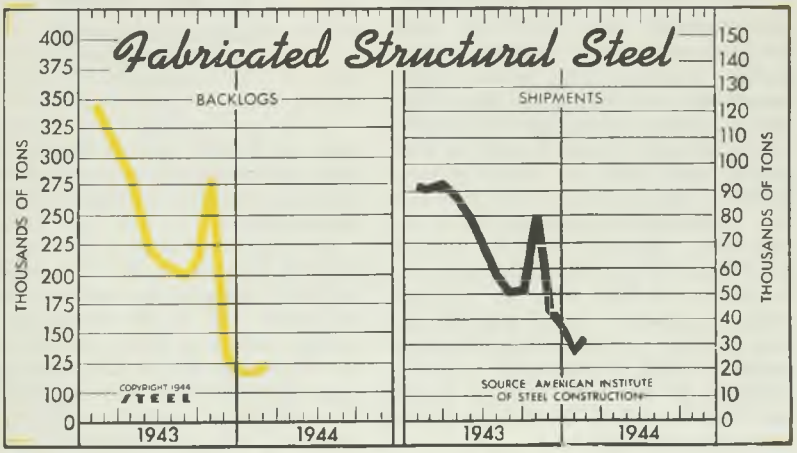
	Commodities (1926 = 100)			Living Costs (1935-39 = 100)		
	1944	1943	1942	1944	1943	1942
Jan.	103.3	101.9	96.0	124.1	120.6	112.0
Feb.	103.6	102.5	96.7	123.7	120.9	112.9
Mar.	....	103.4	97.6	....	122.8	114.3
Apr.	....	103.7	98.7	....	124.1	115.1
May	....	104.1	98.8	....	125.1	116.0
June	....	103.8	98.6	....	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.	27.7	91.9	167.8	113.1	339.1	704.4
Feb.	32.5	90.8	164.6	117.6	321.0	706.7
Mar.	....	94.0	191.3	.....	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

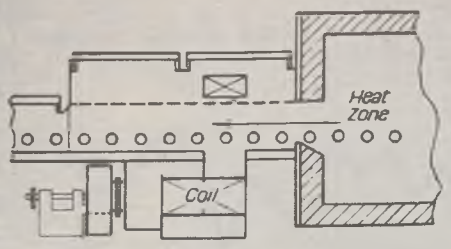
	Latest Period*	Prior Week	Month Ago	Year Ago
Bank Clearings (Dun & Bradstreet—millions)	$9,379	$10,873	$8,076	$8,371
Federal Gross Debt (billions)	$184.5	$187.9	$189.6	$119.9
Bond Volume, NYSE (millions)	$52.6	$64.5	$56.2	$95.6
Stocks Sales, NYSE (thousands)	4,946	6,696	3,973	9,714
Loans and Investments (millions)†	$52,401	$52,885	$53,854	$42,004
United States Government Obligations Held (millions)†	$38,329	$38,601	$39,139	$29,289

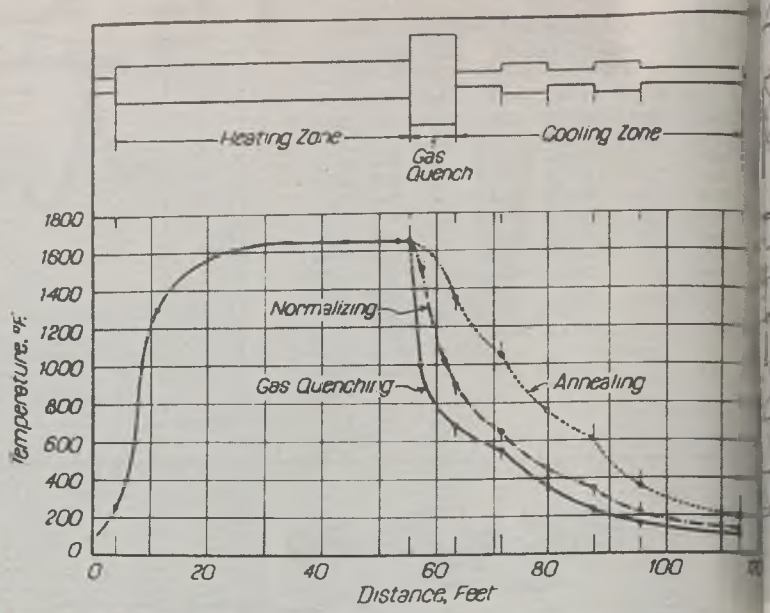
†Member banks, Federal Reserve System.

PRICES

STEEL's composite finished steel price average	$56.73	$56.73	$56.73	$56.73
Spot Commodity Index (Moody's, 15 items)†	250.0	251.3	249.5	249.5
Industrial Raw Materials (Bureau of Labor index)†	114.0	113.9	113.0	112.5
Manufactured Products (Bureau of Labor index)†	100.7	100.6	100.6	100.7

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





Gas Quenching

. . . . is developed to point where it functions well. Results produced by gas quenching SAE X-4130 are applicable to NE-8630 steel

By WM. LEHRER
Development Department
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STEEL TUBING is one of the principal materials from which the main structural members of airplanes such as fuselage structures, wing beams, engine mounts, etc., are fabricated. Since lightness is a primary requirement in airplane construction, the tubing is made of high quality steels and is invariably heat treated to develop high physical properties. Common aircraft tubing steels are SAE-1025, X-4130, X-4135, X-4340, X-6150, and of late NE-8630. Of these, X-4130 or NE-8630 is by far the most widely employed. Better than 90 per cent of the aircraft tubing structures consist of SAE X-4130 steel which is processed by the tube mills in rounds and ovals as well as streamlined, square and rectangular shapes.

The Army-Navy specifications for aeronautical chrome-molybdenum (X-4130) welded steel tubing specify 0.25 to 0.35 per cent carbon, 0.40 to 0.60 per cent manganese, 0.040 per cent phosphorus (max.), 0.050 per cent sulphur (max.), 0.80 to 1.10 per cent chromium, 0.15 to 0.25 per cent molybdenum.

"After the last forming operation, the tubing shall be normalized, stress relieved, or otherwise heat treated to develop the physical properties specified in Table II."

Although bright gas quenching of welded SAE X-4130 aircraft tubing, will be discussed here, a brief outline of fundamental principles and gas quenching apparatus appears advisable.

The heat treatment above will produce the required physical properties in most heats of X-4130 steel as long as single tubes are handled or as long as the heat-treating operation is carried out on a small scale.

On large production continuous heat-treating furnaces, however, normalizing as above produces the specified physical properties only in few instances. The carbon content of the steel must be on the high side of the allowable carbon range and even then only thin wall tubing responds to cooling in still air. Furthermore, the production rate of the furnace has to be greatly reduced by suitable spacing of the tubes on the furnace conveyor and by adequate conveyor speeds so as to prevent an excessive temperature rise of the air surrounding the tubes and thus a retardation of the rate of cooling to a detrimental degree.

Forced Cooling: For the average carbon analysis and for the average tube sizes and wall thicknesses, however, cooling in still air is inadequate. The rate of cooling must be considerably faster and can be secured only by forced cooling in a continuous stream of cold gases so arranged that the gases being heated by the immediate contact with the hot steel are constantly replaced by a fresh supply of cold gases.

Cooling Medium: It is well known that a scaled surface of [illegible] cooled or quenched reduces the rate at which heat can be removed from the steel by a cooling medium; that is, it decreases the rate of cooling and thus affects the physical properties. A scaled surface is conducive also to nonuniformity of the results obtained. Obviously cooling in still air produces scale and consequently does not facilitate the attainment of the best possible physical properties.

The use of air as the cooling medium has another disadvantage. The rate of cooling of metals is to an appreciable extent dependent upon the heat capacity of the quenching medium applied. Air having a specific heat of 0.2374 is a comparatively slow cooling medium, particularly if the cooling process is carried out in still air.

A marked improvement of the cooling rate and of the resultant physical properties of steel is obtained by the application of a bright annealing gas in place of air. Such a gas eliminates any scale or oxide film on the surface of the steel to be treated not only during the rapid cooling cycle but also during the much longer heating and soaking periods at elevated temperatures. The most frequently encountered bright annealing gas which is produced by the partial combustion of a fuel gas and which contains approximately 5.0 per cent carbon dioxide, 10 per cent carbon monoxide, 12 per cent hydrogen and a moisture content equivalent to a 40 degrees Fahr. dew point has the [illegible] pacity

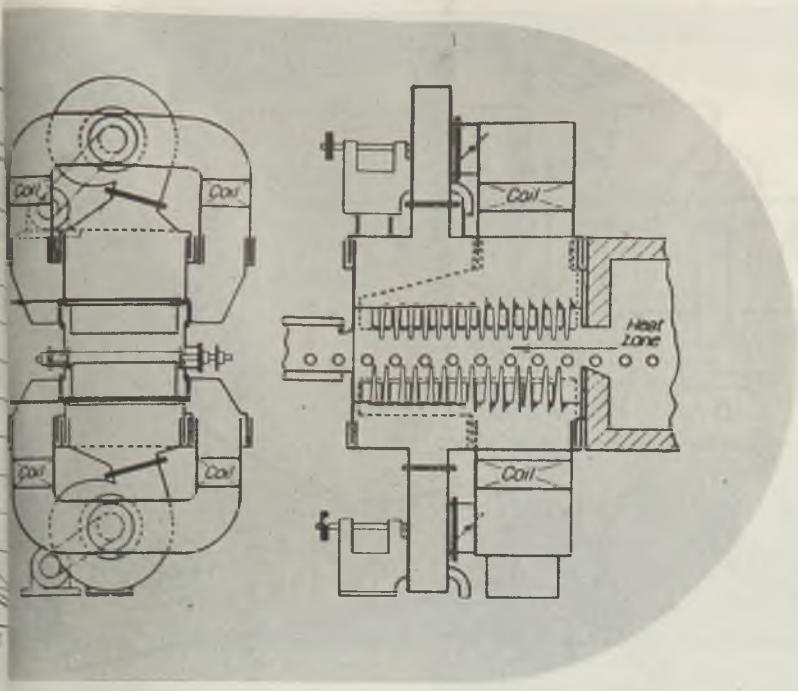


Fig. 1. (Extreme left)—Arrangement of fast cooling zone

Fig. 2. (Center, left)—Heat-treating cycles obtainable with fast cooling zone and with gas quenching zone

Fig. 3. (Left)—Details of the gas quenching zone, elevation and plan views

is 13 per cent higher than that of air, its specific heat being 0.2686.

Besides promoting a faster rate of cooling for two reasons just outlined, the use of a bright annealing gas results in considerable saving of time, labor and material because no removal of scale is required after heat treating.

The continuous roller hearth bright annealing furnace, is ideally suited for continuously conveying elongated material such as tubes through the heating and cooling chambers.

The fast cooling zone used for rapid cooling of the tubes is located immediately adjacent to the discharge end of the heating zone and forms one continuous work chamber with the heating zone on its work entering side and with the slow cooling zone on its discharge side. This general arrangement is illustrated by Fig. 1. The same protective atmosphere is maintained throughout the entire length of the furnace. Whereas the work in the heating zone and in the slow cooling zone is surrounded by the protective gases in an almost quiescent condition, the gases in the fast cooling zone are forced against and around the work at accelerated velocities. The gases are withdrawn from the bottom of the zone and are pulled over a suitable water cooled coil by means of a fan which delivers the cooled gases under pressure to a large plenum chamber located above the work. From the plenum chamber the gases are discharged onto the work and, having absorbed their quota of heat from the hot work, are again removed from the work cooling chamber, are cooled and returned to the plenum chamber. The atmosphere gases are thus being recirculated over the work to be cooled in a single pass arrangement.

Fast cooling zones of this type have produced satisfactory physical properties as specified for normalized tubing. Two precautions were essential. First, the tubes had to be spaced on the conveyor so as to allow the recirculated cold gases to pass between the tubes and to completely envelop each individual tube. Secondly, the carbon content of the steel had to be on the high side of the permissible carbon range, that is, above 0.30 carbon.

A typical heating and cooling cycle obtained with this type of fast cooling zone is presented by the normalizing curve shown in Fig. 2, above.

Physical properties produced on SAE X-4130 seamless tubes by these rates of fast cooling are listed in Table II.

The results obviously better the minimum requirements for normalized SAE X-4230 *seamless* tubes by a good margin; they are, however, being secured only with a considerable sacrifice in production and economy. The necessary spacing of the tubes on the conveyor reduces the hourly rate of production for normalizing to approximately 50 per cent of that obtainable when operating the furnace on annealing in which case the conveyor hearth is fully loaded.

Super-Fast Cooling Zone for Welded Aircraft Tubes: Heat treatment of *welded* SAE X-4130 aircraft tubing presents a more difficult problem. Welded tubes are produced from a flat-rolled steel strip formed by a series of rolls into a practically perfect cylinder the seam of which is joined by a continuous welding process. To assure a soundly welded seam, the carbon content of the steel used for welded X-4130 aircraft tubing is normally held on the low side of the permissible carbon range, that is, 0.3 per cent carbon or lower.

This makes it harder to secure the desired physical properties by heat treatment. Furthermore, the degree of cold working which invariably increases the tensile properties is in the case of welded

(*Please turn to Page* 134)

TABLE I—PHYSICAL PROPERTIES

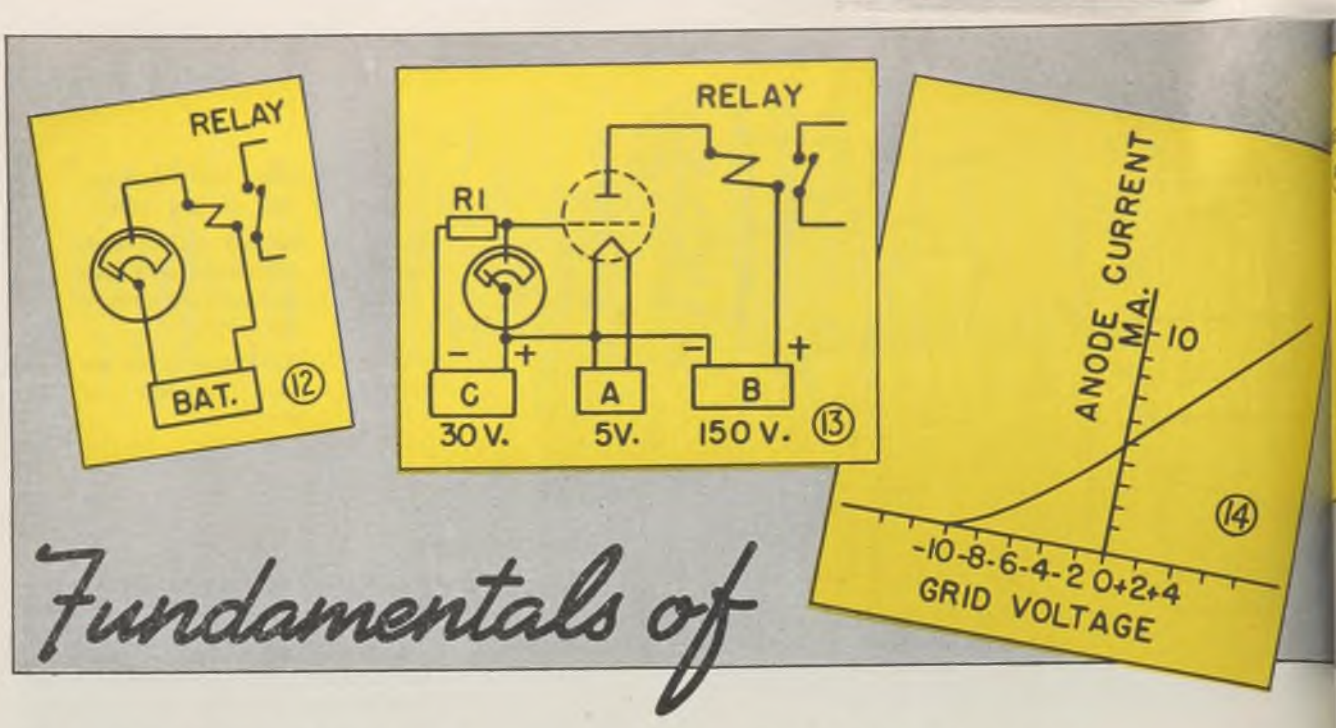
Condition and Wall Thickness Inch	Tensile Strength (Min.) Lb. Per Sq. in.	Yield Strength at 0.2 Per Cent Set or at —Extension Indicated— (Min.) Lb. Per Sq. In.	Extension Under Load Inch in 2 Inches	Elongation In 2 Inches Full Tube (Min.) Per Cent	Strip (Min.) Per Cent
(A) All sizes (N)	95.000*				
Up to 0.035 incl.	95,000	75.000	0.0090	10	5
Over 0.035 to 0.188 incl.	95,000	75,000	0.0090	12	7
Over 0.188 (HT-125)	90,000	70,000	0.0087	15	10
All Walls (HT-150)	125,000	100,000	0.0107	12	7
All Walls (HT-180)	150,000	135,000	0.0130	10	6
All Walls (HT-200)	180,000	165,000	0.0154	8	5
All Walls	200,000	165,000	0.0154	7	4

*Maximum

TABLE II—PHYSICAL PROPERTIES OF SEAMLESS SAE X-4130 NORMALIZED TUBES

Tube Size	Yield Strength P.S.I.	Tensile Strength P.S.I.	Elongation Per Cent
½" O.D. x 20 ga.	88,800	119,200	19.5
⅝" O.D. x 20 ga.	95,300	116,500	19.5
1⅛" O.D. x 18 ga.	94,800	121,800	20.3
1½" O.D. x 17 ga.	99,600	121,700	18.7
1" O.D. x 11 ga.	89,700	107,800	24.2

From A.S.M. *Transactions*.



Fundamentals of INDUSTRIAL ELECTRONICS

Second article in series discusses functioning of three-element tube used in relays for controlling many industrial processes, including injection molding, timing of machining and heat treating operations, rivet-heating and the like. Author shows how electronic tubes can operate in practical circuits

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

IN PART I of this series the operation of a simple form of electron tube device, the phanotron rectifier, was covered. This tube has only two elements, the anode and the heated cathode, which produce the electrons that flow through the space inside the tube. Two basic types of tubes were mentioned, the high-vacuum tube and the vapor-filled tube. Considering either of these tubes only as a rectifier, we find no difference in operation except that the amount of anode current can be several amperes in the vapor-filled tube, but is limited to milliamperes in the high-vacuum type. These tubes act merely as valves, and allow current to flow whenever positive voltage is supplied to the anode.

The Pliotron, or High-vacuum Triode

In this article, we will show how an electron tube of the high-vacuum type can be controlled by adding a third element which we call the grid. With three elements—anode, cathode, and grid—the tube is classed as a triode. Here we limit the discussion to the high-vacuum type of triode, the pliotron. The new fundamental to learn is that such a three-element tube acts as an amplifier — that is, a signal (a small change of potential at the grid) controls a considerable flow of current through the tube. A large amount of amplification can be obtained by combining a number of tubes in such a manner that each tube amplifies the output of the previous tube. This feature of amplification is basically important in the study of electronics, for it is the secret whereby a radio loudspeaker shouts in response to the small signal received from a transmitter hundreds of miles away, or it makes it possible for a 10-horsepower motor to move a gun turret to follow a signal reflected from an airplane miles above in darkness.

A Contact Problem

Suppose, as shown in Fig. 12, that we have a sensitive contact-making instrument which—as its pointer moves slowly up the scale—finally closes the contacts and thereby energizes a small relay to operate some external circuit. For simplicity, we show this circuit operated from a battery power supply. The current passing through the meter contacts to energize the relay coil has to be about 0.1 ampere for a 6-volt coil, or 0.005 ampere for a 110-volt coil. In either case, this amount of current passing between the slowly moving contacts of the instrument eventually causes sparking and burning of the tiny sensitive contact tips. This circuit will work, but the amount of current needed to energize the relay coil is too large to be satisfactorily and repeatedly controlled through the tiny meter contacts. To solve this difficulty, we introduce the electron tube.

The Electronic Answer

In Fig. 13, we have kept the same contact-making instrument, and we have kept the same 110-volt relay coil, but between these two devices we have now inserted a three-element vacuum tube or amplifier. In order to make this electron tube work, we must, of course, provide means of heating the cathode and also a power supply to furnish the necessary potential at the anode of the tube so as to force the current through the tube and through the coil of the relay.

For simplicity, we have shown these power supplies in the form of batteries. Looking back to the days of the battery-operated radio sets, you may recognize this "A" battery as the low-voltage source for heating the tube cathode, while the "B" battery furnishes perhaps several hundred volts for the anode circuit of the tube, and the "C" battery is for the required negative grid voltage. Notice

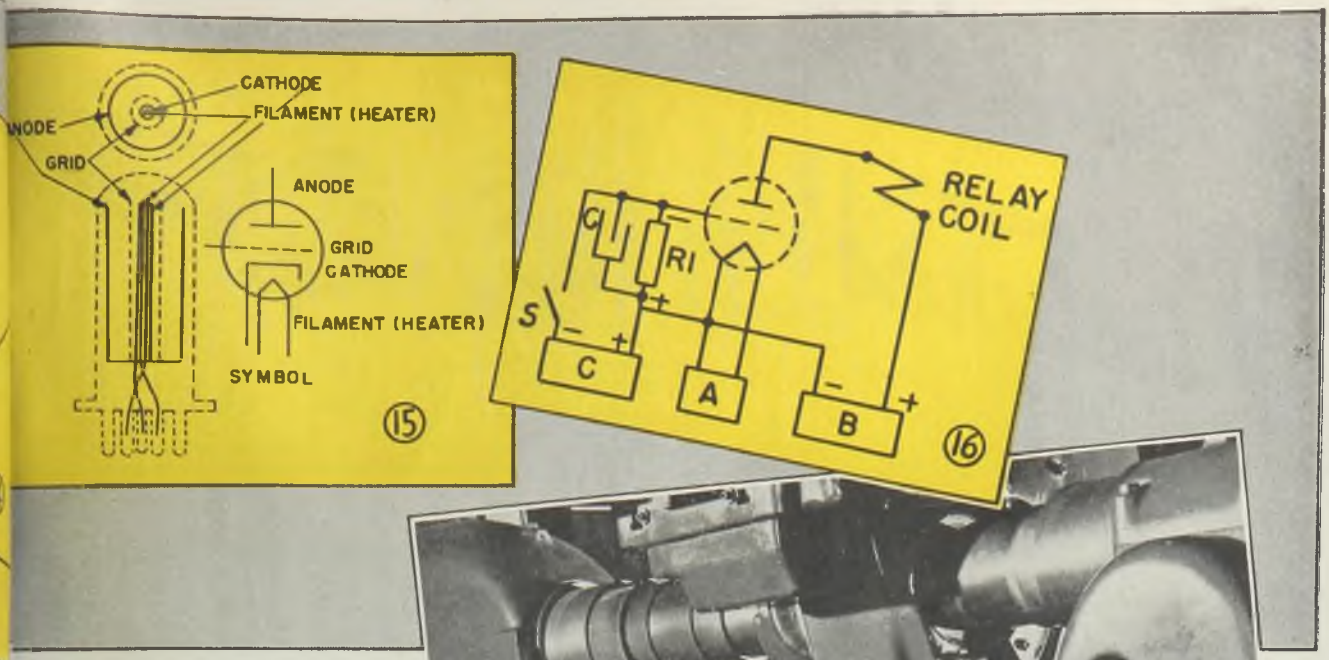


Fig. 12—A relay operated by a contact-making instrument

Fig. 13—A relay operated by a contact-making instrument through a pliotron

Fig. 14—Effect of grid voltage on anode current

Fig. 15—Cross section and diagram symbol for a triode pliotron

Fig. 16—A battery-operated electronic timer

Fig. 23—Here an electronic timer (lower right) times period for grinding operation on motor stators. The timer, installed on a Bryant grinding machine, is preset so that after a certain period, depending on the amount to be ground and the size of the grinding wheel, it automatically stops the operation

that the "B" battery must be positive on the right side which is connected to the tube anode.

In the symbol for this tube shown in Fig. 13, we have shown not only the anode and cathode, but we have added the third element, the grid. We have connected this grid to one contact of the contact-making instrument. The other contact is shown connected to the cathode of the tube. When this instrument's contacts close, they connect the grid of the tube directly to the cathode of the tube, so that the grid is at the same potential as the cathode. In this condition, the tube passes current almost as though there were no grid at all.

However, when the instrument contacts are open, you will see that the grid is not at cathode potential, but is at a negative potential supplied by the "C" battery. With the instrument contacts o

the high resistance R1 (approximately 3 megohms), so there is no voltage drop across this resistor. When the grid of this tube is made as much as 20 to 30 volts more negative than the cathode of the tube, the tube current cannot flow from anode to cathode, even though the anode may be several hundred volts more positive than the cathode. As long as the instrument contacts remain open, this negative voltage at the grid will prevent current flow and will thereby prevent the closing of the relay contacts.

However, just as soon as the instrument contacts close, the grid of the tube is connected directly to the cathode of [illegible]e and no longer has a negative potential. It will no longer prevent the flow of current between the anode and cathode of the tube, so the relay picks up and closes its contact. Notice that the amount of current flowing through the instrument contacts is now only a few millionths of an ampere. This current is so small that it will not damage the sensitive instrument contacts and is also too small to directly energize the coil of the relay. Yet by inserting the electron tube in the circuit and with very small current in the contacts, it is easily possible to change the potential at the grid of the tube so that the tube can thereby be controlled so as to allow

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Precision Fixtures

. . . . reduce machining problems, cut costs 35 per cent

By H. V. WENGER JR.
Senior Tool Engineer
Boeing Aircraft Co.
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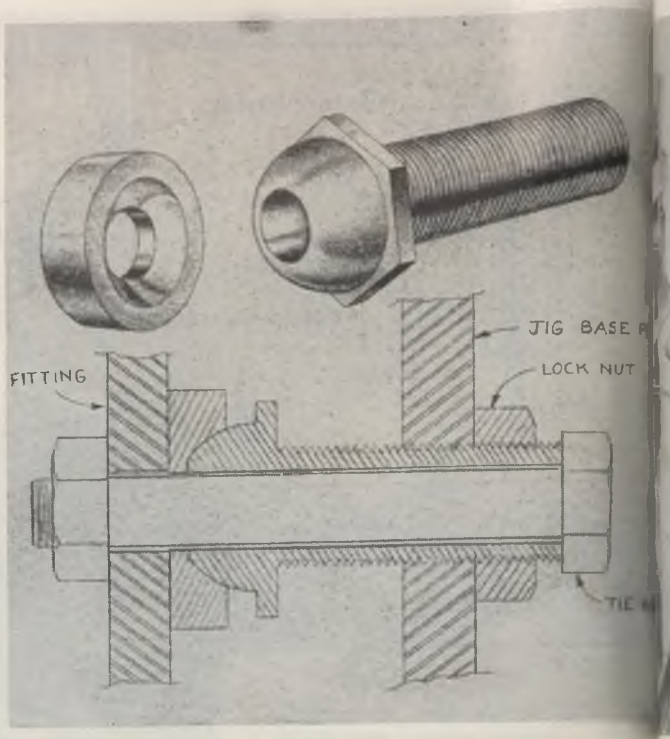


EVOLUTION of tooling at Boeing Aircraft Co. is typical of the experiences of many large firms in the aircraft industry. Originally the tools, as well as the airplane itself, were composed largely of wood. Later airplanes progressed to welded tubes covered by fabric but the orders, being small, did not warrant a change from wooden jigs and fixtures. This condition existed until the orders for airplanes were for a quantity that warranted more permanent tooling. Wooden jigs had long been unsatisfactory due to changes in dimension from aging and drying.

The first steel jigs were built up of used pipe or structural steel and arc welding was used for fabricating all of the rough structure. Likewise, many of the fittings were made up of bar sections welded together. The further possibilities of arc welding were left uninvestigated.

Nearly all aircraft jigs consisted of a framework and fittings which were set on the frame structure. The framework followed a rather definite pattern and generally consisted of a structure of used pipe or structural steel sections welded together. To this structure were attached pads or pieces of steel plate which would later be machined to a common level. After the structure, which sometimes required the largest of planers, was machined, a layout was made on the machined surface which also served as the base plane of the jig.

The fittings which held the individual parts of the airplane assembly in their proper position were made by welding mild steel bar sections together, after which the fitting was normalized and machined. Machining usually consisted of milling the base and then milling a recess for nesting the airplane part at a determined height above the base. The tolerances were of the nature of plus or minus 0.010-inch which meant medium-class work by skilled machine operators. Each fitting required a new setup on the mill which took time and, due to rather severe inspection, often was returned for rework.

The fittings were located on the frame structure to the layout made on the machined base pads and after being properly set and checked a hole was drilled in the base of the fitting and tapped in the base pad of the frame. The hole in the fitting was made slightly oversize for adjustment. The fitting was then rechecked and any adjustment required was made by a tap with a mallet. After the fitting was set it was double doweled with taper pins to secure it.

It is obvious that these machine operations represented a considerable portion of the jig fabrication time and when the machine shop became overloaded all work was tied up. The situation was even further complicated by the types of labor involved.

Skilled Mechanic Required

Semi-skilled laborers torch cut the rough structure and prepared it for the welder. They also sawed up the lengths of bar stock that went to make the fittings. This type of work went fast because tolerances were large and the work was not held up waiting for other groups to perform certain operations. However, after the base frame came back from machining the problems were more involved. The layout required a skilled mechanic as did the work of setting the fittings. These men could proceed providing all of the fittings were available from the machine shop and no problem came up that required machine work. If all of the fittings were not available this crew had to transfer to another job with the result that each crew soon had several jobs under way, none of which could be completed to make room for new jobs coming on.

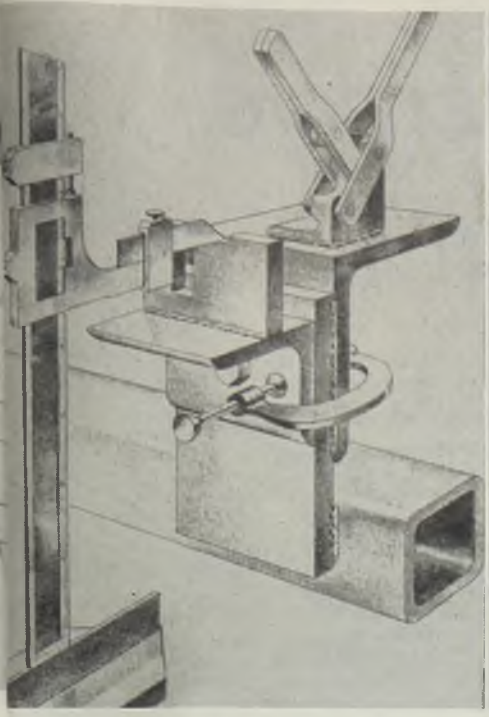
New Jig Design Procedure: Orders for military aircraft have called for production schedules that are appalling to an industry where 40 ships to be delivered over a period of a year was a big order. It was obvious that if the tooling department was to meet its schedules a departure must be made from the former jig fabricating practices.

The old jig fabrication procedures, described here were not the result of planned development. They just grew. Likewise, the development of a new design procedure could not well be the inspiration of one man nor the product of one company. Rather, it was a result of a study of the best features developed in our own shops and incorporating the best features of tools developed by other aircraft manufacturers. Formerly, jig design drawings were incomplete. Many details were left to the fabrication shops. With this free rein they developed many novel ideas. Due to the lightning growth of aircraft production, there is a natural shortage of skilled workers and the shops now require complete working drawings.

In developing a new design procedure there were three objectives:

1. Minimize machining.
2. Minimize tools required for jig fabrication.
3. Minimize time required for jig fabrication.

The reason for minimizing machining has been completely covered. It should be brought out that welded jigs made without machining are common and are



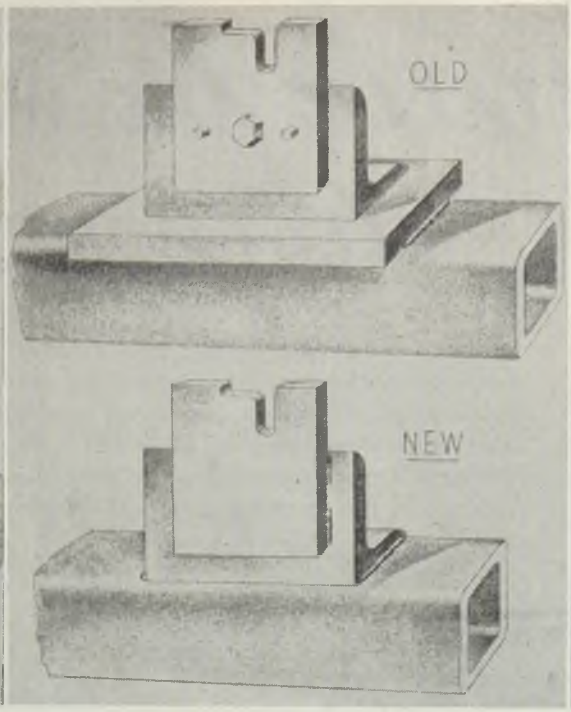


Fig. 1. (*Left, opposite page*)—*Spherical bushing and head with cross section to show method of application*

Fig. 2. (*Left*)—*Height gage aids in setting fittings in place for tack welding to jig structure*

Fig. 3. (*Center*)—*Old and new method of attaching a nesting fitting. All data and photos from paper submitted in James F. Lincoln Arc Welding Foundation's* $200,000 *award program*

Fig. 4. (*Right*)—*Old and new method of attaching a hinge fitting to structural member*

pictured frequently in welding literature. These jigs, however, are for comparatively rough structure with tolerances of the nature of plus or minus ⅛-inch. Our problem was to make tools with a tolerance of plus or minus 0.010-inch which comes in the range of medium machining tolerances. This was accomplished by a planned use of arc welding.

Minimizing the tools required for jig fabrication was so successful that the only tools required by the jig shop were welding machines, surface plates, surface disk grinders, metal cutting band saws and drill presses. This is in contrast to a complete machine shop including a 20-foot planer formerly required.

Minimizing time required for jig fabrication had two motives. The first was to cut down the floor space required in the jig shop and the second was to get jigs out of the shop before changes came through due to minor airplane redesign. It was found cheaper to rework the jigs after they were set up on the assembly lines than to hold up the tools in the fabrication shop waiting for the change information to come through.

Major Jig Design: The large jigs have always been easier to fabricate than the minor jigs mainly because they are rough structure and scaffolding with relatively few fittings. However, there was often a complicated machining problem with the former method of fabrication. The terminals were mounted on machined pads and frequently the pads were attached to a sizable structure which was difficult to set up even on a large planer. A spherical bushing developed by the shop solved this problem and has become a universal fixture on all of our designs.

The spherical bushing is shown in Fig. 1. The set-up consists of a hollow bolt with a spherical head. This sets in a cup with a spherical recess. A plate, or pad, is welded to the jig structure and is drilled and tapped for the hollow spherical bolt. The fitting is then drilled for the tie bolt that goes through the spherical bolt and the cup is put in place. The fitting is set to position by adjusting the hollow spherical bolt in or out of the pad. When properly set the cup is tack welded to the fitting and the hollow spherical bolt is locked by a tack weld

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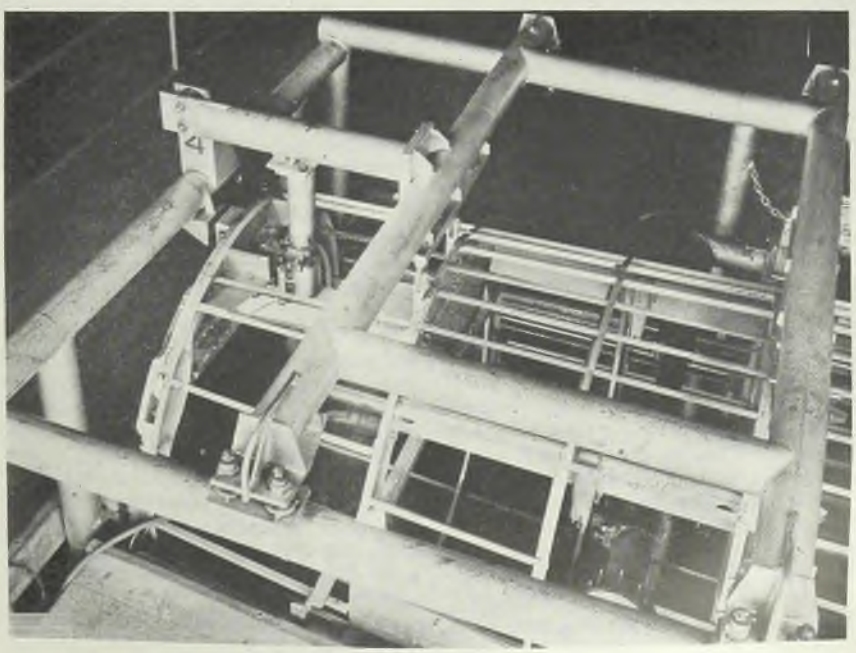


Fig. 5—*A major assembly jig, illustrating application of spherical bushings which reduce machining*

METALLIC ARC WELDING ELECTRODES

(Class E6020 and E6030)

With Section VI presented here, the author completes the series of articles on unalloyed electrodes that have been appearing weekly in STEEL. Two succeeding articles will cover electrodes that add alloys to the weld metal from the coating during the melting stage

By HAROLD LAWRENCE
Metallurgist and Welding Engineer

A COMMON theme carried through the preceding articles in this series was continued reference to all-position electrodes. Four separate articles were presented because each group of electrodes possessed distinctive characteristics with which users of the welding process should become acquainted.

Sometimes an effort was made to give clues to permit the user to separate one type from another even when the manufacturers tended to suggest all-inclusive properties embracing several groups with but one electrode. Now, however, when E6020 and E6030 electrodes are being considered, no effort at separation will be attempted.

Like Peas from One Pod

Why are the E6020 and E6030 electrodes treated as though they were a single type? Simply because the outstanding experts in the welding field cannot distinguish one from the other. Nor is this state of affairs surprising when one remembers that the two groups have identical physical properties. But the same statement may be made of the E6010 and the E6011 electrodes; or for that matter of the E6012 and E6013 electrodes. Still these groups are separable because the E6010 and E6012 electrodes were developed as direct-current electrodes while the E6011 and E6013 types were intended for alternating-current. These are the distinguishing characteristics.

So far so good, except for some explanation as to why there are provisions for two groups when the facts indicate that one group would serve. Originally electrodes were introduced for downhand or flat-position welding. On heavy weldments such electrodes were without equal. Then the welding fabricators felt a need for a similar electrode that would permit the making of horizontal fillets. In this application the E6030 electrodes had definite limitations. A "colder" electrode with better slag properties was needed. And enterprising electrode producers were not long in finding a product capable of doing this job. Thus the E6020 electrode came into being.

Summing up now we have E6020 electrodes suitable for horizontal fillets and flat position welds while there are E6030 electrodes for welding in the flat position only. Most E6020 electrodes incorporate the features of the early E6030 electrodes so it is natural for many manufacturers to state that their electrodes meet the specifications for either E6020 or E6030 groups. Since both types work well with direct current (straight or reverse polarity, with the former preferred for speed) as well as with alternating-current, there is no hallmark of distinction between them.

Why Called "Hot" Rods

Seven of the 20 manufacturers shown in Table I consider the E6020-E6030 electrodes interchangeable. These electrodes are often called "hot" rods. This nickname springs from their ability to perform well at higher currents than can be used with any other electrode type in the E60xx bracket. Naturally operation at high currents means excellent rates of deposit as measured by the pounds of metal laid down per welder per day.

It is a safe generalization to say that any place where "hot" rods can be used, their choice ought to be automatic because the best, strongest, soundest, smoothest weld is made with such rods. To be sure they must be applied in the flat position or in the horizontal fillet position. Another restriction indicates that plate thicknesses of ⅜-inch or more are required to absorb the terrific amount of heat released by the molten steel and slag.

But where positioning ... where plate thickness is ample, E6020-E6030 electrodes are a MUST!

The modern pressure vessel industry has been built upon the flat-position electrode. Wall thicknesses greater than 4 inches are now welded layer by layer with E6020-E6030 electrodes. Then the X-ray is introduced to examine the seam. Picture after picture shows an absolute freedom from defects until to relieve their boredom inspectors begin to quibble about nonsensical trivialities. Where welding technique is an established routine, the foregoing statement bears not the slightest tinge of exaggeration.

Skeptics Overwhelmed

For some time, welding shops displayed thick sections of welded test plates bent double on themselves and flattened into a sharp 180-degree bend. Such plates were welded with "hot" rods and the number of similar samples became so great as to overwhelm the most confirmed skeptic of the welding industry. Stress-relieved ductilities well over a marked elongation of 30 per cent in 2 inches with a reduction of area averaging close to 60 per cent with consistent cupped fractures proved that with the inception of the flat-position electrode, welding had come of age.

On repetitive work, particularly, the E6020-E6030 electrodes have worked out a definite niche for themselves. With the slightest training, operators are able to deposit perfect weld after perfect weld by letting the coating rest lightly on the work as the arc, almost automatically, consumes the rod and places the bead. A common means of demonstrating the extraordinary worth of this type of electrode was to have a novice weld a test-plate with it. In most cases a half hour's training sufficed to enable a beginner to make a weld of good enough quality to pass the most stringent test.

Notwithstanding the spectacular nature of the deeds accomplished with E6020-E6030 electrodes, there are sounder reasons for their widespread ... e ex-

They <u>both</u> need protection! . . . It's a big responsibility—supplying protection to floors as well as trained personnel. "A.W." Rolled Steel Floor Plate makes floors rugged, permanently safe—despite hours of punishing wear. No worn or slippery surfaces to endanger men on foot. Shown above is the "A.W." Super-Diamond Pattern which resists slipping in *any* direction. Plate can be cut and installed almost overnight without disturbing production. Write for folder.

Other products include Plates, Sheets, Billets, Blooms, Slabs—Carbon, Copper or Alloy analyses.

ALAN WOOD STEEL COMPANY

MAIN OFFICE AND MILLS: CONSHOHOCKEN, PENNSYLVANIA : SINCE 1826. District Offices and Representatives, Buffalo, Chicago, Cincinnati, Cleveland, Denver, Detroit, Houston. Sanford, N.C., St. Louis, Los Angeles, San Francisco, Seattle, Montreal.

tremely high melting rate brought about through high currents and large diameter electrodes. E6010 electrodes are most popular in the 5/32 and 3/16-inch diameters while the E6020-E6030 electrodes predominate in the ¼-inch diameter with the 5/16 and 3/8-inch sizes taking second place. As long as the joint design can handle the heat, the electrode has virtually no limit.

All of the E6020-E6030 electrodes perform well with alternating-current while making excellent welds with direct-current when either straight or reverse polarity are selected. All suppliers of arc welding electrodes agree that horizontal fillet welds made with direct-current require straight polarity. This choice is based upon a lessened tendency toward undercut. But welds in the flat position, either fillets or groove welds, call for straight polarity when using some electrodes and reverse polarity when using others. However actual shop experience indicates an almost universal selection of straight polarity in order to gain maximum production rates without any sacrifice of quality of deposit.

It is suggested that even where manufacturers' literature recommends reverse polarity for flat-position welding, a test be made with straight polarity to determine whether or not this latter polarity can be adopted. If it can, there will be a bonus of almost 10 per cent in the additional pounds of metal which will be deposited per hour.

Qualities Lead to Confidence

Smooth beads can be produced with the E6020-E6030 electrodes. Heavy, uniform, wide bands of weld metal such as will be found in the thick-walled pressure vessels attest to good workmanship and lead to confidence in the fabricator. And the welder who is working on weldments of this type enjoys a uniform sidewall wash where the weld metal blends smoothly with the groove walls. Here is an ideal shape on which to place additional weld metal with no fear of slag entrapment. Likewise the smooth section allows ready cleaning of the slag from the groove. Often simple hand tools will suffice for all of the cleaning required.

Arc control is easy with the "hot" rods. A thick, stable coating allows the arc to be maintained over a considerable range of current. In addition the high heat capacity of the electrode means that a good current rate will be used and this greater amperage in itself works wonders in the direction of arc stabilization.

E6020-E6030 electrodes have very heavy coatings with as much as 20 per cent of the total electrode weight being contributed by the coating. As would be expected, the heavy coating produces a considerable amount of slag. Because of the high welding currents employed, the voluminous slag is quite fluid as is the weld metal. It is this combination of properties that prohibits the application of these electrodes in the vertical and overhead positions.

The glowing slag should be left in place until it has cooled. Although the slag left at the end of an electrode may be removed while it is hot and sticky, best practice suggests allowing slag and metal to cool until no color remains. At this point the slag becomes like ordinary glass, being quite friable, while at elevated temperatures it is plastic with a

(*Please turn to Page* 148)

TABLE I—MANUFACTURERS AND TRADE NAMES OF E6020 AND E6030 ELECTRODES

	E6020 Primary Color—Blue Secondary Color—None	E6030 Primary Color—White Secondary Color—None
Air Reduction Sales Co. 60 E. 42nd Street New York 17	Airco 81	Airco 83
Allied Weld-Craft Inc. 401 W. South Street Indianapolis	60	
American Agile Corp. 5806 Hough Avenue Cleveland 3	Blue-Grey	Blue-Grey
Anthony Carlin Co. 2717 E. 75th Street Cleveland	P-70	P-80
Champion Rivet Co. East 108th and Harvard Cleveland 5	Black Devil	Red Devil Black Devil
Electric Arc Inc. 152-162 Jelliff Avenue Newark, N. J.	Speedweld	Silversteel
General Electric Co. Schenectady, N. Y.	W-24	W-23
Harnischfeger Corp. 4400 W. National Avenue Milwaukee	D-H2	D-H2
Hobart Brothers Co. Troy, O.	Hobart 88	
Hollup Corp. 4700 W. 19th Street Chicago	Sureweld F	Sureweld A
Lincoln Electric Co. 12818 Coit Road Cleveland 1	Fleetweld 9 Fleetweld 10	Fleetweld 9 Fleetweld 10
Marquette Mfg. Co., Inc. 401-419 Johnson St., N. E. Minneapolis	33ADS	33ADS
McKay Co. York, Pa.	16	18
Metal & Thermit Corp. 120 Broadway New York 5	Fillex Type F FHP	Fillex Type F FHP
Page Steel & Wire Div. American Chain & Cable Co. Monessen, Pa.	Hi-Tensile "G"	
Reid-Avery Co. Dundalk, Md.	Raco 6 Raco 20	Raco 5
A. O. Smith Corp. Milwaukee	SW-35	SW-20
United States Steel Supply Co. 1319 Wabansia Avenue Chicago 90	Scully No. 80	Scully No. 90
Westinghouse Electric & Mfg. Co. East Pittsburgh, Pa.	DH	DH
Wilson Welder & Metals Co. 60 E. 42nd Street New York 17	105	851

TABLE II—DEPOSIT ANALYSES PRODUCED BY E6020-E6030 ELECTRODES

	Carbon	Manganese	Phosphorus	Sulphur	Silicon	Nickel	Molybdenum	Nitrogen
Min., %	0.06	0.05			0.03			
Max., %	0.15	0.55	0.04	0.04	0.20	0.025	0.025	0.04

TABLE III—PHYSICAL PROPERTIES OF DEPOSITS MADE WITH E6020-E6030 ELECTRODES

Property	Stress Relieved	Non-Stress Relieved
Yield point, psi	47–56,000	52–60,000
Ultimate strength, psi	60–68,000	62–72,000
Elongation, % in 2 inches	30–38	25–32
Reduction in Area, %	40–65	35–60
Izod Impact Strength, ft.-lbs.	50–80	
Density	7.84–7.87	
Endurance limit, psi	28–32,000	

TABLE IV—CURRENT AND VOLTAGE RANGES FOR E6020-E6030 ELECTRODE APPLICATION

Size of Electrode Inch	Recommended Amperes	Recommended Volts
1/16	40-60	
3/32	50-100	18-28
1/8	90-150	22-30
5/32	120-220	24-33
3/16	160-285	26-35
7/32	220-340	28-36
1/4	250-450	29-44
5/16	350-525	32-46
3/8	400-700	34-46

Radium Radiography in Industry

Steam boilers, marine equipment and hydraulic power installations come under close scrutiny by radium's gamma rays. Once positioned, inspection equipment requires little attention. Radium lasts "forever"

By ROBERT TAYLOR*

RADIOGRAPHY with radium has become a valued "tool" in the inspection of castings and welds which are required to withstand high service pressures and temperatures. High pressure steam boilers, marine equipment and hydraulic power installations are most favored, but radium radiography also is used to a great extent for foundry control. Inspecting pilot castings by this means, the foundryman may deduce certain information relating to defects which, by improving mold design and location of gates and risers, sometimes may be eliminated.

In the examination of welds by radium we can reveal lack of fusion, slag inclusion, porosity and cracks. It is used extensively on welded pressure vessels and for certification of individual welders.

Gamma rays from radium can be described as an ideal power plant. Once the equipment has been positioned for exposure, it does its work day and night, with no personnel required for operating it. Also of importance is the fact radium, for all practical purposes, lasts forever when we consider that it takes from 1580 to 1690 years for its intensity to drop to 50 per cent of its original value.

Radium disintegrates into a gas called radon or radium emanation and this, in turn, into a series of successively disintegrating products some of which give off gamma rays.

The two methods of preparing radium for industrial use are as follows:

1—By means of complex vacuum pumps, radon can be pumped from the radium each day or so and sealed into glass capsules. These capsules then become the source of gamma rays and can be used for radiography. This method, however, is not convenient for industrial plants. It is necessary to correct for continual changes in intensity, as the radon disintegrates and drops to half intensity in 3.85 days.

2—Radium can be sealed in a container so that the radon stays in contact with the radium. In this method the radium constantly replaces the radon as fast as it disintegrates and the source retains a constant intensity. This form is most convenient for industrial application and is the one which has been adopted by largest users such as the United States Navy.

Radium for industrial radiography is usually in the form of radium sulphate, an insoluble compound densely packed into a cylindrical air-tight container. This cylinder is then inserted into a slightly larger container of duralumin, as shown in Fig. 1. Such containers are not a shield against the rays and should never be handled directly, even with gloves, but rather should be handled by the strings attached to them, by tongs (no pressure to be exerted) or by a magnetic handling rod. Radium is stored and shipped in lead box containers, with adequate lead for protection against leakage. The capsules should be kept in these boxes when not in use.

Gamma rays are described as a form of radiant energy resulting from the atomic decomposition of radioactive matter and their wavelengths are from 10^{-11} to 10^{-8} centimeters.

The density of a gamma ray film is the ratio of the incident light to the transmitted light and film is said to have one unit of density when 10 per cent of the light falling on the film is transmitted.

Whereas X-rays are generated by the impact of high velocity electrons on a target of high atomic number, gamma rays are ejected from within the radium

*This is the second of two articles by Robert Taylor, consultant in industrial radiology, Spokane, Wash., dealing with inspection of metals by radiographic techniques.

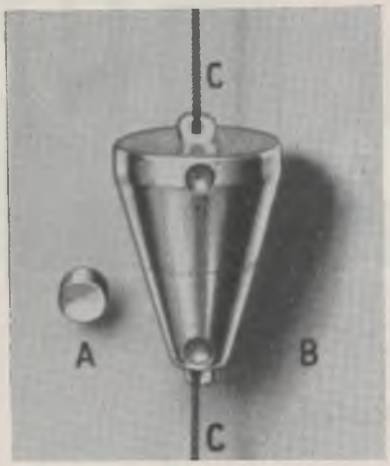


Fig. 1 (Above)—Radium cartridge and capsule. Capsule of radium (A) is placed in duralumin cartridge (B) which is supported rigidly by strings (C) in front of specimen to be radiographed

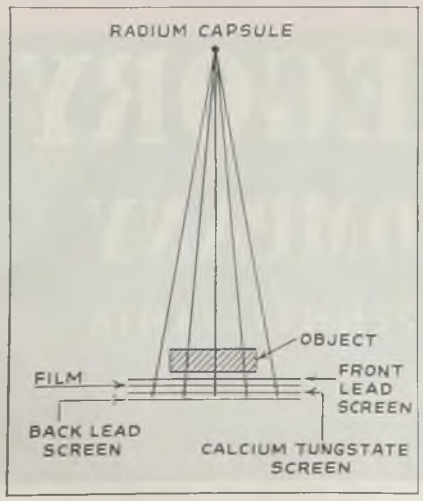


Fig. 2 (Left)—Method of rapidly exposing gamma-ray films. Calcium tungstate screen is employed to intensify the image on the film. From Woods, Metals & Alloys

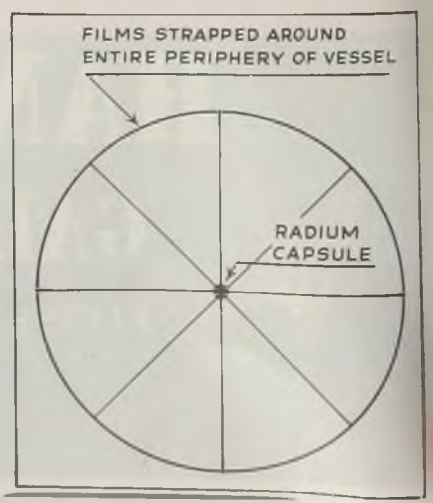
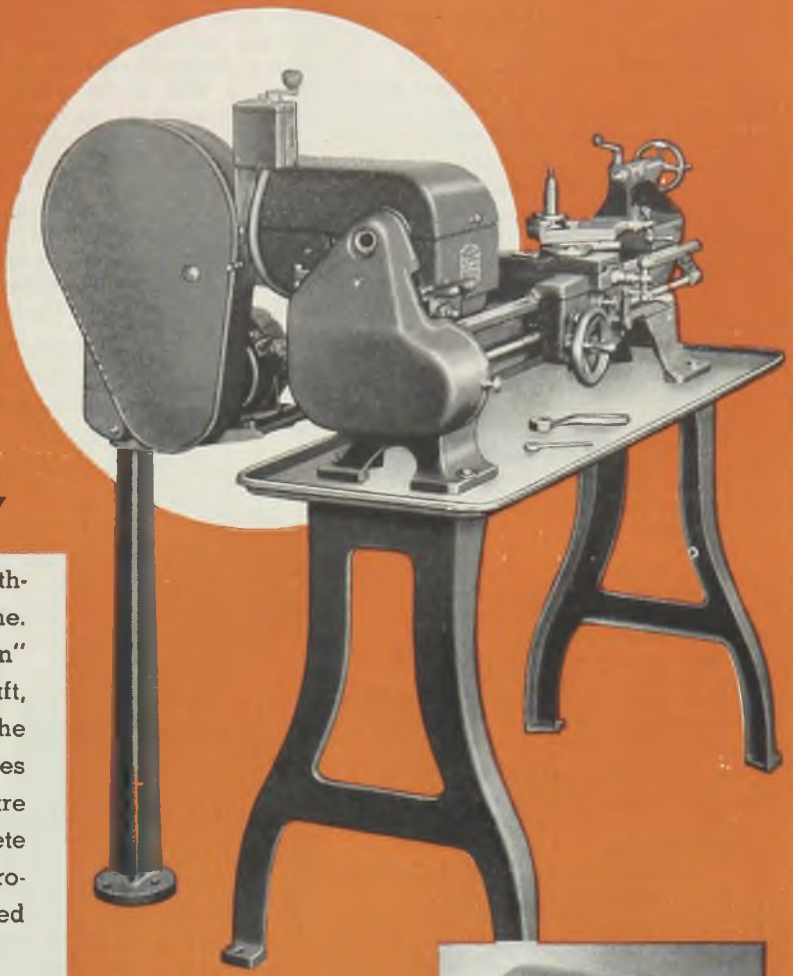


Fig. 3 (Right)—Advantage of radium for inspection of cylindrical specimens is shown by this diagram. Films may be strapped around entire periphery and one exposure made for whole vessel

Enclosed Design

- PROTECTS LATHE OPERATOR
- KEEPS VITAL PARTS CLEAN
- MAKES BELT CHANGING EASY



The operator does not catch fingers or clothing in moving belts or gears on a Logan Lathe. The Cone Pulley Guard in its normal "down" position completely covers the countershaft, headstock and back gear assemblies. The motor-drive belt and change gear assemblies are completely enclosed. All guards are quickly and easily opened giving complete accessibility. Not only is the operator protected, but vital parts of the lathe are shielded from dust and dirt accumulations.

Raised to its "up" position, the Cone Pulley Guard automatically moves the countershaft toward the headstock, releases flat belt tension, and makes changing the belt position easy and safe...an exclusive, patented Logan feature. The flat belt tension is easily and quickly regulated by a simple screw adjustment. Full information on all the advanced design features of all models of Logan Lathes will gladly be sent you on request. Write today for your copy of the latest Logan Lathe catalogs.

OPERATOR PROTECTED . . . VITAL PARTS KEPT CLEAN

Countershaft, back gears, headstock, change gears and motor-drive belt are all completely enclosed, yet quickly accessible.

BELT CHANGES EASY AND SAFE

Raising the Cone Pulley Guard to "Up" position automatically moves the countershaft toward the headstock, releasing tension on the flat belt.

BRIEF SPECIFICATIONS

Swing over bed, 10½" . . . bed length, 43⅛" . . . spindle hole, 25/32" . . . capacity, ⅝" with push type collet . . . 6-position automatic indexing turret . . . stroke of turret, 4¼" . . . 12 spindle speeds from 30 to 1450 r.p.m. . . . all moving parts protected by ball bearings or self lubricating bronze bearings.

No. 850 MANUFACTURING TURRET LATHE

Logan

LOGAN ENGINEERING CO.

CHICAGO 30, ILLINOIS

*One of a series describing the finer features of Logan Lathes . . . Look for the next of the series

atom during a spontaneous internal breakdown and subsequent rearrangement. Also emitted are alpha rays, hydrogen nuclei and beta ray electrons, but these particles are readily absorbed by matter of all kinds and so are of little interest to industry.

In 1930 the Navy specified that radiographic inspection be performed on all main longitudinal and circumferential joints of welded boiler drums. In 1931 the ASME Boiler Code made radiography of welded seams mandatory for power boiler drums and other pressure vessels designed for severe service conditions. Other code requirements soon followed.

Of interest to industry are the parts for combat vessels subject to radiographic inspection (either X-ray or radium) as required by the United States Navy. They are:

Main and intermediate shaft struts.
Rudder castings
Rudder skegs
Rudder posts
Sternposts
Skegs
Stern tubes
Turret roller paths
Turret holding down clips
Turret buffer castings
Main propulsion turbine casting, including all control valves
Main steam line valves and fittings
Superheater fittings
Boiler stop valves

In all chipping out and welding of defective areas, reradiographing is required by the Navy to determine the extent of repair.

From information given in the accompanying Outline of Procedure, it becomes obvious that the technical application of radium inspection is a rather simple matter and may be accomplished by a layman with no special technical training. This has been made possible by research work on the part of our early explorers of this field, men such as C. W. Briggs, R. A. Gezelius, and others.

For the radiographer, responsible for a given series of inspections (some of which may differ in nature), the data listed here may be of assistance.

Variety of Positions Baffling

Often, the infinite number of possible arrangements for placing radium for exposure makes it difficult to select the best technique. Radiography of a long linear weld in a flat plate or a longitudinal weld in a pipe are cases in point. To attain maximum results in sharpness of image, distance from the object must be considered in relation to intensity of rays. The sharpness of the image (definition) of a defect obtained increases linearly with the distance from radium to the defect and decreases linearly with the distance from defect to film. In other words, if A be the distance from radium to defect and B the distance from defect to film, the defined image sharpness obtained is proportional to A/B. When radiographing a straight weld in a flat plate, or a longitudinal weld in a cylinder or tube, it will be seen from a simple sketch that with a given position of the radium, the ratio A/B is constant at all points along the weld. It can be construed then that, insofar as image sharpness is concerned, there is no limit to the length of a weld that con be inspected with a single exposure. Intensity relations do, however, impose a limit to the length that can be inspected with one exposure[2].

"Assume that it is desired to inspect an entire weld, and all films are to be processed simultaneously. The maximum length of weld then will be determined by the distance of radium to film (assuming the film is in contact with the weld) and the allowable range of blackening of the film. The variation in film density allowable in turn depends upon the size and nature of discontinuities that must be registered. Preliminary work by Briggs and Gezelius indicates that for ordinary purposes a radiograph may stand an exposure two to three times that recommended on available exposure charts. If the factor 3 be assumed, the length of weld that can be covered when the radium is above the center of this length can then be calculated.

"Since it is detrimental to reduce the density below that given by the exposure chart, the extremities of the film should be exposed this standard amount. That portion of the film directly under the radium will consequently be somewhat overexposed."

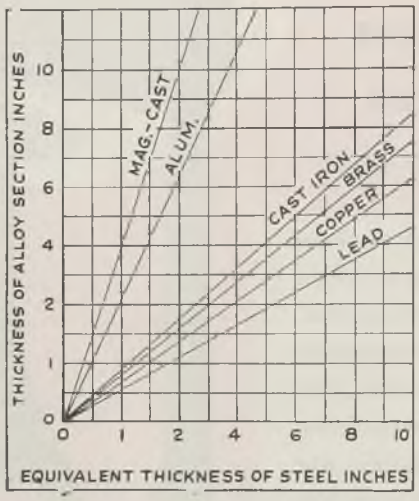


Fig. 4—Conversion chart of thickness of alloy section to equivalent thickness in steel, for use where alloy material is to be inspected. See step No. 3 in Outline of Procedure for Radium Inspection

OUTLINE OF PROCEDURE FOR RADIUM INSPECTION

1. Section to be inspected is suitably marked for identification.
2. Films (for double viewing) are strapped in proper position covering the area of interest.
3. Slide rule or exposure chart is consulted and source-to-film distance determined for thickness of section to be examined and milligram hours of exposure determined for type of film to be used. Film factor scale, supplied by manufacturers, should be consulted for film in use. For alloy thickness conversion chart, see Fig. 4.
4. Radium capsule is placed in position and exposure started.

Briggs and Gezelius have demonstrated that the maximum length that can be inspected with a single exposure without having any part of the film receive more than twice the normal exposure is about equal to two times the radium-to-film distance for steel less than ½-inch thick; 1¾ times for 1-inch steel; 1½ for 1½-inch steel and between 1½ and 1 times radium-to-film distance for 2 to 3-inch steel.

One of the drawbacks to the use of radium for radiographic inspection has been the time required to complete an exposure. Woods recently demonstrated a method of using calcium tungstate for intensification of the image on the film as a means of speeding up the work[4]. An illustration of this method may be seen in Fig. 2.

Preferred for Some Jobs

Gamma-ray radiography is preferred by some engineers for the inspection of circumferential pipe welds, due to the relative simplicity and greater adaptability of the former methods in such instances. (See Fig. 3.) This has been demonstrated as particularly true in the examination of welded power plant piping in the field by R. C. Emerson who presented a very complete study to the American Society for Testing Materials at a recent symposium presented by ASTM[5].

Radium radiography provides a highly satisfactory method for the inspection of steel castings from ¼-inch to 6 inches in thickness and up to a thickness of 10 inches. This is applicable, of course, to brass, bronze and zinc. L. W. Ball has separated castings into three groups, e. g., "well blocked castings", "moderately blocked castings" and "badly blocked castings", for the purpose of studying the effects of secondary radiation on the sensitivity of the inspection.[6] A continuous plate would be described as a "well blocked casting", whereas "moderately blocked castings" are of such shapes that a portion of the direct beam of rays passes around the casting and is scattered back to the film. "Badly blocked castings" are essentially of complicated shapes wherein scattered rays undercut thicker sections of the casting, causing more of a problem in the control of scattered radiation. In the latter two classes of castings, radium is sometimes preferred as an inspection medium.

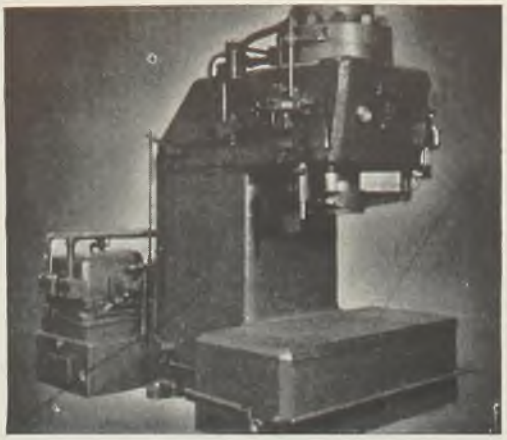
Radium for industrial use may now be obtained readily from reliable radium supply houses. Because of its high cost (about $24 per milligram), it is as a rule rented rather than purchased. It may be rented by the month or year at rates which are extremely moderate when compared with rates prevailing a few years ago. A 100 milligram capsule may be rented for $25 per month on a yearly lease, with straight monthly rental a trifle more. Twenty-five milligrams may be rented for about $8 per month.

In radiography we have a natural

ARC WELDING HIGHLIGHTS

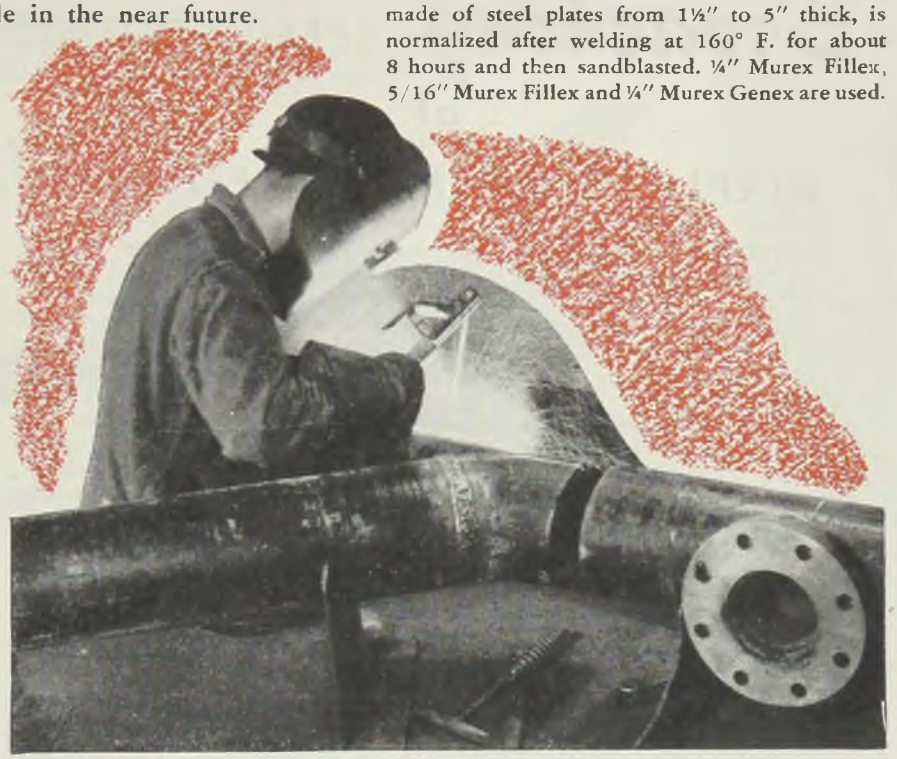
THE QUANTITY PRODUCTION of electrodes to meet the requirements of war production has been, of course, our chief concern. Research and development work has not been neglected, however, and a continuous program devoted to the improvement of present electrodes and the creation of new ones is carried on continuously at our modern research laboratory in Woodbridge, N. J.

As a result of this important work, announcements of several new Murex electrodes will be made in the near future.

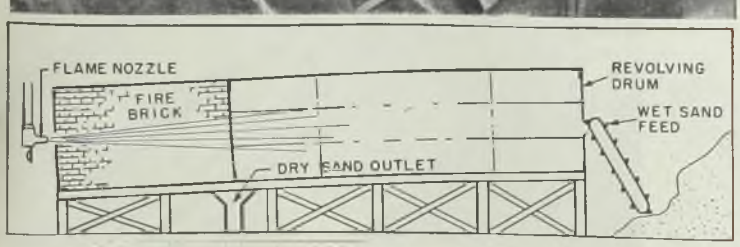


OILGEAR SPECIAL 200-300-TON GOOSENECK PRESS for straightening large, long tubes. Welded frame is made of steel plates from 1½" to 5" thick, is normalized after welding at 160° F. for about 8 hours and then sandblasted. ¼" Murex Fillex, 5/16" Murex Fillex and ¼" Murex Genex are used.

ERECTION OF A 30,000-TON UNIT SYNTHETIC RUBBER PLANT, one of six built by the Blaw-Knox Company, required approximately 11 miles of piping ranging in size from 2" to 30" which called for over 26,000 welds. These piping systems required designs for a wide variety of conditions, such as high pressures and temperatures, refrigeration, vacuum, hazardous liquids, gases and corrosive chemicals. Murex electrodes were used.



(Below) **WELDS IN SAND DRYER WITHSTAND HEAT EXTREMES AND ABRASION.** 450 tons of sand pass through this revolving dryer cylinder during eight hours' operation at red heat temperature which sometimes drops below zero after shutdown. Welded with Murex Molex electrodes, the welds outlast the dryer's half-inch steel liner plates. The liner plates are made in three segments, with a girth weld and 3 horizontal welds for each section.



force, relatively new, readily applied, involving a technique easily acquired, yet based upon a science leading toward the ultimate in studying composition of matter.

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[9] Emerson, R. W., "Gamma-Ray Radiography of Welded High-Pressure Power Plant Piping", ASTM Bulletin, 1942.

Ultraviolet Rays May Aid In Health Problem

Ultraviolet ray equipment now is being made available to industry for protecting employes' health. Such equipment already is being used in hospitals medical offices, and some dispensaries.

The device is a combination of the General Electric germicidal tube and a patented reflector in the fixture designed to project a horizontal beam across an area above eye level. Convected air currents carry air borne becteria and viruses at distances up to 35 feet from the lamp, into the zone of the ultraviolet rays and to their death. This gives the bactericidal effect of over 100 air changes per hour.

Industry may find ultraviolet rays are a new weapon for fighting absenteeism, disrupted production schedules and unavailability of key personnel. The American Sterilizer Co., Erie, Pa., is making the equipment.

Broaching SPEEDS OUTPUT of AIRPLANE BRAKE SHOE PARTS

ABILITY of the broaching process to remove rapidly large amounts of stock and at the same time obtain extreme accuracy with high production is illustrated by accompanying photo showing use of this method to cut deep slots in alloy steel drive spline inserts for hydraulic disk airplane brakes at the Aeronautical Division of National Acme Co., Cleveland. A single machine equipped with two broaches attains a production rate of approximately 100 pieces per hour, removing more than half of the original diameter of 13/16-inch round stock over a length of more than 3 inches in two passes.

Photo at left, below, shows parts for spline inserts before and after slotting. At left is ground bar stock ready for slotting. Next is piece with narrow slot previously broached on another machine. This is an aid in positioning the piece in the clamp for final operations, results of which are shown in two right-hand views.

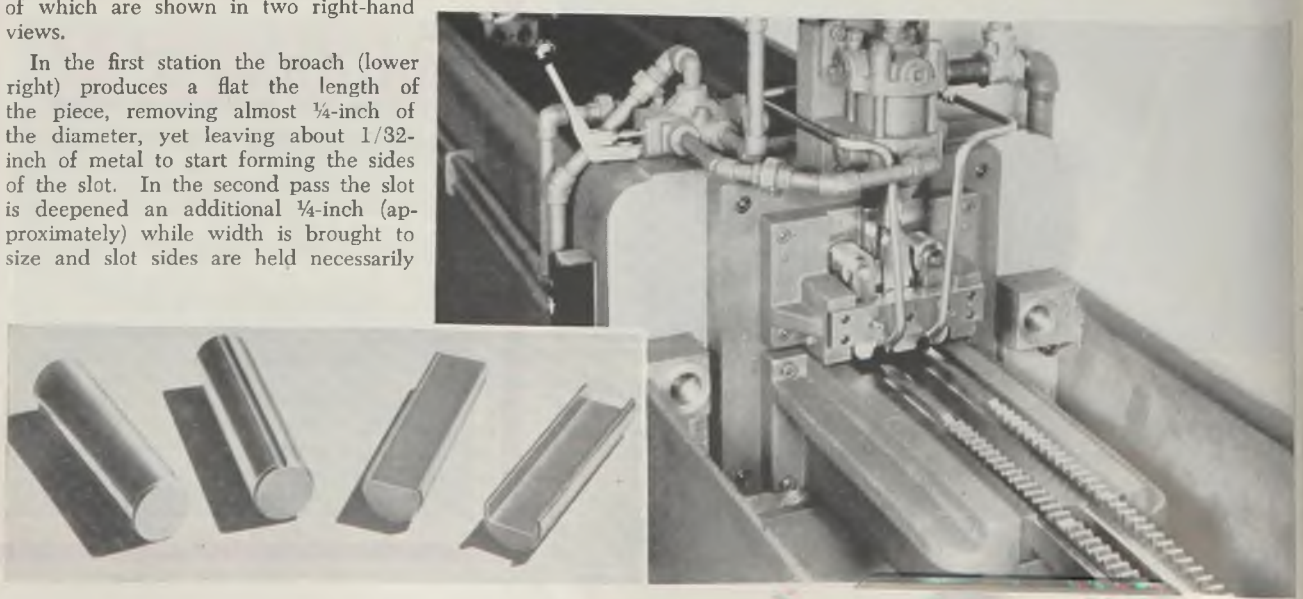
In the first station the broach (lower right) produces a flat the length of the piece, removing almost ¼-inch of the diameter, yet leaving about 1/32-inch of metal to start forming the sides of the slot. In the second pass the slot is deepened an additional ¼-inch (approximately) while width is brought to size and slot sides are held necessarily within close limits and highly finished. Top edges of the sides also are rounded in second pass. Main slot must be located directly opposite the narrow slot on periphery of piece.

Hydraulically operated horizontal broaching machine used on this setup has sufficient capacity to pull simultaneously the two broaches and a special fixture designed by Colonial Broach Co., Detroit, for rigidly holding them in correct locating positions. Pilots of the broaches assist in the loading operation.

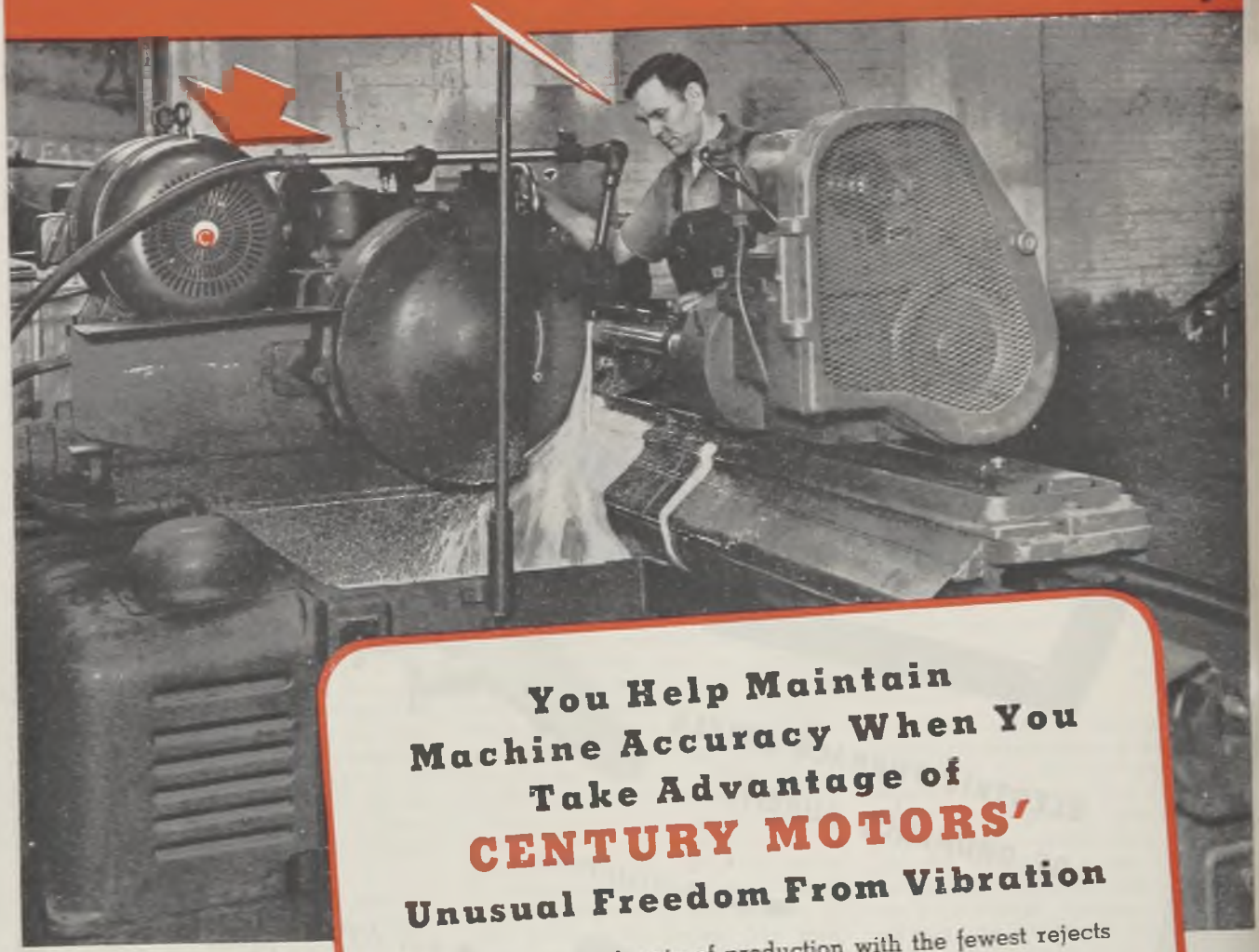
Fixture is mounted against the face plate of the machine and it too is hydraulically operated. Broaches are of the sectional type mounted in broach holders which move in individual guideways bolted to the vertical base plate of the fixture. The latter is of the cam and roller type and simultaneously clamps the two pieces. Center portion of the clamp is rigidly attached to the bar shown across the face of the fixture. This serves a double purpose: To form half the semicylindrical contours in which pieces are held in both stations, and to locate them. Center portion of clamp is fitted with fingers or lips which fit into the narrow locating slots and thus position them directly above the broaches.

Outside center portion of the clamp are two movable arms which move against the parts and hold them tightly in place when the piston of the hydraulic cylinder moves upward. Lower ends of these arms form the remaining halves of the semicylindrical contours into which the parts are placed while being broached.

For convenience in loading, the pilot ends of the broaches are grooved. Pieces are placed by the operator on the broaches so that when the latter move inward, the parts are drawn into the fixture. Fixture clamps then are closed and the broaching passes completed. Return of the broaches pushes the parts out of the clamps. Operator then moves one part into the second station, inserting an unfinished part in the first station. Thus one part is finished with each pass of the two broaches.



"There are two good reasons why that Century Motor helps me on my job — First, it helps the grinder to run smoother and I get out more pieces with less rejects. Second, I don't worry about metallic dust, coolant mist or solution getting inside and destroying the insulation."



You Help Maintain Machine Accuracy When You Take Advantage of CENTURY MOTORS' Unusual Freedom From Vibration

To maintain a high rate of production with the fewest rejects on an accurate grinding job such as that illustrated above, two major conditions must be met. Certainly there are other considerations, but watch for these two basic points —

1. The motor must be smooth starting and running so that it will not transmit appreciable vibration to the machine.

2. The frame construction must protect the motor from the hazards of surrounding atmospheres.

These two major considerations, plus many others, were considered by the Century engineers who recommended the Century motor for the application shown here, as well as for many thousands of others.

Call in a Century engineer to assist you with your electric motor application problems. His experience and advice may prove valuable to you.

Century MOTORS

1/20 to 600 horsepower

368

CENTURY ELECTRIC COMPANY, 1806 Pine St., St. Louis 3, Mo.

Offices and Stock Points

(*Continued from Page* 101)

the flow of an amount of current necessary to energize the relay coil. Naturally, we now want to study the characteristics of this three-element tube to see how such a change of a few volts at the grid of the tube is able to control the amount of current flowing through the tube and the relay coil.

The Action of the Grid

To help explain the behavior of this tube, Fig. 14 shows how the anode current changes as the grid voltage changes. With zero grid potential, this certain tube allows a flow of five milliamperes. Only a few volts change at the grid causes 100 per cent variations in the anode current. Since the anode of the tube is more positive than the cathode under normal operating conditions, it attracts the emitted electrons from the cathode. These electrons traveling to the anode constitute the anode current. In order to prevent the flow of electrons to the anode, the grid of the tube is given a more negative potential (bias) than the cathode. This negative repels the electrons in the opposite direction to the pulling force of the anode. When the repelling action of the grid and the pulling force of the anode neutralize each other, the electrons are no longer urged to move to the anode, so the anode current becomes zero. In Fig. 14 it is seen that the grid voltage must be lowered to minus (—) 10 volts to stop the anode current. This value of grid voltage is often spoken of as the "cut-off" grid voltage; this "cut-off" voltage is different for different anode voltages.

The action of the grid is similar to that of a valve in a pipe which is carrying a fluid under pressure. A small amount of energy, applied to opening and closing the valve, controls a much larger amount of energy represented by the fluid flow under pressure.

Grid Current

While the grid is more negative than the cathode, no current flows in the grid circuit since no electrons are attracted to the grid from the cathode. However, when the grid is made positive, there is current flowing in the grid circuit. In other words, the grid and cathode under these circumstances become the two elements of a rectifier and there is a rectified current flow from grid to cathode. This shows that some electrons emitted by the cathode are attracted to a more positive grid in exactly the same way as these electrons are attracted across the greater space to a more positive anode.

Cathodes and Filaments

The terms cathode and filament are sometimes used interchangeably. The term cathode means the source of electrons. Some tubes have only a filament which emits all the electrons, hence it is called the cathode. However, a great number of tubes have a specially treated sleeve, inside of which is a filament or heater. The heat from the filament causes the treated sleeve to emit a large number of electrons. Since the sleeve is now emitting the electrons, it is properly called the cathode. The cathode

(*Please turn to Page* 142)

Fig. 17—Timing cycles which may be obtained by changing values of R1 and C1 in Fig. 19

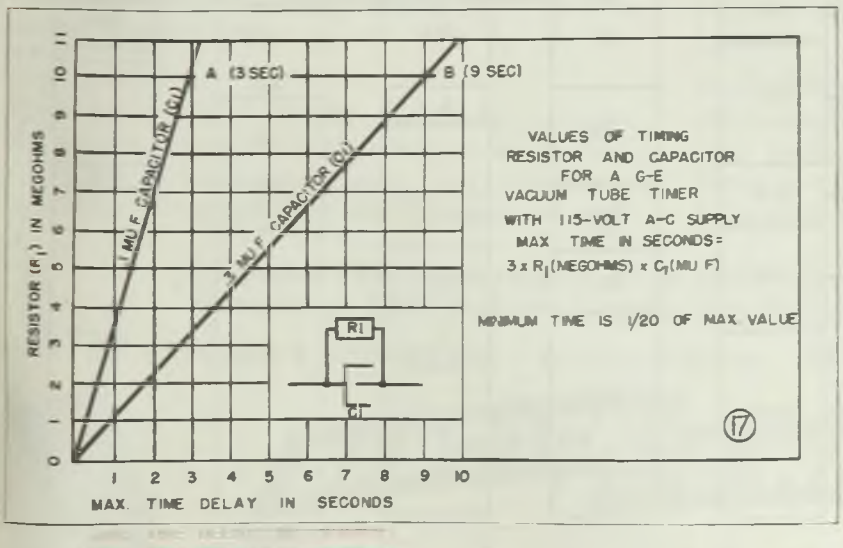
Fig. 18—An alternating-current operated electronic timer

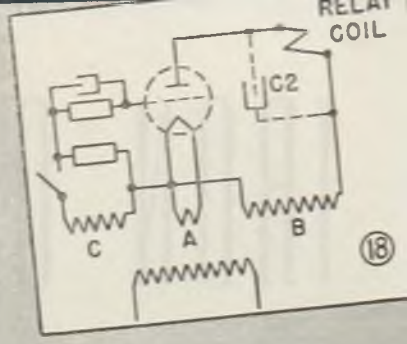
Fig. 19—Circuit of a typical electronic timer relay

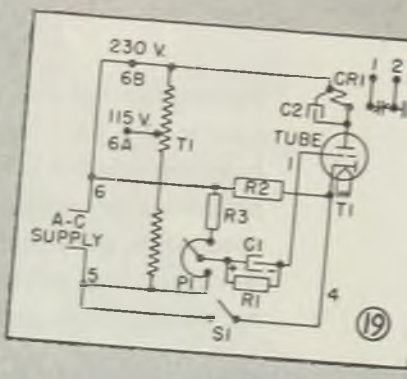
Fig. 20—Simplified form of the circuit in Fig. 19

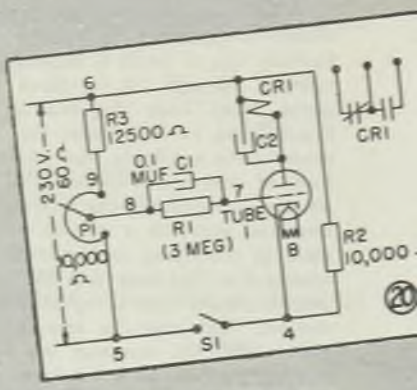
Fig. 21—Grid voltage and anode current when timer is set for four cycles

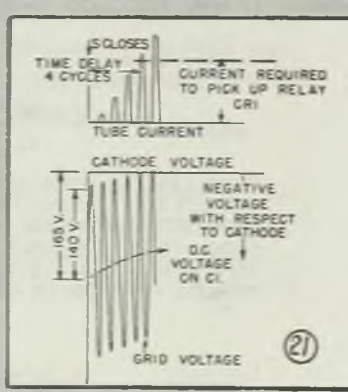
Fig. 22—Grid voltage and anode current when timer is set for 14 cycles

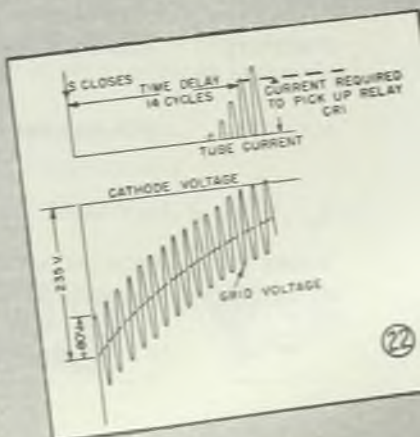












By CARL ZAPFFE
Manager Iron Ore Properties
Northern Pacific Railway Co.
Brainerd, Minn.

IRON ORES ...of the Pacific Northwest

Iron ores in the states of Washington and Oregon are uncommon to the steel industry principally because they have not been subjected to adequate metallurgical tests nor the physical properties of resultant metallic determined. While they are unsuited to present-day steelmaking practice, yet there is the likelihood they will find application in electrothermic processes for making new products

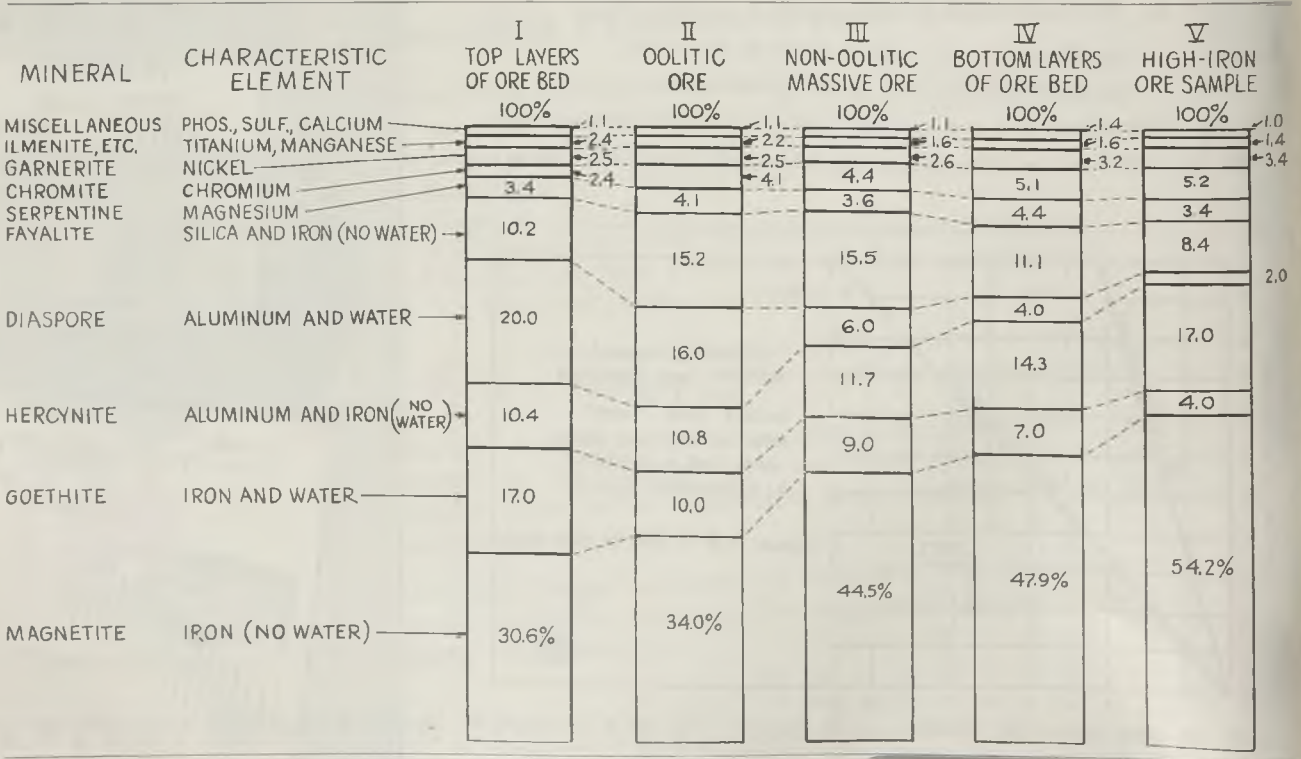
UNDER the Congressional Act of July 1, 1864, and for military reasons, a charter was granted the Northern Pacific Railway Co. to build a transcontinental railroad through the northern tier of states, from Lake Superior to Puget Sound; and to help meet the cost of construction a subsidy was given in the form of government-owned land. A restriction concerning the acquisition of this land was that it was to contain no minerals other than coal or iron. It was reasoned at that time that the company would require coal to operate its locomotives. This was the case, and since about 1880 the company has held the leading position as a producer of coal in both Washington and Montana. It also built and is now operating a battery of 17 coke ovens in Tacoma, Wash., in actual partnership with the St. Paul & Tacoma Lumber Co. and the Defense Plant Corp.; this was done to supply the Northwest with needed metallurgical coke made from coking coal mined on Northern Pacific Railway Co. land.

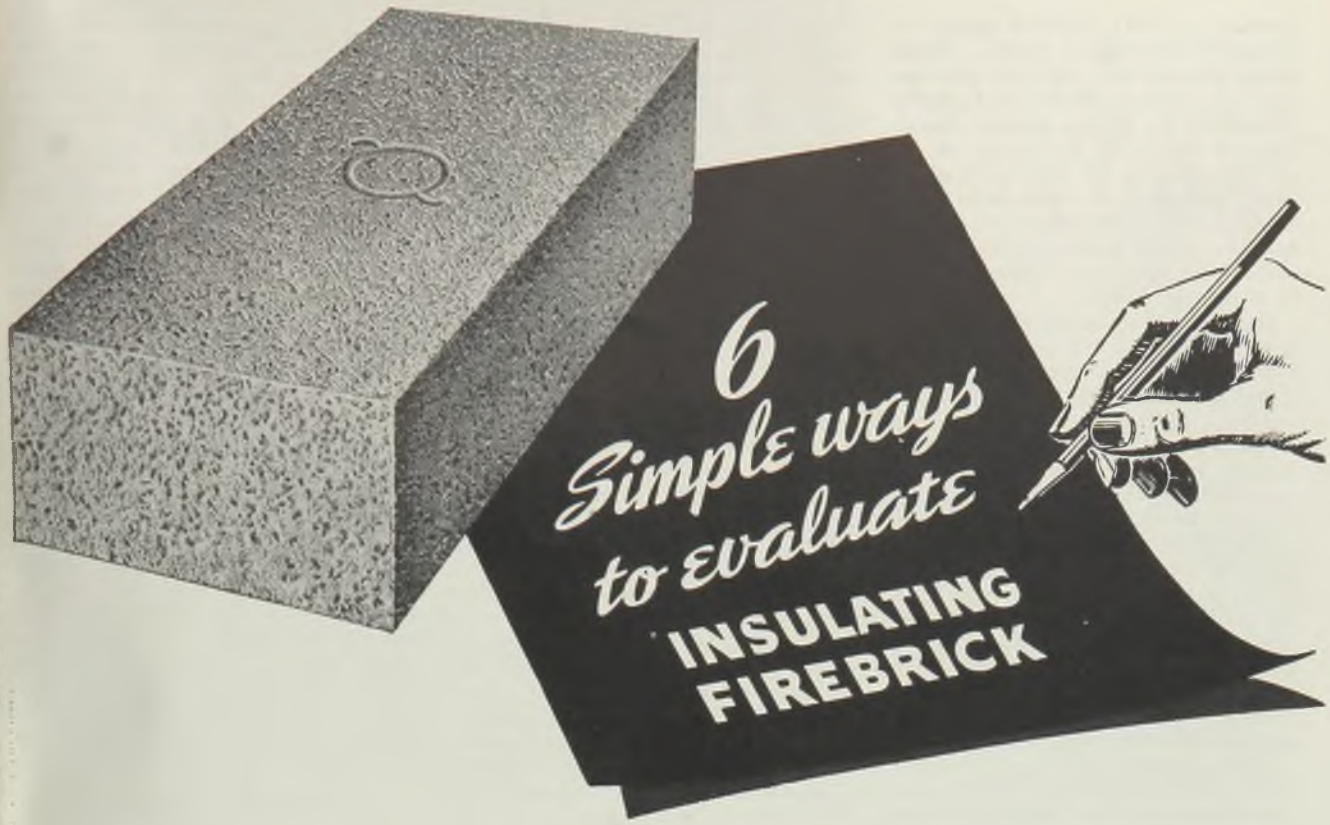
As to reserving iron ore, the theory in the sixties was that the company would mine it and smelt the ore and make the rails it required. In that respect the company did not have to face iron ore problems until about 1900, when it was called on to issue prospecting permits in Minnesota. In 1906 it undertook drilling lands and in 1915 became a producer and then a seller of iron ore. These activities were discontinued in 1928, the company confining its policy to issuing operating leases. Today 12 developed mines are on its lands, and more than double that number are explored deposits leased to operators who from time to time convert each deposit into an operating mine.

This joint interest in coal-coke-iron ore since 1864 has in these later years led to active participation in trying to help people solve the problem of the Northwest iron ores and attempt to get a successful industry established in the State of Washington. Published information of years past about the Northwest ores was regarded as of little use because in those earlier years deposits of ore had not been examined like users examine ores today. For that reason the

From a discourse presented at the Seventeenth Annual Mining Institute of the College of Mines, University of Washington, Seattle, Wash., Jan. 19, 1944.

Typical mineral composition of various portions of Cle Elum iron ore formation. Vertical height represents per cents by weight





Different grades and makes of Insulating Firebrick have widely differing properties. To obtain the maximum value for a given application, select the brick that will best fulfill the following:

1—*Limiting Service Temperature*—
The group or grade of insulating firebrick is established by the maximum temperature at which your furnace will operate. Select the group or grade next above this temperature.

2—*Weight and Conductivity*—
Generally, the lighter the brick, the lower the conductivity will be. Heat losses can be kept at the minimum only by selecting the lightest brick with the lowest conductivity. Compare conductivities based on ASTM test C-182-43T. Do not compare results obtained by different testing methods; they cannot be correlated.

3—*Stability*—
Cold crushing strength does not always indicate the stability of an insulating firebrick under fire. Compare the hot-load strengths. This is an essential factor for spring arch and for high wall construction and an important indication of length of service to be expected.

4—*Durability*—
Insulating firebrick should show little or no permanent volume change after heating to their recommended temperature limits. Compare results based on ASTM test C-93-42.

5—*Responsibility*—
Consider the manufacturer's responsibility, his ability to produce uniformly high quality materials, and his knowledge and experience with applications of insulating firebrick to different types of furnaces.

6—*Value*—
An evaluation of benefits and advantages for your particular furnace application should be made as a final step. Price alone is no criterion—a low price may result in an expensive investment.

Your local B&W representative will be glad to give you the necessary information on B&W Insulating Firebrick to make this kind of an evaluation.

THE BABCOCK & WILCOX CO. *Refractories Division* **85 Liberty St., New York 6, N. Y.** R-176

BABCOCK & WILCOX

company, in 1941, initiated careful examinations and special studies. Better known deposits were surveyed and sampled in a manner which would provide opportunity for getting intimate knowledge of them. To be certain of the analytical results, all chemical analyses have been made by Lerch Bros., Inc., Hibbing, Minn. Rock thin-sections have been made and studied microscopically and in some instances polished surfaces have been examined.

Iron, a fourth most abundant element, is widely distributed in the rocks of the earth and occurs as deposits in about 36 states, but it is mined in only half that number. In 1942 one state alone produced 70.5 per cent of the total tonnage used by our steel industry. Of all the ores charged into the furnaces 89 per cent was hematite, 6 per cent magnetite and 5 per cent brown, hydrous limonitic ores; the Lake Superior region produced a total of about 86 per cent of all these ores and nearly all of it was hematite. The Northeastern district produced virtually only magnetite. The Southeastern district produced mainly a low-iron high-lime or self-fluxing ore. The brown ores are not easily classified.

Various Grades Available

In contrast with the foregoing, the ores of the Western district comprise only 1.5 per cent of the total production; and in some places they are magnetite, in another place they are a mixture of hematite and magnetite, and in other places are limonites of various kinds and origins, thus making for exceptionally wide variations both chemically and physically. The ores not yet being used but commonly proposed as possible reserves, add to these abnormalities.

Lake Superior iron ores mostly used by the steel industry, include 22 per cent of bessemer grade; 68 per cent of low-phos, nonbessemer grade; 6 per cent of high-phos, nonbessemer grade; 3 per cent of manganiferous grade; and, 1 per cent of siliceous grade. At least 90 per cent of all ores are low in phosphorus.

Involves Close Tolerances

Close tolerances are required in the various elements of all the Lake Superior cargo shipments originating from one mine, through one season. Suitably grading of productions coming from many small mines will be required, if large annual consumptions ever are to become prescribed by an industry in the western ore area. Small size seems to be a limitation in the Western area.

If the current penalties inflicted for small variations in the chemical composition of Lake Superior ores are applied to western ores, these penalty schedules would often make it uneconomical to ship certain mine productions and would prevent many deposits from being developed as mines. New methods of pricing and new uses, therefore, must be originated.

Carefully determined comprehensive analysis of Washington and Oregon iron-bearing rock samples are presented in the accompanying tables. The ledges and deposits were carefully surveyed, measured and platted; they were sampled at specific places, to show a true story on the basis of quantity and not of character samples or of good-looking specimens. Samples were analyzed for many constituent elements, and, when analyses were combined, were weighted for quantity represented. It is believed that the ore-type and the general overall problems are now accurately disclosed for each area. Old published analyses have been discarded because seldom is recorded how the samples had been taken and never how much is thereby represented. A common omission, but perhaps a misunderstanding as to iron ores, is with regard to needed observance of iron in the natural state rather than iron in the dry state, even though for some rocks the moisture-content is low and the difference is then not much of a factor. Analyses are offered to show what substantial amounts of the best known deposits of Washington and Oregon look like chemically. Some are quantitatively not deserving of further record than to say that now and then a few tons are shipped to a nearby cement plant; and some of the rocks are shipped to seaboard, there to be used as ballast in newly built wartime cargo vessels, in which case only the weight per cubic foot is the specification prescribed (*b*, Table I).

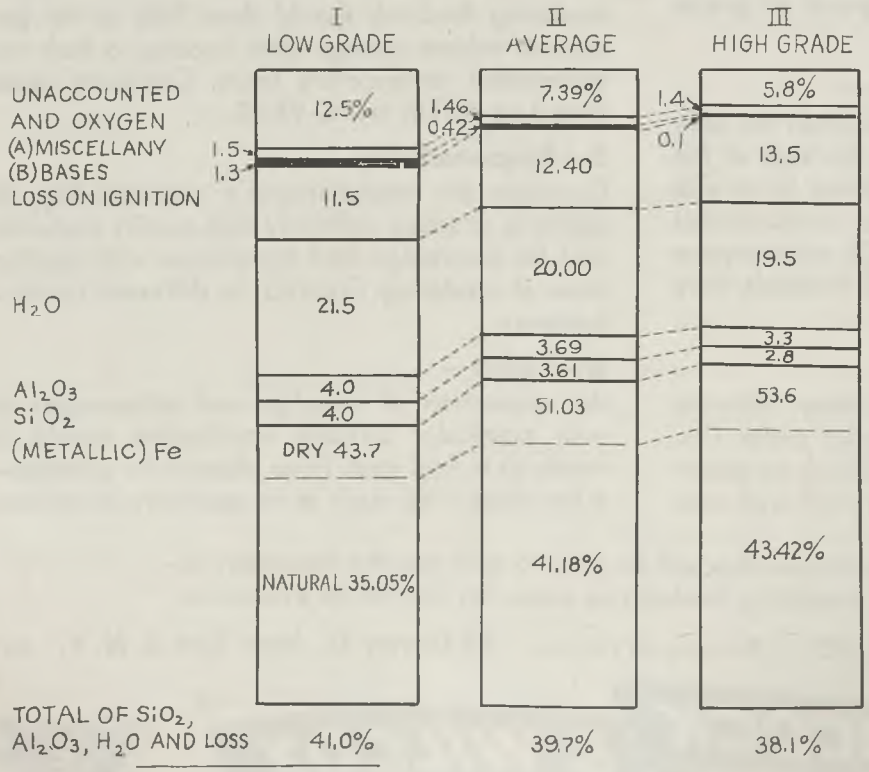
Deposit Is Magnetic

The analyses shown in Table I are for the deposit known as Magnetic Mine, on Buckhorn Mountain, Okanogan county. It is wholly magnetite, but with pyrite. It is being operated as a quarry in a small way by a few men and for the odd purposes as just mentioned. Because of the attractive analysis of the selected magnetite (*c*, Table I) much attention has been given to this deposit. Rarely, however, has anyone emphasized the need for beneficiation if large tonnages are to be mined annually. In that case, a mass of highly altered, indurated hornstone containing magnetite pods and pyrite enclosed in garnet and epidote must be mined (*a*, Table I). Fine grinding of tough rock and roasting to reduce the sulphur, are first considerations to providing both suitable quality and adequate quantity in support of a furnace industry.

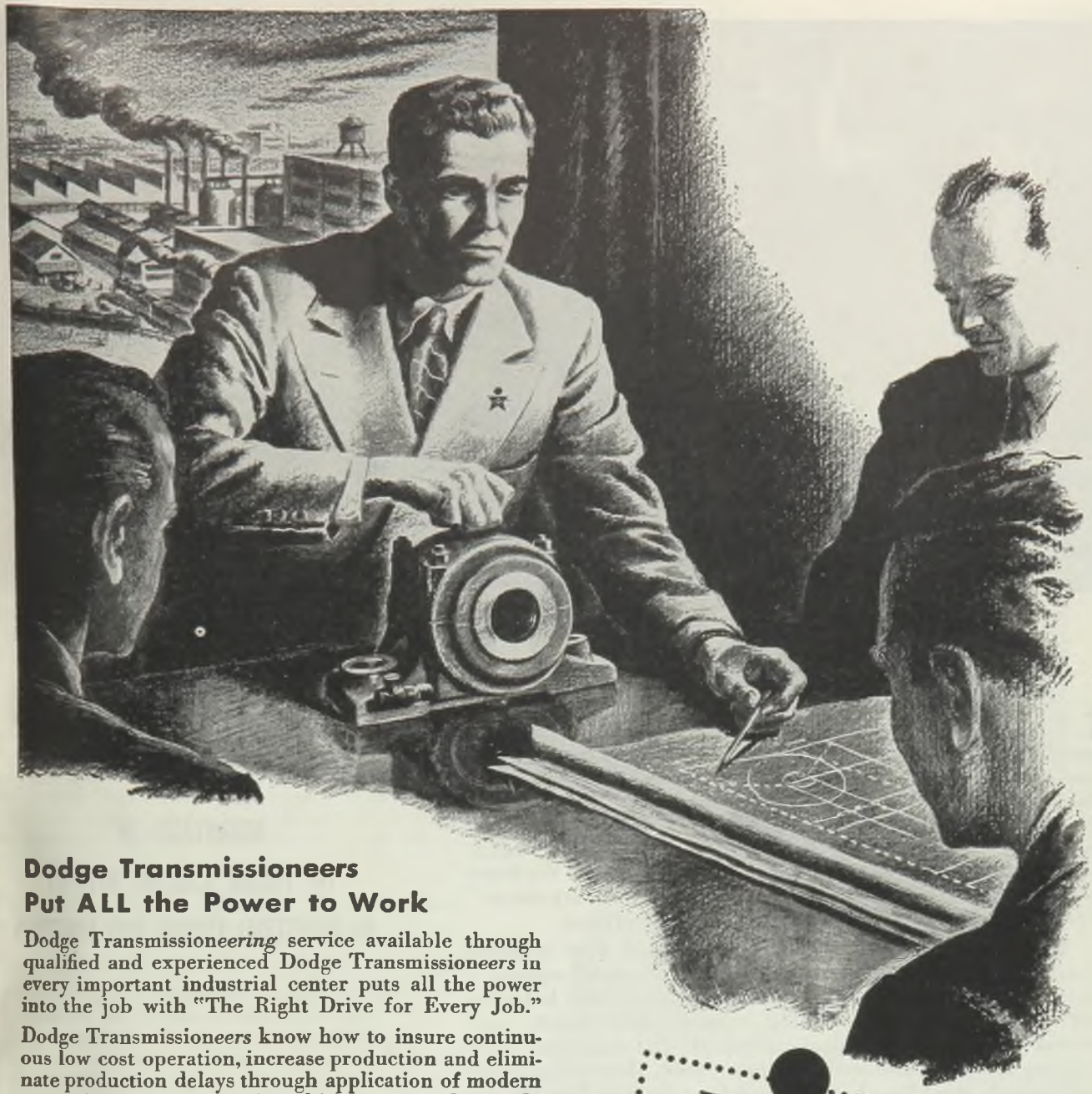
The available quantity has often been greatly exaggerated.

Instead of being spoken of as an iron ore, the rock for which an analysis is given in Table II should be designated a nickel-ore. This is likely the best nickel deposit in the United States (including Alaska). A nickeliferous steel is apt to be the end point in this metallurgy, yielding a chrome-bearing slag which may yet become important as a source of alumina as well as chromium. The rock is so dense and the mineral components are so intimately associated

(*Please turn to Page* 136)



Chemical composition of many Scappoose iron ores (Oregon). Vertical height represents per cents



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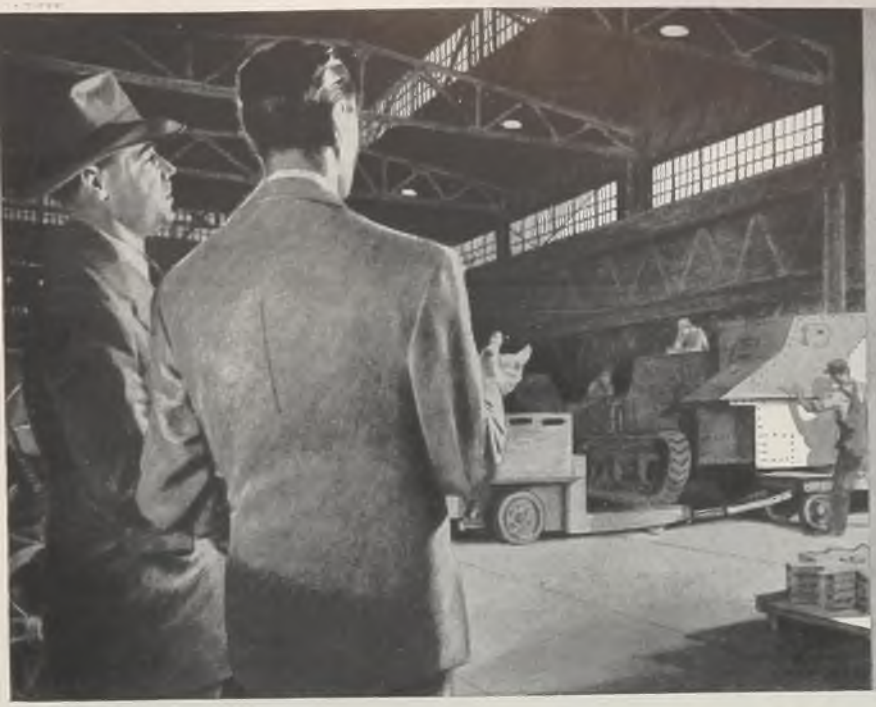


CAN ONE BATTERY DO THE WORK OF TWO ?

What Happened When an Electrician Tried To Find Out

Early in 1941, an industrial plant converted to war production and changed from an 8-hour to a 24-hour day. But when the Edison field engineer recommended spare batteries for the industrial trucks, the plant electrician replied "We don't need spare batteries. We'll find enough time for charging during lunch periods and early morning hours. We know our Edison Batteries can 'take it' even if we overwork them." And in this he persisted in spite of every warning.

Then, two years later, he told the Edison field engineer that the batteries were not holding up. At the field engineer's recommendation tests were conducted, and the batteries delivered 110 per cent of rated capacity. This finally convinced the electrician that, although the batteries were "taking it" as he had insisted they would, there simply was not enough time for charging and he agreed at last that he needed spares to keep his trucks in 24-hour service.

The fact that these batteries did "take it" as the electrician expected is no argument for trying to make one battery do the work of two. It is, however, an impressive demonstration of dependability under intolerable conditions, and it testifies to that reserve of dependability which alkaline batteries have available under all conditions.

Some of the unique characteristics of the Edison Alkaline Battery which account for its extraordinary performance are cited in the column at the right.

EDISON STORAGE BATTERY DIVISION
THOMAS A. EDISON, INCORPORATED, WEST ORANGE, NEW JERSEY

Edison
ALKALINE BATTERIES

ADVANTAGES OF THE EDISON ALKALINE BATTERY IN INDUSTRIAL TRUCKS AND TRACTORS

★ It is durable mechanically. High strength steel construction is used in the containers, grids, pole pieces, etc. The electrolyte is a preservative of steel.

★ It is foolproof electrically. It may be accidentally short-circuited, over-charged, over-discharged, or even charged in the reverse direction without injury.

★ It can be charged rapidly. It is not subject to finish-rate limitations. It requires no equalizing.

★ It withstands temperature extremes. It is not damaged by freezing. Free air spaces on all sides of all cells provide ventilation for rapid cooling under high temperature conditions.

★ It is simple to maintain. Merely charge adequately, add pure water, keep clean and dry.

★ Its tray assembly and cell connections are extremely simple.

★ Its life is so long that its annual depreciation cost is lower than that of any other type of storage battery.

Tight Storage Situation Solved by

GRAPPLE-MOUNTED FORK TRUCK

Other adaptations of the fork truck turn unused yard area to profitable account and eliminate risk in handling heavy loads on upper floors too light to support them

A POWER-OPERATED sheet steel grapple mounted on an inverted fork arrangement for a conventional battery-powered truck has enabled the materials handling department of General Electric Co.'s Fort Wayne, Ind., works to solve a particularly tough storage problem and to place one-third more stock in the area available.

Existing storage and handling facilities for lamination sheet steel in one department of the plant were overburdened. The only available space that could possibly accommodate the floor load was the basement area.

This steel is received for storage in packages consisting of three or four 5000-pound lifts, separated by lengthwise dunnage strips. Before being stored the banding is removed and, subsequently, the steel is handled in 5000-pound units. Packages vary from 26 inches to 32 inches in width and up to 122 inches in length. Gages are too light to permit safe movement by forks in unbound bundles.

Previously, overhead cranes handled this stock in an area where head room was ample but floor space was quite congested. In the present basement storeroom the situation is reversed. Low ceilings limit the height of the stacks. However, the electric truck and sheet grapple have proven ideal for this job, piling one bundle on another to within a few feet of the ceiling. Unstacking is done with equal ease.

As shown in Figs. 1 and 2, the grapple mounted on the fork truck is a commercial model, a standard unit modified by adding a 30-volt motor to operate from the truck battery and provided with limit switches at the ends of the travel to prevent jamming. A standard G-E reversing switch is mounted under the steering wheel of the truck to control the opening and closing of the grapple.

Inverted fork and suspension arrangement, designed at the Fort Wayne Works, has a hook-on attachment which permits the grapple to be set on the floor or on top of a pile of steel when not in use. Minimum time and effort are required to change back to conventional forks on the truck.

Successful operation is attributed to the four-point ball-and-socket suspension on each of the four suspension rods. This eliminates rigidity and still prevents excessive, uncontrolled sway, features which add inducement for the use of this or similar equipment for the handling of other materials of a kindred nature.

Fork trucks have been put to profit-

Fig. 1—Fork truck with grapple stacks lamination steel to within few feet of ceiling in low-roofed basement area

Fig. 2—Power-operated sheet steel grapple mounted on inverted fork arrangement on conventional battery truck

Fig. 3—Formerly inaccessible yard space now fully utilized for plate storage by use of gas-powered fork truck with 98-inch lift and 10,000-pound hoist

Fig. 4—Battery-powered pallet truck with platform on forks safely handles heavy spools of wire over upper floors too light for heavier trucks

able use in several other instances at the plant. In one case, yard area formerly inaccessible for the storage of steel plate stock is now fully utilized to store heavy plates as large as 6 x 12 feet and narrow sizes up to 5 tons. This material, to be fabricated into bases and frames for motor-generator sets, is now safely handled by one operator with a large, pneumatic-tired, gas-powered fork truck, shown in Fig. 3. The truck has a 98-inch lift and is rated at 10,000 pounds on hoist. It can negotiate the necessary distances and grades swiftly and with a high degree of safety, even when traveling on ice and snow with a heavy load.

There is illustrated in Fig. 4 a battery-powered small pallet truck which is helping to relieve a handling problem on upper-story floors too light to support, and in some respects too congested to accommodate, the standard heavy fork trucks. This little truck is equipped with a manually operated 3½-inch hydraulic lift and has maximum capacity of 4000 pounds. It moves much material too heavy to be conveniently transported on hand pallets and functions as a medium to transfer loads on and off elevators. With this unit it is possible to do away with the deadheading of truck and driver between floors.

Increasing engineering applications seen in postwar period for

DIE CASTINGS

By B. W. HINDMAN
Consultant, Conservation Division
War Production Board

PRIOR to the opening of hostilities in the global war, the die casting industry, like most American industries, had concerned itself primarily with production for a peacetime economy. Automotive parts, washing machines and other home appliances, business machine and industrial equipment, are but a few of the items for which die castings were manufactured.

The principal metals in use during this prewar period were zinc and aluminum, with zinc a three or four to one favorite. Smaller quantities of copper, magnesium, lead and tin were employed for special usages.

The decrease in production of civilian goods with the outbreak of the war, dealt the die casting industry a heavy blow which could be absorbed only by the transfer of the equipment, skill, and knowledge of the industry to an active part in the production of war goods. Some industries found this change-over a comparatively simple task, as the items manufactured for war were identical, or at least quite similar, to their peacetime products. Not so with the die casting industry, for the peacetime economy had no place for the huge quantities of airplanes, tanks, radio, and ammunition components which were later to become their war time work.

Practically all of the early combat items were designed during a period when procurement was low, and it was not necessary to consider conservation of materials or, in many cases, speed of production. As a result, the die casting process, with its ability to produce accurately large quantities of duplicate parts with great rapidity, was not utilized to the fullest extent in many of the early designs.

This war, as compared to its predecessors, is one of transportation, of movement, of lightning action. Planes fly faster and carry heavier loads; trucks, tanks, and other vehicles have been speeded up; the infantrymen carry a greater variety of specialized equipment. All of this has meant a greater demand for the production of parts in the lighter metals, aluminum and magnesium, as lower weights permit greater speed, greater distance, and greater carrying power.

In order to take its rightful place among the war production industries, it was necessary for the die casting industry first, to provide more equipment for the casting of aluminum and magnesium in order to meet the demand for light alloy castings; and second, to sell the armed services on the desirability of using the process to a greater extent. The first was an internal problem which the industry in co-operation with War Production Board, handled by the conversion of equipment and the addition of some new equipment. The second problem was more complex in nature, requiring the help and assistance of the individual die casters, the War Production Board, and its industry advisory committees, the American Die Casting Institute, and many others, in addition to the engineering staffs of the armed services.

The armed service policy of accepting a change in process or a new design, only after exhaustive tests, required that many experimental dies be built and sample runs of castings be made and tested. The industry responded immediately to the call f

proving its skill and ingenuity by speedily designing and efficiently producing the required munition components.

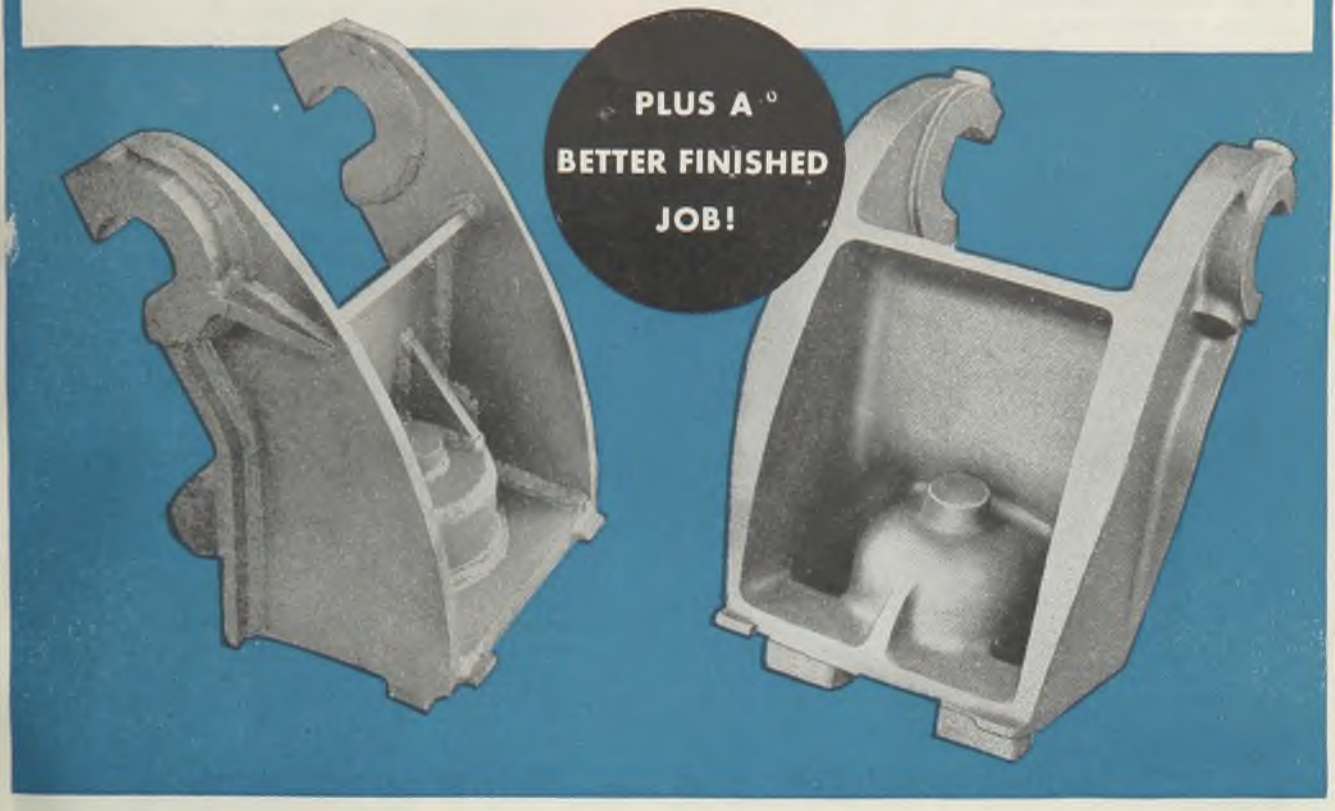
The willingness of the die casting manufacturer to strive for perfection in his product by using more stringent laboratory and inspection controls has been a big factor in the industry's success in obtaining contracts for direct and indirect war products. In many cases, entire shop routine was reorganized. Washing machine parts and the like, although important to their own industry, do not carry the responsibility of aircraft or ordnance parts, where an imperfection might result in serious loss of life and equipment. Inspection standards were thus of an entirely different order. More accurate control of metal alloying, a [illegible] iodic X-ray examination to determi[illegible] structure and greater attention to di[illegible] mensional accuracy were among the standards set up by the die casters for their war time work.

The die casting industry accepted the huge new responsibility and produced millions of satisfactory castings under the watchful eye of the Army, Navy, Air Forces and industrial inspectors. As a consequence, this industry, seriously crippled at the outbreak of the war, has risen to one of the major factors in the production of war weapons. The ability of the die casting process, in the case of aluminum castings, to utilize lower grades of material and in the case of all metals, to produce castings with a minimum of scrap losses, has proved to be one of the outstanding contributions to the conservation of our critical materials. The ability to produce castings rapidly and to close tolerances, requiring a minimum of machining, has been a major factor in the elimination o[illegible] man and machine hours.

What then of the industry after the war? Will the added supplies of all nonferrous materials, particularly aluminum and magnesium, likely to be available in the postwar period, provide greater impetus to increased utilization of die castings in consumer products? Will new high pressure die casting equipment permit the casting of parts heretofore considered beyond the scope of the die casting process? Will recent developments in alloy steel technology make available better die steels and thus permit an extensive use of high melting alloys? Will the experience gained during the present emergency period result in a greater use of die castings for important functional items?

All these and many other questions confront the die casting industry when considering the postwar possibilities. These questions will only be answered in time, but it is safe to assume that practically all prewar markets for die castings will return. A more extensive use of die castings will undoubtedly be made by design engineers, when there is a demand for a proven engineering material and a method of fabrication capable of accurately reproducing a gr[illegible] number of parts with the minimum [illegible] and labor

22 pieces here vs 1 piece here



The cradle at the left is a satisfactory job. It is made up of 22 pieces of steel. Each piece must be cut to size and then all 22 must be joined together to make a single assembly.

At the right is its equivalent, redesigned as a one-piece steel casting. It is an even more satisfactory job in operation, with strength, precision and rigidity.

But, the casting is a one-piece job. Twenty-one fewer pieces to handle! No cutting—no fitting. No jigs required. No assembly cost.

This is a typical example of the cost savings that are being achieved by steel castings, in an almost infinite range of applications.

Well worth looking into—this subject of a wider use of steel castings for your product. Here you might find worth-while advantages for the products you are going to put on the market when the "shooting stops."

We suggest you talk it over with your own steel foundry. Or if you prefer, write to Steel Founders' Society, 920 Midland Bldg., Cleveland, Ohio.

MODERNIZE AND IMPROVE YOUR PRODUCT WITH

STEEL CASTINGS

Engine-Driven Welder

A new Shield-Arc engine-driven welder rated at 200 amperes with powerful enclosed rubber-mounted engine of 29 horsepower, is announced by Lincoln Electric Co., Cleveland. Of light weight, rugged construction, this new unit has a current range of 40 to 250 amperes. Dual control of welding current is accomplished by adjustment of series fields and generator speeds. For metallic arc welding, with bare or coated electrodes, the new model also supplies uniform welding current for carbon arc welding.

The general control or "job selector" assures accuracy of open circuit voltage and permits precise control of engine speed of from 1500 to 1150 revolutions per minute for welding. In addition, this control may be used to manually reduce the engine speed to as low

as 750 revolutions per minute whenever it is necessary to stop welding at intervals of a few minutes. This feature permits adjustment of engine speed to fit the individual job and also affords improved welding and keeps down fuel consumption and engine wear.

With this new unit an engine speed of from 1150 to 1400 revolutions per minute is used for the majority of welding applications. The generator can produce its rated current of 200 amperes when the job selector is set so that the machine operates at speeds as low as 1200 revolutions per minute.

Weight of the unit as illustrated is approximately 1130 pounds, overall length, 65¼ inches; width, 24 inches and height 41½ inches.

Toggle Clamp

A small, light duty toggle clamp with a T-shaped handle is a recent addition to the line of Detroit Stamping Co., 359 Midland avenue, Detroit 3. It may be used in places where limitation of overhead space prohibits the use of larger or taller clamps.

The new clamp is available with either the straight solid work bar. De-Sta-Co model No. 207-TS or the U-bar, model 207-TU. In the latter, the retaining bolt can be set at any desired distance from the handle, thereby making the clamp adaptable to varied job requirements. Dimensions are 3⅞ inches from end of work bar to base and 4 inches high.

Lift Truck

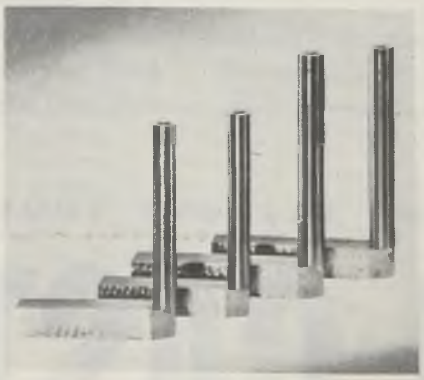
Where loads have to be carried in narrow aisle or stacked in crowded quarters, the Hyster "20" lift truck is an aid. Of 2000-pound capacity, pneumatic tires on the truck practically double the operating speed, permitting faster starting and stop-

ping, smoother travel over rough ground or floor obstructions, better traction for going up ramps, starting and stopping on wet or greasy floor.

It is a gasoline-powered fork-type unit with a 25-horsepower 4-cylinder V-type motor equipped with spark arresting mufflers. The 66-inch turning radius, made possible by the unique design of combined counterweight and trunnion wheel, provides a high degree of maneuverability. The new lift truck has a wheel base of 45 inches with an overall length, not including load arms, of 71 inches and an overall width of 36 inches. It is a recent development of the Willamette Hyster Co., Portland, Oreg. and Peoria, Ill.

Industrial Tri-Square

Line accuracy, greater checking range and constant accuracy to within 0.0001-inch are claimed for a new industrial tri-



square now available from Thomas Tool & Machine Co., Pontiac, Mich. The square uses a hollow cylindrical post to provide temperature control and stability, eliminating the stresses and strains inherent in solid construction. As contact against the side of the cylindrical post is possible only at point of tangency, line accuracy is obtained. Materials used in the construction of the tri-square are aged, treated and tested to 60-64 rockwell C hardness.

The square is available in 4, 6, 8, 10, 12, 14 and 16-inch sizes. One of the outstanding features is said to be a long useful life because it can be reconditioned inexpensively.

Coolant System

A special coolant system designed for the standard and high-speed Perfect 36 vertical turret mills now is being built for new vertical turret mills and for those already in operation by Rogers Machine Works Inc., 125 Arthur street, Buffalo 17. The design of this system permits the delivery of two streams of coolant to the

tool and the work through flexible tubing.

Mounted on the base is the pump driven by a direct-connected fractional horsepower motor. This pumping unit is self-contained all-enclosed and self-priming. To insure positive coolant flow during all machining operations, the pump starting switch is connected to the main switch. The coolant flows back to the lowest point on the frame where it is picked up, cleaned and recirculated.

Test Kit

A test kit, contained in a sturdy carrying case which may be used as a table while testing or experimenting, has been developed by Infra-Red Engineers & Designers, 1633 East Fortieth street, Cleveland. It includes the following standard equipment: Two Miskella Hy-Heat insulated reflective heat units 11 x 11 x 9 inches deep; four Mazda infra-red re-

(All claims are those of the manufacturer of the equipment [illegible]

Prelude TO A PERFECT FINISH

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MOUNTED WHEELS AND SMALL GRINDING WHEELS

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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Specialization—with full W P B approval—on sizes 3" in diameter and under, means no waiting for Chicago Grinding or Mounted Wheels. Let us take care of your present and post-war requirements.

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Half a Century of Specialization has Established our Reputation as the Small Wheel People of the Abrasive Industry.

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Just as the prelude to a new world is better tools of war, so the prelude to a perfect finish is better grinding wheels.

Today's standards of finishes are far and beyond those of yesterday. To acquire them without sacrifice of production time is a goal which everyone seeks.

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.

HERE'S WHAT MAKES CHICAGO WHEELS CLICK—

A—Sensational new FV BOND. Result of research and experiment on hundreds of aircraft jobs.

B—No sacrifice of cutting time or wheel life.

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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Send Catalog and Survey Form. Interested in
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flector lamps sealed in vacuum, each 250 watts; one set shelf and heat unit adjustments for varying "distances away"; one metal-edge expanded metal easy-sliding shelf 11 x 12 inches; two control switches—one for each heat unit; one sturdy supporting framework to support units either vertically or horizontally; one flexible cord 10 feet long with at-

tachment plug; one flexible cord with breakapart connector between the two heat units; one carrying case with handle, hinges, latch for lock and six individual compartments for lamps in transit and it also contains extra large compartment for general use.

The test kit complete weighs 30 pounds and is 36 inches high, 12 inches wide and 12 inches deep. It is wired for 115 volts unless otherwise specified and operates on either alternating or direct current. It supplies temperatures from 70 to 400 degrees Fahr. Heat units are insulated with compressed Fiberglas 1 inch thick. Either clear or reflector lamps may be used.

Portable Heating And Dipping Tank

A new type of portable heat and dipping tank, including an acid compartment has been developed by Heil Engineering Co., 12901 Elmwood avenue, Cleveland.

Known as a "utility tank" it is divided into three compartments which are basically designed for degreasing, rinsing and pickling. However, it also is suited for etching, plating, metal coloring, waxing, fluxing, etc. It can be used in any manufacturing plant, machine shop, garage, public utility or laboratory.

An unusual feature is a dual purpose cover and shelf which is thoroughly acid-proof and arranged to drain into the tank [illegible] the compartment.

SOUTH BEND LATHES

FOR CLOSE TOLERANCES AND SMOOTH FINISH

To meet war production demands, close tolerances and smooth finishes must be maintained without sacrificing output. Machine tools must have the accuracy, speed, and rigidity required for the efficient machining of exacting work.

These are the kinds of jobs for which South Bend Lathes are designed. The smooth operation, wide range of spindle speeds, power, dependable accuracy, and rigid construction of these lathes enable them to hold the tolerances and produce the finish that is required.

South Bend Lathes are made in both Toolroom and Engine Lathe types with 9″, 10″, 13″, 14½″, and 16″ swings, which cover a wide range of work. Also precision turret lathes. Write for a copy of Catalog 100-C in which they are all described.

SOUTH BEND LATHE WORKS

Lathe Builders for 37 Years — **South Bend 22, Indiana**

Specifications

Swing over bed . . 10⅝″
Spindle bore . . . . 1⅜″
Maximum collet capacity . 1″
Thread cutting feeds (48)
. . . 4 to 224 per in.
Spindle speeds (12)
. . 50 to 1357 r.p.m.
Power longitudinal and
cross feeds . . . 48

★

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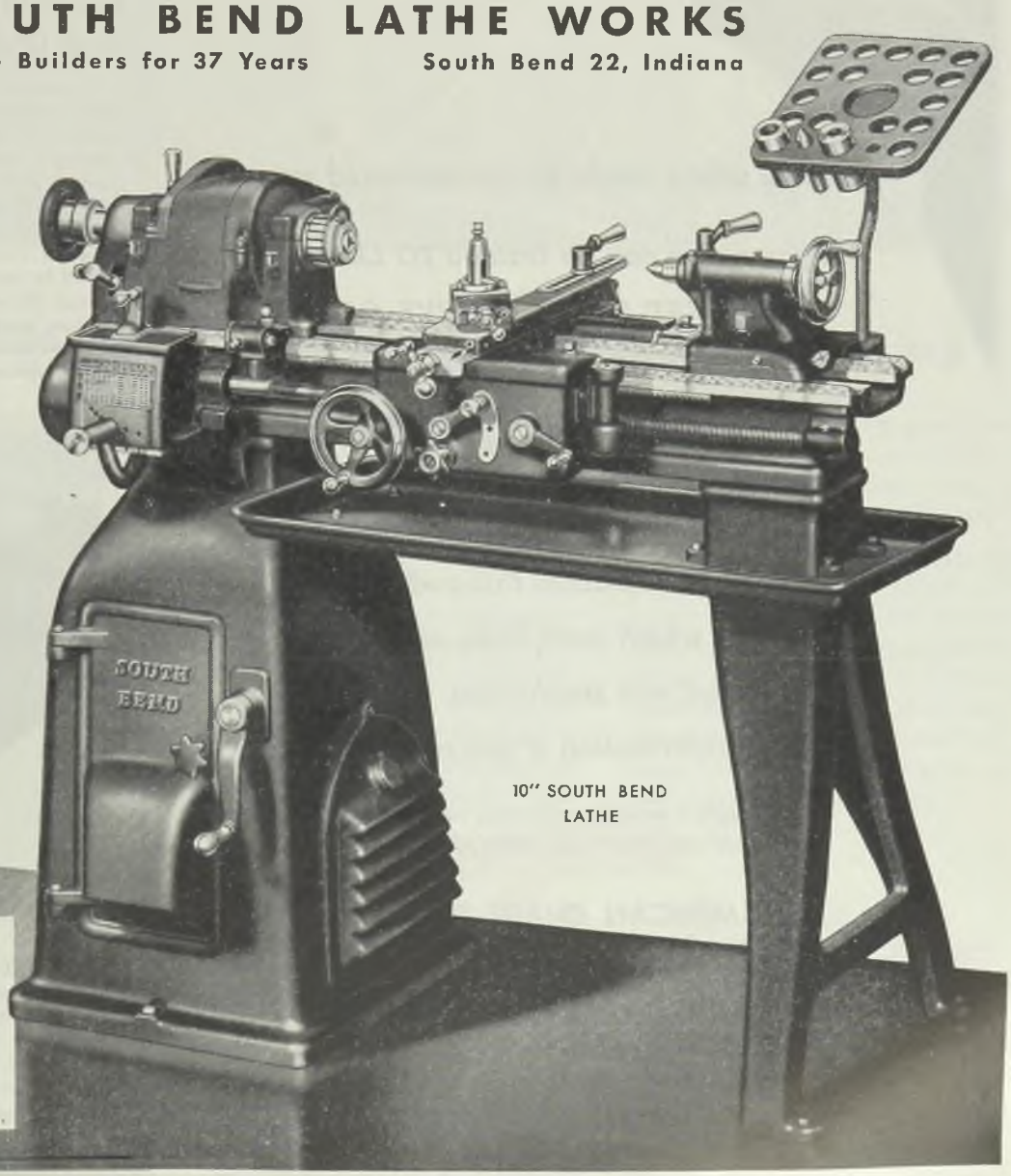
"HOW TO RUN A LATHE"

A helpful handbook on operation and care of engine lathes. Contains 128 pages, 5⅛″ x 8″. Price 25c.



10″ SOUTH BEND LATHE

are filled and the extension cord is plugged into a 110 or 220-volt circuit. Compartment No. 1 has a standard heating unit for hot alkaline degreasing compounds, compartment No. 2 is for cold rinsing and compartment No. 3 is lined with an acid resistant coating suitable for pickling acids. This lining also is satisfactory for most electroplating chemicals.

Heating units can be supplied extra for all three compartments if required. An insulating wall between compartments 1 and 2 prevents heat loss from compartment 1 when compartment 2 is used without heat. All compartments are equipped with bottom and overflow outlets. Heating units have automatic temperature control.

The tank is integral with a welded steel frame, equipped with swivel casters. Overall size of standard models is 20 x 56 x 36 inches high, however special sizes of the same equipment are available. In standard models compartments accommodate 12-inch round or square baskets.

Oil Bath Tempering And Drawing Furnace

A compact, heavy duty oil bath furnace, designated as model 128, is announced by Stanwood Corp., 4819 West Cortland street, Chicago 39. These furnaces rapidly and effectively temper or draw small parts to relieve stresses set up by quenching or to bring about a change in grain structure. Gas fired, they are heated by immersion tubes for maximum thermal efficiency and quick pick-up. The company's super power burners are used and are completely enclosed, being accessible through the door in the front of

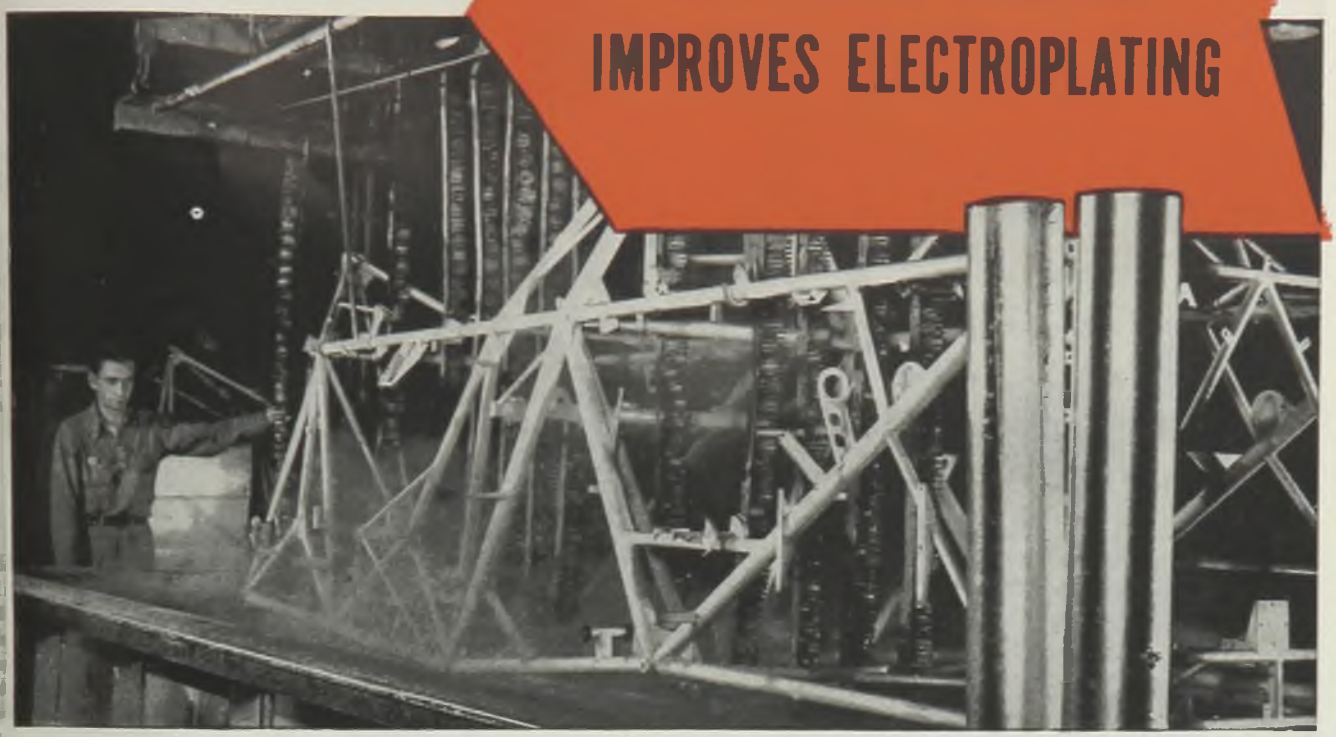
the unit. Thermostatic control assures accurate temperatures. Indicating regulator mounted on instrument panel is within easy reach.

Units can be equipped with right or left-hand drain boards, pitched so oil flows back into bath. Square or cylindrical baskets for holding parts to be tempered [illegible] with the

Prosolv *B*

offers outstanding advantages

NEW TURCO CLEANER IMPROVES ELECTROPLATING



Equally effective in still tank and electro-cleaning

o positive are the advantages of Turco rosolv *B* that prominent electroplaters ave switched to this new cleaner im-ediately following tests *although they ad considered satisfactory the materi-ls they had been using.*

Turco Prosolv *B* insures the chemical d physical cleanliness that is essential 100% bonding to steel of zinc, cad-ium, chromium and other plate. It re-oves every trace of oil, grease, smut, aint and rust preventive compound. It ntains no soap; leaves no deposit. insing is complete, even though parts ay have dried.

A highly concentrated product, Turco rosolv *B* is 100% active. Every particle orks; there is no waste.

As this new cleaner is effective in th still tank and electro cleaning, it mplifies stocking and plant procedure here both processes are employed.

Try Turco Prosolv *B* for stripping deposits formed during certain ctro-pickling processes. A standard cleaning tank may be used for this.

Call the Turco Field Service Man for details on this specially formulated electro and still tank cleaning material which is doing such a notable job the nation over. Write today.

Follow Prosolv *B* with Turco Descaler This second step in preparing steel for plating is as necessary to a perfect job as the primary cleaning operation in Prosolv *B*. Any rust, mill, welding or heat-treat scale will prevent bonding of plate. Turco Descaler removes these without attacking the base metal. Thus the combination of Turco Prosolv *B* and Descaler insures quality plating at low cost. Let us furnish full details.

Rust Bar treatment for unplated portions. Partially plated parts, if treated with Turco Rust Bar, are well protected from corrosion during indoor storage although subjected to severe conditions. A thin film of Rust Bar is resistant not only to airborne water vapor, but also to corrosive gases and other types of corrosive agents.

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furnaces. They are available in a variety of sizes. Particular unit illustrated has overall dimensions of 24 inches wide, 34 inches from front to back, 34 inches in height, with tank depth of 14 inches.

Wheelbarrow Type Air Compressor

Many postwar uses are foreseen for the new, compact, wheelbarrow type air compressor unit manufactured by Quincy Compressor Co., Quincy, Ill. Weighing 225 pounds, the unit incorporates a powerful single-stage air-cooled model 216

Quincy compressor with an air delivery in excess of 16 cubic feet per minute at 80 pounds pressure. The compressor operates at a speed of 1250 revolutions per minute, approximately double normal compressor speed.

The unit is wheeled easily by one man

Combination-Type Heat Treating Unit

Designed to do a complete heat treating job, a new combination unit has a high temperature hardening furnace on the left, quench tanks in the center and a recirculating draw furnace on the right. Built by the Waltz Furnace Co., 2463 Gilbert avenue, Cincinnati 6, this model,

known as CH, is made in three sizes—8 inches wide, 6 inches high and 12 inches deep, also in 10 x 8 x 15-inch and 12 x 10 x 18-inch sizes.

The temperature in the hardening furnace is automatically controlled, assuring correct heating, by an indicating pyrometer that can be set by hand to hold any temperature in the range of 1350 to 2300 degrees. Within the muffle or heating chamber, a protective atmosphere (to prevent scaling and soft skin) can be introduced, which is controlled by the two valves located beneath the gages shown. These gages make it possible to duplicate the atmosphere once the type

IT'S NOT ONLY *Which* CUTTING MATERIAL

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Newly revised and reprinted—a comprehensive book on the properties, uses, and best methods of handling, treatment, etc. of tool, stainless and other alloy steels. Plenty of tables to facilitate quick reference and selection. 136 pages, pocket-sized, latest data.

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THERE'S hardly a single cutting operation that can't, in some way, be improved. Our record files contain hundreds of instances. Redesign of the tool itself often works wonders. In other cases, a switch of cutting materials shows a marked increase in production, or in pieces between grinds.

That's the job of our Mill Service organization—to work with you for improvement—and the Allegheny Ludlum line now offers you absolutely complete selection. The range extends from Carmet carbide metal blanks and tipped tools—through ALX cast alloy-metal ground bits—to DBL and Super DBL low-tungsten high speed steels, as well as the various high-tungsten and "moly" types of high speed steels. Call us in, any time, anywhere.

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STEEL CORPORATION

GENERAL OFFICES: BRACKENRIDGE, PENNA.

W&D A-9332

needed has been established. Efficiency of operation is maintained by the 7-inch thick walls of firebrick and insulation.

There are two quench tanks in the center of the unit, the small one for oil and the large one for water—the water entirely surrounding the oil tank through double walls.

The recirculating draw furnace has a range of 250 to 1100 degrees controlled by an automatic indicating pyrometer similar to that on the hardening furnace. The interior of the draw furnace is of alloy steel around which is a cast insulating lining which in turn is protected by the outer shell of steel. Inside the furnace the hot air for tempering, which is heated by a unit in the base, is recirculated by a high velocity alloy steel fan.

The outside shell is of formed steel all welded construction with air grills as shown. The foot treadles in front are for opening the doors of the furnace. All equipment necessary for operation is located inside the base and easily accessible. The unit is compact, occupying 33 x 98 inches of floor space for its small size and requiring only a gas connection and an electric power outlet.

Milling Machine Vise

By eliminating hand clamping, by synchronizing opening and closing of the vise jaws automatically with the movement of the machine bed, the new CV-60 automatic milling machine vise developed by Bellows Co., 861 East Talmadge avenue, Akron, O., cuts loading and unloading time as much as 40 per cent. Utilizing the company's Sensitrol air motor, operating through predetermined leverage, the new vise provides clamping pressures ranging from 1 to 40,000 pounds. Clamping pressures are applied by the finger-tip control valve integral with the vise. Any designated degree of pressure may be applied and maintained exactly throughout the day's operations. This clamping action, uniformly applied, eliminates the danger of a loose part wrecking expensive cutting tools, lessens rejects due to inaccurate milling as a result of the part moving in the vise jaws.

Vise jaw opening is adjustable through 4½ inches, though the moving jaw moves only ⅞-inch at the full extent of the stroke, providing a safety factor of importance when equipment is operated by newly trained hands. The large size of the jaw opening in comparison with the depth and width of the jaws permits the vise to replace larger holding fixtures in many instances. The vise fits all standard milling machines and can be installed without drilling holes or alterating existing equipment.

Fixture for Jominy Test

A new fixture with accessory tools has been announced by Claud S. Gordon Co., 3000 South Wallace street, Chicago 16 for simplifying the Jominy end quench hardenability test.

We've pioneered the use of FLAME HARDENING in the midwest area. We've developed new equipment and new techniques to FLAME HARDEN an ever increasing range of steel analyses. At the present time we are hardening parts for our armed forces—parts which, without our skill, would have to be made of more costly steel and take many valuable hours of machining. When you have parts which you believe may fit the range of FLAME HARDENING, call us. We can quickly give you information on this valuable process.

OUR SERVICES . . . Flame Hardening · Annealing · Aerocasing · Heat Treating · Bar Stock Treating and Straightening · Nitriding · Chapmanizing · Tempering · Cyaniding · Pack or Gas Carburizing · Sand Blasting · Physical, Tensile and Bend Tests.

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THE LAKESIDE STEEL IMPROVEMENT CO.

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Gas Quenching

(*Continued from Page 99*)

tubes negligible compared to seamless drawn tubes. The cooling rates produced by the fast cooling zone on seamless tubing were found to be entirely too slow for welded tubing. Still faster rates of cooling in the nature of a quench were needed.

The desired result was accomplished in the super-fast cooling zone shown in Fig. 3. For the sake of ready comparison the same scale applies to Fig. 3 as to Fig. 1. The super-fast cooling zone is again placed immediately adjacent to the discharge end of the heating zone but blasts the tubes, as they leave the heating chamber, by large volumes of cold gases issuing from a series of high velocity gas nozzles. Gas nozzles are located above and below the work and extend the full width of the hearth. Withdrawal of gases is through a series of outlet openings on both sides of the chamber and also placed above and below the hearth line. Gases are cooled by pulling them over four water-cooled coils by means of two large recirculating fans which then deliver the cold gases back to the high velocity discharge nozzles.

Consists of Two Units

The gas recirculating system consists of two separate units—one being placed above the work and the other one below the work. The construction of each unit is such that the fan suction ducts discharge ducts and cooling coils can readily be removed as one complete assembly for any necessary repairs. The joints between the removable assemblies and the stationary middle portion of the cooling chamber are made gas-tight by the use of suitable liquid seals.

The combined gas recirculating capacity of both fans is more than 10 times that of the fast cooling zone applied for normalizing seamless aircraft tubing.

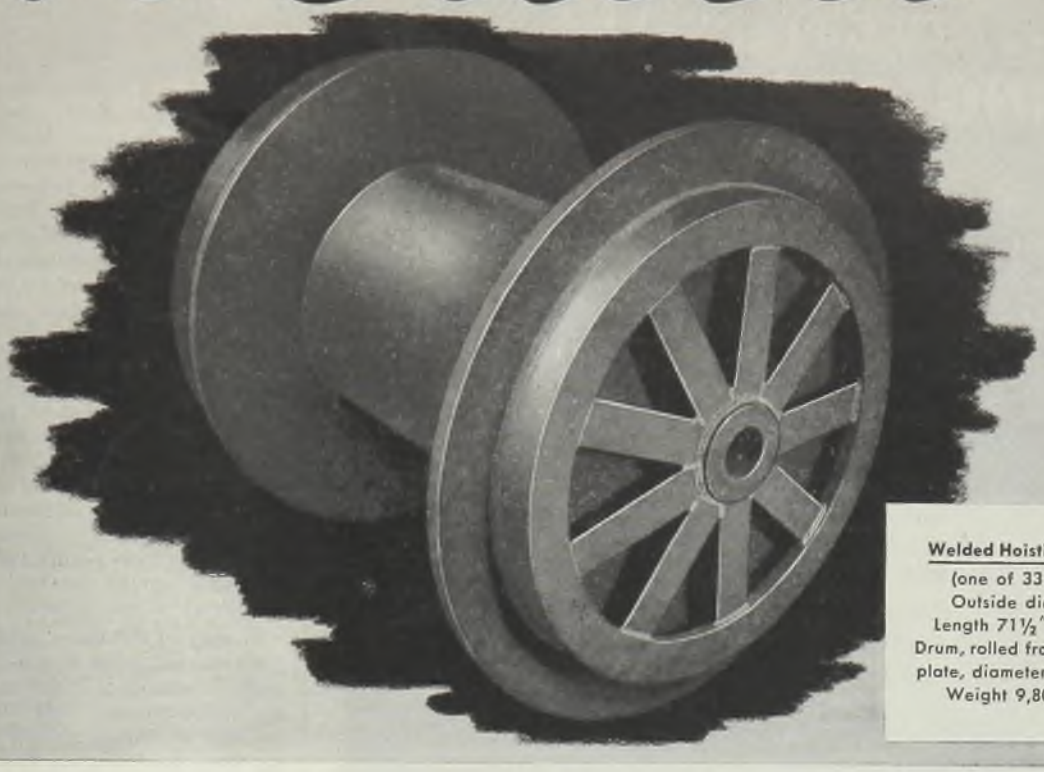
The three identical furnaces, in which the gas quenching results presented in this paper were secured and which have a heating zone 4 feet wide by 50 feet long, are each provided with a maximum gas quenching rates are made possible.

The resultant high rate of heat removal is obviously due to the rapid circulation of the relatively cool gas. The two most vital requirements for quick gas cooling are met, and the most rapid gas quenching rates are thus made possible.

Gas Quenching: For the reasons just disclosed the term "normalizing" no longer is applicable in the heat treatment of welded SAE X-4130 aircraft tubing but has been replaced by "gas quenching." Since the gas quenching medium produces a bright surface of the quenched work, the new heat treatment is commonly referred to as "bright gas quenching". The super-fast cooling zone section in which the drastic cooling is performed is known as the "gas quenching zone".

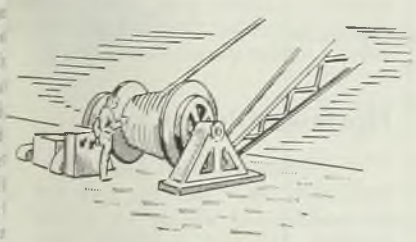
Specifications for "normalized" X-41[illegible] readily m[illegible]

Welded



Welded Hoisting Drum
(one of 33 units)
Outside dia. 68"
Length 71½" overall
Drum, rolled from 2" steel plate, diameter 36" O.D.
Weight 9,800 lbs.

for GREATER STRENGTH . . . LONGER LIFE . . . LOWER COST



Savings in manufacturing time and lower production costs are two important advantages usually resulting from welded construction. Add to this, extreme rigidity and lifetime service, and you have the reasons for the rapidly increasing demands for Graver Weldments.

Tremendous advances in welding progress have brought scores of leading industries to Graver for a wide variety of heavy welded equipment. Machine and engine bases, machine frames, and hoisting drums, like the one pictured, are typical examples.

Modern manufacturing methods, facilities for X-raying and stress relieving, experienced and trained personnel, all combine to enable us to meet the most exacting requirements. Maybe you, too, have a job that can be fabricated faster and more economically by welding. Let us submit quotations. There's no obligation.

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by bright gas quenching. The conveyor is fully loaded across its width and length. The conveyor speeds for the different tube sizes are at least equal to and in many instances faster than the speeds required for annealing.

In the furnace equipped with the small fast cooling zone, the work has to be run through the furnace at reduced speeds to allow adequate cooling time. Therefore, the hourly production rate of the furnace when operating on normalizing is limited by the cooling capacity of the fast cooling zone. The gas quenching zone having a tremendous cooling capacity has completely eliminated any production restrictions from this source. The tubes are conveyed through the furnace at approximately twice the speed formerly possible with the small fast cooling zone. The increased conveyor speed and the above mentioned full loading of the conveyor account for the high rates of production obtained when bright gas quenching.

Production Limitations: A longer soaking period has to be allowed in the heating zone, about one-third the length of the heating zone is utilized for soaking (when gas quenching) . The time in the quench must be sufficient to allow the heat from the center of the object to flow to the cooled surface. Finally in order to secure uniform results, the tubes must be loaded on the conveyor in a single layer.

In spite of the above precautions, the gas quenching zone of a 4-foot effective width is capable of bright gas quenching at a continuous rate 4500 to 5000 pounds per hour of X-4130 welded aircraft tubing from 1650 degrees Fahr. (900 degrees Cent.) to black heat in less than 1 minute. The actual quenching time depends on the rate of gas recirculation and on the conveyor speed which in turn is governed by the tube size and wall thickness. Tubes having a wall thickness of 0.049 inch are gas quenched from 1650 degrees Fahr. to black heat in 30 seconds. Lighter gage tubes require a shorter quenching time and heavier gage tubes a longer quenching time.

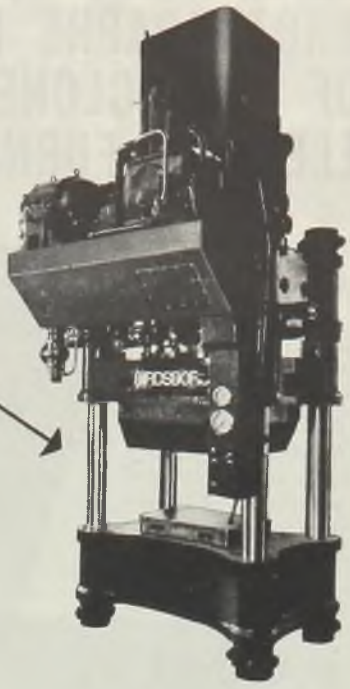
Northwest Iron Ores

(*Continued from Page* 118)

with each other that the rock can not be beneficiated except by a leaching process. The rock is slightly magnetic, but much of the iron is present as the aluminate hercynite, and the remainder of the alumina seems to be mainly diaspore, both of which are strange minerals for men of the iron ore industry.

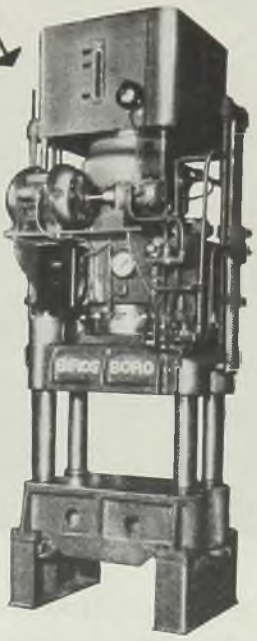
The Hamilton rock, Table III, is a hydrothermal replacement deposit in schistose volcanic rocks and is best named amphibole-magnetite. About one-third of the iron percentage is present as ferrous oxide of which much forms the two unusual silicate minerals garnet and riebeckite. The ratio of magnetite to hematite is usually 3:1 or 2:1 and only rarely 1:1 occurs as the

Use These *Specialists* For Small Pressing Jobs



A special segment of the Birdsboro hydraulic press line is this 150 to 750-ton group, built for the aircraft and allied metal working industries to mass-produce small metal parts.

It will pay you to consult Birdsboro the next time you need a small part press. Our experience in helping hundreds of other hydraulic press users solve their problems is ready to serve you.



For additional information write for the Birdsboro Hydraulic Metal Working Press Catalogue.

Birdsboro Hydraulic Metal Working Presses are built in sizes from as small as 150 tons to as large as 5500 tons.

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HYDRAULIC PRESSES

monoxide replacing ferrous oxide in the magnetite. The high silica-content di vides nearly equally between silicate minerals and quartz. The amphibole is

TABLE I—MAGNETITE, OF OKANOGAN COUNTY WASH.

Element	(*a*) Iron-bearing rock, or crude ore, per cent	(*b*) Hand-picked mine product per cent	(*c*) Selected magneti per cent
Fe, dry	42.11	51.22	59.66
Fe, natural	41.88	50.89	59.40
P	0.034	0.033	0.017
SiO_2	15.95	10.90	6.04
Al_2O_3	3.01	2.56	2.01
CaO	7.34	5.79	3.58
MgO	0.222	0.11	0.23
Mn	0.17	0.14	0.10
Cu	0.265	0.07	0.05
TiO_2	0.057	0.020	0.036
S	2.99	1.543	2.099
Ignition loss			1.14
Ignition gain	0.550	0.200	
H_2O (—110°C.)	0.527	0.65	0.44

As_2O_3, PbO, and WO each do not exce 0.001 per cent for either *a*, *b* or *c*.

(*a*) Unless this rock is crushed, magnetic cobbed, roasted and agglomerated, the avail able tonnage of (*c*) would be too small for steel industry except as a minor contribution a mix.

(*b*) A season shipment, used as ship-ballas was hand-cobbed to make the desired wei per cubic foot and eliminate the sulphur ha

(*c*) Must be roasted to reduce sulphur; la tonnage not available.

TABLE II—CLE ELUM (HARD LATERITE) OF KITTITAS COUNTY, WASH.*

Element	Entire formation per cent	Lower 1/3 only, per cent
Fe, dry	45.31	49.90
Fe, natural	45.07	49.62
P	0.032	0.04
SiO_2	7.68	7.60
Al_2O_3	16.25	11.80
CaO	0.31	0.39
MgO	2.43	3.31
Cr	2.02	3.07
Ni	0.74	0.94
Co	0.084	0.078
Mn	0.59	0.64
TiO_2	0.53	0.28
S	0.045	0.067
Ignition loss	2.83	2.81
H_2O (—110°C.)	0.53	0.56

*This rock might be better used as a so of nickel and cobalt, or even chromium.

the sodium-bearing riebeckite, which here common and comprises about per cent of the rock. The magnetite hematite are so fine, and the silic minerals and quartz so intimately inte mingled with them, that no amount fine crushing can be of use in any for of gravity concentration. Sulphur is to be higher than shown when mini gets to running into high tonnage.

The Scappoose ore, Table III, is a lo iron foundry ore. It is apt to run high in manganese than shown. The zi content is a deterrent to the use of t ore, and the total of 32.40 per cent ignition loss plus moisture bespeaks the pulverulent physical property. It a dusty ore. Upon heating, it in tegrates rapidly. Its ready accessib is an advantage the other ores do have.

For the total area involved, probl nowhere else is to be found in an e area such a collection of unorthodox ores. Insofar as grading is concer

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Built to do a BETTER JOB

Here's Why

MAXIMUM STRENGTH WITH TOUGHNESS AND DURABILITY . . . ONE PIECE, TUBULAR BEAM . . . FORGED AND HEAT TREATED . . . NO WARPING OR DISTORTION . . . LESS UNSPRUNG WEIGHT . . . MINIMUM MAINTENANCE . . .

Another PRODUCT of CLARK EQUIPMENT COMPANY

STRONG – TOUGH – DURABLE . . .

. . . these qualities are engineered into the Clark one-piece tubular forged housing; the most widely used truck axle housing in the world. Briefly stated, some of the reasons for this leadership are:

1. Made of high carbon steel, specially treated.
2. Added parts are welded on before heat treating to make a homogeneous structure.
3. Sections controlled to eliminate localization of stresses.
4. Grain flow controlled throughout to improve fatigue qualities.
5. Rigid support of differential carrier assembly.
6. Correct wheel bearing alignment.
7. Flexibility without permanent set.

The many advantages of this axle housing begin with the steel from which it is fabricated. Steel mill metallurgical laboratories and Clark engineers collaborated to develop the most desirable chemical and physical specifications. Once the steel is in the Clark plant, it is subjected to the most rigid control at every operation. Critical inspections are frequent.

One of the first operations is swaging the steel tubing to provide a proper metal section in the load carrying area. Next, heat is applied to form the banjo and wheel end sections. Spring pads and flanges are then welded in place. Next the complete housing is heat treated, quenched and drawn to provide a homogeneous structure capable of carrying maximum loads.

Strong, tough, durable—it is no wonder that this husky unit has won high praise from foremost automotive engineers as a most effective and dependable load-carrying member . . . giving long lived usefulness and trouble-free low-cost performance. Here's a thoroughly sensible, practical idea: arrange an axle discussion—your engineers and Clark's.

CLARK EQUIPMENT COMPANY

BUCHANAN, MICHIGAN . . . also BATTLE CREEK . . . JACKSON . . . BERRIEN SPRINGS, MICH.

Another PRODUCT of CLARK EQUIPMENT COMPANY

CLARK *Forged* HEAT TREATED AXLE HOUSINGS

Some other CLARK *products*

TRANSMISSIONS

BLIND RIVETING PROCESS

AXLE HOUSINGS

FRONT AND REAR AXLES FOR TRUCKS AND BUSSES

DRILLS AND REAMERS

GEARS AND FORGINGS

ELECTRIC STEEL CASTINGS

INDUSTRIAL TRACTORS

RAILWAY TRUCKS

WHEELS

to mix them serves no good purpose. By the same token, one can not combine their respective tonnages to arrive at a total reserve of usable ore. Under current practices of metallurgy, these several ores can not be regarded as a basis for a blast-furnace operation.

The great need is for some research metallurgist to melt these rocks and ascertain how each one responds under various conditions of reduction, what

TABLE III — HAMILTON ORE, SKAGIT COUNTY, WASH. AND SCAPPOOSE ORE, COLUMBIA COUNTY, ORE.

	Hamilton hard magnetite (with hematite) (general average), per cent	Scappoose soft limonite (general average) per cent
Fe, dry	33.25	51.03
Fe, natural	32.89	41.18
P	0.556	0.596
SiO_2	30.68	3.61
Al_2O_3	4.51	3.69
CaO	3.03	0.264
MgO	1.04	0.156
Na_2O	2.03	?
K_2O	0.07	?
Cr.	0.024	0.001(*b*)
Ni	0.01	0.001(*b*)
Mn	6.71	0.432
Cu	0.03(a)	?
ZnO	?	0.415
TiO_2	0.70	0.30
S	0.134	0.020
Ignition loss	0.74	12.40
H_2O (—110°C.)	1.08	20.00
H_2O (+110°C.)	1.65	?

(*a*) Certain parts of some lenses contain much copper, but would not be used for the copper or the little iron present.

(*b*) As_2O_3, PbO, WO, each not to exceed 0.001 per cent.

kind of metal can be made, its physical properties, and its adaptation. Electrothermal reduction is the obviously preferred method in these cases because it enables handling small amounts of ore and operating intermittently in a locality and where cheap electric energy is abundant. A use undoubtedly exists; these rocks can not be summarily dismissed as useless. Perhaps the nation can secure metal from them suitable for making more serviceable laboratory utensils, but for lack of trial nobody today knows anything about this. Unlike in years past, today we now know the composition of these ores and what it is likely to mean, and wild guesses and hunches about certain big things can be safely dismissed.

Beryllium Copper in More Adequate Supply

Where nickel-silver or bronze have been used in place of beryllium copper to the detriment of the optimum performance, reversion to beryllium copper should be considered by the manufacturer of communications equipment, according to Major R. A. Walker, Signal Corps, Resources Branch, Production Division Army Air Forces, Washington.

Major Walker said that the supply of beryllium copper now is adequate for all essential Signal Corps requirements although it may still be difficult to obtain sheet and rod in thin sections.

Industrial Electronics

(*Continued from Page 115*)

(sleeve) is usually insulated from the heater. In these indirectly-heated tubes, the heater supplies only the heat to cause electron emission from the cathode, and the cathode is used for the return circuit for anode and grid currents.

Mechanical Construction of a Triode

A sketch of the internal structure of a triode is shown in Fig. 15. The cathode is located in the center of the tube. Concentric with the cathode is a grid. The grid is usually constructed of a fine wire or screen mesh. The grid and cathode are surrounded by a metallic cylinder called the anode. It will be noted from the sketch that the grid is located nearer to the cathode than to the anode.

The distance between the grid and the cathode, compared to the distance between the grid and the anode, has an effect on how much the tube will amplify.

A D-C Electronic Timer

Having seen how the tube performs as an amplifier in response to exceedingly small potential changes in the grid circuit, we now proceed to the somewhat similar operation of the circuit of a typical time-delay relay. Of course, such a commercial relay operated from alternating-current power supply introduces several complications as compared to the simple tube circuit already shown operating from direct-current batteries. Temporarily, let's retain the direct-current battery supply and show how we can get time-delay operation in Fig. 16 by introducing a capacitor and resistor in place of the contact-making instrument of Fig. 13. Assume C1 is not in the circuit. When the switch S is closed, the "C" battery produces 30 volts drop across resistor R1 which is negative at the top, where it is connected to the grid of the tube. No anode current flows since the grid is now 30 volts more negative than the cathode. However, when the switch is open, the grid voltage immediately returns to cathode potential and current flows. If capacitor C1 is in the circuit, and the operation is repeated, we see that C1 becomes charged to this same 30-volt drop across R1. When the switch is opened, the potential of the grid cannot immediately rise to the cathode potential for the capacitor C1 requires a certain length of time before it can discharge through the resistor R1. This length of time required to discharging C1 becomes a time delay before sufficient current can flow to pick up the relay. As a rough measure of the time delay, use the time constant formula: seconds = R (megohms) × C (microfarads). This value RC shows the number of seconds required for the capacitor to discharge to about 1/3 of its original voltage (0.368 E). Note that either a large capacitor or a larger resistor will increase the time delay. This is illustrated in Fig. 17. Curve A gives the maximum time available with Curve

What will your †† future I.P. be?

This is the Fourth of a series of advertisements presenting "Industrial Par" and its importance to your company in all future planning. Save this and succeeding I.P. advertisements as the basis for discussion and as a guide to your planning program.

Dream Products?

...WE'RE ALL FOR THEM But

STRATO-LINERS, tear-drop cars, super-streamlined passenger trains, pre-fab houses, electronic gadgets in every home, helicopters and many other "dream products" have been heralded as the stepping stones to new prosperity after the war.

Without minimizing their importance, we feel these things to be still pretty much in the "dream" stage. There's no question in our minds that they will contribute substantially to our world of tomorrow — many of America's great industries, providing work and wages for millions, had their origins in the ideas, experiments and vision of creative, imaginative men — but such things take time to develop.

The gap between wartime production and peacetime manufacturing will most likely be shortened by the making of prosaic things — things we already have and use which war either suspended or curtailed.

One doesn't have to be a crystal-ball gazer to realize that the peacetime future isn't so unpredictable after all. Those manufacturers who are pointing their postwar planning to the production of quality products — in quantity — at low cost — can be quite sure of being among those "most likely to succeed" in the peacetime to come.

To accomplish that objective, machine tools — the most modern and advanced types — are indispensable.

For only with the most modern machine tool equipment can manufacturers hope to attain or excel national industrial par — the vitally significant situation which all must face as summarized in the panel "Spotlight Facts for Your Future I. P. Planning." And only as *industrial par* is maintained or excelled by industry as a whole can a high level of national prosperity — its benefits in terms of jobs and wages for the greatest number of workers — be achieved.

Spotlight facts for your future I.P. *planning*

* Production methods — developed in wartim —increase man-hour output; pent-up buyi power — released in peacetime — deman increased production.
* The rate of 2½% increase per year outp per man-hour, established by a 12 year reco of industrial production, can be expected reach at least 4% per year — compounde
* Manufacturers must set a goal of 50% i creased output per man-hour every 10 yea — to maintain a high level of national pro perity and achieve its benefits in terms security of jobs and wages for the greate number of workers and the volume productio of more goods for more people at lowest co
* Machine tools — the most modern, most ef cient — are recognized as the most effecti implements of mass production and increase output at lowest cost — but only continu replacements with the newest and finest m chine tools assures full productive capacit *Such replacements yearly should be equal 10% of the total machine tool investment in keeping with increased output.*
* The cost of machine tools is insignificant terms of their productive power . . . fro 1927 to 1937, according to census repor American manufacturers had only a total about 2% invested yearly in machine tools ratio to a total volume of 9 billion dolla worth of production annually.

†† **Industrial Par** — *the constantly increasi output per man-hour equal to approximate 50% every 10 years.*

KEARNEY & TRECKER CORPORATION

MILWAUKEE 14 WISCONSI

NDS

Milwaukee Machine Too

indicates how the maximum time is increased with a 0.3 microfarad capacitor.

An A-C Electronic Timer

Now substitute an alternating-current supply in the above simple time-delay circuit. Fig. 18 shows this change, using transformer windings in place of batteries. Obviously, a five-volt transformer winding can take the place of a five-volt battery, merely for the purpose of heating the cathode. Transformer winding B replaces the "B" battery and furnishes the voltage for energizing the relay coil by means of current flowing through the tube anode circuit. Recall, however, that this current can flow only when transformer B is positive at its right side. During the other half cycle, when the left side of B is positive, no current can flow through the tube or relay coil. Therefore, the current passing through the relay coil consists only of positive half cycles with intervening spaces of no current flow. This would permit the average relay to chatter, so it is customary to add a capacitor, C2, in parallel with the coil. This capacitor is charged while the tube current is flowing, but then discharges through the resistance of the coil during the period when tube current does not flow.

The use of transformer winding C in the grid circuit in place of the battery C, causes certain complications. Therefore, before we try to explain this grid-circuit action, let's introduce the basic circuit arrangement of a well-known vacuum-tube time-delay relay.

The complete elementary diagram of this time-delay relay is shown in Fig. 19, but the circuit operation is more easily described by means of the simpler circuit in Fig. 20. (Fig. 20 assumes the relay is connected for operations from 230 volts alternating current, and provides time delay which is adjustable from 4 to 65 cycles.) The tube filament is supplied from transformer winding B, but the circuits to the anode and grid of the tube are connected directly to the alternating-current power supply (leads 5 and 6). Momentarily disregarding the grid circuit (P1, R1, C1), notice that tube 1 cannot allow current to flow while switch S1 is open. However, when S1 closes, tube 1 immediately allows current to flow (disregarding the grid), energizing relay CR1. Notice that this current flows only during the half cycles when 6 is positive and 5 is negative (from 6, through CR1 coil, tube 1, S1, to 5). If we now include the grid circuit, but still omit capacitor C1, the operation is unchanged, for whenever 6 is more positive than 5 the grid is also more positive than the cathode, so tube 1 conducts immediately when S closes.

The Timing Circuit

However, adding C1 to the circuit produces a time delay, so that tube 1 does not fire immediately when S1 closes. Similar to the action in Fig. 16, capacitor C1 has become charged while S1 is open, and must lose most of this charge (discharging through R1) before tube 1 [illegible] current to energize