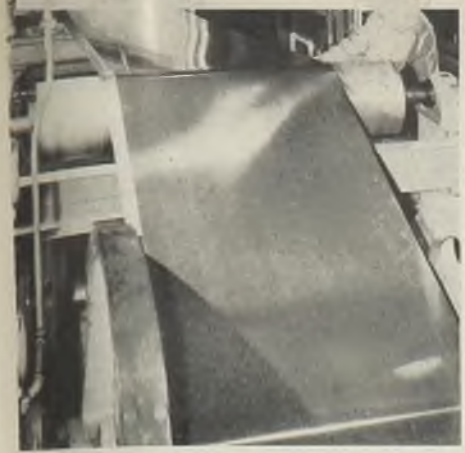

No. 1 uncoiler starts strip through new electrolytic tin plating line at Niles, O. Page 92

STEEL

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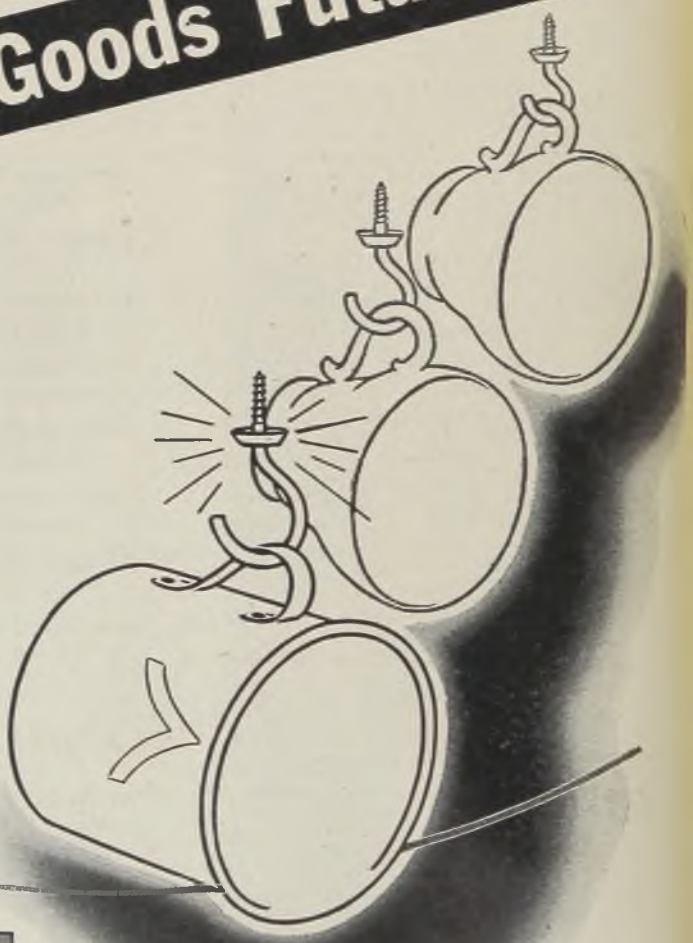
NEWS

TECHNICAL

FEATURES

MARKETS

A Bright Wire Goods Future



. . . worth many miles of wire rod.

One new cup hook in ten million homes is a big order . . . but it's only a small part of the new tonnage piling up for V-Day. Chain Store buyers anticipate an *immediate* postwar demand for bright wire goods alone that will be 600% of prewar requirements.

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STEEL
January 10, 1944

A Stockpile for Security

One of the strongest traditions of America is that ours is a land of plenty. For decades we have been careless in the use of many materials because we believed that the supply was almost unlimited. We have boasted of our self-sufficiency, assuming that we could do very well without importing much from abroad.

The experience of this war should bring us down to earth. We have been consuming many of our natural resources at a fearful rate. In cold fact, we are far from being as self-sufficient as we thought we were.

William L. Batt, vice chairman of WLB, laid heavy emphasis upon this point in his address before the Chicago Association of Commerce last Wednesday. He warned that we are "moving in the direction in which England has found herself—that of having to depend upon imports of material from abroad in order to maintain her very lifeblood of existence."

Having awakened to this danger, what can we do about it? Mr. Batt's answer, which reflects the thinking of men high in business circles who now are assisting the government in Washington, is challenging.

He proposes that we import all of the critical materials we can from abroad and use our own precious remaining supplies sparingly. We should offer to ship to foreign countries, which are rich in natural resources, manufactured articles which we have in surplus and which they need, on condition that these foreign countries pay us in critical raw materials which we can use in our economy.

The obvious objection to this proposal is that the United States cannot absorb unduly large quantities of critical raw materials and that any surplus thus imported would seriously depress American prices. This valid objection can be met, he argues, by deciding "to sterilize the surpluses over and above normal needs, retaining these materials in a stockpile not to be touched except in a case of national emergency."

This proposal deserves the careful consideration of every industrialist. It has the merit of exchanging our exportable surpluses for critical materials which—sterilized and stockpiled for an emergency—would be infinitely more valuable to us than the gold at Fort Knox which was of little comfort when the Pearl Harbor attack plunged us into war.

What would it have been worth to us to have had on Dec. 7, 1941, a five-year supply of sterilized tungsten, industrial diamonds, chromium, manganese, etc.?

CUTBACKS AND JOBS: Although a considerable number of cutbacks and cancellations of war orders are being reported currently, the effect on employment has not been severe. A check-up of conditions in typical industrial centers indicates that to date most workers released by cutbacks or cancellations have been re-employed promptly on other war work.

This appraisal bears out the report of WMC which shows that the number of areas in which labor shortages are acute was reduced from 69 on Dec. 1 to 67 on Jan. 1. In the same period the number of areas "having a labor stringency and anticipating a labor shortage within six months" declined from 124 to 119.

From these figures it is apparent that the manpower situation in general has eased slightly. Nevertheless there are areas in which acute shortages exist and there are others where thousands of additional employes will be needed in the near future. For some

(OVER)

time to come there will be a job waiting somewhere for every worker released by cutbacks. The challenge to our manpower organization is to keep the time lost in shifting from one job to another to a minimum. —pp. 43, 45

° ° °

PENALTY FOR BUNGLING: As Congress reconvenes, its members return to Washington with fresh impressions from constituents as to how the nation's affairs are being managed. Many of the lawmakers resume work fully conscious that the public is highly critical of the administration's hodgepodge attempts at "economic stabilization."

This criticism arises chiefly from the absence of a definite policy in the government's efforts to "hold the line." One agency does one thing, another does something else. One becomes discredited and the President creates a new agency to supplant it, and finally after dozens of agencies often working at cross purposes have reached a point of futility, the President himself steps into the breach and, ignoring much that has gone before, makes his own ruling.

As a result, we have wage increases in prospect which sooner or later must blow the roof off prices. This situation confronts the steel industry now. The penalty for mishandling wage and price problems will hit this nation hard. —p. 46

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HEAT FROM THE FLOOR: Last winter the Murray Corp. had an opportunity to compare radiant heating in one section of a plant with unit heating in another section and with standing cast iron radiator heating in its office building. The radiant heating, accomplished by pumping hot water through pipes laid in the floor, seemed to be more satisfactory than the other methods of heating.

This experience in an industrial plant is interesting because it comes to attention at a time when progress is being reported in the radiant heating of residences. The building magazines also are beginning to devote attention to "solar" heating, whereby a properly designed roof overhang used in conjunction with a newly developed installation of window glass, utilizes the heat of the sun to augment artificial heat in winter time. May we soon expect a trial of this device in an industrial building?

Apparently we are in for interesting new developments in heating, lighting, ventilating and air conditioning—all of which will be significant to industry. —p. 90

PRECISION CASTING: For years metal dentures and fine jewelry have been produced in small centrifugal casting machines by the "lost wax" or "investment" process. First, a mold is formed around a wax replica of the piece to be cast. Then the mold is heated to melt or vaporize the wax, leaving no trace of residue. Finally metal is cast in the mold, forming a casting which reproduces the original pattern with extreme accuracy.

Under the incentive of war, this simple process has been adapted to the production of parts ranging in weight from a fraction of an ounce to several pounds. Parts cast in this manner have excellent physical characteristics and require little additional processing. A noteworthy application of precision casting is in the new gas turbines which drive aircraft supercharger impellers at 20,000 r.p.m. and which operate at 1500 degrees Fahr.

Among materials which can be precision cast satisfactorily are alloy steels, including tungsten tool types, and nonferrous alloys such as the silicon bronzes. Thus far most of the work has been done with high-temperature alloys but it is believed the process can be adapted to the more common grades of low alloy steels. —p. 78

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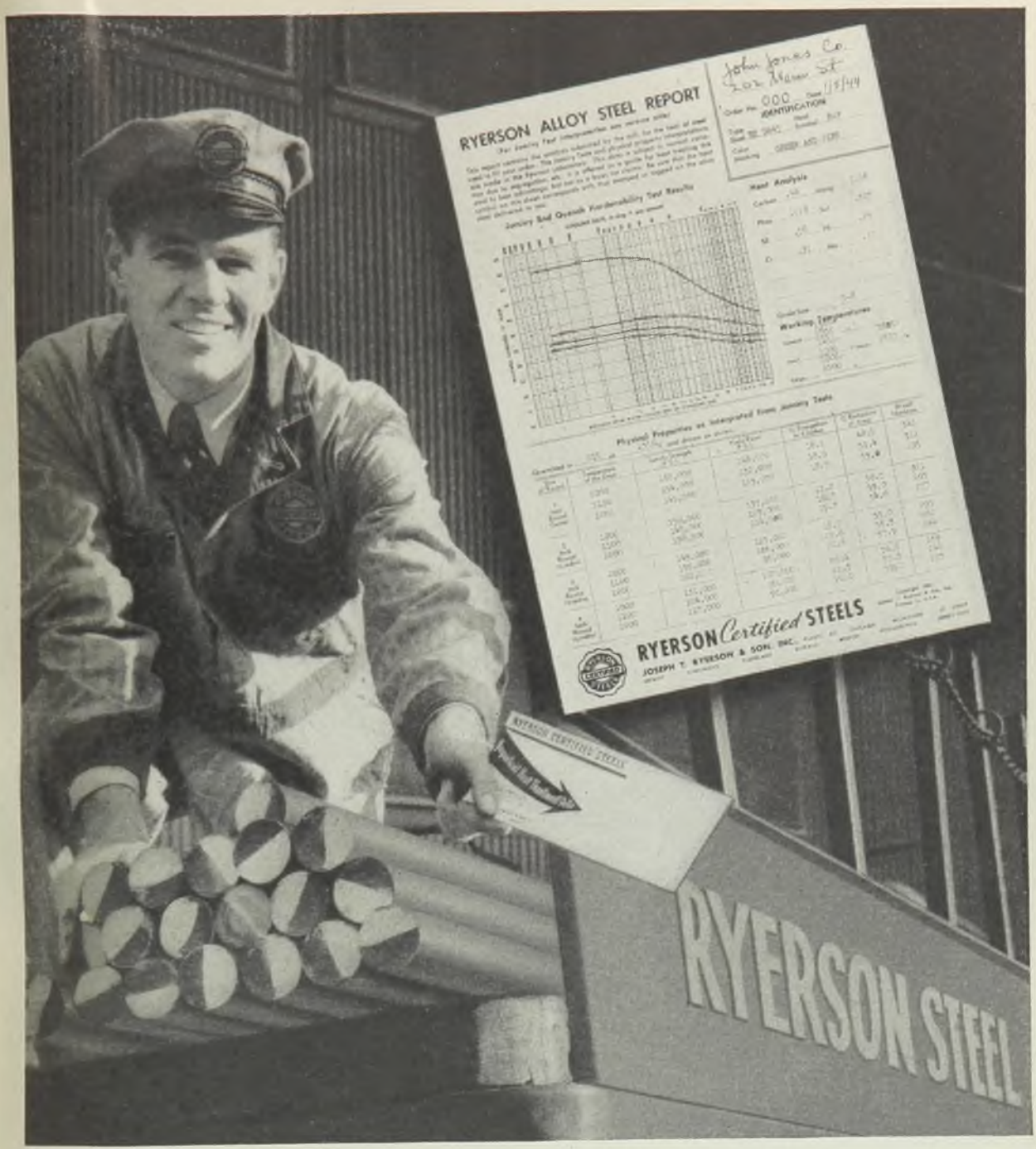
GLORIOUS ACHIEVEMENTS: Standing out clear as crystal in the fog of current domestic confusion is the generally enthusiastically conceded fact that American industry has done a magnificent job in production for war. This enviable record is the sum total of the extraordinary achievements of individual companies.

Almost every week this publication has been reporting record-breaking accomplishments of industrial companies. In this issue, for instance, we present in detail the remarkable achievements in steelmaking, shipbuilding and ship repair by Bethlehem Steel and in steel production by Jones & Laughlin and Republic Steel.

The records made by these and countless other companies represent victories over unprecedented obstacles. They spell teamwork between management and labor which has been effective in spite of powerful efforts to split them apart. Nothing confounds carping critics as effectively as glorious deeds accomplished. —p. 48

E. L. Shaner

EDITOR-IN-CHIEF



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Changes To Bring Some Dislocation

Military and war production officials insist reduction in one phase of munitions program will be more than offset by increases in other. Displacement of workers expected to be only temporary

WILL shifts in war materiel production and the contract cutbacks and cancellations necessitated by such changes pose serious reconversion problems to industry in the near future? Will they cause dislocations of employment? Will they permit substantially increased production of civilian goods?

These questions are being asked with increasing frequency. The answers often are apparently contradictory.

Recent news reports have contained a number of items indicating an easing in the war production effort. For example, the War Production Board announces aluminum production is to be reduced by 40,000,000 pounds monthly, due to a surplus of supply. A Cleveland aircraft parts manufacturer releases 1000 workers and reduces its work-week to 41½ hours as a result of contract cutbacks. Plum Brook Ordnance Works at Sandusky, O., announces it will curtail production of explosives. Output of 2,000,000 electric irons and 50,000 bathtubs is authorized by WPB.

On the other hand, WPB officials and military men, who best know overall requirements, insist the volume of munitions that must be produced in 1944 will equal or exceed the 1943 total.

C. E. Wilson, WPB executive vice chairman, says: "In some categories the increase must be tremendous if we are to keep our Army, Navy and Maritime Commission going. The $61 billion worth of munitions we made in 1943 must be greatly increased in 1944, without the help of new plant facilities being constructed."

The changes ahead are expected to bring some temporary dislocation of labor, but workers displaced soon should be absorbed in other work. The changes will have different effects in the various sections, and to present an overall picture of probable effects of these changes, STEEL herewith presents the following summaries by districts.

Traffic is all one way at this Marietta, Ga., bomber plant of the Bell Aircraft Corp. The first shift is shown here homeward bound; the second shift already has checked in through the same turnstiles. The factory was laid out to avoid conflicts in pedestrian traffic during shift changes

Labor Displaced by Cutbacks at Detroit Being Readily Absorbed

DETROIT

ALTHOUGH sentiment definitely has veered to the belief manpower requirements for war plants in the Detroit area have eased greatly, no specific details have appeared regarding layoffs resulting from program cutbacks or cancellations, probably for the reason such changes, while numerous, have been of relatively narrow extent in each individual case and those displaced could be readily absorbed in other departments.

Airplane Engine Program Revised

Revision of the airplane engine program has resulted in disemployment of 3000 at a Buick plant in Flint, 3000 at a Buick plant in Chicago, and unspecified totals in Chevrolet air engine plants building the same engine as Buick. Unconfirmed reports are heard of retrenchments at Studebaker, while at the same time Continental Motors is making ambitious plans to rush the Packard Rolls-Royce airplane engine into production at plants in Muskegon.

Continental recently was awarded another $40,000,000 DPC loan for equipment for this project, and a furious wave of buying is under way for around 8500 engines. Releases against this total for the first three months of 1944, however, are a mere trickle, and opinions are heard that the Rolls-Royce will never get into production at the Muskegon plant.

Cancellation of the steel shell case program has displaced an unspecified but small number of men in various plants. Some of these programs have been abandoned; others switched to brass. One 40-millimeter job is still going ahead in steel.

Changeovers in airplane models at several plants, including Chrysler and Hudson, have meant temporary displacements, but no indications have been given of the numbers of workmen involved.

Detail check is being made of employers as to realistic manpower needs, to compare them with earlier estimates gathered by the War Manpower Commission, now generally agreed to be far in excess of actual needs. Meanwhile another check is being made by the Office of Civilian Defense of untapped worker supply, chiefly women. Neither of these surveys has reached the point where any conclusions can be drawn.

Meanwhile Detroit is still a critical labor area and the 48-hour work week is enforced, even in plants which are weeks ahead on orders. Any attempt at reducing the work week to the normal 40 hours from this present 52-hour equivalent would be met with a storm of protest from unions and probable walkout of the personnel involved, since the

WMC would immediately grant releases to employes whose hours have been reduced below the 52-hour basis.

Prospects of labor trouble in automotive plants are not held too likely as long as the present level of production can be maintained, since earnings are at an all-time high, and exceed the levels of such industries as steel and railroads.

Wolverine Tube division, Calumet & Hecla Consolidated Copper Co. has announced the incorporation of a profit-sharing plan in its UAW-CIO contract. It provides for distribution of specified bonus payments to employes each time that a dividend is declared for stockholders. This is one of the few if not the only such plan in force among Detroit plants.

UAW-CIO is seeking a number of changes in its contract with Briggs Mfg. Co., one of which is a guaranteed 48-hour week, whether or not there is sufficient production to sustain it. These demands have been dismissed by the local War Labor Board as being "postwar" in character and as such outside its province. There is a suspicion such demands are not nearly so "postwar" as the WLB alleges, and may more logically reflect the determination of the union to maintain the present level of "take-home" pay, regardless of whether overtime work is necessary or justifiable.

In summary, it may be said that a truly accurate determination of whether there is a surplus or deficiency of manpower in Detroit is impossible at the moment. The next 30 or 60 days should provide more reliable information on the trend.

New Orders Fill Cutback Gaps in Buffalo Area

BUFFALO

Although the Buffalo-Niagara area critical manpower situation has eased, new orders have been placed to take the place of cutbacks and cancellations, and the area still faces a shortage of approximately 12,000 workers, according to local WMC officials.

The Niagara Frontier Division, Bell Aircraft Corp. reduced its total working force roughly 10 per cent since Sept. 1. The company said, however, only "several hundred" workers have been laid off, but that the "normal turnover"—quits, releases, Selective Service calls, etc.—is now running at the rate of about 300 a week. Few of these are being replaced.

Numerous small arms plants in the area report "off the record" cutbacks or cancellations in contracts, but new orders, or expansion of other contracts take up the gap.

Republic Steel has been operating only two-thirds of its open hearths for about a month, due to a surplus of ingots. Workers affected were promptly absorbed by other departments.

Local steel mills are hiring only slightly more workers than in 1940, despite record output.

"One hundred and forty-five thousand planes are scheduled for completion in the next 15 months. They will be heavier and more elaborately equipped. The average airframe weight of planes being produced now is twice as great as it was a year ago . . . There must be no lag in production."—Gen. H. H. Arnold, commanding general of the Army Air Forces

Fifth Region War Plant Labor Requirements Expected To Rise

CLEVELAND

DESPITE the possibility of additional cutbacks in production schedules of some war materiel items, War Manpower Commission estimates overall war essential employment in Ohio, Michigan and Kentucky will increase by about 170,000 workers before the middle of 1944.

This estimate by Robert C. Goodwin, Director WMC Fifth Region, is based on reports of estimated manpower needs by employers and on assurance of WPB that cutbacks will be in the nature of readjustment of production plans, rather than a lowering of production goals.

In the past year war employment in this three-state region increased to 2,550,000, a gain of 18 per cent or 380,000. By May it is expected to reach 2,720,000, or an increase of 6.8 per cent over the November total.

In the period Sept. 1 to Nov. 1 last, employment increased 0.5 per cent in Ohio, 1.6 per cent in Michigan and 6 per cent in Kentucky.

Information received from war production manufacturers and WPB indicates that total war materiel output in 1944 is expected to be higher than the present level. If this materializes cutbacks in most areas will be balanced by additional contracts for different types of war material although this may not hold for every community.

"It should be recognized, however, that even were war production to be reduced somewhat, demands upon the national manpower would not be reduced," Mr. Goodwin said. "This conclusion is based upon the increased severity of the shortage of some types of consumers' goods. Absolutely essential civilian needs are expected to be met to the limits made possible by the amount of manpower and supplies available. Consequently, there is no basis for assuming unemployment or reduction in employment generally during the year, even in event of cutbacks far more extensive than any now foreseen," he added.

Dr. William P. Edmunds, Cleveland WMC director, is of the opinion the peak in war employment needs in the district has been reached, and anticipates a leveling off in employment until the war with Germany ends. The Cleveland USES office has orders for about 8000 for war work and nearly the same number for civilian jobs. Actual employment of 281 companies in this district on Nov. 1 last, employing 300 or more persons, totaled 287,655. Based on the Nov. 1 report the estimated employment total for this group March 1 next was placed at 294,589; and 307,462 May 1.

Supporting Dr. Edmunds' view of future manpower needs for the Cleveland area is the recent release of 1000 men by Thompson Aircraft Products Co. because of cutbacks in orders. The com-

Employment Trend of Major Industries in Fifth Region

Industrial Groups	No. of Estab.	Employment Sept. '43	Pred. Employ. Jan. '44	Pred. Employ. Mar. '44	Change from Sept. '43-Mar. '44	Women Employed	Pred. Employ. of Women Mar. '44
Ordnance and Accessories	212	329,488	352,322	356,151	26,663	95,458	113,607
Iron & Steel & their products	325	257,937	277,102	279,737	21,800	35,314	43,524
Transportation Equip. (excl. autos)	232	698,312	762,140	768,952	70,640	212,347	270,186
Nonferrous Metals and their prod.	76	69,158	80,404	81,607	12,449	15,581	20,743
Electrical Machinery	93	97,165	103,698	104,403	7,238	49,671	55,231
Machinery (excl. electrical)	463	287,831	302,997	304,580	16,749	60,080	67,228
Autos and auto equip.	68	116,170	124,178	125,538	9,368	26,640	32,549
Total	1,469	1,856,061	2,002,841	2,020,968	164,907	495,091	603,068

pany has reduced its work week to 41.5 hours, otherwise an additional 1000 men would have had to be released. Other companies and the number of men involved in this area that have been released over the past few months for the same reason, include: Parker Appliance Co., 400; Addressograph-Multigraph Co., 400; Euclid Case plant, Chase Brass & Copper Co., 250; Cleveland Pneumatic Tool Co., 300; Brush Development Co., 200; Cleveland Twist Drill Co., 400; A. W. Hecker Co., 50; Swarthout Co., 25.

A number of other companies in this area are expected to be forced to release some men in the near future, for with Cleveland listed as a critical labor shortage area and their current contracts running out, there seems some doubt at the moment that they will be able to obtain sufficient additional contracts.

Dr. Edmunds feels that Cleveland soon will be taken out of the critical labor shortage area classification and also anticipates lifting of the 48-hour week ruling within a short time after this occurs.

Migration into industrial areas throughout the Fifth WMC region reached a high of about 40,000 workers during August, but has recorded a downward trend since.

Throughout 1944 increasing attention will be made to the placement of returning veterans, and by the middle of the year this service is expected to be a highly important part of WMC's job.

Demand for Labor Unabated In Youngstown District

YOUNGSTOWN

No signs of expected "softening up" of demand for labor have developed in the Youngstown area, said Dr. Joseph E. Smith, War Manpower Commission area director, and A. E. McCully, manager of the U. S. Employment Service.

They said sharp declines in the industrial plants' estimates of labor requirements and layoffs had been expected to develop at the beginning of the year as a result of cutbacks in war orders, but instead some industries have actually increased their estimates of labor needs.

Some sharp declines, however, had occurred more than a month ago when steel plants here suffered sharp recessions in steel orders, and 16 of the 83 open hearths in the district currently are idle, although some of these are due to suspensions for repairs.

3000 Coal Miners Needed in Alabama

BIRMINGHAM, ALA.

Three thousand coal miners are badly needed in this district. The Semet-Solvay Co., Ensley, was closed Jan. 1, due to failure to obtain coal. Some 270 men laid off were immediately absorbed in other industries.

In general, there has been little furloughing of workers due to cutbacks, and workers wanting employment can be placed immediately.

Order Cutbacks Have Only Minor Effect on Chicago Labor Supply

CHICAGO

WAR goods production in this area continues to suffer from inadequate manpower supply. Demand for help from new plants which have not yet acquired full payrolls or from established plants receiving new or expanded contracts more than offset release of workers by factories suffering contract terminations or cutbacks. Experts are unable to foresee in the immediate future the time when labor supply and demand will approach a balance.

LABOR SUPPLY UP

Overall manpower situation improved slightly last month. The number of areas in which labor shortages are acute declined to 67, as of Jan. 1, from 69 a month earlier, according to the War Manpower Commission.

Areas withdrawn from group I, which contains areas of acute labor shortages, are: Bridgeport, Conn.; Elizabeth City and New Bern, N. C.; Evansville, Ind.; Oklahoma City, Okla.; Provo, Utah; and Spokane, Wash. Those added to that group are: Aurora-Elgin, Ill.; Michigan City-LaPorte, Ind.; Muncie, Ind.; Ogden, Utah; and Santa Ana, Calif.

Number of areas classified in group II, containing cities having labor stringency and those anticipating a labor shortage within six months, has declined to 119 from 124. Areas withdrawn from group II include: Aberdeen - Hequiam Wash.; Amarillo and Brownsville, Tex.; Bellingham, Wash.; Burlington and Des Moines, Iowa; and Marion, O.

The decline in number of group I and II areas is attributed, in part, to cutbacks in employment, better utilization of labor, shifts in timing of demands, and good returns from recruitment drives.

In steel plants, chief need is for common labor; in metalworking plants in general, practically every degree of skill is wanted.

In numerous cases, plants which have been operating on a 54 or 60-hour week absorb contract cutbacks if not too severe by reducing hours to 48 or more rather than by releasing employes to find jobs in other shops of industries.

Among Chicago plants recently completed but not fully manned are Dodge Chicago Division of Chrysler Corp., Aluminum Co. of America, and Douglas Aircraft Co.

WMC spokesmen say that only about one-third of monthly worker requirements are being met. Furthermore, reports from actual payroll and personnel records of about 700 major firms and Selective Service show a high turnover of labor in this area. Companies reporting employment totaling 600,000, or about half the area's working force, show approximately 50,000 separations each month. These firms hired 110,000 workers during a two-month period, for a net gain of 12,000.

For about nine months the Calumet area has been on a mandatory 48-hour week. Chicago proper was so decreed as of Dec. 1, with Jan. 16 set as the date for full compliance.

New England Manpower Pinch Eases Slightly

BOSTON

Except for scattered industries, notably ball bearing and aircraft and shops subcontracting for the latter, the manpower problem has eased in New England.

There have been further layoffs at machine tool plants since the first of the year affecting newer and more inexperienced help. Machine tool industry has been slowing down for some months and operating schedules have been gradually curtailed. Many are operating not better than one shift and overtime schedules have practically disappeared, except in one case at Worcester.

Shipyards have ceased their scramble for workers and, while there are few layoffs, shipbuilders are seeking to maintain present forces at the usual rate of turnover.

In the metalworking industry new orders placed in the district in the last two months have been nearly one-third below bookings during the same period one year ago. Many fabricators have carried through on the momentum of old contracts but as these are completed new ones are not forthcoming in the heavy volume earlier in the war program.

Cutbacks in small arms ammunition have hit some steel producers and fabricators hard and, while there has been some release of workers, most of the employes have been absorbed in other departments. Closing of a small arms plant at Lowell, Mass., affected 3600 which will be partially offset by the installation of equipment for Signal Corps wire. This unit will eventually employ 1600. Further reduction in the production of small arms appears terminated. Workers released in this area will be channeled into plants making bearings and aircraft components where possible,

(*Please turn to Page* 122)

Steel Price Level Too Low To Absorb Requested Wage Boost

Overall labor cost of producing steel has risen sharply since prices were frozen in spring of 1941. . . Rise in payrolls major factor in decrease in the industry's earnings in 1943

SUBSTANTIAL increases in steel prices will be necessitated if any considerable part of the wage demands of the United Steelworkers of America are granted.

Steel prices, frozen since the spring of 1941 at levels prevailing during the first quarter of that year, already have had to absorb wage increases totaling 25 per cent of the basic rates at the time prices were frozen. The increases in basic pay now asked would raise the rate to a level 52 per cent higher than that in effect when the prices were frozen. Actually the increase would be considerably more due to the demands for shift differentials, longer vacation allowances, sick leaves, severance pay, minimum wage guarantees, more holidays and other concessions.

The union has asked for a flat increase of 17 cents an hour in base pay, plus a shift differential of 5 cents an hour for the second shift and 10 cents an hour for the third shift. Assuming operations are continuous, this is equivalent to an average flat increase of 22 cents an hour.

The increase asked would raise the base rate for the first shift to 95 cents an hour; for the second shift to $1 an hour, and for the third shift to $1.05 an hour.

Extent to which such an increase would add to the cost of producing steel may be roughly computed by relating the wage increase asked to the man-hours required to produce the various steel products.

For example, 52 man-hours are required to produce a ton of tin plate. Assuming continuous operations would raise the base rate of pay 22 cents an hour, the indicated increase in the cost of making a ton of tin plate would be $11.44.

However, average hourly earnings of steelworkers during the past three years have been approximately 40 per cent above the base rate. This would indicate the wage increase now asked by the union would raise the cost of making tin plate by about $16 a ton.

To produce a ton of pipe requires 37 man-hours. The indicated increase in the cost of producing pipe thus would be $11.39. To make a ton of sheet or strip, 33 man-hours are required, indicating an increased cost of $10.16 a ton for this product. Plates and shapes require about 16 man-hours per ton, indicating an increased production cost of $4.92. Semifinished steel takes 12½ man-hours a ton and the increased cost would approximate $3.85 a ton.

These computations do not take into consideration the other increases in costs that would result if the union's demands for other concessions were granted, such as longer vacations, sick leaves, severance pay, more holidays, free industrial clothing and equipment, and so forth. Nor do they take into consideration the increased costs due to higher coal prices and the two wage increases already granted since the freezing of prices. These included a 10-cent-an-hour advance in April, 1941, at the time price ceilings were ordered for all steel products, and a 5½-cent-an-hour increase awarded by the National War Labor Board in the summer of 1942 in establishing the "Little Steel" wage formula, and raising the basic steel rate to its present level of 78 cents an hour.

Over the past 30 years, average hourly wages in the industry have increased 340 per cent. In July of 1914, the average was 26.3 cents an hour; by last October the average had mounted to $1.158.

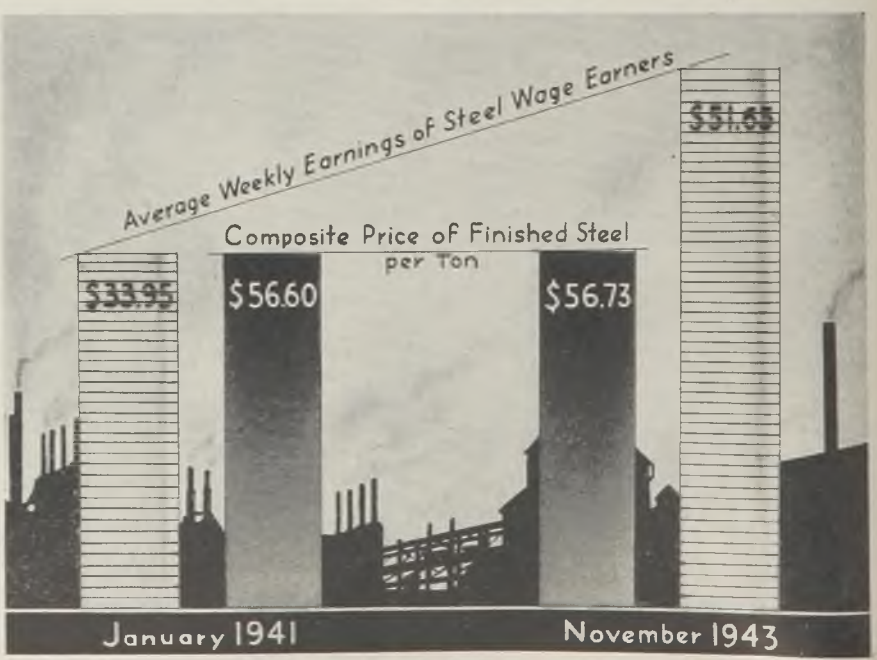
The following table compares the average hourly earnings and the number of hours worked per week since 1914:

Year	Average Hourly Earnings	Average Hours Worked per Week
1914 (July)	26.3c	57.0
1920	70.8	63.2
1921	52.2	54.1
1923	59.6	57.7
1929	65.4	54.9
1930	66.1	48.9
1932	53.1	27.2
1933	52.4	34.0
1934	62.8	29.5
1935	65.5	34.2
1936	66.8	39.8
1937	81.8	36.8
1939	84.2	34.8
1940	85.0	36.2
1941 (April)	97.0	40.0
1942 (October)	107.7	39.9
1943 (October)	115.8	44.6

As might be expected in view of these figures, the overall labor cost of producing steel has risen sharply since prices were frozen.

In March, 1941, the industry produced 7,131,641 tons of ingots and total payrolls amounted to $98,025,000, or $13.74 per ton of ingots produced. In October of 1943, the industry produced 7,819,061 tons of ingots, and total payrolls amounted to $144,937,000, or $18.53 per ton of ingots produced.

WARTIME CHANGES IN STEEL WAGES AND PRICES



War Production To Be Discussed At Conference

Meeting under the sponsorship of Engineering Societies Committee to be held in New York Jan. 14

MANUFACTURING problems will come in for searching discussion at a war production conference to be held at Hotel Commodore, New York, Friday, Jan. 14, under sponsorship of the Engineering Societies' Committee on war production, at the request of the War Production Board.

Of special interest to the steel and metalworking industries will be two panels on metallurgical problems, one early in the afternoon and the other in the evening; one on production and tool engineering; another on welding problems; and two on foundry problems, one late in the afternoon and the other in the evening.

Particularly pertinent from the standpoint of the steel trade will be a paper on the processing and selection of NE steels by Dr. Norman E. Woldman, chief metallurgical engineer, Eclipse-Pioneer division, Bendix Aviation Corp., Teterboro, N. J. This will be presented at the evening discussion of metallurgical problems, with Lewis S. Bergen, associate director of metallurgy and research, Crucible Steel Co. of America, New York, presiding.

Other panel meetings will relate to the chemical industries, transportation, civilian requirements, safety and manpower utilization.

Postwar Employment To Be Studied by Marketers

Maintenance of a continuous high level of employment in this country after the war will be the major concern of the marketing conference sponsored by the American Management Association, to be held Jan. 12 and 13 at the Waldorf-Astoria hotel, New York.

Plans Completed for Scrap Institute Convention

Plans have been completed for the sixteenth annual convention and victory conference of the Institute of Scrap Iron and Steel Inc. at Hotel Statler, Cleveland, Jan. 12 and 13.

Carl A. Ilgenfritz, manager of purchases and raw materials, Republic Steel Corp., will be toastmaster at the annual dinner, Jan. 3. Other speakers at the dinner will include, E. C. Barringer, president of the institute, and Frank J. Lausche, mayor of Cleveland. William J. Wolfe, Wolfe & Co., Hamilton, O., will be awarded the institute's annual Certificate of Merit for exceptional service to the industry.

Auto Wreckers To Hold First Annual Meeting

First annual convention of the National Auto Wreckers Association Inc. will be held Jan. 10 and 11 at Hotel Statler, Cleveland. A highlight of the convention will be a radio roundtable discussion on "Automotive Parts Replacement for War," to be broadcast over a nationwide chain.

Expect Heavy Attendance At S.A.E. Meeting

Space is at a premium in all hotels in the Detroit area, due to influx of hundreds attending the war engineering annual meeting and engineering display staged by the Society of Automotive Engineers at Book Cadillac Hotel, Jan. 10-14.

Among the 48 papers which will be presented are a number by high ranking army officers—including Maj. Gen. G. M. Barnes, Ordnance Department.

A number of the papers are of considerable postwar significance, including those on recent developments in steel, aircraft, and machine shop practice.

Present, Past and Pending

■ FIRST GENEVA BLAST FURNACE STARTS

PROVO, UTAH—Pig iron production has been started at the government's new $180,000,000 steel plant near here with the blowing in of the first of three blast furnaces. Plant is operated for government by Geneva Steel Co.

■ PROPOSE TERMINATION OF 4 STEEL PLANT PROJECTS

WASHINGTON—Cancellation of fund grants for construction at four more steel plants has been recommended to the Defense Plant Corp. by the War Production Board. The four projects, valued at $1,658,000, are in plants of Carnegie-Illinois Steel Corp. at Munhall and Braddock, Pa., and Chicago. Other government-financed steel expansion projects not yet completed are being reviewed for possible termination.

■ DECEMBER PLATE SHIPMENTS ESTABLISH NEW RECORD

WASHINGTON—Plate shipments established an all-time record in December with 1,169,196 tons, compared with 1,060,039 in December, 1942, War Production Board announced last week. Highest previous record was for March, 1943, at 1,167,679 tons.

■ WEST COAST WIRE PLANT COMPLETED

ANAHEIM, CALIF.—New plant of Essex Wire Corp. has been completed here to eliminate necessity for transcontinental shipping of wire and its products. Plant occupies a site of 10½ acres, is equipped with electric furnaces and a complete line of drawing facilities.

■ PIONEER SILVERY IRON PRODUCER DIES

JACKSON, O.—John E. Jones, industrialist and chairman of the board of the Globe Iron Co., died Jan. 5. He was 79 and was the originator and pioneer producer of silvery pig iron.

■ SHARPSVILLE BLAST FURNACE SOLD

WARREN, O.—Sharpsville, Pa., blast furnace of the Pittsburgh Coke & Iron Co., has been purchased by the Hetz Construction Co., liquidating and dismantling engineer. Pittsburgh Coke & Iron will operate the furnace until its stocks of ore are exhausted.

■ HEARING REQUESTED ON GENEVA STEEL MILL PROJECT

WASHINGTON—McCarran Committee to Investigate Centralization of Heavy Industry has been requested to hold a hearing in the Middle West to take up the question of discontinuance by the War Production Board of construction of the steel mill at Geneva, Utah. The committee was granted $5000 by the Senate to carry on its work.

■ WAR EXPENDITURES LOWER IN DECEMBER

WASHINGTON—United States war expenditures in December totaled $6,717,000,000, down $823,000,000 from November.

■ STEEL EXPANSION PROGRAM NEARS COMPLETION

WASHINGTON—Steel expansion program expected to be completed in April. Open-hearth construction is 85 per cent completed, blast furnaces 85 per cent and electric furnaces 91 per cent. Plate capacity coming in this year will total 1,500,000 tons.

■ BIG TRUCK PROGRAM FORMALLY AUTHORIZED

WASHINGTON—War Production Board has formally authorized production during 1944 of 1,000,000 trucks and trailers for military and essential civilian use. It is estimated about 80,000 trucks and 47,000 trailers will go into civilian service.

Bethlehem Expected To Better Its 1943 Ship Record in '44

President Grace lauds 300,000 employes for their contribution to war effort. Navy Secretary Knox says company's 1944 task to be bigger than ever

President E. G. Grace of Bethlehem addresses 300,000 employes over a national hook-up from a destroyer on the repair ways at Staten Island, N. Y. Lending attentive ears are Capt. Edward Ellsberg, left, a salvage expert, and Rear Adm. J. M. Irish, supervisor of shipbuilding for the New York area

A STEEL company, although long a shipbuilder, has made good in a big way in building ships as well as in producing steel. Thus, the Bethlehem Steel Co. established a world's record in building a total of 380 fighting and cargo ships in 1943, E. G. Grace, president, revealed recently in a coast-to-coast broadcast from a new United States destroyer at the company's Staten Island, N. Y., shipyard to the 300,000 company employes throughout the United States.

And as large as this fleet was—a fleet characterized by Secretary of Navy Frank Knox as "bigger than most nations could boast before the war"—and as outstanding as were the company's other war activities in 1943, naval and other war commitments now scheduled by Bethlehem for 1944 will even exceed them, Mr. Grace said.

Bethlehem's ship production last year was equivalent in value to more than 1000 Liberty ships—which would represent more than 10,000,000 deadweight tons or a total in excess of 50 per cent of the nation's entire merchant shipping output for 1943.

Reviewing the company's activities, Mr. Grace stated Bethlehem established a new peak for itself in producing steel—13,000,000 tons (sufficient to build 3500 Liberty ships), against 12,500,000 tons in 1942 and less than 8,000,000 tons in 1939.

Bethlehem's shipyards serviced, repaired or converted more than 7000 ships—a total representing almost 25 per cent of all the ocean-going ships in the world prior to the war. Since the outbreak of the conflict, Bethlehem yards, in fact, have handled more than 21,000 ships, or two-thirds of the prewar world merchant fleet.

The company's Navy and Maritime Commission program of combat and cargo ships embraces 38 different types, from super-battleships and aircraft carriers to trawlers, and is the greatest and most diversified for any company in history, Mr. Grace asserted.

Paying warm tribute to Bethlehem supervisors and workers, Mr. Grace added that "I believe that Bethlehem was able to handle this enormous shipbuilding job because of the way we are set up—as an integrated company. By integrated I mean we are a company which produces materials all the way from the ore in the ground to the completed ship."

Unusual and extensive provisions were made to carry the coast-to-coast broadcast to Bethlehem employes at home and at work. Radio sets were put into mine shafts; public address systems were used in shipyards; sound trucks were employed at various plants; and special wiring carried the speech into Bethlehem office buildings.

In his congratulatory message to the employes and management of Bethlehem, Navy Secretary Knox said that the "production assignment for next year is bigger than ever before. The navy looks to you to surpass your 1943 achievement in 1944."

Rear Admiral Emory S. Land, chairman, Maritime Commission, lauded the "remarkable record" of Bethlehem shipyards and added that during 1944 the company will have "a large responsibility in building a goodly share of the new Victory ships."

Bethlehem is operating 15 shipyards, having a combined total of 76 ways. Close to 200,000 of Bethlehem's 300,000 employes are primarily engaged in shipwork.

Asked in a press conference what he believed should be done with excess government-owned shipbuilding facilities after the war, Mr. Grace said there should be no haste in dismantling these yards. Their salvage value would not be great and he thought it would be wise to simply lock them up and hold on to them for a while.

Jones & Laughlin Plants Set New Production Marks in 1943

OPERATING at 102 per cent of capacity for 1943 to produce a record tonnage of steel for war, the Jones & Laughlin Steel Corp. reports its works at Pittsburgh, Aliquippa, Pa., McKeesport, Pa. and Otis works, Cleveland, had broken 598 production records during the year.

At Pittsburgh works, 42 yearly production records were broken, including the best previous records of the blast furnaces, open-hearth and bessemer departments, the blooming mills, the rolling mills, the 96-inch strip-sheet mill and the cold finishing mills.

At Aliquippa works, 19 yearly production records were broken, including the best previous records of the blast furnaces, open-hearth and bessemer departments, the blooming mill, the 14-inch mill, the 30-inch round mill, the lap welded and the seamless tube mills.

At Otis works, Cleveland, 10 yearly production records were broken, including the by-product coke department, No.

2 blast furnace, sinter plant, open-hearth department, the 77-inch strip mill and the plate mills.

The McKeesport works bettered 3 previous yearly records for the production of war material.

Republic Breaks Output Records

REPUBLIC Steel Corp., Cleveland, broke every one of its basic producing records during 1943.

Steel production was at the rate of 100.4 per cent of capacity as compared with 99.6 per cent of capacity in 1942.

Electric furnace ingot production of 1,085,000 tons exceeded the 1,029,067 tons output of the entire industry in 1939. Republic's 1942 tonnage of electric furnace ingots was 916,000 tons.

Coke output increased 374,000 tons to 5,109,000 in 1943. Production of pig iron increased 232,000 tons from 5,316,000 tons in 1942 to 5,548,000 tons in 1943.

During the year, Republic operating districts established 20 new steel ingot production records, 17 blast furnace records and 22 coke records.

The Warren (Ohio) blast furnace set an all-time record with a production of 472,014 tons as compared with the previous record of 465,148 tons made in 1941. The furnace also made a new monthly record in December with 42,302 tons as compared with the previous record made in October of 42,120 tons.

Baruch Recommendations Ready; Expected To Be Acted on Quickly

Meeting of war plant executives in New York told adoption of uniform terms for settlement by Army and Navy to be announced shortly. Action on disposal of surplus war plant and materials also seen

ADOPTION of uniform terms for settlement of contract terminations by the Army and Navy will likely be announced shortly, Col. D. N. Hauseman, director of the Readjustment Division, Army Service Forces, told a meeting of war plant executives in New York recently.

Recommendations by Bernard M. Baruch, director of the Postwar Adjustment Unit in the Office of War Mobilization, "are now on the President's desk and I think we will see some quick action," Colonel Hauseman declared.

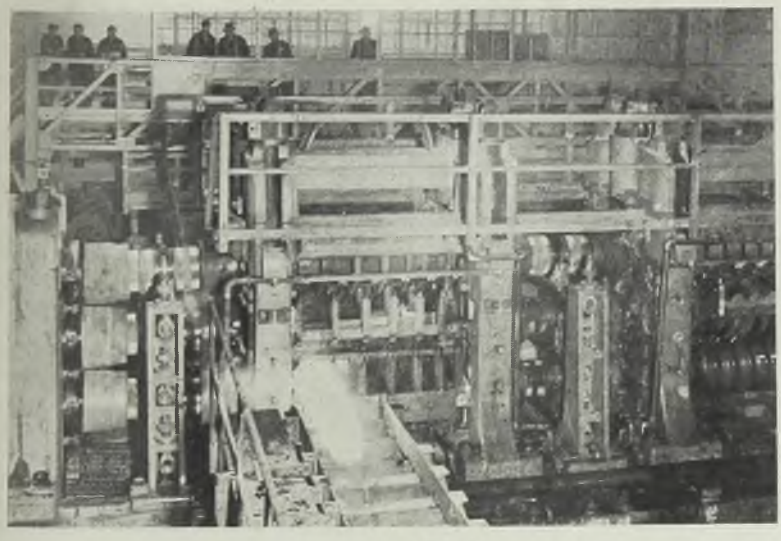
The termination board will also take action on disposal of surplus war materials shortly, he predicted.

To assure immediate liquidation of frozen capital and clearance with war plants of materials not needed upon contract termination, Colonel Hauseman said it is the government's duty to determine fair methods of settling charges represented by the costs incurred, to develop methods for interim financing of prime and subcontractors, to establish a reasonable profit for work partially performed and to establish means of settling disputes.

A statement of cost principles amplifying the government's position on such items as pre-production engineering expenses, depreciation, obsolescence, advertising and interest, has been prepared and submitted to representatives of industry for comment, he disclosed. When formalized, it will become part of the uniform termination clause.

Among other steps contemplated in drawing up uniform procedure, the speaker said, was the determination of the ceiling on profits to be allowed on all materials for uncompleted portions of the work. Consideration is also being given, he said, to inclusion of a statement in new contracts of what profits will be permitted in the event of termination.

The War Department, he emphasized, will continue to favor actual settlement of charges by officers in the field, if possible, through negotiation. Where no agreement is reached, settlement by fixed formula is favored, and failing a settlement by either of the two methods, he said, the matter should be subject to appeal.



NEW HEADACHE FOR AXIS: This new 24-21 inch rolling mill is now in operation at the Copperweld Steel Co.'s plant in Warren, O. The 24-inch train has three stands and the 21-inch train consists of four stands. Flexibility of operation is the feature of this new mill. A 50-ton an hour continuous furnace, 60 feet x 22 feet, is fired by natural gas with oil as a standby

Flatiron and Cast Iron Bathtub Quotas Set

Programs to make 2,000,000 flatirons for civilian use and 50,000 cast iron bathtubs for war housing projects have been approved by the War Production Board.

Flatiron manufacturers are at liberty to accept or reject a quota of 43 per cent of their production in 1940. WPB regional offices will recommend whether or not the quota may be placed with firms indicating they are in a position to accept the quota. A manufacturer unable to accept his quota will be permitted to have his quota made for him by another manufacturer.

All bathtubs produced under the new program will be released only for installation in construction projects which have been authorized by preference ratings regularly assigned to war housing projects. Each of the following manufacturers has been assigned the job of producing 10,000 tubs: American Radiator & Standard Sanitary Corp., Louisville, Ky.; Crane Co., Chattanooga, Tenn.; Eljer Co., Salem, O.; Kohler Co., Kohler, Wis.; Richmond Radiator Co., Uniontown, Pa.

WPB officials have warned both manufacturers and consumers against interpreting its recent actions as an indication that there is to be shortly a general resumption of civilian goods manufacture.

Timken-Detroit Axle Chairman Replies to Patterson Testimony

In letter to editor of STEEL, Col. Willard F. Rockwell answers statement by Under Secretary of War at recent session of Senate Finance Committee. Says many manufacturers fear order cancellations and political smear if they testify

IN ITS issue of Dec. 27, STEEL presented a summary of the testimony given before the Senate Finance Committee in the renegotiation case of Timken-Detroit Axle Co. Both Col. W. F. Rockwell, company chairman, and Under Secretary of War Robert P. Patterson testified.

Colonel Rockwell in a letter to the editor of STEEL discusses Judge Patterson's testimony. The letter in part follows:

"In the Dec. 27 issue of STEEL, your report on The Timken-Detroit Axle Co.'s charges of unfairness in renegotiation is one of the best summaries of my testimony that I have seen. Judge Patterson, the Under Secretary of War, appeared at the last open session of the Senate Finance Committee, and you also summarize certain damaging statements he made, which I would like to answer.

"In the excess profits tax, Congress uses the years 1936 to 1939 inclusive, but permits the taxpayer to omit one bad year; but you will observe that the Judge did not follow this rule. The year 1938 was a bad one in the automotive industry.

Withheld Dividends Discussed

"You will also observe that Judge Patterson speaks on the dividends paid and apparently does not recognize that the very withholding of dividends enabled the company to meet wartime requirements as no other company was able to meet them. He speaks of an average of $20,000,000 annual sales during the base period. The sales in the fiscal year 1942 after renegotiation were $122,000,000, without any financial aid or advances from the War Department. Judge Patterson says that the profits after taxes and renegotiation were two and one-half times the profit in the base period, but neglects to say that before renegotiation the volume was nearly six times greater. It would have been equally correct for him to say that The Timken-Detroit Axle Co.'s profits after taxes and renegotiation in 1942 were less than half the profits in the base period on its sales. You will find that I wrote a letter to the Under Secretary of War stating: 'The percentage of profit after taxes for the period of 1936 to 1939 is 3.4 times the profit after taxes on the price adjustment board basis.' This statement has not been denied.

"In a published letter, Judge Patterson talks about percentage of profits on book net worth. Many of our large wartime plants have been built entirely with government money, and private management is paid a management fee. These companies have no book net worth, so the management fee is their compensation. The airplane companies have been criticized for large returns on their book net worth, but it must be obvious to anyone who understands accounting that their so-called 'profit' contains a management fee for the use of their organization, their designs, and their patents. By neglecting to state that part of the 'profit' is management fee and a much smaller part is a direct return on the investment, the public is given a badly distorted picture of war profits.

"Judge Patterson says that the charges of abuse and arbitrary action are not borne out by actual results, but the testimony before the House Ways and Means Committee and the Senate Finance Committee is full of charges of coercion and intimidation. Senator Guffey said he was present with four other witnesses when an Army representative threatened to break a manufacturer if he did not yield to the demands of the Price Renegotiation Board.

"Judge Patterson testified on Dec. 6, '. . . The impression was left by Mr. Rockwell that we were trying to punish him by holding a contract from him that he was entitled to and he felt that we, just out of spite or something worse, were trying to indulge in a little punishment.' This contract was signed by the Detroit district ordnance chief on Oct. 2 and must have been approved by the legal and fiscal branches, because more than $700,000 was advanced on it prior to Dec. 6; but on that date the Judge said, '. . . . the terms demanded by Timken are utterly unreasonable. They are terms that the government should never yield to.' If that is not a recommendation to cancel the contract, I cannot understand plain English. On Dec. 11, this contract received the written approval of the War Department without the change of a single word or figure in it. The Judge did not know that the Detroit ordnance district chief had previously said that this contract was another fine contribution to the war effort by Timken!

"Both the House Ways and Means Committee and the Senate Finance Committee recommended changes in the law, and yet Judge Patterson says that there should be no change whatever.

Firms Fear Cancellations

"Many manufacturers and industrialists have begged me to carry this fight through after they heard, or read, my testimony on the maladministration of the act. When I ask them why they are interested, they tell me that they have been treated unfairly and subjected to intimidation and coercion. When I ask them why they do not testify before the congressional committees, they tell me they are afraid of cancellations and a political smear. The results of my testimony certainly prove that a political smear will follow. (Ed. note: Here Colonel Rockwell refers to treatment of his testimony by a radio commentator and a newspaper columnist.)

"On Dec. 6, Judge Patterson admitted that he was in error when he wrote me that Timken paid three and one-half times as much in dividends in 1942 as in 1940 and paid five times as much in 1942 salaries as in 1940. Right in the face of this correction, a sensational newspaper repeats these charges as true, and adds a new lie, quoting me as saying, 'There is nothing in the law that required government officers to make such criticism.'

"The first chairman of the Price Adjustment Board, Mr. Maurice Karker, described the act as dangerous and un-American. He and many others listed as board members in the 1943 House Ways and Means Committee report have resigned from these boards. Judge Patterson made the statement that less than forty cases had reached the impasse stage (leading to a unilateral decision with its utterly fascistic action). One of the district board members stated last week that there were more than forty cases in his own single district.

"The statement that war profits cannot

POSTWAR TIMETABLE?

Apparently Sen. Walter F. George (Dem., Ga.), chairman of the Senate Finance Committee and the Senate Committee on Postwar Economic Policy and Planning, is attempting to establish a postwar legislative timetable based on Gen. Dwight D. Eisenhower's forecast that "We will win the European war in 1944."

Saying he is sure that America's military leaders "are not engaging in mere idle speculation," and that he is not among those who visualize Japan as holding out long after the collapse of Germany, he thinks that "between now and June we've got an immense amount of work to do to be prepared for the problems that will arise when the shipyards and other war plants cut back or close down."

We must be ready with a program, he said, under which tens of thousands of small and medium-sized businesses can be gotten back into peacetime production quickly so as to furnish jobs to the many millions who will face unemployment.

be reached by an increase in the excess profits tax is absolutely and utterly ridiculous. You will find that most of the violent defenders of the Renegotiation act benefit from war production but are not subject to the act. Are they not war profiteers to the extent that they want to load this unjust tax burden on other classes of business or industry?

"To the manufacturers and industrialists who have told me that they are afraid to appear in Washington, I can hardly hold out hope that they will escape the smear. I can say, however, that they will find some of the most intelligent people in this country are congressmen and senators, and they should not fear to write to their congressmen in confidence so that they can act promptly. Remember that the bureaucrat testifies with immunity and that his statements receive wide publicity; but if you tell your congressmen the truth, they will recognize it in most cases and they know how to take the hide off a lying bureaucrat. There are many good lawyers in Congress who can recognize the shyster practice of abusing an opponent when the case is weak.

"After World War I, there appeared the political smear, that 20,000 millionaires had been created in industry through war profits. As less than $20,000,000,000 was spent in producing war munitions and materiel, there could only be 20,000 millionaires if there was 100 per cent profit on munitions. No doubt stock market rise created paper profits in the billions, but the market crash in 1920 washed them out completely.

"Our best labor leaders, industrialists, and statesmen do not want to have postwar industry on relief, but when I told Judge Patterson that we would be faced with an enormous surplus of heavy duty trucks, which would cut our postwar production to starvation size, he smilingly assured me that the relief measures in the tax bill would help us out. Let him tell that to our men now in the armed services who write us asking for assurance of jobs when they return!"

POSTWAR PREVIEWS

PLANNING—Congress faces an "immense amount of work" between now and June to prepare a postwar program which will meet the predictions of General Eisenhower that the European war will end this year, according to Sen. Walter F. George, chairman of the Senate's postwar planning committee. See page 50.

INTERNATIONAL TRADE—Formation of an "Economic Union" which would be an extension of the reciprocal trade agreement program is proposed by Otto Tod Mallery to promote international trade and to help maintain peace. See page 54.

MARKETS—Pentup demand for products after the war totals about $22,500,000,000 in goods, according to the postwar committee of the National Association of Manufacturers. Potential buying power in the hands of the public is estimated at $58,000,000,000. See page 55.

PLASTIC PACKAGING—New dipped coating for protecting machine parts in shipment may revolutionize packaging procedure for parts. Details of material now are military secret and none is yet available for general distribution. See page 59.

AUTO ENGINES—Large motor car builder is testing nine types of engines for possible use in postwar models. Patterned after aircraft engines, the test models appear to offer important weight saving possibilities. See page 60.

MATERIALS—Rapid rate of depletion of country's mineral resources threaten United States position in the future. Increasing attention being paid to development and beneficiating of lower grade ores. See page 68.

GAGE BLOCKS—Offering variety of combinations for measurement of any angle from zero to 103 degrees at 1-second intervals, new system of precision gage blocks will facilitate checking of angular measurements. See page 74.

PRECISION CASTING—Three distinctly different casting techniques are now applied to production of tool and alloy steels and some hard bronzes for parts weighing up to 7 pounds. Close dimensional limits and high strength obtained are factors inviting expanded application of the processes in the future. See page 78.

REFRIGERATED STEELS—Beneficial effects on many steels of subzero temperatures, when employed with conventional hardening method, are acknowledged. Experts foresee time when every hardening room will include refrigeration as part of regular heat-treating procedure. See page 86.

OPA Authority To Set Ceilings Upheld by Court

Federal Judge Conger rules in favor of government agency. . . Views powers as part of anti-inflation program

NEW YORK

IN the first decision of its kind in the country, United States District Court Judge Edward A. Conger, recently upheld the authority of the Office of Price Administration to fix the ceiling price on goods sold for export. The case in which an attack was made on the validity of the export price regulation arose from action brought by OPA against John A. Bittson, owner of John A. Bittson Engineering Co., and World Distributors Corp., this city.

OPA sought to enjoin the defendants from violating regulations in the sale of iron and steel shipped to Portugal and Iran, and further sought treble damages of $58,500 for alleged overcharges of iron and steel shipped to foreign countries.

Judge Conger held that under one of the sections of the act the district court had no power to pass upon the validity of the export regulation since the act provides for the Emergency Court of Appeals and for the United States Supreme Court to determine such questions.

"Price control would virtually cease to exist if there were conflicting decisions," wrote Judge Conger in his decision.

Conflicting decisions would naturally arise, he pointed out, if each district court had the power to determine for itself whether a particular regulation was reasonably or properly issued by the administrator.

The decision of the court denied in all respect the motion of the defendants to dismiss the complaint.

Steel's Hourly Earnings Set Record in November

Steel employment declined in November to 611,000 employes, according to the American Iron and Steel Institute. In October, 615,000 were on the payrolls, while in November, 1942, the total was 632,000.

Payrolls during the month were $141,467,000, against $144,937,000 in October, and $122,816,000 in November, 1942. Average hourly earnings were $1.164, highest on record, compared with $1.158 in October, and $1.093 in November a year ago.

Wage earners worked an average of 44.8 hours a week, against 44.6 in October, and 39.4 in November of last year.

Not Liberal Enough

NUMEROUS congressmen fear that the War Department proposal of $300 discharge pay for servicemen, now under study by the House Military Affairs Committee, is not sufficiently liberal. They feel it is not going to be a simple matter to reabsorb our returning soldiers and sailors, and that provisions should be made to give them security over a fairly long period before putting them on their own. Following are some excerpts from the record which are of special interest to employers:

By Rep. Chester H. Gross (Rep., Pa.): "Congress made itself ridiculous in passing a law requiring reinstatement in jobs. Many prewar jobs won't exist. Others will be different—and the men will be different. If your hired man has gone to war and you hire another, is it going to help matters if you fire the second man and put him out of a job when the first one comes home?"

By Rep. William Lemke (Rep. N. D.): "Men aren't the same when they come back, especially if they've been somewhere like Guadalcanal. They're high strung and nervous."

One of the recommendations now receiving serious attention is that advanced by Lemke; it would give servicemen $100 at time of discharge and continue their service pay over a period of one year.

Grievance Study

Copies of a pamphlet entitled "Settling Plant Grievances" may be had by writing to the Division of Labor Standards, U. S. Department of Labor, Washington 25. It summarizes the mechanics of grievance procedure "tested and proved effective over a period of years and established in hundreds of collective bargaining contracts." It reports ways in which labor and management have made this machinery work smoothly. Included are a number of forms for record-keeping and analysis used by various companies and unions, and the complete text of sample union agreement clauses covering grievance procedure and arbitration.

Build Morale

A rapidly growing activity is publication of house organs that are devoted largely to the publication of war news. Of a total of some 2500 house organs, at least 1000 now are devoted almost entirely to news of a character to build and maintain morale. They tell about new ideas for stimulating production, giving credit to their originators. They tell about former employes in the armed forces and publish letters received from them. They tell how many war bonds the employes are buying, supply nutrition data, carry information on safety questions, discuss transportation, operation of child nurseries and other subjects of interest to workers. Most rapid growth is reflected in the number of magazines and papers published by labor-management committees; there now are between 60 and 70 of them.

Bond Drive Nears

In planning its Fourth War Loan Drive, the Treasury Department is counting on raising $14,000,000,000. Of this amount, five and one-half billions are wanted from individuals and eight and one-half billions from other non-banking sources. Treasury is counting on reaching the quota set for individuals by special efforts at the "source" of income. Plant and office workers will be contacted at their places of business rather than at their homes. Expansion of the payroll savings program will be sought; individuals will be asked to buy at least one extra $100 bond. Plant managements are urged to ask local war finance committees for the new treasury booklet, "How It Has Been Done."

NAZI DECLINE

The once superb German armament definitely has deteriorated in quality in the last three months, according to a statement by Maj. Gen. Levin H. Campbell Jr., chief of Army Ordnance. Small arms, field pieces, machine guns and ammunition are said to be definitely inferior. The quality of German steel is not what it was and new Nazi tanks do not withstand the severe pounding they once could take. The quality of welding in tank construction is poor, and tanks break apart at the welded joints. The Nazis, the general said, are very short of alloys such as chromium, nickel and molybdenum. They are beginning to feel the loss of the Ukraine. They counted on getting large quantities of Russian manganese ore. There are signs that Swedish shipments to Germany have been cut down, also that Turkey as a source of chromite is more doubtful. The general attributes a lot of the German troubles to the heavy bombing of steel and other industrial plants.

Industrialists Report

Copies of "100 Industrialists Report"—a booklet containing 100 statements from responsible management officials on the operation of their labor-management shop committees—may be obtained from the War Production Drive Headquarters, 3014 Municipal Center Building, Washington.

War History

Now being assembled is a complete history of our war effort so that the record may be available in permanent form, not only for purposes of history but also to help the country prepare for war with maximum speed should we be faced with another emergency. Such a history was compiled with respect to the last war, but not until after the war, when it had become difficult to assemble information and obtain photographs and drawings. That mistake is not to be repeated. By acting while the war still is in full swing and production lines of many different types are working to capacity the War Department is getting information and illustrations to comprise a work which will run into at least 24 separate volumes. It will cover the complete war record of the Ordnance Department, Signal Corps, Surgeon General and all other branches of the Army. Numerous key contractors have been requested to supply detailed information about their production lines and their manufacturing techniques.

Approval Needed

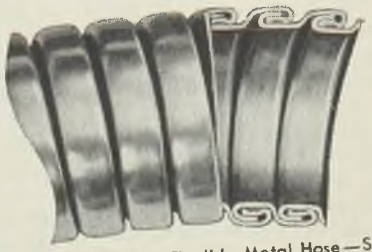
It will be unsafe for anyone to set up a business or expand an existing business requiring use of motor trucks without first obtaining approval from the Office of Defense Transportation, in order to make certain of obtaining the needed gasoline. Under amendments to ODT orders, soon to be announced, no gasoline will be issued for new or enlarged truck operations unless the ODT finds they are necessary to the war effort or essential civilian economy.

Encourage Postwar Planning

Up to recently the term "postwar planning" has been taboo as far as any public utterances of the War Production Board were concerned. The ban now seems to have been at least partially rescinded. A short report on a recent meeting with the Domestic Laundry Equipment Industry Advisory Committee lays stress on the need that "plans for a reconversion program should be laid now, since the problems connected with reconversion are considerably more complex than those associated with conversion of the washing machine industry to war work." Postwar thinking also was reflected in discussion at a recent meeting of the Venetian Blind Industry Advisory Committee. It was pointed out that companies producing Venetian blinds have declined from approximately 1700 in 1941 to about 510 at present and a recommendation was made that "to keep the industry alive" a quantity of ponderosa pine be allocated to the companies producing pine slats. It also was recommended that an attempt be made to get an allocation of strip steel for those companies equipped to handle steel. So far all attempts to obtain steel for this purpose have failed.

Dependable Action BECAUSE IT'S Flexible

American Seamless Flexible Metal Tubing—Bronze.

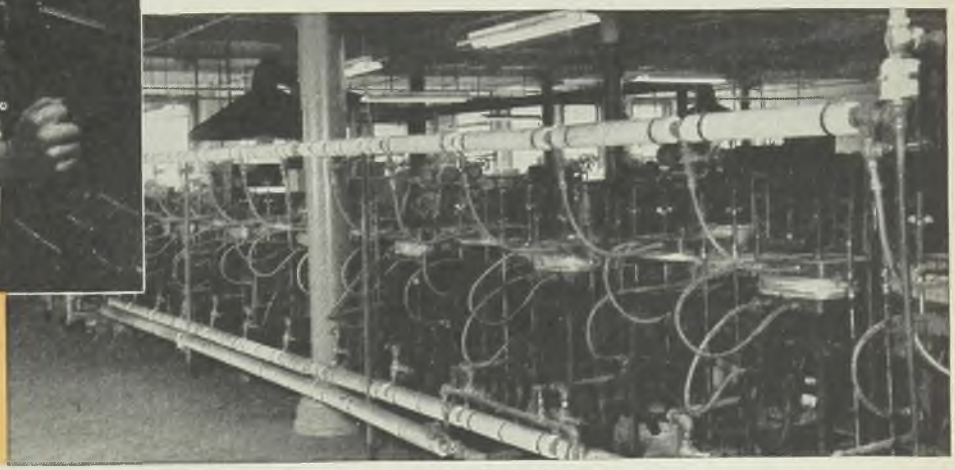


American Interlocked Flexible Metal Hose—Steel.

For conveying air, water, oil, steam or fuel, where flexibility is required, there is *nothing* more dependable than flexible metal hose and tubing. Illustrated here are 2 typical installations of American Seamless—selected from a seemingly endless range of applications.

Using almost any workable metal, we can build a flexible hose or tubing from a simple spout to a high pressure seamless hydraulic line. Whether you need a flexible connector for misaligned or moving parts, for isolating vibration, or for conveying fluids, you'll likely find we have a flexible metal hose or tubing to do the job dependably and economically.

43206



Above: American Oil Feed and Coolant Tubing lubricates the work on machine tools.

Right: Live steam being fed through American Seamless to hot forming presses.

ANACONDA
from mine to consumer

American Metal Hose

AMERICAN METAL HOSE BRANCH OF THE AMERICAN BRASS COMPANY • General Offices: Waterbury 88, Conn.
Subsidiary of Anaconda Copper Mining Company • In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ontario*

Holiday Over, Legislators Seen Concentrating on New Tax Law

Consideration of other important matters, such as contract termination and reconversion, expected to be held up until new revenue bill has been disposed of. Democratic House majority now reduced to single seat

WHEN Congress resumes its sessions on Jan. 10, after a holiday recess since Dec. 21, it still will have before it the difficult matter of the new tax law, including a new contract renegotiation law. This means action on such important matters as contract termination and reconversion probably will be held up for some time as many of the members who are actively concerned with tax legislation also are the bellwethers on these other subjects.

When the seventy-eighth Congress adjourned for its summer recess it had established a reputation for independence and sound thinking. Since it returned in September it certainly has added to its reputation for independence. Time alone will tell whether it has enhanced its position on the score of sound thinking.

Various committees have made considerable progress in their studies of postwar planning, contract termination, reconversion, disposition of government-owned plants and surpluses, mustering out pay for discharged soldiers and sailors, the progress of the war, slowdowns in war plants, postwar stockpiling of minerals, a new revenue law, revision of the Contract Renegotiation act, the future of radio broadcasting and numerous other subjects.

The only important action that jelled, however, was the drafting of a tax bill by the House, now before the Senate with sharp revisions. It includes two greatly revised and liberalized substitutes for the existing renegotiation statute.

The administration is thoroughly enraged over both bills. Whereas the Treasury asked for an additional 10½ billions, largest increase that could be expected from either the House or Senate bills is about 2¼ billions. The administration says both bills are "inflationary." And, as to the proposed renegotiation legislation, Secretary of the Treasury Morgenthau says it holds "the seed of a national scandal," and predicts that if it is drafted into law "war manufacturers will spend the rest of their lives on the Hill before investigating committees."

Congress took other actions that the administration regards as invitations to wild inflation. The Senate voted—74 to 4—over the head of the War Labor Board to grant a flat 8-cent-an-hour wage increase to nonoperating railroad employes. The House voted—171 to 92—over the head of the Office of Price Administration to boost crude oil prices no less than 25 cents a barrel. The House voted—278 to 117—against the administration's use of subsidies to hold down the cost of living.

It remains to be seen whether the compromise settlement of the subsidy battle is the first sign of a moderating attitude on the part of Congress. The life of the Commodity Credit Corp. was extended until February, but only after the administration spokesmen had given assurance that no new subsidies will be instituted in the meantime. The battle is expected to be reopened in January.

Of course, political considerations at all times enter into congressional debate and action. But there seems to be a lot of good faith among those members who now are supporting measures which are assailed by the administration as being aimed at wrecking the "hold-the-line" policy. Rep. Jesse P. Wolcott (Rep., Mich.) made a very good speech recently in which he charged that the administration had not complied with a congressional mandate that it place wages and prices under ceilings—that it had permitted wages to rise faster than food prices—that it had been the original violator of the "hold-the-line" order. Wolcott also did a pretty convincing job of exploding the administration claim that the removal of subsidies would result in increasing the nation's food bill by 6 billions of dollars. "Elimination of the subsidies," he declared, "could not possibly increase living costs by more than 2 cents per day per person." He held that the subsidy program is just another tricky spending device.

It is of interest to note that deaths and other changes have reduced the Democratic House majority to a single seat.

Constitutionality of Contracts Renegotiation Act Challenged

SUPREME COURT last week denied the Alliance Brass & Bronze Co., Alliance, O., permission to institute proceedings attacking the constitutionality of the War Department's authority to renegotiate war contracts without first going to the lower courts.

The company's petition had been filed directly with the Court by its counsel Charles F. Short Jr., Chicago attorney. Technically he sought a writ of mandamus to compel the War Department to stop pending renegotiation proceedings in connection with 1942 contracts.

Mr. Short contended the renegotiation law is invalid because it confers on executive departments or administrative tribunals "the power to make final determinations of all matters in relation to what may constitute reasonable profits." He contended that the controversy is one that should be decided by a jury trial in court.

"The threat," his petition read, "is to re-examine the situation with the possibility of a debt against the company, created by the uncontrollable action of the secretary (Secretary of War Stimson), should this court deny the prayer of this petition, with no right of review of his decision, even if rendered ex parte. The author of this brief knows of no place outside Nazi Germany where such an arbitrary proceeding would be audacious enough to claim the blessing of legal or judicial propriety.

"A devotion to the concept that complicated matters of government must increasingly be done through administrative agencies is misguided if it leads in any degree toward the totalitarian goal of uncontrolled authority in any agent of government."

Durable Peace Through Strong Economic Union

Economic Union and Durable Peace, by Otto Tod Mallery; cloth, 5½ x 8½ inches; published by Harper & Brothers, New York and London, for $2.

In an informative discussion of international trade after the war, the author proposes a program which he believes would go far in maintaining peace, once it is restored, through the establishment of a sound and healthy economic relationship among nations. He envisions a plan which would be flexible, could be gotten under way at once (at least it in part could be "prefabricated" now and set up afterwards) and one which, he further points out, would incorporate practical experience in export and related fields.

He proposes formation of an "Economic Union" which would be an extension of the Hull Reciprocal Trade Agreement Program. The organization would have a board of managers modeled upon the governing board of the International Labor Organization, comprising managerial, labor and government representatives (technicians all, and not including "ranking statesmen and am-

bassadors with plenary powers"). Also among other features would be a bank patterned after the Inter-American bank proposed by governments of the American republics in 1940.

A composite photograph of the Reciprocal Trade Agreement Program, the International Labor Organization, the Federal Trade Commission and the Inter-American Bank, Mr. Mallery asserts, would show close family resemblance to the Economic Union he has in mind.

In outlining various phases of the organization, he emphasizes that the Union would not depend upon political unification of the world nor upon the prevalence of a single form of political organization. Nor would it depend upon world economic unification. It would assume, he declares, continued diversification of political and economic organization. He also stresses that the plan would not have to wait on world-wide acceptance in order to be effective.

The organization would confine itself wholly to international measures and controls, with power for joint international action against international depressions, for regulation of international cartels and for defining and enforcing fair trade practices in international trade. In plain simple English, devoid of much technical phraseology, the author describes in some detail how these measures and controls should be set up and enforced, and the reasons for them.

Well known in the field of international economics and social engineering. Mr. Mallery presents also an interesting analysis of international economic trends, describes various world-wide forces now at work, and compares several leading plans bearing on international relationships after the war.

Predicts Postwar Demand For $22.5 Billions in Goods

Pentup consumer demand for products now unavailable due to war restrictions totals about $22,500,000,000 in goods, including about 10,000,000 autos and 20,000,000 radios, the postwar committee of the National Association of Manufacturers estimates.

The committee believes there is a deferred demand for about 17,500,000 tons of steel in the export market. This compares with prewar exports of 2,435,000 tons of steel annually.

Potential buying power in the hands of the public is estimated at about $58,000,000,000, including $27,000,000,000 in war bonds, $26,000,000,000 in individual savings accounts and $5,000,000,000 in installment credit.

Construction of homes is expected to reach 1,000,000 annually for the first three years. Prior to the war the average number of homes built was about 504,000. Expansion of old business concerns and the establishment of new businesses is expected to require an annual expenditure of $5,000,000,000 in capital, according to Noel Sargent, economist and executive secretary of the N. A. M.

Steel Cartridge Case Production Suspended with Brass Supply Up

RECENT substitutions of brass for steel as cartridge case material were not made because of failure in the steel case program, according to an Ordnance Department inside memorandum commenting on recent inferences to that effect.

Approximately 15 months ago it became evident that the requirements of cartridge brass were larger than the supply of copper would permit, so that experiments were launched to make cartridge cases, both small arms and artillery, from steel.

"These experiments," the memorandum states, "were pushed with the greatest vigor, and the Ordnance Department owes the success of such experiments to the technicians and production men of American industry. The fact that successful cartridge cases have been made is one of the mechanical miracles of this war. It is not a marvel—it is a miracle that from steel disks could be drawn cartridge cases in the wide range of diameter and length to cover all classes from the small arms ammunition to the large artillery cases."

A few weeks ago, it adds, a revision to the Army Supply Program called for a greatly reduced number of rounds of small arms ammunition. "Obviously this reduction was caused by the fact that our forces in the field, and the forces of our allies in the field, and the reserves in the battle areas and the reserves at home were built up to a safe level so that manufacture could be reduced to that required to replace combat and training uses. To continue on a large scale manufacture after the country was safe is obviously not for consideration where the ammunition is not needed.

"The reduction in the manufacture of small arms ammunition thus made available a large tonnage of cartridge brass for artillery cases and obviated the necessity for consideration of steel in either small arms ammunition or artillery cases. It so happens that the steel case used in the caliber 0.45 pistol ammunition is a better case than is brass and will be continued in use without limit."

But, the memorandum states, steel in artillery cases is not as satisfactory as is brass. "At the time we went into steel it was a case of Hobson's choice. Years and years of experience have been had in the use of brass in the manufacture of cartridge cases. The scrap losses incident to manufacture are much smaller than those to the same manufacture in steel.

"To manufacture a given number of steel cases requires more equipment than is required to manufacture brass cartridge cases by reason of the different character of the metal. The work performed in drawing steel is heavier than that performed in drawing brass. More operations are involved in the manufacture of steel cartridge cases than in those of brass.

"Hence, we prefer the use of brass and the Armies in the field prefer the use of brass."

All of the technical data accumulated by industry in the development of the steel cartridge case is being brought to a conclusion so that in the event of another brass shortage steel cartridge cases again may be placed in production.

There has been no waste in this steel cartridge case effort as far as known, the memorandum adds. The equipment which will manufacture steel cases also will manufacture brass cases.

Restrict War Profits in Britain to 7½ Per Cent

While the British never have made any public statement as to their formula for determining the amount of profits that may be earned by war contractors, studies of the annual financial reports of a large number of British corporations indicate it is substantially as follows:

British corporations are allowed to earn a profit of 7½ per cent on capital investment and cash actually tied up on war production. This does not include capital tied up on private work and it does not include capital invested in war bonds or other securities or any idle cash.

They are allowed to earn a profit of up to 2 per cent on their war sales, as a reward for performance. The 2 per cent is maximum and in many instances the performance reward is at a lower rate.

They also are allowed to earn a profit on their sales of war goods that are produced in government-financed plants or with government-financed equipment. This profit is the equivalent of one-eighth part of the sum of the two profits mentioned above.

To illustrate, take a case where a British corporation is producing war materiel with a plant investment, plus operating capital of $1,000,000, and where its sales of war materiel come to $250,000 during the year. Say that this same corporation also is operating a government-owned facility. First, on its investment, the corporation is allowed to earn a profit of $75,000. Second, on its sales turnover, it is allowed to earn a profit up to $5000, for performance. Third, it is allowed to earn a profit up to $10,000 as compensation for operating the government-owned facility. Thus, its maximum possible total profit is $90,000.

All these profits are before taxes. Examination of annual statements of British corporations shows that their profits, before taxes, seldom rise above 10 per cent, and average between 5 and 10 per cent. These profits, in turn, are subject to heavy income tax rates.

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

MAGNESIUM: Users of magnesium castings, forgings, sheet and extrusions must file a new form, WPB-3462, by Jan. 15 to obtain authorization to purchase these products for April deliveries. Aircraft consumers must file the form, which replaces form ASU-13, with the Aircraft Scheduling Unit, Wright Field, Dayton, O. Other consumers must file with the Aluminum and Magnesium Division, Washington.

AUTO REPLACEMENT PARTS: The term "wheels", as used in order L-158 (automotive replacement parts), does not include hub caps, wheel caps and wheel trim rings which serve only as ornamental or decorative items. Hub caps which serve as grease retainers are considered components of wheels.

ALUMINUM FORGINGS: Inventory limitations on aluminum forgings, pressings, upsettings and impact extrusions have been extended from 60 days' to 120 days' supply. This action was taken to eliminate short production runs by fabricators of these materials. and to facilitate more efficient operation of plants.

FARM MACHINERY: Certain requirements have been removed for the filing of reports covering exports of farm machinery and equipment to foreign countries (excluding Canada) regardless of the schedules filed on forms WPB-3053 or WPB-3181, provided total shipments to any country or group of countries during the current quota period must not be more than the quota for that country or group of countries originally established under the order. Shifts of this nature do not have to be reported on WPB-3181.

Firm allotments of 100 per cent of farm machinery manufacturers' controlled materials requirements have been made for all four quarters of 1944, and as a result, such manufacturers will not be required to file form CMP-4B applications for the second quarter of 1944.

RAILROAD FROGS, SWITCHES: Railroad frogs and switches now are classified as class B products, rather than controlled materials, under the Controlled Materials Plan. They are available to users on preference rated orders rather than on authorized controlled materials orders. A preference rating applied to an order that was originally placed as an authorized controlled materials order is considered as if it had been furnished on the date when the original authorized controlled materials order was received by the producer.

CONSTRUCTION APPLICATIONS: Regional offices of WPB now are authorized to process applications to begin small-scale construction projects, with certain exceptions, if the cost of the project is less than $25,000. Applications for water fire-extinguishing equipment totaling less than $25,000 may be processed in the field. "Blanket authorizations" totaling less than $25,000 may be processed in the field, provided none of the construction jobs grouped together in such applications amount individually to more than $10,000.

SHIP REPAIRS: Applications for allotments of controlled materials needed to make class A products (other than Bureau of Ships' Special Navy products) required for ship repairs are filed by manufacturers on CMP-4A with the Army repair yard when used by Army repair yards; on CMP-4A with Navy repair yards when used by Navy repair yards; on CMP-4B with WPB when used by Navy section bases, private repair yards or private dockside. Applications for allotments when materials are needed to make Bureau of Ships' Special Navy products are filed by manufacturers on CMP-4A with the Navy when used by Navy repair yards or Navy section bases; on CMP-4A with the Navy for use in naval vessels by private repair yards and private dockside; on CMP-4B with WPB when used for other vessels by private repair yards or private dockside.

E ORDERS

BEARINGS: Surplus antifriction bearings now may be sold only to a prime or subcontractor who will incorporate the bearings into a product he manufactures or who will deliver them as spare bearings with such a product. (E-10)

INDEX OF ORDER REVISIONS

L ORDERS

RAZORS AND BLADES: Production of razors and razor blades now are limited only by amount of materials which can be allocated for the purpose under the controlled materials plan or which are available outside CMP. The order has been revoked which had restricted safety razor production to cover only the needs of the armed forces, export and lend-lease; had prohibited production of straight razors for any purpose; and had limited output of safety razor blades. (L-72)

OIL BURNERS: Dealers and distributors now are free to sell or deliver any class B oil burner to another dealer or distributor for resale. Domestic type burners over 10 years old or those beyond repair may be replaced without restriction from dealers' stocks. Class A and C oil burners may be delivered only on orders rated AA-5 or higher. (L-74)

FARM EQUIPMENT: WPB has extended to Feb. 1 its permission to farmers to purchase fractional horsepower motors and certain other items of general industrial equipment on a farmer's certificate declaring that the equipment is needed for farming pursuits. (L-123)

REFRIGERATORS: Specifications for the production of commercial refrigerators and electric water coolers for land use have been established by WPB. (L-126)

CONTROL VALVES: Control valves and regulators for hydrogen fluoride service have been exempted from the restrictions on inner valve and seat ring construction contained in the industrial instrument order. (L-134)

FARM TRACTORS: Use of copper in farm tractor radiator fins and power take-off gears is now permitted by WPB. (L-170-a)

CAST IRON BOILERS: Production of cast iron boilers during 1944 equal to 100 per cent of the number produced in 1940 has been provided. Each manufacturer may produce quarterly 25 per cent of the low pressure cast iron boilers he manufactured in 1940. However, any producer may exceed this quota if he obtains permission from WPB. Quota assignments include production of boilers for all purposes, including the armed services, hospitals and war housing, but limitations do not apply to the manufacture of repair parts for boilers. Manufacturers must file a monthly report of shipments, inventory, and repair parts on form WPB-1510. Applications on WPB-1791 for authority to produce and deliver cast iron boilers for the armed services, hospitals and certain war housing projects will no longer be necessary. (L-187)

STEEL DRUMS: Restrictions have been tightened on the use of steel drums. Products are classified in three categories; those in the first cannot be shipped in steel drums, those in second cannot be shipped in new steel drums, and those in the third can be shipped in new drums only when authorized by WPB but may be shipped in used drums. (L-197)

ROTARY FILES: Machine tool accessory manufacturers now may make monthly special rotary files at the rate of 25 per cent of his total file production in the preceding month. The manufacturer also may supply "chip breakers", or transverse grooves, in the cutting section of a rotary file, if specifically requested by the purchaser. Restrictions on the jaw size and weight of all types of vises, except machinists' bench vise and combination vises, have been removed. (L-216)

TACKLE BLOCKS: Manufacture of tackle blocks has been standardized and simplified by WPB. Tables listing the sizes, styles, grades, etc. cover wood blocks for manila rope, metal blocks for manila rope, metal blocks for wire rope, and attached fittings.

Each manufacturer is limited to one type or style of each block listed in the tables, but he may produce the full range of permitted sizes for each type or style he elects to manufacture. Only ferrous metals (other than stainless steel) may be used, with these exceptions: Bushings and bearings may be made of copper-base alloy; galvanizing is permitted on metal blocks for marine use, on metal parts of wood blocks for marine use, and in cases specified in the tables.

Chief exemptions to the provisions of the schedule are : Tackle blocks manufactured, fabricated or assembled in establishments wholly owned and operated by the Navy; parts manufactured for maintenance and repair; tackle blocks and attached fittings specially designed and constructed for use in the operation or equipment of lifeboats.

Simplified practices established by schedule IV are effective Jan. 21. Tackle blocks made from parts in the possession of the producer on or before Dec. 21 are exempt from the provisions of the schedule; so also are blocks made to fill orders received before Dec. 21, when such orders have been scheduled for delivery under M-293. (L-236)

PORTABLE CONVEYORS: Weight restrictions have been removed on the amount of metal which may be used in the manufacture of portable conveyors. (L-287)

FOOD PROCESSING MACHINERY: Production quotas for meat packing and grain milling machinery and equipment have been increased. Quotas for milling machinery are based upon allowed percentages of controlled materials used in the 1939-41 base period. While percentages vary for different types of milling machinery, the average is 105 per cent of the base period output.

Most packing machinery and equipment manufacturers are permitted to use 125 per cent of base period consumption of controlled materials for the production period ending Sept. 30, 1944. Restrictions do not apply to materials obtained through priorities regulation No. 13. (L-292).

M ORDERS

ZINC OXIDE: Lead-free zinc oxide has been placed under allocation but exempts de-

liveries of two tons or less. The order lists permitted uses. (M-11-a)

ZINC: Use of zinc now is permitted without restriction for: eyelets, grommets, closures for glass containers, repair parts to replace parts made of zinc, fractional motors, pulleys for power transportation and flexible couplings. Zinc is permitted also for weatherstripping up to 60 per cent of the amount consumed in 1941. Use of zinc for these products previously was restricted. (M-11-b)

GRAPHITE: Restrictions on the acquisition of graphite crucibles have been removed and inventory control after Jan. 1 has been substituted. No person, other than a jobber, may accept without specific WPB authorization delivery of crucibles which will bring his inventory over 25 per cent of the dollar value of all crucible received by him during 1943. Persons who purchased less than $200 worth in 1943 may have in inventory up to $100 worth. Domestic and Ceylon graphite are excepted from the definition of "strategic graphite." (M-61)

PRIORITIES REGULATIONS

EXCESS MATERIALS: No regulation issued prior to Dec. 22 has any effect on redistribution of idle and excess materials, except directive No. 16 (governing aircraft inventory transfers) and order P-98-c (governing special sales in the petroleum industry).

Special permission to sell idle and excess controlled materials for any permissible use under WPB orders and regulations may be granted for sales of such controlled materials either to persons who have no allotments or to persons who have allotments but desire to acquire controlled materials in excess of the amounts included in the allotments which they hold. In cases where such special sales are authorized, the buyer need not certify that he is entitled to the material under CMP allotments nor need he deduct the amount of materials so acquired from his allotment account.

In the case of copper or copper-base alloy, such permission may be granted by the regional offices only if the buyer has an allotment and an authorized production schedule for the product which he intends to manufacture from the excess or idle materials which he will acquire.

The regulation also eliminates provisions which have been applicable to the steel which was reported to the Steel Recovery Corp. (PR No. 13)

P ORDERS

MINES AND SMELTERS: Preference rating orders P-58 and P-73 have been revoked and operators serialized under them will continue operations with the same serial numbers under P-56.

Provisions of P-56, relating to mines, smelters and refiners, have been changed to provide the following: Capital additions not exceeding $500 are included in the definition of "maintenance, repair and operating supplies;" sales of excess or idle materials covered in priorities regulation No. 13 now are permitted under the order; all privileges granted in other WPB orders to persons operating under priorities regulation No. 5 are permitted producers operating under this order; mines and smelters desiring to obtain machinery and equipment must make prior application to the Mining Division, WPB, and must also make prior application for authorization to buy MRO supplies, where a preference rating is necessary. (P-56, —58, —73)

U ORDERS

TELEGRAPH INDUSTRY: Order which controls maintenance, repair and operating supplies for the telegraph industry has been amended as follows: Ocean cable, grapnel rope and buoy rope are excluded from minimum working inventory restrictions and consumers must apply separately for each purchase of these materials. The dollar value of MRO materials for use in a single installation is raised from $500 to $2,500. (U-4)

Tungsten, Vanadium, Molybdenum And Cobalt Allocations Removed

WPB lifts restrictions on delivery and sale since production and importation of these materials now exceed use. . . Vendors must file sales reports when monthly bookings equal specified quantities. . . Controls over alloy steel melts remain

RESTRICTIONS on the delivery and sale of tungsten, vanadium, molybdenum, and cobalt have been removed by the War Production Board. This development was made possible by the fact that production and importation of these materials now exceed the amount used.

At the same time, WPB issued order M-369, continuing on allocation pure tungsten, molybdenum ingot, wire and sheets. These products are used largely in radio tubes and electric light bulbs. This action was taken because these items are critical, and it was felt by the WPB that they should be continued on allocation contrary to the general policy of removing controls from alloying metals.

In revoking general preference order M-29, WPB explained that the stockpile of tungsten has been increasing steadily and that there now is an excess of supply over use.

While restrictions on delivery and sale of vanadium have been removed from order M-23-a, vendors of more than 500 pounds of the material in any month will be required to report all sales during that month on form WPB-3454.

Expansion in the nation's facilities for producing vanadium has been substantial. It is estimated that the combined value of ferrovanadium and vanadium pentoxide (the usual commercial forms) produced and of ores and concentrates consumed was over $22 million compared with an average annual value of about $7.75 million in the 1936-40 period.

The action taken by WPB in the case of molybdenum was similar to that taken in vanadium. While restrictions on delivery and sale were removed from order M-110, vendors of more than 2000 pounds of the material in any month will be required to report all sales during that month on form WPB-3453. Supplemental order M-110-a has been revoked by WPB.

Controls over melts of alloy steel (the manufacture of which consumes 95 per cent of all molybdenum and 98 per cent of all vanadium used) still remain in force. In the past four months no allocation request has been refused on the basis of end use.

The combined value for 1943 of molybdenum products produced and ores and concentrates consumed in the United States is estimated to exceed $95 million. No data are available for value of the output of molybdenum products during the immediate prewar period but the average annual value of domestic mine shipments of molybdenum ores and concentrates was just under $18 million.

Vendors of more than 1000 pounds of cobalt in any one month now must report all sales during that month on form WPB-3454, although restrictions on the delivery and sale of this material have been removed from order M-39.

The average annual value of imports of cobalt ores, crudes and products for the period 1936-40 was slightly under $3 million compared with an estimated 1943 value of more than $19 million.

Another important alloying material, calcium metal, had been removed previously from allocation control when supply and demand were brought into balance. Domestically produced calcium metal entered the commercial market for the first time in the summer of 1939.

WPB Orders Shutdown of Four Aluminum Pot Lines

Immediate closing of four aluminum pot lines, having a monthly capacity of 12,000,000 pounds of aluminum was ordered by the War Production Board as of Dec. 31, 1943. Two of these lines are located in New York city and two in the Burlington, N. J., area and are operated by the Aluminum Co. of America for the Defense Plant Corp., owners.

This action was taken to relieve the stringent coal shortage and also to lighten the transportation load entailed in hauling alumina to these plants from the Mississippi valley. In view of the ample production of aluminum ingots at this time, the output of these four plants can be dispensed with, officials explained.

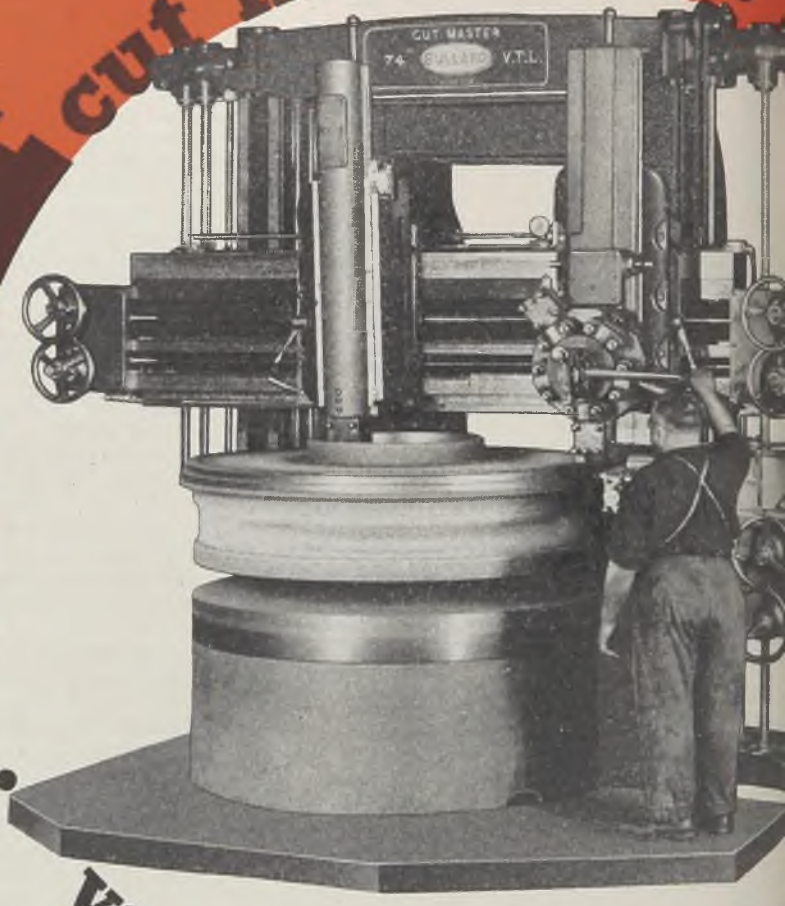
Copper Recovery Inventory Branch, WPB, Organized

Copper Division, War Production Board, has organized a Copper Recovery Inventory Branch whose offices are located in the Empire State building, New York. This branch is an outgrowth of the Copper Recovery Branch of the Copper Division, formerly located at the offices of the Copper Recovery Corp.

This new branch will direct the redistribution of copper and copper-base alloy material on an "as is" basis. A total of about 112,000,000 pounds of this type of material has been distributed by the Copper Recovery Branch since its inception.

Versatility in the Largest Bullar

74" cut master . . . the . . . vertical turret lathe



Cut Master has available three types of heads: Vertical Ram Head, Vertical Turret Head on the main rail, and Side Head on the side rail. Each head is equipped with its own individual range of feeds and power traverse. Select any of six head combinations to meet your requirements.

2 Ram Heads and Side	2 Ram Heads
Ram, Turret and Side	Ram and Turret
Turret and Side	One Ram and Side

Widely variable speed ranges upon request.

These versatile machines can also be equipped for thread cutting, drum scoring, or angle turning.

Ask Bullard Engineers about the Four Speed Ranges obtainable.

Send for Circular, giving full specifications.

THE BULLARD COMPANY

BRIDGEPORT 2,

Manufacturers' representatives to be "renegotiated" by government procurement agencies. Entertainment items on expense accounts likely to be questioned. . . Harry Bennett elevated to director of administration in Ford organization

IN WAR as in peace Detroit swarms with sales agents and commission men, some handling a single manufacturer's account and others plugging away at several, often in entirely unrelated fields. These representatives, at one time mere order takers who had the faculty for knowing how to keep motor company buyers wined, dined and in a happy and receptive mood for business, gradually have been required to assume a considerable amount of engineering and follow-up work, particularly as new war assignments disrupted the usual pattern of automotive requirements. However, in spite of the new and more difficult tasks, manufacturers' representatives always have been and still are well paid for their efforts.

Recently a large section of the group received their "greetings" notices from the government in the form of announcement that they were to be renegotiated on 1942 and 1943 commissions. Confined to those earning in excess of $25,000 exclusively via commissions and handling parts or products actually used in finished war equipment, the renegotiation announcement was accompanied by forms requiring data on expenses and commissions for each business year back to 1939.

The news burst like a bombshell among the commission men. Some returned the acknowledgment which the government requested, others laid the whole matter aside until they could consult with attorneys, a few unfortunately tossed the ugly thing in the file and forgot about it.

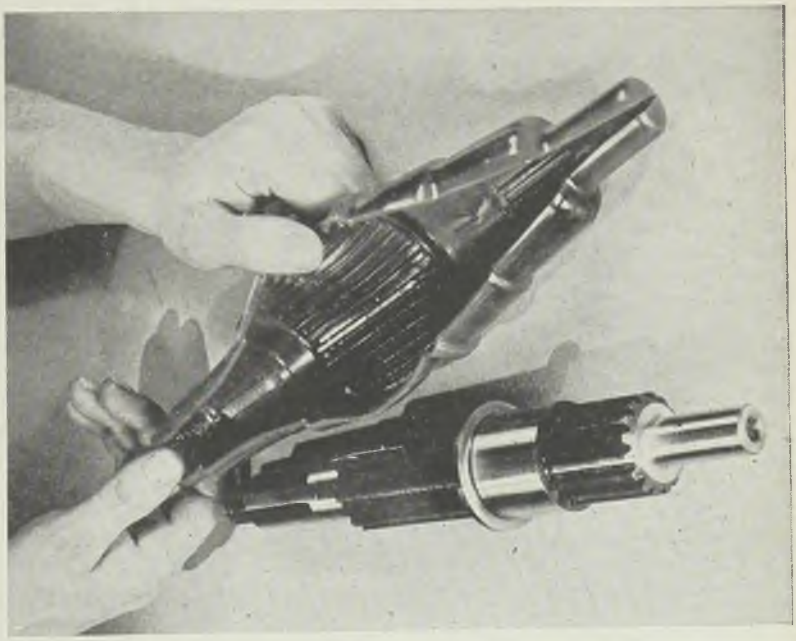
Because of some legalistic quirk, the renegotiation proceedings could not be prosecuted unless acknowledgment was received prior to Jan. 1. Hence last month there suddenly appeared in town a young naval lieutenant, a lawyer by earlier profession, who represented the renegotiation board and who proceeded to telephone the list of those individuals from whom no acknowledgment had been received, asking them to appear at an informal meeting at a specified time and place. Most of those telephoned attended the meeting and were greeted with the announcement that by their attendance they had automatically acknowledged the serving of renegotiation proceedings. The meeting was brief and was climaxed by a question from the lieutenant, "Now do you gentlemen know anyone else who should be here but is not on hand?"

Renegotiation action on the commission men has not progressed far enough yet to give a clear picture of just how tough the government intends to be. Some of those notified have submitted the requested data, others have asked for and obtained postponements. The tendency seems to be to wait for the first "guinea pig". But it looks as though some of these people are in for interesting sessions. The renegotiation experts will have the benefit of income tax reports from the Treasury Department, and also renegotiation actions which have been concluded with companies the commission men represent, in which full details regarding commissions paid on 1942 and 1943 business will appear. So, if anyone slips on the side of accuracy, he is likely to find himself in the soup.

Current Commissions Higher

Generally speaking, commissions paid out on war business exceed to a considerable degree those the same agents received before the war. At the same time, the percentage on total dollar volume of sales involved probably is somewhat lower than in peacetime. One of the principal questions the government doubtless will ask is in respect to "entertainment" items and why they have been required on government business. There are no logical answers to this query. In the first place, if it is the government's intention to disallow such expenditures, this should have been made clear early in the game and not put out now as a new rule. In the second place, most sales agents and commission men always have been lavish with entertainment expenditures and simply were continuing in their old groove. After all, many of them are not dealing directly with the government, but with prime and subcontractors they have regularly dealt with, thus they saw no vital reason for discontinuing normal relationships.

The forthcoming discussions with commission men are not confined to Navy business, but to all government work, whether Army, Navy, Air Forces, Maritime, Treasury or lend-lease. Evidently the renegotiation work is being divided up among the services according to various types of business, with the Navy handling manufacturers' representatives. It is understood three distinct boards will be set up—in the East, in Chicago



PLASTIC PACKAGE: New dipped coating for protecting machine parts in shipment, developed by the Dow Chemical Co., Midland, Mich., is known as Stripcoat; has ethylcellulose base, a plastic-like substance applied by a simple hot dip (350-375 degrees Fahr.) process; sets into a tough, skin-tight coat in a few seconds to protect metal from rust, corrosion and dirt during shipment. Although the material is not yet available for general distribution, being under rigid government control, production experts believe it may eventually revolutionize this phase of packaging procedure for parts. Standard packaging methods frequently require the hand-wrapping of parts in a special greaseproof wrapping material followed by dipping in hot wax, or an alternative process of precoating the parts with heavy grease, difficult to remove in the field. These grease-coated parts likewise have to be hand wrapped before shipment

Ja

and on the West Coast—so that speedier action can be obtained. Renegotiation of prime and subcontractors as yet has not gotten much further than 1942 business, and clearances requiring no refunds have been granted in only 60 per cent of the cases examined.

Latest change in administrative circles at Ford Motor Co. is the elevation of Harry H. Bennett to the post of director of administration and the naming of John S. Bugas as his assistant in charge of "internal security." Since Ford never allocates titles to his executives, it is a little difficult to assess personnel changes, but the consensus of the newest shift is about as follows: Mr. Bennett, long very close to Mr. Ford, and concerned principally with personnel work and direction of the Ford service (or plant police) department, now moves to one of the top rungs in the executive ladder, to a position commensurate with that of C. E. Sorenson, who directs production activity. Stan Fay, University of Michigan football luminary of several years ago and for the past several years an immediate assistant to Mr. Bennett, was the logical choice to succeed his former boss, but company officials apparently decided they needed someone of a little greater stature, so they retained Mr. Bugas, who for almost six years has made an exceptional record as head of the Detroit office of the Federal Bureau of Investigation.

Family-Like Organization

A young man, with young ideas, Mr. Bugas appears an ideal choice to head up the "internal security" administration at Ford, and conceivably could play an important part in management of the vast Ford domain in years to come. As a large corporate-type structure, Ford has been notably weak in the matter of executive replacements, probably because the company has been such a "family" enterprise, despite its size. Where the individual overshadows the corporation, there are likely to be gaping holes left with the departure of key individuals. General Motors, on the other hand, has been distinctly the reverse type of organization, in which the corporation always transcends the individual, and replacements for key men are constantly being trained, two and three deep. Renowned as are many high GM officials, there is probably not one whose sudden absence would make any great dents in the corporation's efficiency or steady progress.

On this score, the retirement of Richard H. Grant, for 14 years vice president in charge of sales for General Motors, was confirmed last week. He will be given a farewell party by close friends this week and will remove to his farm near Dayton, O., remaining in an advisory capacity for the corporation. Able and beloved though Mr. Grant has been through the years, the GM sales organization suffers little by his leaving, principally because of the "brains in depth" policy, in furtherance of which Mr. Grant himself likely had no small part.

One of the little-publicized phases of Ford operations during the war is the magnesium reduction plant, operated on the Pidgeon ferrosilicon process, with improvements and innovations developed by Ford engineers. The process involves the thermal reduction of dolomite, which is ground, mixed with ground 75 per cent ferrosilicon and compressed into pellets. These are charged into series of horizontal centrifugally cast chrome-nickel steel tubes, about 10 inches in diameter, 12 feet long and with 1-inch wall thickness. These tubes are positioned in multiples up to 16 in an oil-fired furnace, vacuum applied to the tubes after being charged, and one end water cooled. Novel development worked out by Ford was the submersion of the tubes in a bath of molten glass which is overfired and transfers heat to the tubes. Reduction temperature is in excess of 2000 degrees. This, combined with the vacuum on the inside, made the problem of retort life a critical one in early work, use of the glass bath seems to have overcome the trouble.

The process is not continuous, the reduced magnesium metal condensing on a plate in the water-cooled end of the retort from which it is removed and the reduction products, principally iron and silica, cleaned from the interior.

The process is not considered to be an economical one, compared with the Dow seawater extraction method or the basic magnesium electrolytic reduction system. One research expert reports the Pidgeon process under even the most favorable conditions could not provide metal under 25 cents a pound. The Ford plant was set up at the request of the War Department and WPB when the demand for magnesium far exceeded available supply. Its future now looks extremely precarious in view of the reported oversupply of magnesium metal.

One of the larger motor car builders now has on test nine types of engines for possible use in postwar models. All are of the type employing cast aluminum block and crankcase, with steel or alloy iron cylinder sleeves. Variations are in the type of sleeve, some the wet type, some, the dry type, and in the design of the block casting. One version is split horizontally in the conventional manner between block and crankcase. Another is split vertically down the center of the block and crankcase —a radical innovation.

This style of engine is patterned after the Rolls-Royce and Allison aircraft types, in which engineers have long seen intriguing automotive possibilities. Important weight reduction is possible, but manufacturing costs presumably would be appreciably higher. Research work is under way leading to improving the quality of sleeves and liners. Centrifugal casting of these elements has resulted in large savings in machining. To come are changes in the design of molds used in this casting work, and their materials, which will provide an even better product. Centrifugally cast piston rings can be included, along with sleeves and liners.

Engine Output Rises

A 70 per cent increase in output of aircraft and marine engines, many of which embody increased horsepower, at only a 60 per cent increase in government billings, is reported by Packard Motor Car Co. for 1943. The company estimates 1943 business in Rolls-Royce aircraft and Packard marine engines for PT boats at $355,000,000, or 3½ times the company's biggest car production year. Assuming cost of around $10 per horsepower, the 1943 total would indicate output of better than 25,000 engines. Volume for 1944 is expected to reach $500,000,000.

A total of 6271 former Packard employes are now in military service, and the company is continuing to lose an average of 200 a month to the armed forces. Despite this, employment is nearly triple the peacetime peak. Of the expanded total, 27.2 per cent are women.

Four month's time needed for Packard to resume car manufacture is the estimate made by George T. Christopher, president, assuming unusable government-owned machinery could be cleared from the plants and material purchased for car building. Other plans possibly might materialize which could even shorten this time.

SEEK HUGE BOOST

Economic demands of the United Automobile Workers Union (CIO) upon General Motors, if granted by the War Labor Board, would increase the wage costs of General Motors war production more than $400,000,000 annually or by more than 40 per cent in 1944, under a conservative estimate, it was announced last week at a public WLB panel hearing on 36 points in dispute between the two parties opened in Detroit.

The $400,000,000 increase in war production wage costs does not include all of the UAW-CIO's economic demands but only those on which reasonable estimates of minimum cost could be made.

The UAW-CIO's demands, particularly those for wage adjustments, were summarized in the following manner in General Motor's brief, submitted to the special panel.

"They present a picture of contradiction and confusion. It is difficult, if not impossible, to make a rational answer to such irrational demands. The only consistent element in the union wage demands is that they all ask for more money for doing the same, or less, war work."

2 HIGHER PRODUCTION RATES

In the postwar period the manufacturer will face two demands that are difficult to reconcile: (1) his customers will want products of highest possible quality at lowest possible cost, and (2) labor will exert every effort to maintain highest hourly wage rates. Without higher machine production rates, such demands are obviously impossible. Inevitably the manufacturer must have machines which will produce more and better products with fewer man hours and machine hours per unit.

Vickers Hydromotive Controls are solving this problem for machinery builders in many industries. For example, completely automatic operating cycles are easily obtainable with Vickers Hydraulic Equipment... much of the required skill can be built into the machine. Flexibility in hydraulic control systems frequently permits time saving by traverse and return at higher speeds. Overload protection can be positive and automatic. Controls are simple and easily operated; they can be so interlocked that neither the work nor the machine can be damaged by the inexperienced or careless operator.

Vickers Application Engineers will be glad to discuss with you the higher production rates and the many other advantages of Vickers Hydromotive Controls.

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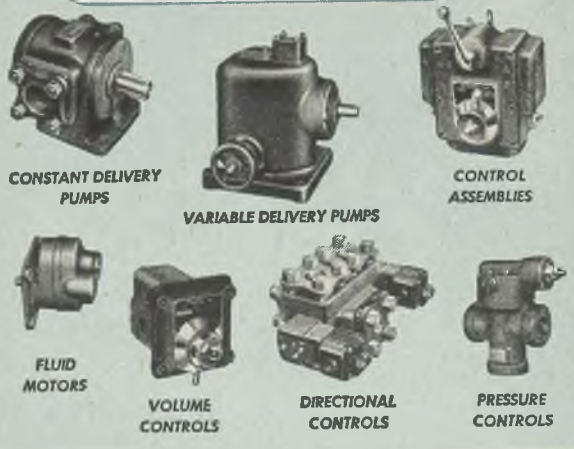
What will Users Want in POSTWAR MACHINERY?

Representative of More than 5,000 Standardized Vickers Units for Every Hydraulic Power and Control Function



From rags to riches back to rags seems plight of airplane manufacturers, though sober evaluation of postwar future is not altogether discouraging. Industry preparing to relinquish its present eminence

APPRAISALS of the postwar possibilities of the aviation manufacturing industry are becoming more realistic and by the same token gloomier. The No. 1 industry in the country today is preparing to relinquish its present eminence with the end of hostilities, perhaps even before, and to subside to a level commensurate with requirements of postwar military, commercial and civilian air transport.

Almost any company which today has on its books an appreciable volume of business from aircraft producers, whether it be materials, parts, equipment, accessories or subassemblies, had best be prepared to write off this business *in toto* with the end of the present military emergency, if such a company was not active in the aviation field prior to the past two years. This covers a wide range of suppliers and subcontractors, possibly as many as 26,000. It may be a shocking disclosure to them, but a consideration of the factors involved will demonstrate its probability.

Air transport after the war, as now, will be subdivided into three general types—military, commercial and civilian or pleasure flying. The air services should come out of the war amply covered with more than enough planes in categories of trainers, fighters, medium and heavy bombers. Even assuming a measure of world policing, there will be plenty of serviceable reconnaissance and combat airplanes for the military forces.

Furthermore, no one as yet has outlined or demonstrated just how an air police force works. Does it make routine flights over conquered enemy nations trying to spot trouble? Does it drop a few bombs on crowds of people who seem to be disturbing the peace? Does it look for new secret armament plants which former enemy powers might be building out in the woods? The term air police has a pleasant ring, but its *modus operandi* and airplane requirements in point of numbers are extremely vague things.

Assume, however, that a standing air force of 20,000 planes appears reasonable, requiring annual replacements of possibly 6000. That is a drop in the bucket alongside our present military production of 9000 a month.

Commercial Requirements

Next, look at commercial requirements. The airlines today are operating a fairly successful network of airways throughout the country with a fleet of about 220 transports. Travel, under the pressure of the war emergency, is heavy, both military and civilian. Before the war, commercial airlines operated 434 planes and there were many empty seats on regularly scheduled flights.

Even with the sharp reduction in equipment available, 1943 brought a gain of 34 per cent in express tonnage, 10 per cent in revenue passenger-miles and 78 per cent in mail ton-miles, compared with 1942, and still greater gains when compared with 1939. Five factors explain this seeming paradox: Airlines now use 80-100 per cent of transport capacity on each flight, compared with 68 per cent in 1942 and less in 1941; with only two types of transports retained—Douglas DC-3s and Lockheed Lodestars—maintenance and repair are quicker, simpler; each plane is used more hours and more miles per day—10-12 hours and 1725 miles daily, as against 8½ hours and 1100 miles in 1941; new wartime traffic pattern has been worked out by the airlines and the Civil Aeronautics Board; and the War Department priorities system which gives precedence to vital airborne cargo and personnel.

Year-end figures released by the Air Transport Association show domestic airlines operations to have covered 1,540,000,000 revenue passenger-miles; 15,774,000 express ton-miles, and 37,639,000 mail ton-miles. Number of passengers was roughly 3,105,000, off 25 per cent from the 1941 peak of 4,060,545.

The airlines cheer when the Army Air Forces returns two or three of the planes bought or leased when the war started. There has been no talk of any 100 or 200-plane orders which the airlines would like to place. Assume, for the moment, a postwar acceleration of air travel to the extent the airlines would need 1000 new 2-engine and 4-engine transports. Where the passengers will come from is a perplexing question. Close of the war will have lessened the demands of speed on the part of commercial travelers, while pleasure travelers will be so burdened with continuing high taxes that they will think twice before traveling exclusively by the high-cost air route.

All first class mail by air? A fine thing, if it is the consensus that first class mail now is too slow and must be speeded up. The postoffice department even now operates in the red in movement of first-class mail; switching to the air would deepen the deficit.

Air freight? Other than perishables, how many commodities carry a time factor which will cancel out the 50 to 1 advantage which rail and truck freight now have over air movement? Not many.

Nevertheless, assume the airlines can digest 1000 new planes and extend feeder lines to serve more cities while increasing the number of regular flights between principal centers. The industry now is building monthly more than 1000 4-engine bombers, and a bomber represents many more man-hours than the comparable 4-engine commercial transport.

It might be thought that the airlines could avail themselves of some of the huge fleet of cargo transports which the AAF will have on its hands immediately following the war, but aviation sources report the airlines already have decided they do not want these planes, which have been built expressly for military use and are not readily convertible to commercial purposes. They prefer to wait for assembly of new and better-performing models from the plants of airplane builders, so the AAF surplus either

FROM CRADLE TO PLANE: Main landing gear wheel is being attached to a B-25 Mitchell bomber at the California division of North American Aviation Inc. The wheel is carried on a special castered cradle and held securely in place until the spar is bolted in the wheel nacelle

BOHN

The engineers of the Bohn organization have made extensive studies in light alloys which will be of great importance in the development of tomorrow's new designs. Among other things, new types of highly efficient motor trucks will come forth. Bohn is the only organization in the world specializing in large volume, in three of the most essential alloys—aluminum, magnesium and brass. Thus this company is in a position to give unbiased advice. Consult us freely for the correct use of the correct light alloys.

TRUCKS TO COME

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Designers and Fabricators

ALUMINUM • MAGNESIUM • BRASS • AIRCRAFT-TYPE BEARINGS

will have to be scrapped or sold at fire sale prices to foreign countries.

Turning to the private plane market, the outlook is equally gloomy. Before the war there were 13,406 aircraft registered in this group—6020 pleasure, 1606 business and 5780 nonscheduled commercial units. Many of these planes are now receiving grueling punishment in CAP courier service and training programs, so replacements are indicated. One estimate of replacements in the two-year period following the war is set at 9500 new planes and 25 per cent spares, including a highly doubtful 2500 helicopters.

Many enthusiasts point to the 2,500,000 men now serving in the Army Air Forces, most of whom, so the forecasters declaim, will return home completely air-minded, itching to get their hands on the controls of their own personal planes. This is pure "baloney." In the first place, out of the AAF personnel, perhaps only 5 per cent ever see any actual flying, the rest being ground crews and ground operational men. Thus, we have only 125,000 "eagles" and for many of these men, the novelty and glamor of flying will have become dull and bedraggled when finally they return from their combat missions. Furthermore, they will be the next thing to broke, and no one has yet suggested the government present every returning airman with a free airplane. Before aircraft, they will want automobiles, clothes, houses and the other "necessities" of American life. And on top of these things, they will have to shoulder their share of a tremendous tax burden.

The private plane so far has been limited to the higher income groups. Not many returning airmen will be earning $10,000 a year very soon.

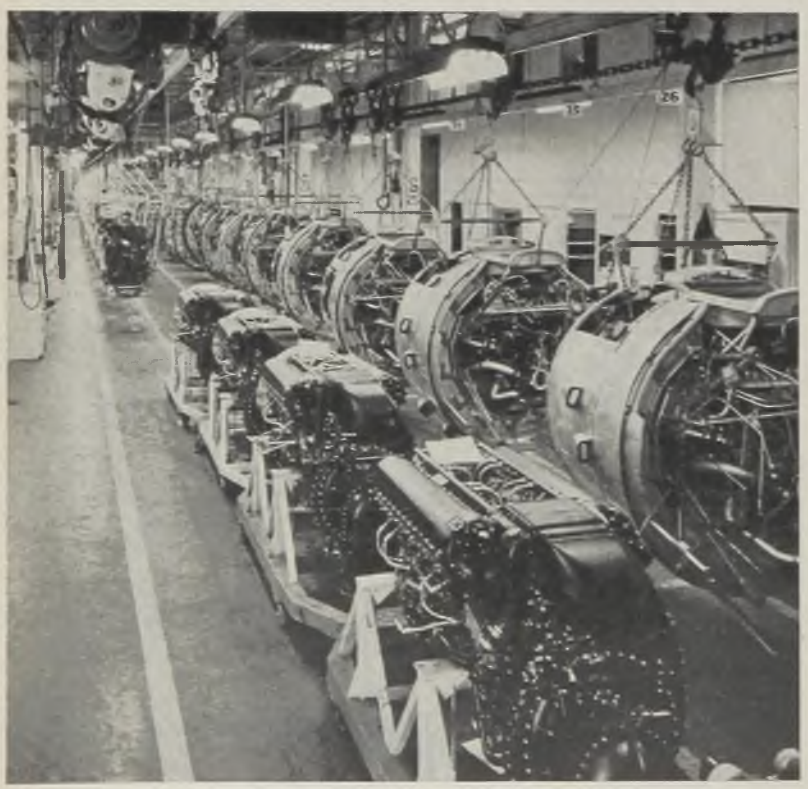
Helicopter Needs Refining

As far as helicopters are concerned, their glittering future also is being washed off with the harsh soap of reality. It is said to be more difficult for a trained pilot to learn to fly a helicopter than for a person who has never been in any kind of plane. In addition, many engineering hurdles have yet to be cleared before this plane is ready for any mass market.

Other problems ahead in establishing the "air-age" include the inbred fear which many persons have of flying, as well as the difficulty of regulation and traffic control in the air. Already, the Air Forces are bumping into troubles on the latter score. General Marshall in a recent statement before a Senate committee pointed to the excessive number of mishaps and fatalities in air training maneuvers. Some of these are directly traceable to the lack of, or inefficiency of, traffic control measures governing military flights. The sudden mushrooming of the AAF naturally made difficult the application of the painstaking and detailed control measures developed by the airlines to regulate commercial flights.

Education of pilots is the immediate answer, as well as a greater measure of discipline. Too many army fliers are said to be skybanging around the country without paying sufficient attention to the rudiment of long-distance flying, including constant radio contact with ground stations, close control of altitude, procedures involved in landings and take-offs, etc. The AAF has recognized this and is now moving toward an intensive program of flight safety education.

It is well to look on the future of air travel, whether military, commercial or civilian, with a distinct measure of reserve. It has moved too fast in the past two years and will have to recede a considerable distance to resume its normal pattern of progress. Changing concepts of transportation are always evolutionary, seldom revolutionary. This is a good rule to apply to advancement in the air.



UNHARNESSED POWER: Packard-built Rolls-Royce engines at the left are readied for installation in P-51 Mustang fighters and Wright Cyclone engines are tuned up for B-25 Mitchell bombers on these two-engine conveyor lines at California division, North American Aviation Inc.

Aircraft Companies Predict Greater Output in 1944

Republic Aviation in Farmingdale, L. I., and Grumman Aircraft in Bethpage, L. I., are planning to intensify their production of aircraft during 1944 and the Wright Aeronautical Corp., Paterson, N. J., expects to double its production of plane engines during the coming year.

The Grumman company has completed the manufacture of Avenger torpedo planes and now is converting facilities to construction of Hellcat fighter planes. The Avenger plane will be manufactured by the aviation unit of an automobile company.

Alfred Marchev, president, Republic Aviation Corp., reported that the company had met its 1943 production quota of the P-47 Thunderbolt which were so effectively used in the European theater of war as a bomber escort and dive bomber.

The Wright Aeronautical Corp. predicted that its 1944 horsepower output of radial engines would be about double that in the last twelve months with the production of Cyclone 18's of 2200 horsepower increasing 750 per cent over 1943.

1943 War Plant Construction In Chicago—$162,239,437

New plant construction and extensions of manufacturing facilities in the Chicago area in December represented investments totaling $7,456,500, bringing the total for all of 1943 to $162,239,437, according to the Chicago Association of Commerce.

Since the beginning of the nation's defense program in June, 1940, the Chicago area constructed new facilities valued at $980,894,437, an amount greater by several hundred million dollars than that of any other area in the country for like purposes and the same period, the association reports.

Air conditioning

Aviation (private and commercial)

Electrical industries

Electrical heating equipment (infra-red, induction and high frequency)

Fluorescent lighting

Food processing and packing

Household appliances

Hydroponics (tank farming)

Instruments for automatic control

Industrial safety equipment

Packaging

Photocopying processes

Plastic molding equipment

Research equipment (Tools of Science)

Rural electrification

Rural food lockers

Structural wood-metal connectors

Television

Transportation (automotive, rail, water)

Welding

Wire Photo

POST-WAR HORIZON

THE peace-time plans of many manufacturers are growing into an extensive list of promising products, processes and equipment. It reflects the vision and ingenuity of alert planners who always realize the future is TODAY — the same keen ability that is producing for Victory.

Somewhere in the success of most infant industries, precision cold rolled strip steel by CMP can play an important part. Its use can mean a production economy, a sales advantage or a consumer benefit.

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CMP STRIP STEEL
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D. W. FIGGIS

Who has been named president, American Can Co., New York, reported in STEEL, Jan. 3, p. 414.

MAX D. HOWELL

Who has been appointed assistant to the president, United States Steel Corp., Pittsburgh, as announced in STEEL, Jan. 3, p. 414.

HENRY A. ROEMER

Who has resigned as chairman of the board and director of Pittsburgh Steel Co., Pittsburgh, in order to give full attention to Sharon Steel Corp., Sharon, Pa., of which he is chairman and president, noted in STEEL, Jan. 3, p. 414.

L. A. Danse, chief metallurgist of the Cadillac Motor Car division, General Motors Corp., Detroit, has relinquished this post to devote full time as chairman of the metallurgical committee of the corporation. **Arthur H. Smith**, for the past three years metallurgical contact engineer for Republic Steel Corp. in Detroit, succeeds Mr. Danse as chief metallurgist at Cadillac.

—o—

Richard W. Banfield has been elected secretary, Pratt & Whitney division, Niles-Bement-Pond Co., Hartford, Conn., and **Ernest J. Meuten** has been elected assistant secretary. **Benjamin H. Gilpin**, vice president, general manager and treasurer, Chandler-Evans Corp., South Meriden, Conn., **Milton E. Chandler**, vice president in charge of engineering for Chandler-Evans Corp., and **John B. Byrne**, president, Hartford-Connecticut Trust Co., were elected members of the Niles-Bement-Pond board.

—o—

G. L. McBreen, chief of the Aircraft Alloy Steel Section of the WPB Iron & Steel Division, has resigned and returned to his position with Republic Steel Corp., Cleveland.

—o—

L. D. Granger has been elected a vice president, American Wire Fabrics Corp., Mt. Wolf, Pa. **George H. Creveling** has been named treasurer and **Franklin Berwin**, secretary. Mr. Creveling is also treasurer of the parent company, Wickwire Spencer Steel Co., New York, and Mr. Berwin is secretary and a director of the parent company.

—o—

Edmund J. McSweeney, former superintendent of motive power, Baltimore & Ohio railroad, has been named president, Vulcan Iron Works, Wilkes-Barre, Pa. Mr. McSweeney succeeds **Perry Holder**, who resigned Sept. 15 to become president of Wickwire Spencer Steel Co., New York.

—o—

Willard J. Stahr has been appointed assistant plant manager, Perfect Circle Co., Hagerstown, Ind., and **J. C. Linn** has been named consulting engineer.

—o—

C. W. Garvey, who has served for 15 months as section head in the Warehouse Branch of the Steel Division, WPB, has joined Gilmore Steel & Supply Co. Inc., San Francisco, as general manager of the Oakland, Calif., plant. Formerly, Mr. Garvey had been associated for many years with Joseph T. Ryerson & Son Inc., Chicago.

—o—

Heber Atkins has been appointed territory supervisor for the Midwest sales offices of Crown Can Co. These offices will be established in Chicago soon.

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Dr. Vannevar Bush, president of the Carnegie Institution of Washington, and director of the Office of Scientific Research and Development of the Office of Emergency Management, Washington, will receive the 1943 Edison Medal of the American Institute of Electrical Engineers at the institute's winter technical meeting in New York, Jan. 26.

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W. L. McGrath, former executive vice president, Williamson Heater Co., Cincinnati, has been elected president, to succeed the late W. C. Williamson. Mr. McGrath is a past president of the National Warm Air Heating and Air Conditioning Association.

—o—

Robert W. Dierker, formerly sales manager, Gary Screw & Bolt division, Pittsburgh Screw & Bolt Corp., Chicago, has been appointed general sales manager. **Gerald J. Garvey**, previously assistant sales manager, has been named manager of railroad sales, and **Bernard C. Ruthy** succeeds him as assistant sales manager.

—o—

G. Herbert Marcy, assistant to the president, Gillette Safety Razor Co., Boston, has been elected a vice president of the company. Other newly-elected vice presidents are: **A. Craig Smith**, advertising manager for the past six years; and **Louis H. Young**, plant superintendent.

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Marvin G. Sedam has been appointed director of research, Alloy Rods Co., York, Pa. Previously Mr. Sedam was associated with Harnischfeger Corp., Milwaukee, as chief metallurgist in charge of welding rod research and development.

—o—

Pinkney W. Love has been appointed manager of the Washington office of Lukens Steel Co. and subsidiaries, By-Products Steel Corp. and Lukenweld Inc., Coatesville, Pa. He succeeds **Charles A. Carlson**, who is resigning to establish his own business for the manufacture of the Carlson internal combustion engine.

—o—

Ray F. Rucker, general superintendent of the Aluminum Ore Co., East St. Louis, Ill., has resigned because of ill health.

—o—

V. C. Mekeel, superintendent of foundries, Ampco Metal Inc., Milwaukee, has resigned to become manager of product engineering and sales development, Syncro Machine Co., Rahway, N. J.

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John U. Anderson, secretary-treasurer, Pittsburgh Steel Co., Pittsburgh, has been elected a vice president.

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Henry P. Chaplin, treasurer, Cone Automatic Machine Co., Windsor, Vt., and **John J. Duggan**, president, Chapman Valve Co., Indian Orchard, Mass., have been elected directors of the New England Council.

—o—

S. P. Murphy has been appointed western representative, Sperry Rail Service, Hoboken, N. J., and will make his headquarters in Chicago. **C. A. Stephenson**

B. F. STAUFFER

HOBART W. SEYLER

GEORGE M. CARVLIN

H. I. LEWIS

has been named eastern representative, with headquarters at Hoboken.

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B. F. Stauffer, previously assistant general manager of the Industrial Products Sales division, B. F. Goodrich Co., Akron, O., has been elected president and general manager of American Anode Inc., Akron. Mr. Stauffer succeeds **Raymond W. Albright,** general manager of American Anode since 1926, who has been named vice president and general manager of Distillation Products Inc., Rochester, N. Y.

—o—

James G. Graham has been named general sales manager of the newly-formed Industrial Fasteners division, Oliver Iron & Steel Corp., Pittsburgh, and **Edward M. Welty** has been named assistant general sales manager for the new division. **Bennett W. Johnson** has been made general sales manager for the company's Pole Line Hardware division, and **Bernard J. Beck** has been appointed general production manager of that division.

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Hobart W. Seyler, who has been assistant general superintendent of the Clairton Works of Carnegie-Illinois Steel Corp., Pittsburgh, since 1939, has been appointed general superintendent, succeeding **Frank F. Marquard,** retired.

—o—

George M. Carvlin has been elected a vice president of Koppers Co., Engineering and Construction division, Pittsburgh. Mr. Carvlin had been an assistant to **Joseph Becker,** vice president of Koppers Co. and general manager of the Engineering and Construction division, since 1940.

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H. I. Lewis, a director and vice president, American Hardware Corp., New Britain, Conn., has been named executive vice president, Weatherhead Co., Cleveland, and **Henry F. Bailey,** vice president, National City Bank of Cleveland, has been made vice president in charge of finance for Weatherhead.

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H. Russell Loxterman has been appointed engineer in charge of sales of furnace equipment in the Middle West for Blaw-Knox Co., Pittsburgh.

—o—

R. C. Hardy has been appointed district manager of General Electric Co.'s Central Station division, Cleveland, succeeding the late Erle F. Whitney.

OBITUARIES . . .

Dr. James T. Pardee, 76, former secretary and board chairman, Dow Chemical Co., Midland, Mich., died Jan. 3. Dr. Pardee was an outstanding structural engineer, having designed a double swing bridge which was the first of its type in this country.

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Edwin DeWitt Coddington, 78, former president of E. D. Coddington Mfg. Co., Milwaukee, and former vice president and production agent, Wisconsin Bridge & Iron Co., Milwaukee, died Dec. 25 in Queens, N. Y.

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Daniel Hinchcliffe, 86, originator of two of the five known zinc rolling processes, and since 1911 a supervisor at zinc mills of Ball Bros. Co., Muncie, Ind., died Dec. 31 in that city.

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Curtis H. Veeder, 81, inventor and president of Veeder Mfg. Co., Hartford, Conn., from 1895 to 1928, died Dec. 27 in Hartford.

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Nicholas L. Moon, 77, president, Upper Merion & Plymouth Railroad Co., Conshohocken, Pa., died Dec. 27 in Norristown, Pa . At one time Mr. Moon had been associated with Alan Wood Steel Co., Conshohocken, as traffic manager.

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Raymond D. Jenks, 56, an executive of American Brake Shoe & Foundry Co., New York, died Dec. 28.

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Edwin S. Sickes, 71, who retired seven years ago as senior vice president, Aluminum Co. of America, Pittsburgh, died recently in Pasadena, Calif.

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Walter H. Hermsdorf, 54, vice president, treasurer and general manager, Hump Hairpin Mfg. Co., Chicago, died Dec. 26.

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Frederick B. Whitlock, 71, sales manager, Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., died Dec. 25 in that city.

—o—

George W. Vary, 54, manager of industrial relations, Bethlehem Steel Co., Bethlehem, Pa., died Dec. 25 in that city. Mr. Vary had been associated with Bethlehem Steel Co. since 1905.

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Henry Goebel Sr., a member of the purchasing department, Bethlehem Steel Co., Bethlehem, Pa., died Dec. 28.

—o—

Arthur B. Mead, 55, vice president, Peter A. Frasse & Co. Inc., New York, died there Dec. 25.

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Kenneth D. Traver, 45, process engineer for the California Shipbuilding Corp., died Dec. 21 in Los Angeles.

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Oscar T. Roder, 53, assistant to the general manager, Globe-Union Inc., Milwaukee, died in Mishawaka, Ind., Dec. 26.

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Walter Mooney, 78, retired office manager, C. S. Osborne & Co., Harrison, N. J., died in Newark, N. J., Dec. 28.

—o—

James Cowin, 59, president, Cowin & Co. Inc., Minneapolis, died recently in that city.

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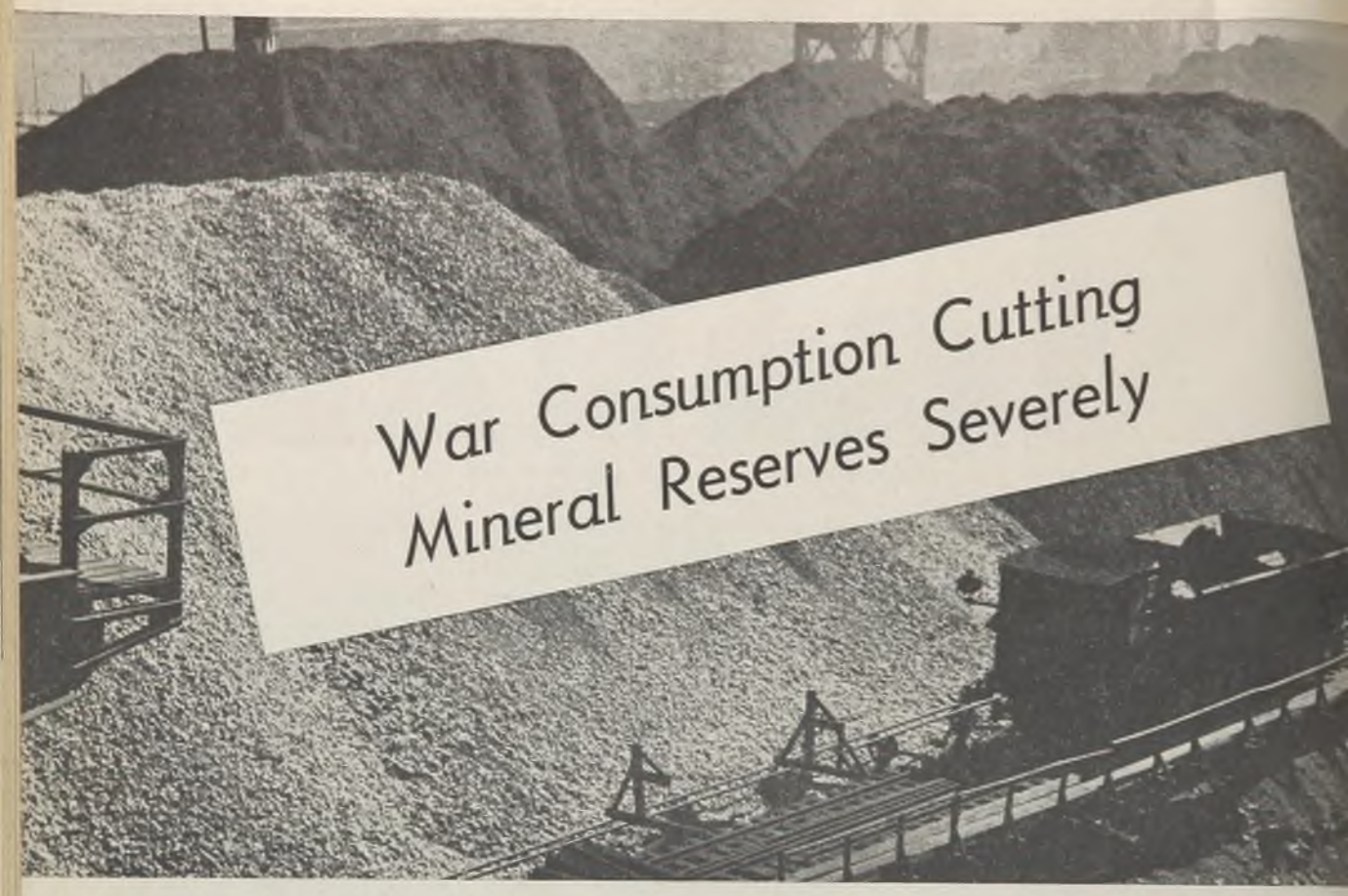
Robert F. Hamilton, superintendent of Vance Iron & Steel Co., Chattanooga, Tenn., died Dec. 30.

—o—

Lawrence Monte Verda, president, California Electric Steel Co., San Andreas, Calif., died recently.



War Consumption Cutting Mineral Reserves Severely

Secretary of Interior Ickes warns use during war is at such rate serious depletion threatens. . . Says evidence indicates nation has reached or is approaching peaks in several lines

By J. C. SULLIVAN
Assistant Editor, STEEL

MINERAL consumption is at such a rate some authorities are of the opinion the nation is in sight of the time when the demand for certain raw materials cannot be met from high-grade domestic sources and that it is essential low-grade reserves be quickly developed and arrangements made for access to the scattered sources of minerals throughout the world.

As a hedge against future emergencies it is considered necessary that stockpiling of strategic minerals be continued. Discovery of new ore deposits and improvements in low-grade ore beneficiation, it is said, are not keeping pace with consumption. On a world-wide basis more minerals have been consumed in the first 25 years of this century than in all previous history, with the current rate of consumption in this country the highest on record.

Production of minerals and mineral products in the United States during 1943 exceeded all previous records, Secretary of the Interior Harold L. Ickes recently stated.

"While this record achievement is an outstanding contribution to the war, we should not lose sight of the fact that production at this rate involves serious depletion of our irreplaceable mineral resources", he said.

"It raises the question of how much longer we can continue to lead the world in mineral output and enjoy the large measure of self-sufficiency that we have experienced in the past. There is ample evidence that we have reached or are approaching peaks in several lines. We must insist on strict adherence to all sound conservation practices, adopt prudent measures to safeguard national defense and assure the United States its share of the world's minerals at fair prices, and press to completion the present government program of inventorying our mineral wealth so that we may enjoy full development of our resources and know where we stand with respect to the future", Mr. Ickes said.

Mineral production values reached $8 billion last year, or 6 per cent above the previous record of $7.6 billion in 1942. This increase resulted from higher prices realized in 1943 and an increase of 3 per cent in volume output.

Of the $8 billion grand total for 1943, metallic products contributed $2.5 billion, a gain of 6 per cent over 1942 record; mineral fuels, $4.6 billion or a gain of 12 per cent over previous year; other nonmetallic minerals, $964 million, a decline of 14 per cent from 1941 output.

Since 1942 there have been 21 different iron ore mining projects undertaken in this country to contribute more than 13 million net tons to existing ore producing capacity when completed.

Despite the huge expansion in recent years in raw materials requirements of the steel industry, there is no likelihood mineral supplies will fall short of needs in the immediate future. However, long range supply prospects—notably for iron ore—present a number of problems. To sustain the nation's 96 million ton steel ingot capacity during the postwar period 130 million tons of iron ore will be required annually, 86 per cent of which normally would be supplied from the Lake Superior region. The easily worked high-grade open pit iron ore deposits in this region, however, are beginning to give out.

Easily accessible high-grade open pit iron ore reserves are estimated at roughly 300 million gross tons. These ores are being currently mined at the rate of about 70 million tons per year.

Life of the high-quality open pit reserves, of course, depends upon the rate at which consumption continues to be

Stocks of iron ore and limestone at Jones & Laughlin Steel Corp.'s Otis Steel works, Cleveland, (left) are slightly below a year ago, but believed to be ample to sustain capacity operations until opening of lake navigation next spring

War demands continue to stimulate record production of copper from the Utah Copper mine (upper right) at Bingham, Utah. More than 1000 cars per day of ore are hauled across the Markham bridge to the concentrating plants Iron ore stocks at Youngstown Sheet & Tube Co.'s Brier Hill works, Youngstown, O., (lower right) partially obscure blast furnace units

pushed. Facing this threat of shrinking supplies, ore producers and consumers have been directing increasing effort to developing lower-grade reserves. For many years a constantly growing amount of the less desirable grades of ore have been beneficiated and this trend is being intensified.

There are enormous deposits of low-grade iron ores in the Lake Superior region. Intensive efforts are being made to separate the silica from iron oxide in the great reserves of low-grade hematite ores, averaging 25-35 per cent iron content.

Estimated iron ore reserves in other sections of the country as shown in the U. S. Tariff Commission report, No. 128, follow: North eastern states, three billion tons (30-35 per cent), largely magnetite, but when beneficiated the iron content is raised to 60-68 per cent; Birmingham area, 1.7 billion tons of red hematite 35 per cent ore; and far western states, 600 million tons of comparatively low-grade ores.

Some authorities feel that unless new high-grade ore reserves are uncovered, or a highly efficient beneficiation process is developed, the nation will have to rely increasingly on imported iron ore.

Brazil and Venezuela have large high-grade iron ore bodies; Africa, Newfoundland and Sweden are other sources.

Bethlehem Steel Corp. is installing iron ore mining facilities in Venezuela. It hopes to bring out this ore by the end of 1944, and enlarge mining operations to a million tons annually. Venezuelan ore runs about 65 per cent iron content.

Financed through lend-lease, Itabira iron ore mines in Brazil are being developed. Current plans call for shipment of all the ore from these mines to the United States, except 75,000 tons yearly to be diverted to Great Britain. The mines are already furnishing about 1500 tons annually, while additional improvements are expected to boost this output to 5 million tons yearly.

Unprecedented war demand has spurred iron ore mining operations in the eastern, southern and western states to record levels.

Manpower shortage is the major problem confronting mining interests in the East. Republic Steel Corp.'s new DPC Fisher Hill project, with a rated capacity of about one million tons annually, has been ready for operation for months but remains idle because of the shortage of labor. Other projects already started or planned have been held up for the same reason.

No appreciable quantity of ore was lost this year in the Lake Superior region because of the manpower situation. Reflecting the decline in vessel ore movement last year, mining operations were off moderately, estimated at 86.3 million gross tons in contrast with 91,064,000 in 1942. Some observers feel that the peak in mining expansion projects in this region has been passed for the duration. Output of iron ore for the whole country is estimated to have declined to about 101.7 million gross tons last year, compared with 105.5 million in the preceding year, due entirely to reduced output in the Lake Superior region.

Petition for Price Relief

In their petition to OPA for price relief last year producers of market ore (which represents about 25 per cent of the total mined, the balance coming from captive mines) pointed out that the cost of labor and supplies alone increased 40 cents per ton produced since 1940 for underground mining operations. Other increased costs brought the total to 55 cents per ton for the mines in Michigan and Wisconsin. In Minnesota, where the open pit production is concentrated, these increased costs add up to 33 cents per ton, disregarding the one big pit at Hibbing that produces more than all the underground mines in Lake Superior region put together.

Substantial tonnages of scrap are said to be rusting away uncollected, while deposits of high-grade iron ore are being depleted. Greater use of available scrap supplies would aid materially in conserving the high-grade ore deposits.

One aspect of the steel industry's raw material supply situation is the added efficiency in the use of many minerals gained through improvements in the alloying processes. For example, special-purpose ferrous alloys, made through combining iron with minor amounts of other metals such as tungsten, molybdenum, chromium, manganese, vanadium and nickel, have been finding a steadily increasing market. The

usual life of some of these important minerals is greatly prolonged by these alloy processes.

Further reduction in consumption of iron and other metals has come from improvement in structural design, making possible considerable reductions in the weight of beams and girders, and other structural shapes, without loss of strength.

Certain other raw materials are expected to be more plentiful this year. It looks now as if there will be plenty of alloy steels and aluminum, and about enough tin, lead, nickel, zinc, chrome and tungsten to meet war requirements and essential civilian needs. There is a surplus of mercury now, and there may be more copper available later this year.

Shortage of manpower was probably the mining industry's biggest "headache" in 1943, with frozen prices assuming increasing importance as the passing months witnessed rising costs of labor and materials.

Increased mineral production, revised military requirements and a greater need for marginal manpower than for marginal minerals, prompted the War Production Board to restrict output of marginal mineral production in the closing months of last year.

Output of aluminum and magnesium showed exceptional gains in 1943; copper output was at a new peak. Production of chromite, molybdenum, vanadium, tungsten, cadmium, barite, fluorspar, potash, phosphate rock and high-grade clays also achieved record levels.

The increasing diversity of minerals used by industry plays much the same role as an increasing volume of use, in augmenting the interdependence of nations in regard to mineral supplies.

The following is a brief picture of some of the more important minerals used by the steel and metalworking industries.

Bentonite—Produced in negligible quantities until 1927, although the first commercial shipments were made in the United States in 1888. This clay is produced principally in the United States. Its principal uses are in foundry molding and core sands and as a filter aid in oil refining.

Cadmium—About half of world output is used as a corrosion-resisting plating on iron; also used as a bearing metal. United States produces and consumes about half the world supply.

Magnesium—Because of its light weight, and strength, it is used as a substitute for aluminum in some applications. Also is used in flares and incendiary bombs. Heavy requirements for both refractories and magnesium led to an estimated 70 per cent increase in production of magnesite in 1943.

Use of Chromium Increased

Chromium — Use of chromium in steelmaking has gained substantially in recent years, particularly in the field of corrosion-resistant steels and in low-alloy high-strength steels. Chromite ore is used as a refractory for furnace lining.

Molybdenum—United States accounts for more than 90 per cent of world output. Used principally as an alloy to harden and strengthen steel. United States production last year topped 1942 total, but shipments were lower as mine stocks gained.

Silicon—Used in increasing amounts as a deoxidizing and heating agent in the manufacture of ferroalloys and steel.

Antimony—Deposits of this mineral have been developed in northern Mexico and reduction plants established at Laredo, Tex., thus making the United States less dependent upon China for its requirements.

Manganese—To meet war demand, new plants and new concentrating process have been established to recover manganese from low-grade ores in Montana, Nevada, Minnesota, Maine, South Dakota, Arkansas, New Mexico and Arizona.

Vanadium—A comparatively recent development has been the identification of vanadium in very extensive beds in and associated with phosphate deposits in Idaho. In past supplies of vanadium ores and concentrates have been obtained principally from Colorado, Utah and Peru.

Brucite—A new source of magnesium. Has been produced in commercial quantities in the United States (Nevada) since about 1934. Used principally in the manufacture of furnace refractories. United States and Canada produce practically all of the comparatively small world supply.

Tungsten—Deposits exploited during the last war in Boulder county, Colorado, and Atolia, Calif., have been nearly exhausted. Since then, the principal new developments have been the Yellow Pine district of Idaho, the Pine Creek area near Bishop, Calif., and at the Nevada-Massachusetts mine in Nevada. Despite labor shortage at some mines, production of tungsten concentrates were well maintained.

Zinc and Lead—The adaptation of differential flotation to the recovery of the complex refractory minerals of the Rocky Mountain region has added materially to the domestic ore reserves of both lead and zinc. This is also true of the lead and zinc ore recovered from the fluorite ores of Illinois. Unless the war period should extend far beyond present estimates, sufficient zinc ore and concentrates will be found to match smelting operations.

Record of iron ore and other mining interests during the war to date deserves praise. Production was stepped up phenomenally in most instances despite manpower shortage, ceiling prices and rising labor and material costs. The pinch in a few strategic minerals retarded war output somewhat during 1942, but this problem was largely licked by the first half of last year.

They Say:

"In early days technology was the servant of political or military ambition. Now, well meaning but ill-advised political reformers propose to take over the control of this fundamental source of progress and parcel it out in the interests of certain pressure groups or of political expediency."—**James Kip Finch,** acting dean, Columbia University School of Engineering.

* * *

"The path to progress is the organization, under the leadership of the American people and their government, of the nations of the world to establish in practical manner, and to maintain, international peace and to open the doors of all nations to world-wide trade."—**Dr. Nicholas Murray Butler,** president, Columbia University.

* * *

"The new developments in manufacturing techniques and in the use of materials made available in greater quantity as a result of our industrial expansion for the war production job, suggest some new approaches to postwar farm equipment design, engineering, and production. Advances in technique offer the engineer greater freedom of design in dealing with new and old problems, and the production man better ways to build machines."—**J. L. McCaffrey,** second vice president, International Harvester Co.

* * *

"It is easy to appreciate the contributions the electrical industry is making in the advancement of aviation, both in devices for actuating parts of the plane and in controlling and operating its armament. It is difficult, however, to tell the whole story today, for many of the devices are new and therefore not to be revealed. Without being too specific about the details, it can be said that precision of control, automatic operation, fire power, range, altitude, and speed of America's aircraft all were enhanced by the year's electrical developments."—J. C. Miller, manager, Aviation division, General Electric Co.

Republic Buys Chateaugay Ore & Iron Co.

Ninety-eight per cent of stock was owned by Hudson Coal Co., subsidiary of Delaware & Hudson Co.

REPUBLIC Steel Corp., Cleveland, has purchased the Chateaugay Ore & Iron Co., Lyon, N. Y., the sale of which was approved recently at a meeting of directors of the Delaware & Hudson Co. Price of the ore property was not revealed.

Ninety-eight per cent of the Chateaugay Ore stock was owned by the Hudson Coal Co., a subsidiary of the Delaware & Hudson Co. The mine has been in operation for about 75 years and has produced for many years as much as 500,000 tons annually of high-grade low phosphorus iron ore. The Witherbee Sherman mine at Port Henry, N. Y., is also operated by Republic.

BRIEFS . . .

Tungsten Carbide Tool Co., Detroit, announces the opening of seven district offices as follows: 1409 Union Central building, Cincinnati; 710 Harries building, Dayton, O.; 431 Penton building, Cleveland; 601 Tower building, South Bend, Ind.; 1009 Fletcher Trust building, Indianapolis, and 1217 Grant building, Pittsburgh.

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Dayton Rubber Mfg. Co., Dayton, O., has received the 1943 award for chemical engineering achievement for its contribution to the American synthetic rubber program. The award was made by a committee of 52 chemical engineers and university professors.

—o—

General Electric Co., Schenectady, N. Y., held the first meeting of its appliance service center managers at Bridgeport, Conn., Dec. 6-9.

—o—

Sanders-Berman Associated, Chicago, is the new name of the recently amalgamated Louis G. Berman & Associates and H. J. Sanders. The new address is 43 East Ohio street, Chicago.

—o—

Charles H. Tate Co., Cleveland, recently was appointed sales representative for the Riehle Testing Machine division, American Machine & Metals Inc., East Moline, Ill.

—o—

Minneapolis-Honeywell Regulator Co., Minneapolis, has purchased Ford Motor Co., plant which will increase its productive facilities in the Minneapolis area by almost 50 per cent. The new plant will be used for postwar manufacture of automatic control instruments.

—o—

American Car & Foundry Co., New York, has arranged to increase by 50 per cent the life insurance of employes registered under the group insurance plan at no additional cost to employes. Additional benefits on hospitalization and sickness and accident insurance have also been approved.

—o—

Farrel-Birmingham Co Inc., Ansonia, Conn., has released a booklet describing milling cutter bodies.

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Gerrard Co. Inc., Chicago, subsidiary of U. S. Steel Corp., has changed its name to Gerrard Steel Strapping Co.

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L. & R. Mfg. Co., Arlington, N. J., has opened a new sales office in the Pittsfield building, Chicago.

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W. S. Rockwell Co., New York, has purchased the business of the Gehnrich Corp., Long Island, N. Y.

—o—

Crown Can Co., Philadelphia, has purchased a two story building at 3051 West 31 street, Chicago, and will move its Madison, Wis, plant into it about February. Midwest sales offices will be established in Chicago.

—o—

Lukens Steel Co., Coatesville, Pa., has inserted a series of advertisements in the local newspaper to combat absenteeism.

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H. K. Porter Co. Inc, Pittsburgh, has published a new catalog giving technical data on its complete line of industrial locomotives.

—o—

Hydro-Arc Furnace Corp., LaGrange, Ill., has been acquired by the Whiting Corp., Harvey, Ill.

Huston, Early Steelmaster, Still on Job at Lukens Steel

Charles Lukens Huston, pioneer steelmaster and first vice president, Lukens Steel Co., Coatesville, Pa., on Dec. 30 celebrated the sixty-eighth anniversary of his first day's work as clerk for that company in 1875.

A contemporary of Andrew Carnegie, John Fritz (who was associated with the Bethlehem Steel Co. and Cambria Steel Co.), and of Charles Schwab in the early days of the steel industry, he has played a leading part in the development which has helped to make America the production giant it is today.

Mr. Huston comes to the office every day and inspects the mills several times weekly. He is patentee of several inventions used in the manufacture of steel and is the author of several monographs and books on related subjects. He planned and designed the Lukens four-high 206-inch plate mill, the largest in the world.

Born in Coatesville, July 8, 1856, he began his long career with Lukens in 1875, and in 1879 was taken into partnership, the firm's name becoming then Huston, Penrose & Co. He was placed in charge of the puddling mill, taking over the managership of all plants in 1882 and continued in sole charge of operations until July, 1925.

THE BUSINESS TREND

Uncertainties Rife but High Output Continues

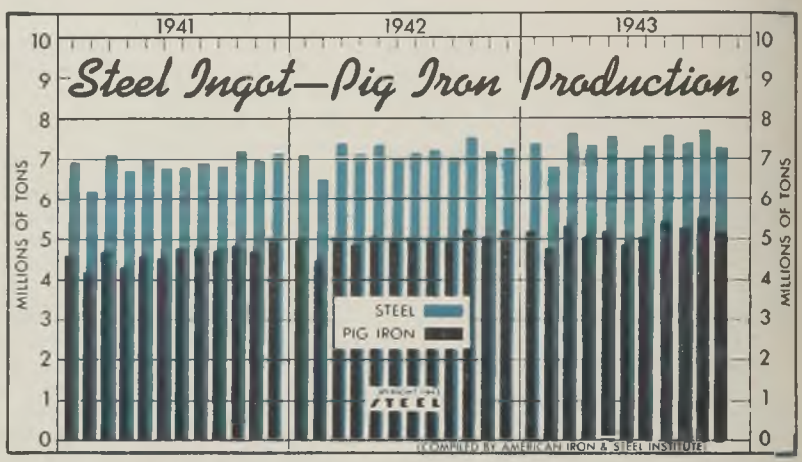
BURDENED with the uncertainties of federal policies affecting war production and postwar programs, management foresees a year charged with confusion and hazards. Additional work stoppages remain as a threat to production as other unions follow the lead of the coal, steel, and railroad workers in efforts to win wage increases. The government's renegotiation and contract termination policies are still far from settled. Cancellations and cutbacks are bringing increased demands for early resumption of civilian goods production on a larger scale.

In face of these obstacles to sound planning, industry enters the new year with a high level of war goods output, and is endeavoring to clear the way for positive action toward postwar production. As an example, the Automotive Council for War Production is staging a drive in Washington for adoption of a reconversion program based on (1) proper disposition of war plants' machine tools and facilities, (2) immediate placement of new machine tool orders, (3) allotment of small quantities of war materials for experimental purposes, and (4) a consistent federal policy on contract termination settlements.

MILITARY, CIVILIAN TRUCK OUTPUT—The armed forces' new emphasis on heavy trucks for their main transport needs, instead of mass-produced light vehicles, greatly increases the truck manufacturers' output problem. The large civilian truck and bus order, made necessary to avert a collapse of domestic highway transportation, will probably be executed on schedule. But new plants and retooling of present factories were required to handle military contracts for extra-large vehicles, and these production lines may not be in operation before midsummer. With truck and bus tires the major bottleneck in output of both civilian and military vehicles, probably quantities of trucks will be built and then held until tires are available.

POSTWAR INVENTORIES—Disposal of raw materials and partly or completely finished war goods is viewed by many firms as the chief inventory problem after victory, according to a recent survey. Other anticipated difficulties concern removal of government-owned materials, disposal of inferior grade goods and substitute materials, and securing of raw materials and supplies for production of civilian articles. Most of the companies questioned had set up reserves to cover operations during the period of postwar adjustment.

FREIGHT CARLOADINGS—Loading of revenue freight for 1943 totaled 42,414,343 cars, a reduction of 1 per cent below the 1942 total, reports the Association of American Railroads. On the basis of shippers' estimates, loadings for the first quarter of 1944 will amount to 8,138,-332 cars, or 1.2 per cent above the total of 8,043,164 cars loaded in the comparable 1943 period. Ten of the shippers' advisory boards estimate an increase in loadings; three boards expect decreases.



Iron, Steel Production

(Net tons—000 omitted)

	Steel Ingots		Pig Iron	
	1943	1942	1943	1942
Jan.	7,424	7,112	5,194	4,983
Feb.	6,826	6,513	4,766	4,500
March	7,670	7,392	5,314	5,055
April	7,374	7,121	5,035	4,896
May	7,545	7,383	5,173	5,073
June	7,027	7,015	4,836	4,935
July	7,376	7,145	5,023	5,051
Aug.	7,562	7,228	5,316	5,009
Sept.	7,489	7,058	5,226	4,937
Oct.	7,786	7,580	5,324	5,236
Nov.	7,357	7,180	5,096	5,083
Dec.	.....	7,305	.....	5,201
Total	.....	86,030	.....	59,959

FIGURES THIS WEEK

INDUSTRY	Latest Period*	Prior Week	Month Ago	Year Ago
Steel Ingot Output (per cent of capacity)	91.5	93.0	98.5	97.5
Electric Power Distributed (million kilowatt hours)	4,300	4,295	4,560	3,780
Bituminous Coal Production (daily av.—1000 tons)	1,554	2,029	2,075	1,456
Petroleum Production (daily av.—1000 bbls.)	4,358	4,363	4,329	3,687
Construction Volume (ENR—unit $1,000,000)	$28.2	$34.7	$52.2	$76.3
Automobile and Truck Output (Ward's—number units)	15,220	15,570	17,880	14,930

*Dates on request.

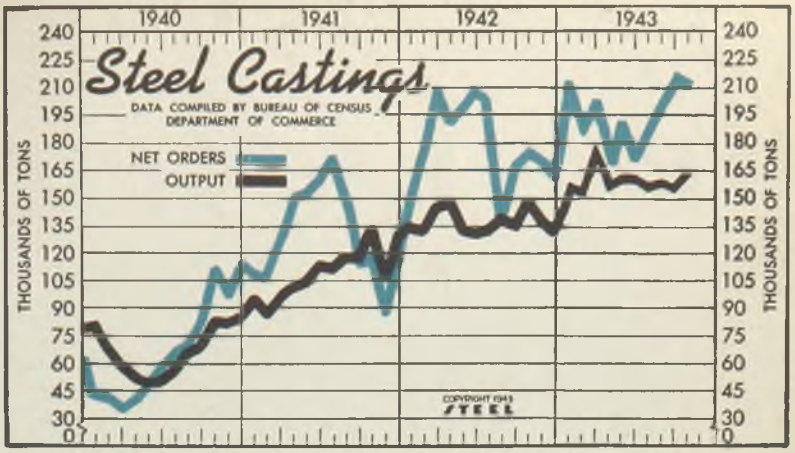
TRADE				
Freight Carloadings (unit—1000 cars)	618†	641	837	716
Business Failures (Dun & Bradstreet, number)	25	21	35	105
Money in Circulation (in millions of dollars)‡	$20,428	$20,382	$19,940	$15,407
Department Store Sales (change from like week a year ago)‡	−4%	−1%	+21%	+10%

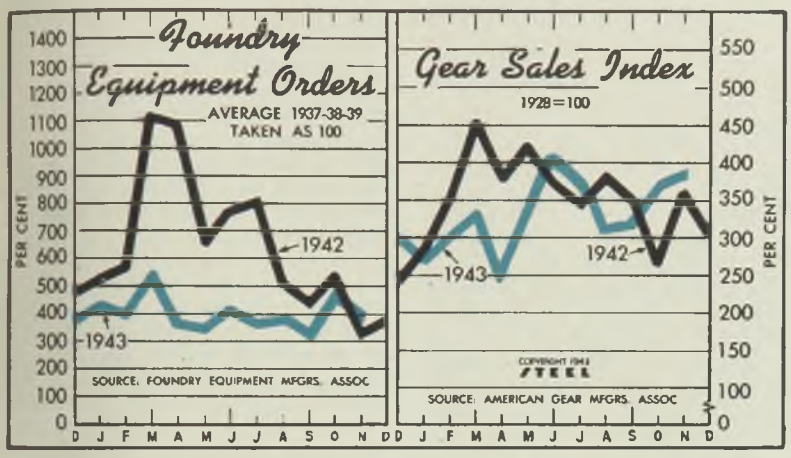
†Preliminary. ‡Federal Reserve Board.

Commercial Steel Castings

(Net tons in thousands)

	Orders		Production	
	1943	1942	1943	1942
Jan.	213.1	150.5	154.7	134.8
Feb.	191.2	179.9	151.5	133.7
Mar.	202.7	211.1	176.5	146.5
Apr.	165.8	191.2	161.4	149.6
May	192.5	199.6	163.8	131.5
June	171.7	208.9	163.9	132.0
July	187.2	202.3	158.7	135.7
Aug.	200.6	141.2	158.8	139.2
Sept.	214.1	177.5	157.8	139.8
Oct.	211.3	179.5	163.9	152.1
Nov.	....	173.3	....	140.4
Dec.	....	172.3	....	143.9
Total	....	2,187.3	....	1,679.2





Foundry Equipment and Gear Sales

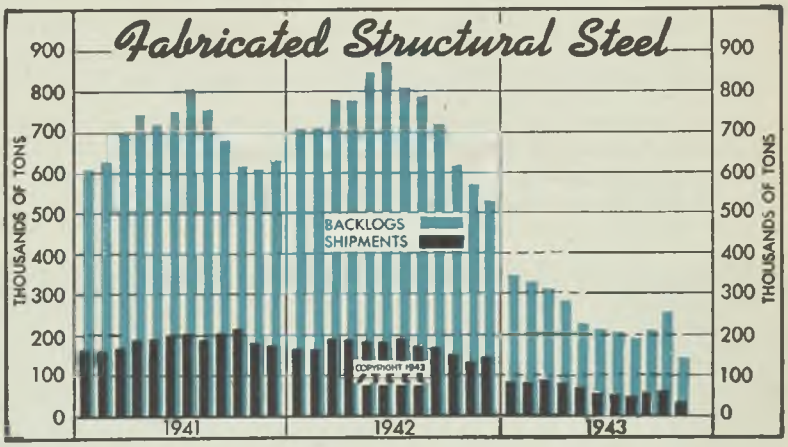
	Monthly Average (1937-38-39=100)		Index (1928=100)	
	1943	1942	1943	1942
Jan.	429.8	532.7	266	288
Feb.	399.5	567.9	803	358
Mar.	562.7	1122.4	334	455
Apr.	362.7	1089.3	240	378
May	348.9	658.6	342	421
June	413.6	774.0	401	378
July	379.4	800.8	374	344
Aug.	390.4	510.8	312	380
Sept.	346.6	446.4	320	351
Oct.	436.6	540.6	368	263
Nov.	388.0	338.8	387	359
Dec.	.	382.5		300
Average	....	646.7		355

Fabricated Structural Steel

(1000 tons)

	Shipments			Backlogs		
	1943	1942	1941	1943	1942	1941
Jan.	90.4	167.8	164.6	339.1	704.4	601.5
Feb.	90.1	164.6	161.4	321.0	706.7	624.2
Mar.	93.5	191.3	170.2	299.8	777.7	697.2
Apr.	84.0	187.2	189.8	272.5	772.4	741.9
May	77.4	184.2	191.9	220.6	843.8	718.9
June	66.9	182.7	200.5	207.1	869.8	747.4
July	54.2	189.9	203.0	201.3	808.6	802.7
Aug.	48.6	173.9	189.3	195.6	783.5	754.5
Sept.	50.3	169.8	204.1	208.1	716.0	678.5
Oct.	63.7	152.9	217.7	274.0	617.7	614.4
Nov.	35.2	130.4	182.6	134.6	566.6	602.9
Dec.	.	145.3	176.1	....	523.5	626.0

Source: American Institute of Steel Construction. Figures for 1943 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)	$8,619	$10,523	$7,668	$7,342
Federal Gross Debt (billions)	$169.8	$169.8	$170.1	$112.0
Bond Volume, NYSE (millions)	$47.4	$35.0	$48.6	$44.2
Stocks Sales, NYSE (thousands)	4,703	3,167	3,701	5,075
Loans and Investments (millions)†	$49,950	$50,509	$51,462	$40,457
United States Government Obligations Held (millions)†	$36,169	$36,722	$37,377	$26,510

†Member banks, Federal Reserve System.

PRICES

STEEL's composite finished steel price average	$56.73	$56.73	$56.73	$56.73
Spot Commodity Index (Moody's, 15 items)†	247.6	246.3	244.8	239.1
Industrial Raw Materials (Bureau of Labor index)‡	112.2	112.1	111.1	106.6
Manufactured Products (Bureau of Labor index)‡	100.4	100.4	100.3	100.1

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

New Gage System

. . . . measures any angle from zero to 103 degrees at 1-second intervals with an accuracy of ¼ second

ONE of those developments that appear so logical you immediately wonder why it was not brought out long ago was disclosed recently by George Webber, president of Webber Gage Co., Cleveland.

In explaining the background of this development, Mr. Webber said the secret that assured the accuracy of the "Jo" block system of making linear measurements was that Johansson discovered how to divide the English yard, the master unit of measure in the English system.

"Logic makes gage blocks," says Mr. Webber. "When Johansson had 36 blocks of equal length which when wrung together were the same total length as the English yard, each block was exactly 1 inch long. These he sent to the bureaus of standards of governments throughout the world, stating 'Here is an inch' and no one could prove he was wrong . . . The same logic," says Mr. Webber, "makes any gage block."

When starting in the gage block business in 1929, Mr. Webber used a single 4-inch standard block in a similar manner to make his first set of master blocks. When he had three 2-inch blocks, any two of which when wrung together equaled the 4-inch standard, then he knew each block was exactly 2 inches long. The same system was utilized to get the other lengths desired.

To make the mechanical comparisons required, it is a relatively simple matter to set up a lever arm or series of arms, using a microscope to check the movement obtained with one block as against another. Any accuracy wanted can be obtained with a long enough lever arm and a microscope. Optical flats can be used also.

In an attempt to clarify the factors involved in making gage blocks, Mr. Webber explains that anyone who knows how to make perfectly flat parallel surfaces on steel (done by lapping) and who can check blocks against each other, can make precision gage blocks.

As is well known, with a set of only a few gage blocks, almost any desired combination can be built up to provide precise *linear* measurements over an extremely wide range.

Why not develop a series of blocks in which are incorporated accurate angles in order to check a wide range of *angular* dimensions by combining different combinations of a few standardized blocks?

That is exactly what has been done.

By utilizing different combinations of

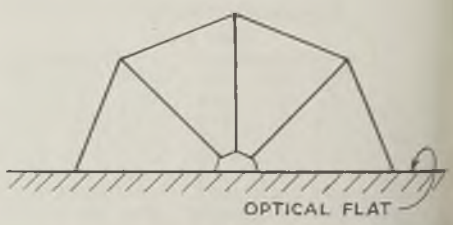


Fig. 1 (Right)—If four angle gage blocks contain the same angle and the total is 180 degrees as shown by checking on an optical flat as illustrated, then each block must be exactly 45 degrees, and you can prove it, says Mr. Webber

Fig. 2 (Below)—To set an angle of 13 degrees, a 15-degree and a 1-degree block are wrung onto a 3-degree block so that the first two angles add and the third is subtracted, giving 16 minus 3 or 13 degrees. A parallel is set on top of gage blocks to take the wear and work placed on that. Indicating across top of work with a dial gage as shown quickly checks angle of work piece

By G. W. BIRDSALL
Associate Editor, STEEL

14 blocks, it is possible to obtain 370,800 different angles. This covers the range from zero to 103 degrees in intervals of 1 second, and the accuracy is within ¼-second.

According to Mr. Webber, developing this system for measuring angles is an extreme.y simple application of logic, more simple in fact than that involved in setting up the original master "Jo" blocks from the English yard, for the system of angles is self checking.

For example if you make four angle gage blocks that have exactly the same angle in each, then set up these four gage blocks in a "pie" formation on an optical flat as shown in Fig. 1 and get no uneven indication, you know that the total angle of those four blocks is 180 degrees. So each one must be exactly 45 degrees. *And you can prove it,* for your optical flat shows that the total of the four is exactly 180 degrees and thus each must be 45 degrees since all have equal angles (which also can be checked with optical flats). Thus *you know* you have divided 180 degrees into 45 degrees.

In a similar manner, it is possible to develop any angle desired. Another point of particular interest is that it is poss.ble to check a greater number of angles with fewer angle gage blocks than it is possible to check linear dimensions with an equal number of Jo blocks. The reason is that angle gage blocks can be *subtracted* as well as *added*, whereas Jo blocks can only be *added*.

For example, with a single 1-degree block and a 3-degree block it is an easy matter to set up 4 degrees by wringing together the two blocks with the apex of each block at the same end, thus adding the angles. However, if the two blocks are wrung together with the apex of one next to the base of the other, the angles are subtracted, giving 3 minus 1 or 2 degrees. Thus these two blocks provide four angles—1, 2, 3 and 4 degrees.

This is how it is possible to obtain 370,800 different angles with only 14 angle gage blocks to cover any value from zero to 103 degrees in steps of 1 second. The set of 14 blocks includes three series—1, 3, 9, 15, 30, 45 degrees; 1, 3, 9, 27 minutes; 1, 3, 9, 27 seconds.

Conventional way of setting up a precise angle is by use of the sine bar which employs trigonometry to measure the angle. The sine bar itself consists of an accurate straight-edge to which are attached two hardened and ground plugs that are perfectly round and of the same diameter. Distance between centers of the plugs is usually an even dimension to simplify calculations—5 inches and 10 inches being commonly employed with the 10-inch preferred because it simplifies calculations still further.

Possibly the simplest way to use the sine bar is on a surface plate as shown in Fig. 3. To set up a certain angle, the sine of that angle is determined by reference to a table of sines. Then x, the difference between a and b is found by multiplying the dimension L by the sine of the angle, since definition of trigonometric sine of the angle B is x divided by L.

For example, suppose the angle we want is 30 degrees 46 minutes. Sine of that angle is 0.5116 as indicated by table of sines. If length of sine bar L is 10 inches, then $L(sine)$ is 5.116 inches and the distance x must be set at 5.116 inches. A 10-inch sine bar is convenient, for the multiplying operation then involves simply shifting over the decimal one point to the right. If the lower plug of sine bar is set on a 1-inch gage block, making b equal to 1 inch, then the upper plug must be set 6.116 inches above the surface plate.

Chief difficulty of using the sine bar is that dimension x rarely comes out an even number. Sine tables go as far as 15 significant figures. That means it usually is possible to only approximate the correct value. Any error so developed is of course magnified when the angle determined is projected for use.

On the other hand, the newly developed angle gage block system assures accuracy within ¼ of a second in setting up any angle from zero to 103 degrees in 1-second intervals. Too, the angle so determined is easily extended by applying a straight-edge to the top side, if the blocks are set up vertically on a surface plate; or by applying straight-edges to both sides of the blocks, if laid flat.

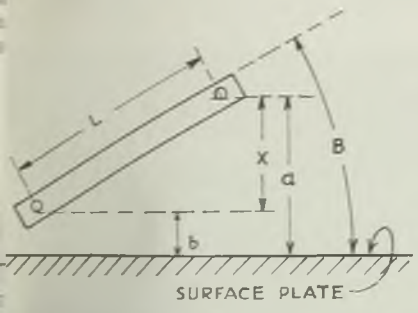
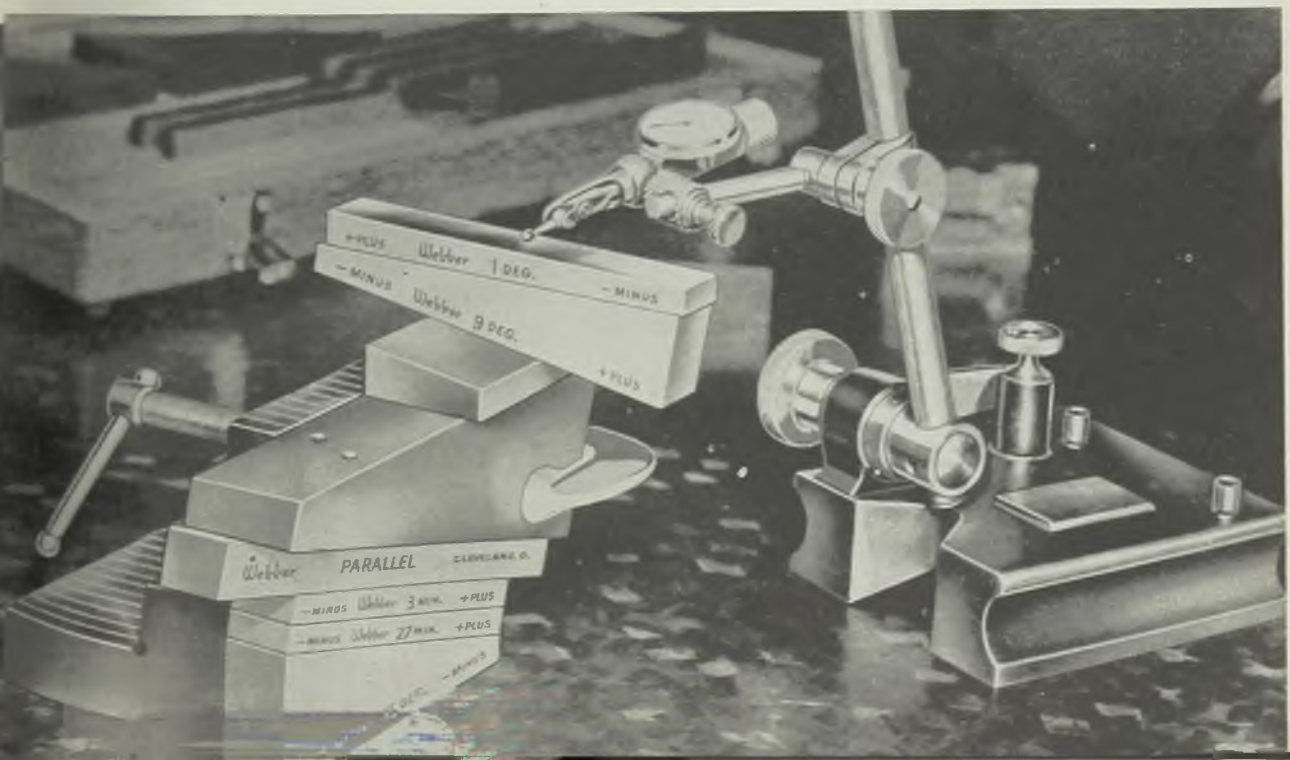


Fig. 3 (Left)—Diagram of sine bar as used for setting up the angle B. *Chief difficulty is that dimension* x *rarely comes out an even number. Bar must be carefully watched for wear on plugs. Setting up bar is explained in text*

Fig. 4 (Below)—Compound angles are checked in similar manner, using two sets of gages and indicating across top as before. Large work can be left on the surface plate and angle gage blocks set on top as illustrated



Many Welding Advances Employed by Surface Combustion in Fabricating . . . . .

MARINE BOILE

By G. ELDRIDGE STEDMAN

BOILER construction has come a long way from the first faltering attempts to use welding. Reason for hesitancy in the early days of welding is easily understood because of the type of service. It is an axiom of boiler manufacturers that boilers are pressure vessels presenting extreme hazards in service. Their failure can be equivalent to a powerful explosion.

The first ASME code authorizing use of welding in boiler construction was introduced in 1931. This marked the entrance of welding into this previously highly restricted field. The code allowed a weld joint efficiency of 90 per cent where such joints met all specified requirements. No change was made in established design ratio of safety, or in plate material specifications. Extensive research in welding preceded establishment of this code and subsequent modifications. Now, good welded boiler construction is recognized and carefully protected by this and other codes set up by the United States Navy, Coast Guard, American Bureau of Ships and Lloyds, for the marine field.

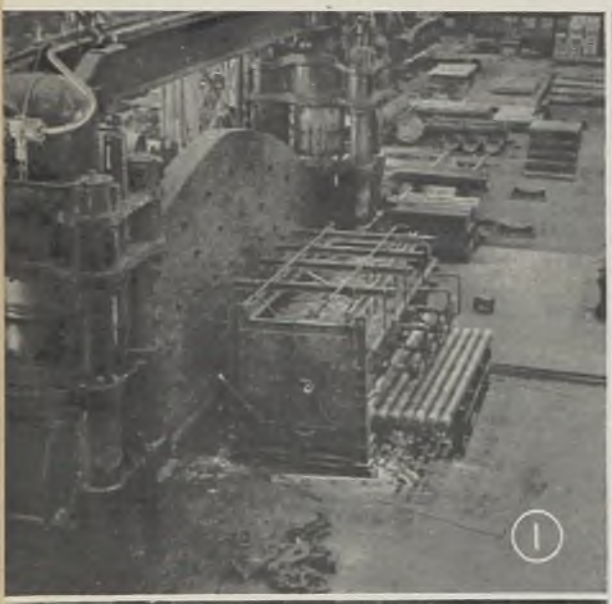
The first welded boiler built according to ASME specifications was constructed by Combustion Engineering Co. Inc. in its Hedges-Walsh-Weidner Division plant at Chattanooga, Tenn. This organization had 50 years experience in making pressure vessels. Into that product, representing at that time a revolutionary step in design, went the combined knowledge and skill of the concern and A. J. Moses, vice president and general manager at Chattanooga and who contributed much to the writing of the original 1931 ASME code. The first all-welded boiler job had some of the flavor of an adventure for C-E, but its consummation actually helped turn boilermaking from a crude operation in which the boilermaker's rule was graduated no finer than 3/16-inch or ⅛-inch to a highly specialized production technique that regularly works within tolerances of 0.001-inch.

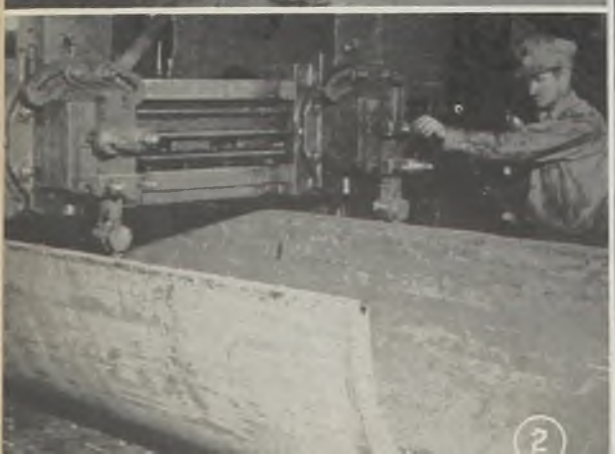
Because of the far-reaching effects of welded construction, much of the work formerly done by hand is now done by machine—such as hand flanging, riveting and caulking. In olden days, 300 pounds per square inch was considered a high working pressure for a boiler. Now boilers have been built to the astonishing specifications of 25,000-pounds pressure. The average is about 900 pounds.

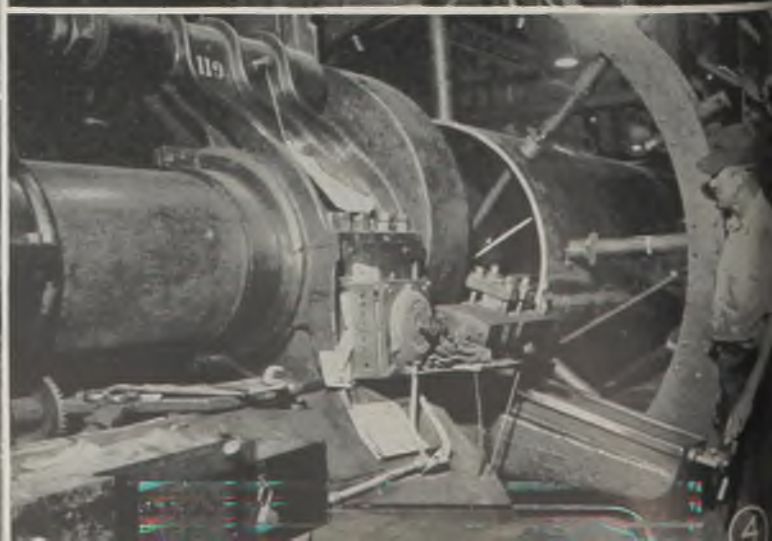
In addition to producing boilers of all types and "believe-it-or-not" sizes, the plant is equipped to make a variety of pressure vessels for industry. Forsaking emphasis upon its industrial boilers, the company has gone into line production of boilers for merchant marine vessels.

First impression of this great plant is of its massiveness—of everything within it, of tools and products. Great banks of the largest drill presses work to tolerances in tube holes between ligaments of less than 0.005-inch, aiming meticulously at the kind of accuracy more commonly required for small pieces rather

(*Please turn to Page* 110)







LANTS

Fig. 1—This behemoth among presses is rated at 6000 tons, incorporates many C-E designed features to facilitate ease of control. It forms plates up to 5½ inches thick. Note portable furnace at right

Fig. 2—Machining taper and weld grooves on drum-half clamped to bed of a 40-foot Cincinnati planer. All work with thickness of 1½ inches or more is machined after forming

Fig. 3—Rollers and turning drives facilitate handling of large shells and drums through nearly all stages of fabrication. Here, welders complete girth seams

Fig. 4—Boring mill built to company's specifications machines weld groove on drum end. Note huge arbor that holds work stationary as machine cutting head revolves

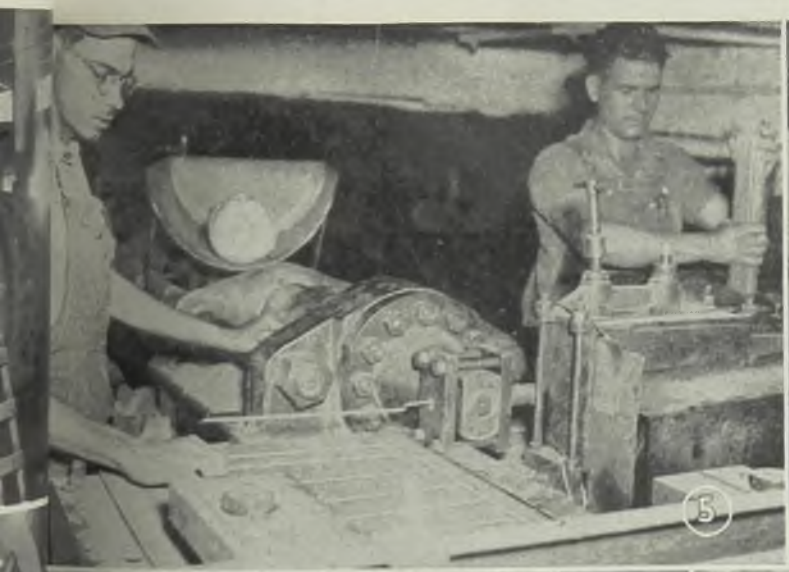
Fig. 5—Welding rods drop from extrusion die to conveyor belt on way to the oven. Rod coating material is forced through dies by hydraulic pressure feeding into nozzles of fixed diameter which control coating deposits

Fig. 6—A large annealing furnace at the C-E plant. It is a car-type furnace whose dimensions are 65 x 14 x 12 feet

Fig. 7—Longitudinal seam welding showing test plate being attached to drum

Fig. 8—All butt-welded joints such as girth seams are X-rayed by this 1,000,000-volt General Electric unit or other X-ray equipment to assure meeting code regulations

Fig. 9—Tube holes are laid out and drilled in this department equipped with a battery of 8-foot Carlton and Bickford radial drills. In this work, tolerances average 0.005-inch to 0.010-inch over or under finish size



Precision Casting

PRECISION CASTING has loomed up on the horizon in the past few months as a production method which may have considerable effect on product design and manufacturing procedure in the next few years. As a technique, precision casting is by no means new for the dental profession and the jewelry trade have been using it for years in making inlays, appliances and fine jewelry. However, most of its applications in the industrial field are definitely new and the list is growing rapidly.

At the outset, small, precision, cast parts for the industrial field were made largely by a half dozen or so companies which gained their experience in the production of dental and jewelry items. Now, parts are being cast weighing several pounds and the number of companies participating probably is close to a score, including at least two of the major producers of electrical equipment.

Possibilities for the process are readily discernible when it is observed that dimensions may be held in some instances within one-half of 0.001-inch and most materials may be cast, such as the silicon bronzes in the nonferrous metal alloy group and the alloy steels, even including tungsten tool steel. One of the most important applications currently is for turbosuperchargers cast from an alloy comprising 60 per cent cobalt, 35 per cent chromium and 5 per cent molybdenum.

In the field of the more common grades of low-alloy structural steels, only a very small amount of work has been done because primary interest has, by force of war necessity, restricted activities to the high-temperature alloys.

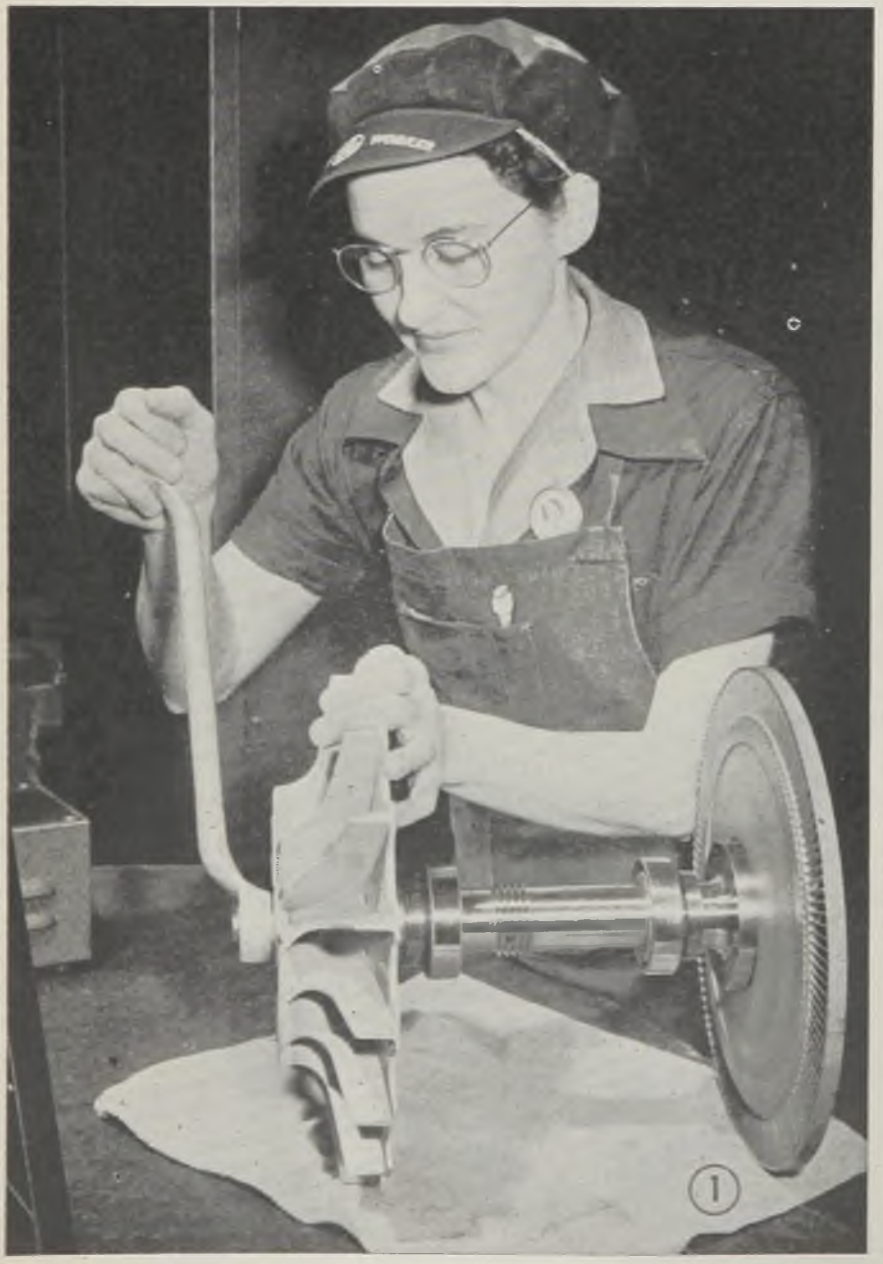


Fig. 1—Worker in General Electric's Fort Wayne, Ind., plant is shown assembling an aircraft supercharger impeller on shaft driven by the turbine wheel at the right. Buckets of this wheel, driven by hot exhaust gases from the aircraft engine at over 20,000 revolutions per minute, are precision cast. The turbine wheel operates at about 1500 degrees Fahr. while the impeller is exposed to temperatures as low as 67 degrees below zero

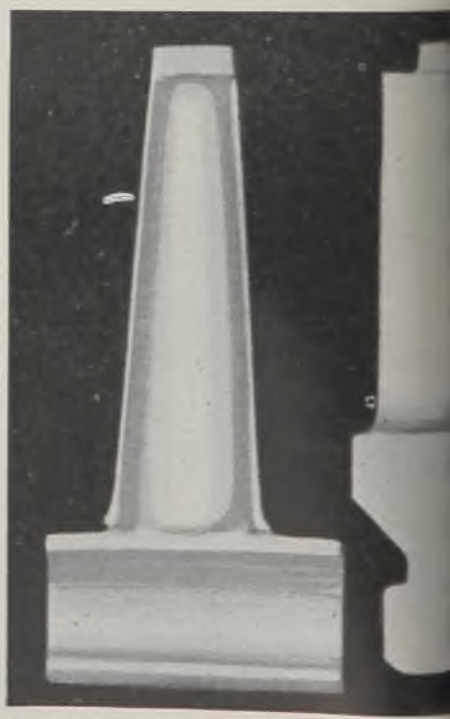


Fig. 2—Blades like these are being precision cast by the hundreds and assembled into turbine wheels. Little finishing of the castings is required prior to assembly

. . . . looms up as important new production tool. Borrowed from the dental and jewelry trades, the process now is being applied to parts weighing five to seven pounds with high strength factors and close dimensional limits. Materials include alloy steels, tool steels and high strength bronzes

However, it has been conclusively demonstrated that the method has been developed to a stage of perfection whereby castings weighing 5 to 7 pounds can be precision cast and it appears that handling of the structural steels will be promoted.

The war agencies have been following the precision casting development closely through the War Metallurgy Committee and WPB's Office of Production Research and Development. Much of the information presented here is drawn from a report prepared by L. L. Wyman, research supervisor and D. Basch, special assistant, of the War Metallurgy Committee and from Joseph Robinson of OPRD. A considerable portion of the "know-how" on the casting process has been developed by the General Electric Co. with which Mr. Wyman and Mr. Basch are associated.

The term "precision casting" has been applied to the method since "centrifugal casting" alone is not sufficiently descriptive although this is one of the three techniques employed, the others being pressure and vacuum. The basic method, as previously noted, is not new, and has been generally known as the "lost wax" or "investment" method of centrifugal casting. There are many variations of the basic method which have been developed for special purposes, but fundamentally the method consists of producing a replica of the desired object from wax, plastic, or some other material which can be melted or vaporized away without leaving a residue of any kind.

This replica must be so designed that the final casting, made in the mold which is formed around the replica, has the desired size, shape, and surface finish. Such design factors must not only consider the volumetric changes of the casting itself during cooling, but must also involve suitable compensations for any dimensional changes in the wax replica or the mold made from the replica which may occur during the process.

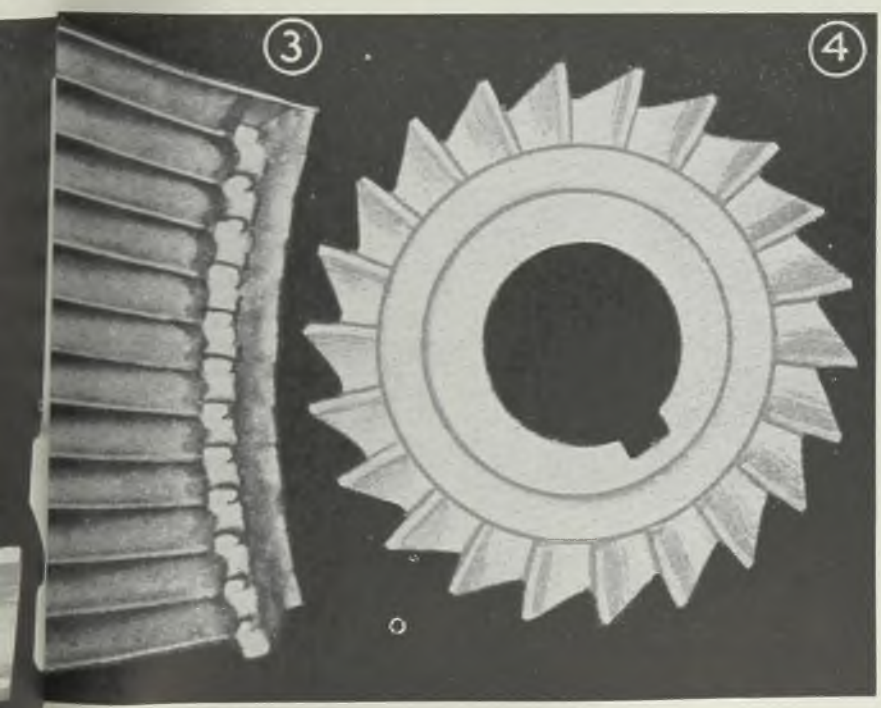
Where large production is involved, the wax patterns are made by carefully casting the wax into highly polished and

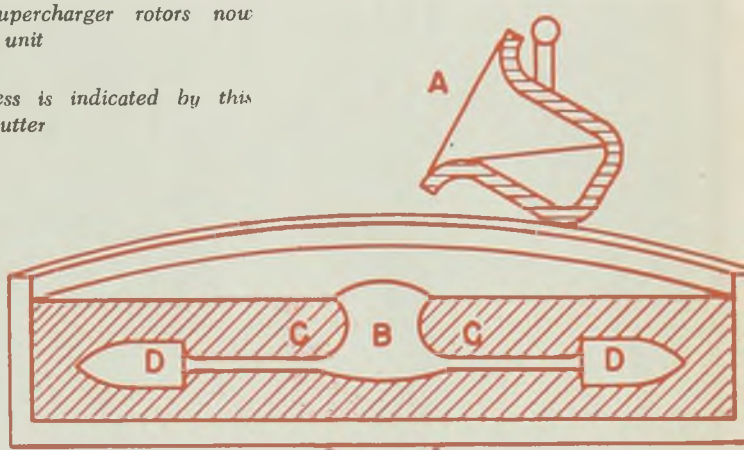
Fig. 3—Twelve turbine blades are cast in one piece as shown here and the segments are assembled. Complete turbosupercharger rotors now are being cast as a single unit

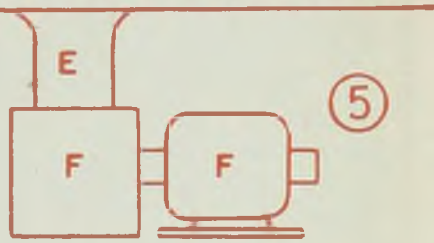
Fig. 4—Versatility of the precision casting process is indicated by this cast high-speed steel milling cutter

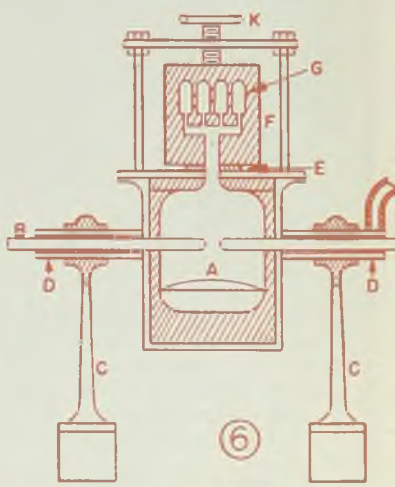
Fig. 5—This schematic sketch shows a multiple centrifugal casting unit used in the production of precision castings with A indicating pouring ladle, B central gate, C side gates, D mold cavities. E rotating support and F the driving mechanism

Fig. 6—Shown here is a sketch of a precision pressure casting unit with A indicating arc furnace, B electrodes, C supports, D trunnions, E gasket, F mold, G mold cavities, H pneumatic pressure pipe and K mold clamp









precisely built metal molds, thus insuring the strict adherence to size, shape and finish. For less precise work, investments or, in other words, the quick-setting, nonmetallic molding powder mixtures such as used in making dental appliances; hard rubber bonded graphite and the like have been found to be suitable for the formation of the replica.

Following the production of the wax pattern, one or more of these wax models may be assembled into a group, and joined together by attaching wax gates, sprues, risers, etc. so that the completed wax pattern is the exact model of the entire space to be filled by the molten metal.

Particular attention must be paid to the lay-out of the assembled wax pattern for several reasons. In the first place, the design of this set-up must be such that all of the wax can be readily removed from the mold which is to be formed on this pattern, whether the wax is to be melted or to be vaporized off.

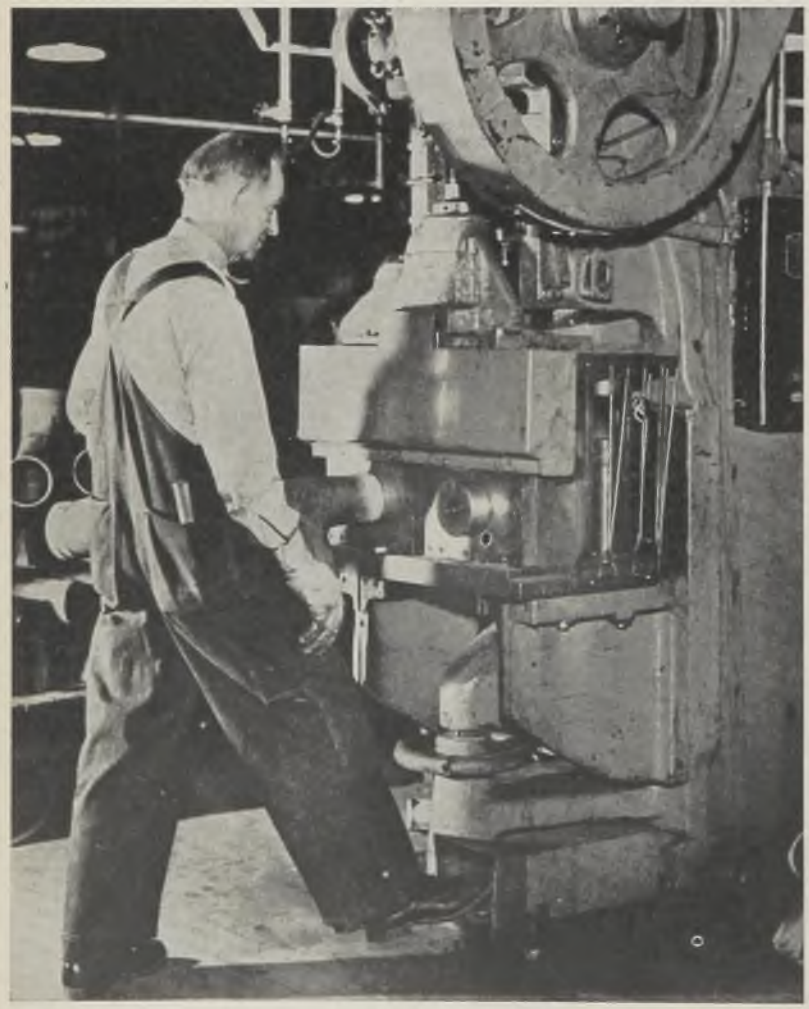
In the second place, the design must be in full accord with the casting method, that is, whether the casting is made by pouring into a mold spinning about its own axis, spinning about an axis external to the mold, such as whirling a bucket full of water, pressure or vacuum cast.

In addition, close attention must be paid to the positioning of the wax replicas in the whole wax assembly with respect to the freezing of the molten metal, inasmuch as freezing first occurs at the outer extremities of the pattern, and progresses inward to complete the object itself and then through the side or radial gates on into the central gate. This is a fundamental requirement in that it not only gives the purging action which tends to move gas pockets toward and into the gates, but it assures the constant supply of molten metal to fill continuously the mold area while the frozen metal is decreasing in volume as it cools down.

Using this wax model for the pattern, the next step involves the enclosing this pattern in a refractory material which will (1) produce the desired finish on the completed casting, (2) maintain the size and shape requirements, (3) not evolve detrimental impurities at the high temperature of the metals being cast, and (4) not crack or spill during the casting operation.

The material to be used for the mold itself presents a number of problems involving finish and dimension, as previously mentioned. The dimensional changes are matters of actual determination as a function of the kind of mold material which is used, and the temperature of the mold at the time of casting. The compensation for the dimensional changes must be included in the master mold for the wax replica.

The problem of surface finish, which also involves the accuracy of reproduction of surface detail, can be solved only by the proper choice and selection of mold refractory which will accurately cover the wax model in every detail of finish and contour. It must "bake out" satisfactorily in the wax removal, withstand the thermal shock of the molten metal on its surface without cracking or spilling, and it must not be a source of any solid or gaseous contamination to the metal being cast or during the process of solidification. In addition, it must be strong enough to withstand the stresses set up in these rather complicated assemblies during their cooling.



BEATS HAND METHOD: Formerly a punch press, this machine in a Fleetwood unit of Fisher Body Division, General Motors Corp., has been fitted with expansion dies which enable it to complete rings on the ends of bomber exhaust manifolds at the rate two per minute. Its prototype was a hand operated expansion die which took ten minutes for each ring. Note dual die mountings and punch press foot control, still employed

Required Materials Expensive

The refractories for this service are usually silica base materials bonded by a silicate or silica forming compound which "sets up" in a very short period of time, and are extremely stable both physically and chemically.

The materials which will meet the above requirements are rather expensive, and consequently, must be used sparingly. Thus it is a general practice to apply this material in its "fresh" or "green" condition, to the wax assembly by spraying, dipping, or brushing methods, followed by the subsequent application of a satisfactory lower-grade refractory. This part is then permitted to "set-up", and is then put into a container which is subsequently filled with the lower-grade material.

After the entire mold assembly has become set, the next step in the process is the elimination of the wax pattern by heating up the assembly and permitting the wax to run out or be vaporized off, leaving the cavity which will later be filled with the molten metal.

Another method of mold preparation makes use of a pattern which is covered by a thin membrane, the refractory being formed around the pattern in such manner as to make a split mold. After the mold body has set up, the two halves are opened up, the pattern removed and the membrane eliminated.

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condition on castings made from some metals, there is a specialized practice in which the refractory has one or more compounds incorporated into its mixture which, in the casting action, effectively "blanket" the solidifying metal or form a glassy surface against the metal. Such proceeding is, of course, not generally applicable due to the danger of contamination to the metal or alloy being cast and to the lack of control over the dimensions of the casting.

Casting Temperature

There are a number of factors which combine to determine whether the casting operation shall be into a hot mold or a cold mold, including the following:

(1) Intricacy of the detail to be reproduced.
(2) Necessity of long distances of metal flow.
(3) Number of side-gates to be run.
(4) Requirement to cast items of large area, thin section, and possibly having knife-edges.
(5) Presence of cores.
(6) Control of dimensions.
(7) Control of direction of solidification.
(8) Control of grain size.
(9) Control of casting surface.
(10) Control of cooling shrinkage.

No attempt has been made to list the above factors in order of relative importance, for the simple reason that changes in pattern, materials, and requirements may completely alter the relative importance of these factors from one job to another.

Centrifugal Method

As practiced in the dental and jewelry trades, the casting machine usually consists of a main support-bar or beam which is pivoted on a vertical axis, and motivated by a spring-wound or other suitable mechanism. The several sections of equipment are mounted on this support bar in such manner that the melting crucible or furnace is centrally located over or near the axis of rotation and the mold is near the outer extremity of the bar. These two units may be so in the above sequence, or they may be connected by an intermediate (and sometimes separately heated) pouring trough. In either event a gate of some kind is interposed between the melting crucible and the furnace, thus permitting the proper compounding and fusion of the metal or alloy in the crucible.

As one example of operation of equipment of this type, the supporting beam is rotated in a reverse direction against a spring mechanism, winding the latter to the tension required to give the desired forward rotational speed during the actual casting. The beam is then latched in this "cocked" condition. Following this the metal or alloy is brought to the proper casting temperature in the furnace and the previously prepared mold (and pouring trough if desired) are attached to the furnace in such manner as to permit the uninterrupted flow of metal from the furnace into the mold.

When the above assembly operations have been completed and the melt is in the proper condition, the support beam is released and whirls the mold assembly around the central axis. At the time when the rotational speed and the temperatures of melt, trough, and mold are satisfactory, the furnace gate is opened and the molten metal flows into the mold cavity under the effect of the centrifugal force generated by the spinning of the assembly.

The more recent counterparts of the commercial centrifugal units have several variations, such as the assembling of many individual molds around a wheel in a manner comparable to that shown schematically in Fig. 5. The gates from these individual molds all progress radially toward the hub of the wheel, terminating in a central pouring gate or trough.

In operation, the wheel is rotated at the desired speed, and the molten metal is run directly from the melting furnace into the mold, or the pouring is done by ladling the metal into the spinning molds.

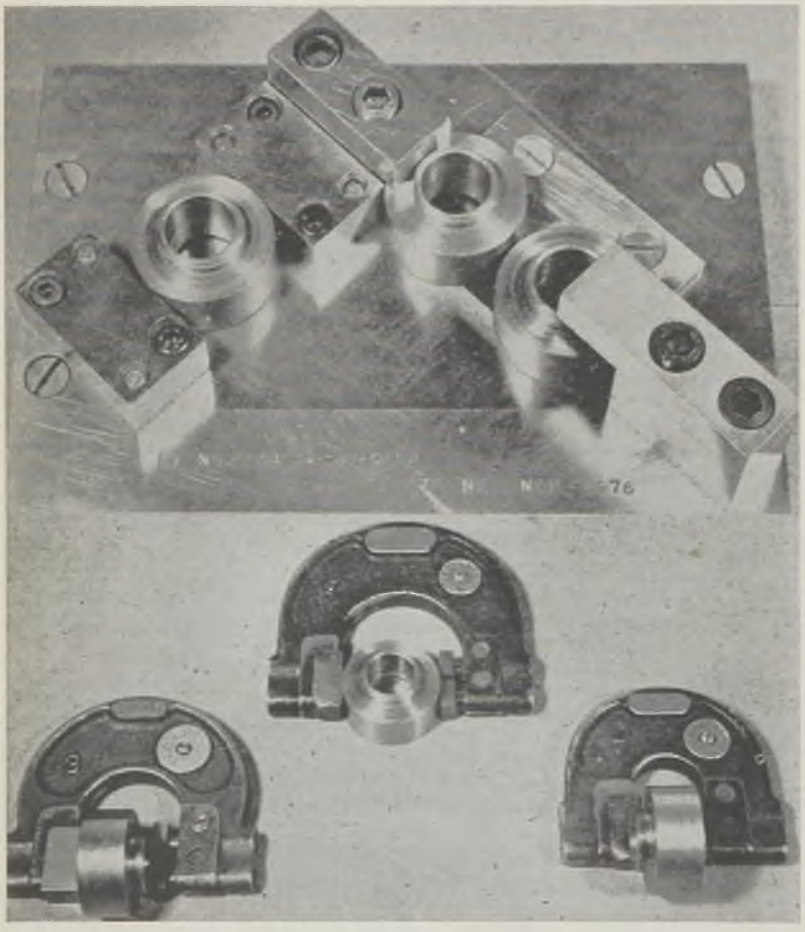
Pressure Method

The pressure casting method employs equipment of the type illustrated by Fig. 6. This unit consists of a totally enclosed indirect arc furnace which is mounted on trunnions and is capable of being inverted. The top of the furnace has a small aperture which serves as a charging and observation hole, as well as the pouring exit. In addition to this, a mold-clamping arrangement is attached to the top of the furnace.

When the furnace charge has been properly melted, the mold assembly, prepared as previously described, is placed in an inverted position on the top of the furnace in such a manner that the furnace exit and mold entry coincide, and are separated by a thin section of soft refractory gasket material. The mold is clamped in this position.

The actual casting takes place by inverting this composite unit at which time the metal runs into the centrally located

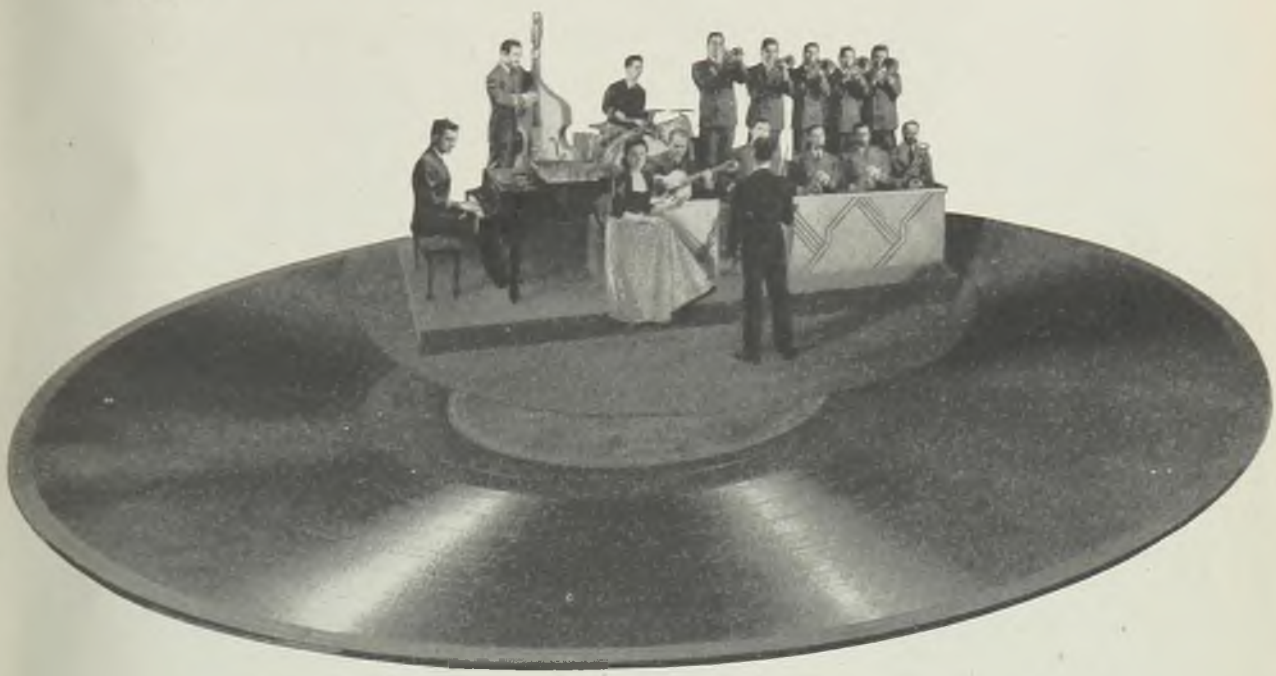
(*Please turn to Page* 96)



MULTIPLE GAGE: The simple three-in-one gage shown above has increased production in the inspection of bearing cups at General Motors' Fisher Body Division 85 per cent. The gage blocks, firmly and accurately placed on a dead level metal plate, permit simultaneous gaging of three pieces for as many different dimensions. Lower photo shows steps taken by the old method to find the measurements with three separate micrometers. The multiple gage was designed at Fisher Body's Ternstedt plant as a result of the suggestion of a woman inspector

A Record of Performance

. . . THAT WINS INDUSTRY'S APPLAUSE !



Like a giant orchestra, all of Industry plays a symphony of Victory. The blare of the starting whistle, the blast of the furnace, the rhythm of the riveting gun, the melody of the saw and hammer, the precision of the lathe . . . all these, rendered on a giant scale, will help to strike the final note of Victory!

Quite naturally, we're proud of our performance in 1943 . . . a record in tune with America's rising crescendo of production. That we hope to play an encore in the months to come goes without saying, for Levinson Steel is constantly seeking and developing new ways to improve and speed its service to Industry.

THE LEVINSON STEEL CO.

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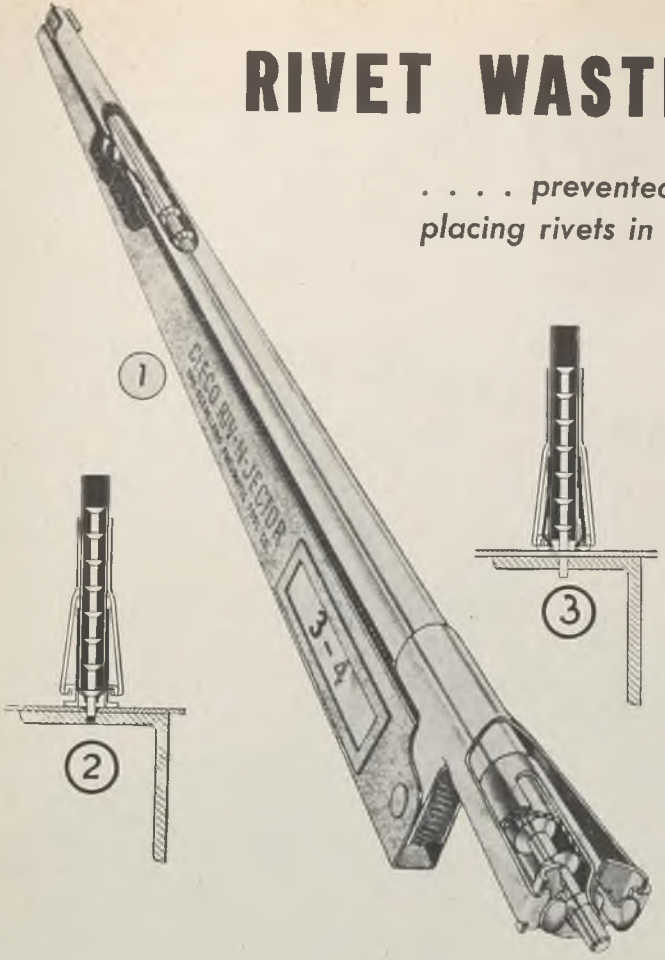
LEVINSON STEEL

RIVET WASTE

. . . . prevented by device that facilitates placing rivets in structures



THEIR EXTREMELY small size and the difficulty of handling the millions of airplane rivets required for every production shift at a warplane plant has raised the problem of rivet waste to major status. It is said that out of three rivets issued to a gun operator, only one is driven home in the fuselage or wing. The other two are either dropped, left loose in the assembled unit or, in the case of "cold" rivets, permitted to come to room temperature, necessitating reheating and "refreezing".

An inevitable result is a huge waste, for cost of reclamation varies from 75 to 125 per cent of the original cost of the rivets. Some large aircraft plants spend as much as $30,000 to $40,000 per month on rivet salvage, devoting considerable space and manpower to the job.

A check of rivet sorting, based on reports of a number of airframe producers, indicates that 50 per cent of those dropped on the floor are not recovered in condition for use in construction, since they have been stepped on or run over by trucks. Mistakes in sorting cause riveters to insert and often drive the wrong rivet, which then must be drilled out with a loss of time and possible damage to the sheets.

In the light of such conditions, admittedly difficult to control, the smallest and most numerous unit of construction in airplane manufacture has become a "cause celebre" in the industry. Vexed production men have "chased" the elusive rivets through many sleepless hours in an effort to pin them down—to make the right sizes and shapes flow in good order to their appointed places and to see that none get lost on the way. In one fighter plane alone, the Republic Thunderbolt, there are 80 pounds of rivets of some 435 different types, diameters or lengths. One-third of all rivets issued to production find their way back to Republic's reclamation department.

Fig. 1—Cleco Riv-N-Jector with portions cut away to show magazine, rivet follower and ejector spring at the tail, and details of the head including spring-clip chuck and bridle controlling release of rivets, one at a time

Fig. 2—Projecting rivet being inserted in a hole

Fig. 3—Jaws open to release one rivet and the next feeds down simultaneously into position at the head

An unusual device, now used extensively by several aircraft factories, is one answer to the rivet salvage problem. Manufactured by the Cleveland Pneumatic Tool Co., Cleveland, the Cleco Riv-N-Jector is a feather-light device embracing a magazine with capacity of about 50 rivets, depending on length; a means of releasing the rivets, one at a time, when the operator presses it, pencil-like, over the hole in which rivet is to be inserted; and an arrangement whereby it is easily opened up for reloading.

Fig. 1 illustrates a standard product, its magazine, which is loaded uniformly by a hopper-loader, and the ejector point. The sectional views, Fig. 2, show the rivet projecting from the end of the device and being inserted in the hole. Fig. 3 indicates the way the jaws open to release the rivet, another rivet feeding down simultaneously into position for insertion in the next hole. Portions of its construction are cut away to bring out details.

The device is so simple as to be almost foolproof. Rivets are loaded, shank down, into the end of the tube magazine shown fastened to the cover by a clamp in Fig. 1. When magazine is full, a follower of slightly smaller diameter than the tube is dropped into place on the head of the last rivet in line. A long ejector spring extends from the tail of the cover-case up to and around a spool at the head of the case, thence back to a lug on the follower where it attaches to an eyelet. In this way pressure is constantly exerted on the rivet load to keep a fresh rivet always in place at the jaws of the ejector.

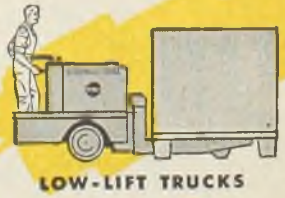
When the leading rivet is inserted in a hole, contact of the jaws with the surface of the sheet spreads them sufficiently to release the rivet. A double spring-clip chuck and bridle comprise the jaws. These then close automatically on the next rivet in line. Meanwhile, the rivet follower is able to force the load down the magazine because its protruding lug, to which the ejector spring is fastened, moves in a slot in the bottom of the tube. In operation, this handy gadget is usually held in the worker's left hand, while the riveting gun is held in the right.

When the device needs reloading, it goes back to a "rivet center" outfitted with a suitable storage box for various rivets and one or more rivet hoppers, depending upon requirements. The attendant at the center makes adjustments on the hoppers, also made under the Cleco brand, to suit the machine for the size and type of rivets and the equipment to be used, loads the devices at the rate of four or five per minute and keeps them stocked, ready for call. In operations using ice-box rivets, no change is needed in refrigeration equipment for Riv-N-Jectors, as this holding device becomes warm enough to handle two minutes after removal from the box, yet it shields the rivets from the air, they do not so quickly reach room temperature. This assures rivets will have maximum ductility when driven.

NEW Baker Truck Catalog GIVES THE ANSWERS TO YOUR MATERIAL HANDLING PROBLEMS

Here's real help for any plant or warehouse faced with transportation problems. The Baker Electric Truck Catalog No. 52 is more than a catalog. It is a handbook of information on material handling with power trucks, designed to facilitate selection of the proper equipment for any set of requirements. In addition to describing the 47 standard Baker Electric Trucks, it covers many special models designed for unusual handling operations.

Actual case histories featured throughout the book show Baker Trucks of all types speeding production, saving time and money and conserving man-power in a wide variety of installations. You are almost sure to find problems comparable to those in your plant, and you can profit from the experience of others in solving them.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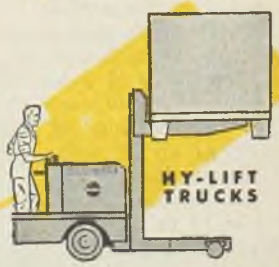
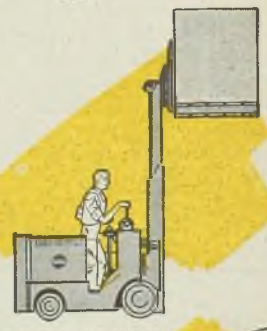

HY-LIFT TRUCKS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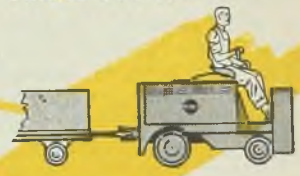
TRACTORS


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Plant and production managers, traffic managers, superintendents, purchasing agents and any others concerned with material handling will find this book a valuable source of information. Write for your copy of The Baker Electric Truck Catalog No. 52 today.

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Baker INDUSTRIAL TRUCKS

Sub-Zero HARDENING CYCLES

. . . . prove advantageous in heat treating many types of steels

By G. B. BERLIEN
Chief Metallurgist
Lindberg Steel Treating Co.
Chicago

ON THE BASIS of investigations conducted so far, it appears safe to predict that within the next few years every hardening room will find it necessary to have some means of refrigeration as a regular part of its heat-treating procedure.

This is for the reason that a more completely heat-treated structure may be obtained by subjecting the work to sub-zero temperatures for given periods of time following somewhat conventional heating and cooling methods. It has been found in the studies made so far that physical characteristics of most steels may be definitely improved through further decomposition of austenitic structure at low temperatures. In the case of one steel, as an example, refrigeration to 120 degrees below zero resulted in an increase of 12 to 15 points in rockwell C hardness.

The academic work in the field of sub-zero transformation has been done by such men as Gordon and Cohen of Massachusetts Institute of Technology; Gulyaev, a Russian investigator; and E. C. Bain, vice president, Carnegie-Illinois Steel Corp., Pittsburgh. The results obtained by these men have been applied in further work on heat-treatment of numerous steel parts.

Everyone is familiar with the fact that properly alloyed steels harden when quenched to room temperature by various means following heating to the critical range. But, what happens when quenching to temperature lower than room temperatures? The answer to this question inspired the investigations carried out by the previously mentioned group of scientists.

The first important discovery was that something actually did happen when steels were subjected to extremely low temperatures but there were many factors which affected the results and these led to further investigations.

A change in microstructure was noted and it was revealed to be a greater percentage of fine martensitic needles. Then higher magnetic values were noted and measurements also indicated an increase in volume. However, all these results were found to vary with quenching temperatures, time cycles and alloy content and it was quite evident that each type alloy had to be studied separately with respect to individual performance.

In the early investigations, liquefied or solidified gases were used as a cooling medium, these including liquid oxygen, liquid nitrogen, liquid air and dry ice.

For most studies in laboratories not highly engineered, dry ice proved to be the easiest to handle either in a suitably insulated container or in alcohol. Liquefied gases provided temperatures that seemed to be lower than necessary. Mechanical refrigeration then was developed which could provide temperatures as low as 120 and 130 degrees Fahr. below zero and this has proved to be a more convenient tool in the processing of parts.

Considerable attention has been paid to high-speed steel since it responds especially well to sub-zero treatment. In one study, an alloy containing approximately 18 per cent tungsten, 4 per cent chromium, 1 per cent vanadium and 0.70 per cent carbon was heated in a suitable furnace to temperatures ranging from 1850 to 2370 degrees Fahr. and oil quenched to room temperature and then transferred to various cooling mediums.

However, it was found that cooling had to be done immediately to obtain full advantage of the chilling treatment.

Transformation Routine Noted

Some parts of the same analysis were transferred to the cooling medium before reaching room temperature and others were permitted to stand at room temperatures for periods varying from 3 to 30 hours before refrigerating. Other samples were quenched and tempered in the conventional manner and then refrigerated.

It was found that the transformation of the as-quenched structure austenite to the harder constituent martensite was most complete only when refrigeration immediately followed the quench. Samples allowed to stand at room temperature for periods of time before refrigeration developed a resistance to transformation and required lower temperatures to overcome the condition. Samples conventionally hardened and tempered and then refrigerated also developed a resistance to transformation.

Temperatures tried experimentally indicated that 150 degrees Fahr. below zero provided the ultimate in transformation but that the major part of the change occurred at 120 degrees, which may be reached readily by mechanical means. As for hardening furnace temperatures, it was found that the lower end of the range such as 1850 degrees Fahr. did not give positive results. Results became more positive as hardening temperatures were progressively increased and it finally was determined that a range of 2300 to 2350 degrees provided the best results.

Based on these investigations, a heat-treating cycle was established which incorporated conventional hardening along with refrigeration and designed to provide maximum results possible in the light of previous experimental work. Arrangements were made with a machine shop for an accurate record of cutting tool results involving a particularly difficult job of turning heat-treated forgings of SAE-2330 steel with a brinell hardness of 300.

On this job, the best results that could be obtained were 25 pieces per grind from stock bits made of 18-4-1, 18-4-1-4 or 14-4-1-4 high speed steel. In conducting the test, a bar of annealed 18-4-1 stock ⅝-inch square was obtained and cut to convenient lengths for bits. About 0.025-inch was removed from the surface to eliminate all mill decarburization.

The bits then were racked up six to a heat and first preheated to 1525 degrees Fahr. in a controlled atmosphere furnace and transferred to a similar furnace operating at 2350 degrees. The bits were heated through when the furnace returned to 2320 degrees. At this point, the bits were quenched in oil and removed after cooling to about 300 degrees Fahr. After cooling further to 200 degrees in air, the bits were placed in a mechanical refrigerator operating at 120 degrees Fahr. below zero and allowed to remain for 6 hours.

Upon removal from the refrigerator, the bits were permitted to return to room temperature normally and then were tempered at 1050 degrees Fahr. for 3 hours. After cooling from tempering to about 200 degrees, the bits again were refrigerated for 6 hours at

ARC WELDING HIGH LIGHTS

MUREX ELECTRODES were among the first of the "hot rods" available to the welding industry. Introduced thirteen years ago by Metal & Thermit, these heavy, all-mineral coated electrodes for downhand welding were sensational because of the high currents at which they operated and the excellent, X-ray clean weld metal they produced.

Fabricators of pressure vessels, machine frames, bases and other heavy units were quick to appreciate the advantages of electrodes of this type, and to put them to use in reducing welding costs and improving the quality of welding.

Today, concerns who were among the original users of downhand Murex Electrodes are the leading producers of war materials and are making use of the high speed welding techniques which these "hot rods" make possible to turn out tanks, gun mounts, bombs and other armaments at an unprecedented rate.

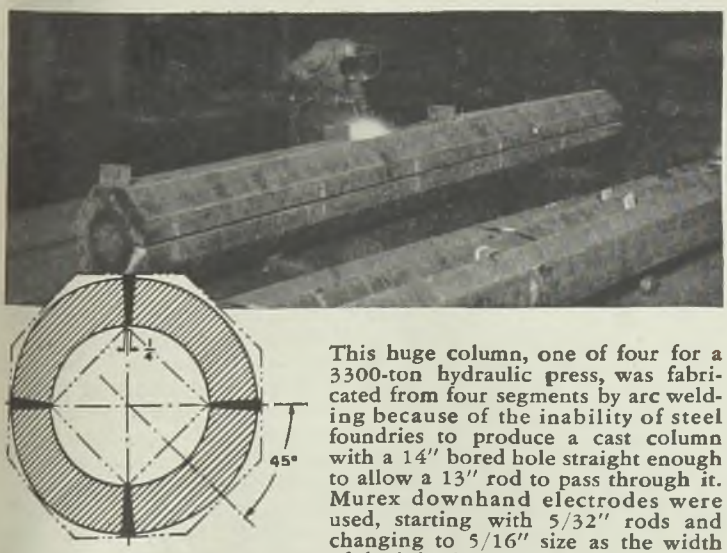
Illustrated are several typical applications—past and present—of this kind of welding.

The Murex line, of course, also includes electrodes for all-position work, for use with a.c. equipment, for welding alloy steels and for hard surfacing. Write for the Murex war time catalog.

Pressure vessels, made by Black, Sivalls & Bryson Inc. of Oklahoma City, for low temperature service in the oil refining industry, are fabricated with Murex nickel steel electrodes, chosen because of their fast downhand characteristics and high physical properties. Such pressure vessels are welded as rapidly as mild steel.

In the early days of coal mining every operation was performed by human labor and animal power. Today mechanization dominates every activity. Typical of the heavy equipment, which must stand hard and constant usage, is this Goodman Shaker Conveyor. Photograph shows welding a shovel trough of a duckbill loading head with Murex Electrodes, selected because of the strength and ductility of the deposited metal.

At the plant of the Eljer Co., Salem, Ohio, men who had become skilled in making plumbing fixtures are now turning out 1000-pound bomb casings. Photograph shows arc welding first pass on upper and lower portions of an aerial bomb. The use of downhand Murex Electrodes assures X-ray clean welds of good penetration and excellent ductilities.



This huge column, one of four for a 3300-ton hydraulic press, was fabricated from four segments by arc welding because of the inability of steel foundries to produce a cast column with a 14" bored hole straight enough to allow a 13" rod to pass through it. Murex downhand electrodes were used, starting with 5/32" rods and changing to 5/16" size as the width of the joint increased.

120 degrees Fahr. below zero, allowed to return to room temperature and finally tempered again at 1050 degrees for 3 hours.

The bits then were ground with proper cutting angles. In service it was found that 100 forgings could be turned before it was necessary to regrind the bits. In other words, cutting efficiency showed the astounding increase of 400 per cent.

The entire procedure was repeated several times to check the accuracy of the first findings and results were comparable. A few bits did provide shorter runs but it was found that 100 pieces per grind was the average figure.

Under some conditions cracking does occur but through increasing familiarity with the new process such cracking can be held at a minimum. Of course, it is desirable to avoid sharp corners and even sharp edges should be avoided since these can be ground after treatment. Rockwell hardness testing after refrigeration and before tempering also should be avoided since cracking sometimes occurs at the point of indentation.

It was observed that hardness right after refrigeration was rather high, usually by one or two points more than obtained by conventional hardening. However, in this condition edges are rather brittle but toughness may be developed by tempering. It also was noted that not all of the austenite is transformed in one cycle of cooling and tempering. After the second cycle, decomposition of austenite appears to be complete.

Other types of tools, as well as bits, may be treated similarly, these including milling cutters, form tools, drills, reamers and the like. Design of most tools results in a greater tendency to crack but this can be checked by slowing up the rate of cooling after the original quench. This may be accomplished by wrapping the parts in one or two thicknesses of paper and placing them in the refrigerator.

It is important to note that cooling from the quench must be continuous for, if the tool is allowed to remain at a constant room temperature, the austenite becomes sluggish and best results will not be obtained when cooling is resumed.

It is difficult to improve the cutting qualities of stock cutters since the heat treatment record often is not available. However, such cutters may be refrigerated at 120 degrees below zero for 6 hours and allowed to resume room temperature normally followed by tempering at 1000 to 1050 degrees for 3 hours. If the cutters have been double tempered prior to treatment, little improvement results. If the cutters have had only a single temper, cutting qualities often are decidedly improved.

High speed steels of the molybdenum type may be handled in a similar manner with the exception that the usual lower hardening temperatures should be used.

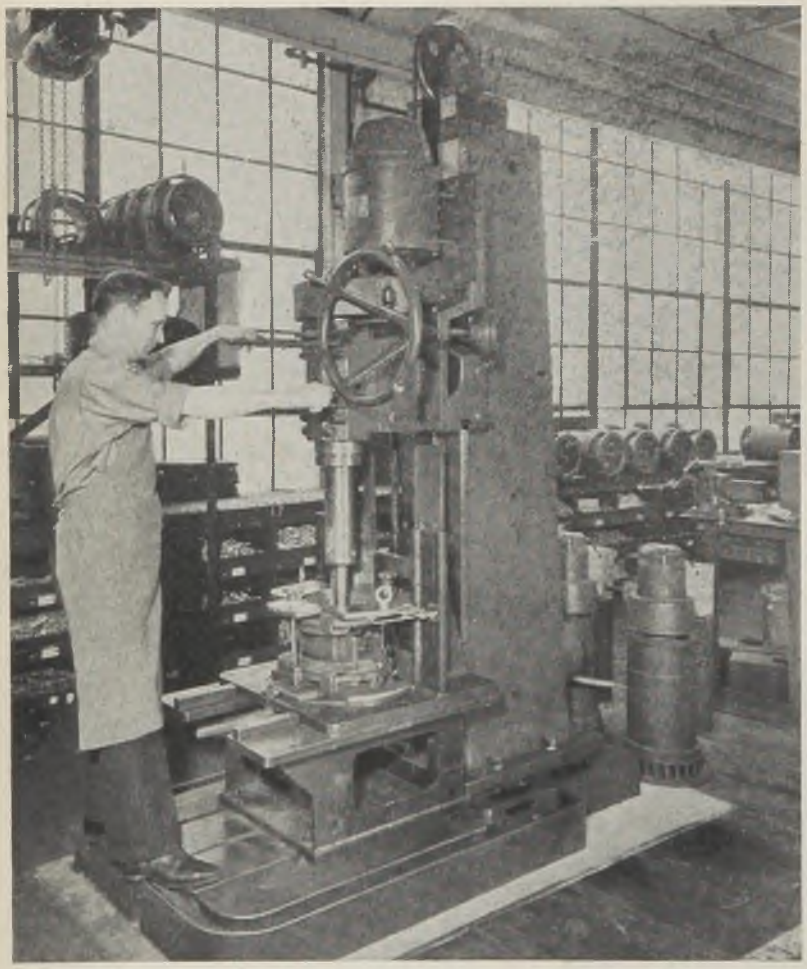
Many steels other than those of the high-speed type may be treated successfully by the sub-zero method. Nickel carburizing steels such as SAE-2315 and 2312 usually are hardened by carburizing to the required case depth either by the pack method, or in gas or liquid mediums at temperatures ranging from 1550 to 1700 degrees Fahr., followed by quenching direct from the carburizing furnaces; reheating to 1375 to 1425 degrees Fahr. to refine the case; and oil quenching again.

Two Alternate Methods

An alternate method is to cool in the retort after carburizing; reheating to 1500 degrees to refine the core; oil quenching; reheating to 1375 to 1425 degrees to refine the case; and oil quenching. With a third method, parts are carburized, pot cooled and reheated to only 1375 to 1425 degrees Fahr. for case refinement and oil quenched.

Any one of those treatments following carburizing can result in surprisingly low hardness ratings, often 58 to 60 rockwell C and even lower. If temperatures are dropped to lower levels the case hardness suffers. And, here is where refrigeration plays its part. A heat is selected that will provide the proper case hardness. Should this be high enough so that hardness in the case falls off due to an austenitic condition, parts made of this heat can be refrigerated to 120 degrees Fahr. for an average of 6 hours and transformation will occur that will raise the rockwell hardness of the case about four points to 62 to 64 without affecting the character of the core. This operation, however, should be followed by tempering for at least 2 hours at 300 degrees Fahr.

Steels of the nickel carburizing type do not require cooling immediately after the quench but can be refrigerated even after tempering, provided that the tempering temperatures have been low or, in other words, in the range of 300 to 350 degrees Fahr. Refrigeration, how-

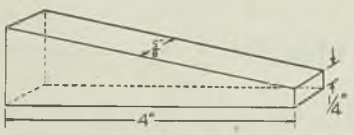


HOME-MADE PRECISION TOOL: Assembled from parts of other machine tools by Reliance Electric & Engineering Co., Cleveland, this motor stator boring machine is the company's answer to a production emergency. It does an accurate job of boring through stator gaps of several sizes of alternating-current motors. Features include 27-inch ways, with clearance for tool removal; operation of feed and spindle motors from a single V-S drive, and speed range of 120 to 960 revolutions per minute, with feed from 0.004 to 0.012-inch per revolution at any spindle speed. Boring accuracy is guaranteed by a vertical cradle fixture with ground and hardened adaptor plates

WEBBER ANGLE GAGE BLOCKS

SPECIFICATIONS

Furnished in sets of 14 blocks in 3 Series as follows:—
1st Series—Degrees—
1—3—9—15—30—45
2nd Series—Minutes—
1—3—9—27
3rd Series—Seconds—
1—3—9—27



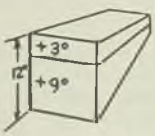
A complete set of WEBBER Angle Gage Blocks will yield any angle from 0° to 103°—a total of 370,800 angles—in steps of 1 second of an arc.

Working surfaces are optically flat—blocks wring together and adhere same as regular gage blocks.

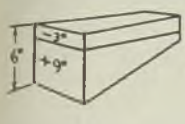
Every set includes a parallel and knife edge.

HOW THEY ARE USED

Webber Angle Gage Blocks are used for precision measurement of angles in the laboratory, inspection room, shop, etc. To obtain a desired angle, blocks are selected from the set which when added—*or subtracted*—will yield that angle. These blocks are wrung together and will adhere just as with gage blocks.



Example: To obtain an angle of 12°—take the 3° and 9° blocks and wring them together with the large ends marked "plus" adjacent. Thus, 3° plus 9° equals 12°. To obtain an angle of 6° take the same two blocks (3° and 9°) but wring them together with the "minus" end of one adjacent to the "plus" end of the other. Thus, 9° minus 3° equals 6°.



Very little study is required to comprehend how 2 or more Angle Gage Blocks may be wrung together to produce any angle in degrees. The blocks in minute and seconds are combined in the same manner and added on.

In the minute and second series only 4 blocks are needed which will combine to form up to 30 minutes. If 32 minutes is required—simply add to the original measurement one more *degree* (60 minutes). Then subtract 28 minutes from this—leaving 32 minutes which was required. No mathematical computation is involved in using WEBBER Angle Gage Blocks. With each set is furnished a table showing which blocks to use and how to combine them to get any angle required. Precision angle measurement is reduced to an extremely simple, fast, sure operation.

If after long use or extremely hard wear, they become damaged or inaccurate, they can be returned to WEBBER Gage Company, and restored to "like new" condition at a modest cost.

Absolute accuracy is assured since proof of the accuracy of the blocks is contained within the blocks themselves. This is true of gage blocks for linear measurement. Example—wring together any number of gage blocks to make a size equal to that of a single block. Then the group of blocks will check perfectly with the single block. By this principle—if the largest block in the set is correct then all the other blocks in combination checking with it must also be correct.

This principle applies in checking WEBBER Angle Gage Blocks inasmuch as the starting place is a straight line (instead of the largest block in the set as above) and a straight line can easily be checked by optical means.

WEBBER Angle Gage Blocks are guaranteed accurate to within $\frac{1}{5,184,000}$ part of a circle. Such accuracy, obviously, cannot be checked with the usual shop tools any more than regular gage blocks can be checked with a micrometer.

A limited number of sets of WEBBER Angle Gage Blocks are now available. Literature and prices furnished on request.

Webber GAGE COMPANY

12915 TRISKETT RD., CLEVELAND 11, OHIO

ever, must be followed with a draw.

Reactions of other carburizing steels, such as SAE-3115 or 3120, 4320, 4615, 4620 and 4815, to the refrigeration process are similar, but to a lesser degree.

The process also has been found to work well with the tungsten shock steels having the approximate composition of 0.50 carbon, 1.25 chromium, 2.75 tungsten and 0.25 vanadium. For many applications a higher surface hardness is required than may be obtained by conventional heat-treating methods. The desired hardness also may be had by carburizing as in the case of other steels but even so, under certain conditions it is not high enough after quenching to meet specifications. Again, refrigeration may be made to play its part, temperatures of 90 to 120 degrees Fahr. below zero being employed for periods of 6 to 12 hours, depending upon the size of the piece. Tempering for a minimum of 2 hours at 300 degrees Fahr. should follow refrigeration. Hardness ratings generally will increase from 59 to 60 rockwell C to 62 to 64.

In handling the oil hardening die steels, which often react favorably under refrigeration, the usual procedure is to preheat first to approximately 1200 degrees Fahr. This is followed by transfer to a furnace operating at 1425 to 1475 degrees, heating through and quenching in oil. Should the piece be so formed that some change in shape is inevitable upon oil quenching, it may be quenched in a molten salt bath operating at 375 to 400 degrees and followed by air cooling. After cooling to about 125 degrees, this type of steel should be tempered at about 300 degrees. Refrigeration to minus 120 degrees for 6 hours often will increase hardness values 1 to 3 points on the rockwell C scale even though applied after the tempering operation. Retempering at 300 degrees, however, is a requisite.

Stainless steel of the 18-8 type is difficult to harden through conventional heat treatment since its carbon and alloy content cause it to soften when quenched from temperatures of 1800 to 2000 degrees Fahr. Of course, this type of steel usually is not used where hardness is a factor. When considerable hardness is essential in using this steel, a shallow surface hardness may be obtained with special nitriding methods. More satisfactory surface hardness, however, may be had by introducing refrigeration. First, the pieces are carburized, preferably by the liquid method but pack carburizing may be used. This is followed by quenching in oil or brine and refrigerating at 120 degrees below zero. Hardness values to 60 rockwell C have been obtained by this method.

SAE-52100 can develop a condition of retained austenite on quenching as well as other alloy steels which evolves problems difficult of solution. In one case, the manufacturer of a line of pumps found that the plungers "grew" in service through the decomposition of austenite into martensite which requires more room. These plungers were heat treated by conventional methods and ground to very close tolerances but an examination proved that breakdown of the austenite was incomplete in the tempering operation and was taking place as the part aged. The decomposition was accelerated to the point of completion by tempering, refrigerating, retempering, refrigerating and retempering and no further difficulties were reported in the field.

The possibilities for use of refrigeration in connection with straight high carbon have not been fully explored but the prospects for further developments in this field appear to be bright. For instance, the introduction of refrigeration into the heat-treatment cycle for cupping punches for steel cartridge cases increased the life of these punches from 3000 to 30,000 strokes.

In studying the progress of the decomposition of the products of austenite by refrigeration, it has been found difficult to trace this progress by microscopic examination. However, ordinary methods of testing used such as for magnetic qualities, size change and hardness, provide definite indications of structural change. It is believed, therefore, that the martensite precipitate is so finely distributed that only magnification of 2000 diameters or more will reveal the progress of the treatment.

It should be noted in employing the method that types of quenching other than oil do not alter the subsequent cooling and tempering cycles. Parts quenched in a salt or lead bath should be placed in the refrigeration unit at the proper time to permit continuous cooling. When straightening is required, the parts in question may be removed from the bath at higher than normal temperatures—say 450 to 500 degrees —and restored to their original form as they cool to 200 degrees. This should be followed by continuous cooling to maximum sub-zero temperature.

Under-Floor Heating System Works Exceptionally Well

LAST WINTER radiant heat not only kept employes in Murray Corp.'s new plant "definitely comfortable" at a temperature of 65½ degrees, but also eliminated drafts. Installed as a method of saving critical materials, the under-floor heating system proved to be the best of three systems currently used by the company, according to A. M. Byers Co., Pittsburgh, suppliers of wrought pipe used in the system. The radiant system operates from the same stoker-fired hot-water boiler that supplies unit heaters in the old portion of the plant and the standing radiator system in the office.

One day last winter—temperature 10 degrees with a strong wind—the office building, with standing cast iron radiation, registered 75 degrees and felt "stuffy". The original building with unit heaters was at 70 degrees and felt cold and drafty. The new addition, with radiant heating, felt "definitely comfortable" at 65½ degrees and there were no drafts. A full season's experience confirmed these reports and established the system's reputation.

Some 2360 feet of 1¼-inch wrought iron pipe are assembled into three banks of grid coils. Each run of pipe in each bank rests on a strip of 1 inch Celotex, 8 inches wide which in turn rests on a 6-inch crushed stone fill. A 6-inch topping of concrete covers all. See accompanying illustration.

Manifold headers consist of 2-inch wrought iron welded to 8-foot lengths of 1¼-inch wrought iron pipe on 18-inch centers. Hot water is circulated by three 1/6-horsepower pumps, one for each of the grids in the boiler return line.

The floor coils not only were successful in carrying the entire heat burden, but it was found desirable to reduce the design flow temperatures from 110 to 98 degrees Fahr. This reduced the floor temperatures to 75 degrees, giving an air temperature of around 65 degrees, yet insuring uniform heating throughout the affected area.

Will your production make this National †† Industrial Pa

RESEARCH reveals that in the 12 years, 1929-1941, the nation's output per man-hour increased 34%. The rate is 2½% per year compounded. And there is ample evidence accumulating that the rate will advance to at least 4%. War — the supreme national productive effort it calls for — accelerates man-hour output. Improved production techniques — developed in war — carry over into peacetime; the pent-up buying power released after Victory will tremendously stimulate production.

Thus manufacturers who intend to keep step with a high level of national prosperity — the volume production which means more goods for more people at lowest cost, and security of jobs and wages for the greatest number of workers — must strive to increase their output per man-hour 50% every 10 years.

To put it another way, American industry sets a definite national industrial PAR for man-hour output or production — 4% compounded per year rate of increase. The management of your company can determine its own competitive standing in terms of its ability to make or break this PAR.

Every industrial executive knows the key importance of machine tools in reaching production goals. Machine tools were basic to the phenomenal achievement of the American aircraft industry in attaining and surpassing the 60,000 plane quota set at the beginning of the war. The majority of the war industries — all machine tool users — were able to produce at a rate far in advance of the timetables set for them.

Manufacturing for peacetime markets is as much of a challenge as manufacturing for war. To make better products — faster — at lower cost — will call for the newest and finest machine tools — essential implements of production efficiency and the increased output that means security of jobs and wages.

Back the attack **BUY MORE BONDS**

Spotlight facts for your future I.P. *planning*

* Production methods — developed in wart —increase man-hour output; pent-up buy power — released in peacetime — dema increased production.
* The rate of 2½% increase per year out per man-hour, established by a 12 year rec of industrial production, can be expected reach at least 4% per year — compounc
* Manufacturers must set a goal of 50% creased output per man-hour every 10 y — to maintain a high level of national p perity and achieve its benefits in terms security of jobs and wages for the grea number of workers and the volume produc of more goods for more people at lowest c
* Machine tools — the most modern, most cient — are recognized as the most effec implements of mass production and increa output at lowest cost — but only contin replacements with the newest and finest chine tools assures full productive capac *Such replacements yearly should be equa 10% of the total machine tool investment in keeping with increased output.*
* The cost of machine tools is insignificant terms of their productive power . . . f 1927 to 1937, according to census repo American manufacturers had only a total about 2% invested yearly in machine tool ratio to a total volume of 9 billion doll worth of production annually.

†† **Industrial Par** — *the constantly increas output per man-hour equal to approxima* 50% *every 10 years.*

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Republic's Electrolytic Tin Plate Line Starts Production

By GEORGE R. REISS
Youngstown, O.

Fig. 1—Looping pit, 40 feet deep, provides reserve strip for plating while new coil is being attached

ONE OF the most important of the new installations of electrolytic tinning equipment in the nation's steel plants is the two tinning lines just put into operation by Republic Steel Corp., Niles, O., works for the Defense Plant Corp. That is because each of the two lines is among the largest of the approximately 29 electrolytic tin lines installed since Pearl Harbor, also because they are probably the most versatile, for they easily may be converted after the war, if the demand should arise, to electroplate steel with other coatings such as lead, zinc, copper, and other materials.

Each of the two lines will contribute a great deal toward adjusting the nation's supply of tin, sharply reduced by the Japanese capture of the big tin-producing mines of Singapore and Malaya, to the demand; each of the two lines will save an estimated 750 tons of pig tin—or 1500 tons between them—over the old hot dip methods, in producing 1,800,000 base boxes of tin plate annually on each, or 3,600,000 tons for both units.

These two units, each 540 feet long, are so versatile that they will handle strip from 16 to 38 inches wide, from 36 to 22 gage (0.007 to 0.030-inch), will put on the steel any thickness of coating desired, and will deliver the finished product either neatly recoiled or cut into pieces of whatever length and width desired and neatly stacked, free of scratches or other blemishes.

Preliminary estimates, based on regulations so far issued restricting the ordinary uses of tin plate, have indicated that the country's military and civilian requirements could not possibly be met because the present available supply is rapidly diminishing, unless new plating methods were developed on a large scale to yield usable plate with considerably less than 1¼ pounds of coating, approximately the minimum which can be satisfactorily applied by the conventional hot-dip process.

Under the old hot dip methods of making tin plate formerly used in Republic's Niles plant, generally 1½ pounds of tin were required for each base box (112 sheets containing 217 square feet of plate), but the electrolytic process now used has cut the tin required to a ½-pound per base box, or a saving on tin of two thirds, and the thickness of the perfect coating is only 0.000030-inch.

These two new lines have made obsolete the fine hot dip tinning plant that Republic Steel Corp. built and opened at the Niles works with much fanfare only six years ago. Then the Niles plant was proclaimed one of the finest tin plate plants in the world; but many of the tinning pots since have been ripped out to make room for these electrolytic lines.

Installation of the lines made it necessary to greatly increase the floor space and the size of the plant. An addition of 200 feet in length was added to one building which originally was 420 feet long and 76 feet wide; a 160-foot addi-

Fig. 2—In these plating cells the strip runs between contact rolls with vertical bus bar, connecting anodes, shown in right foreground. Each cell adds a portion of coating to one side of strip only. The other side is plated in cells on upper deck

Fig. 3—Chemical treatment tank beneath rolls in foreground removes oxide film from flow brightened tin surface and applies thin adherent film which improves enamel adhesion and retards discoloration during baking operation

Fig. 4—Induction melting unit in background melts tin deposit and fuses it to steel base of strip. Note change in reflectivity as tin melts at bottom coil. Precision tension unit, right center; flow brightener control desk, left foreground. The horn is part of the intercommunication control system

Fig. 5—On top deck of plating section strip passes through a solution recovery tank and then through a spray rinse shown in foreground. Recovery operation minimizes loss of plating solution containing valuable dissolved tin

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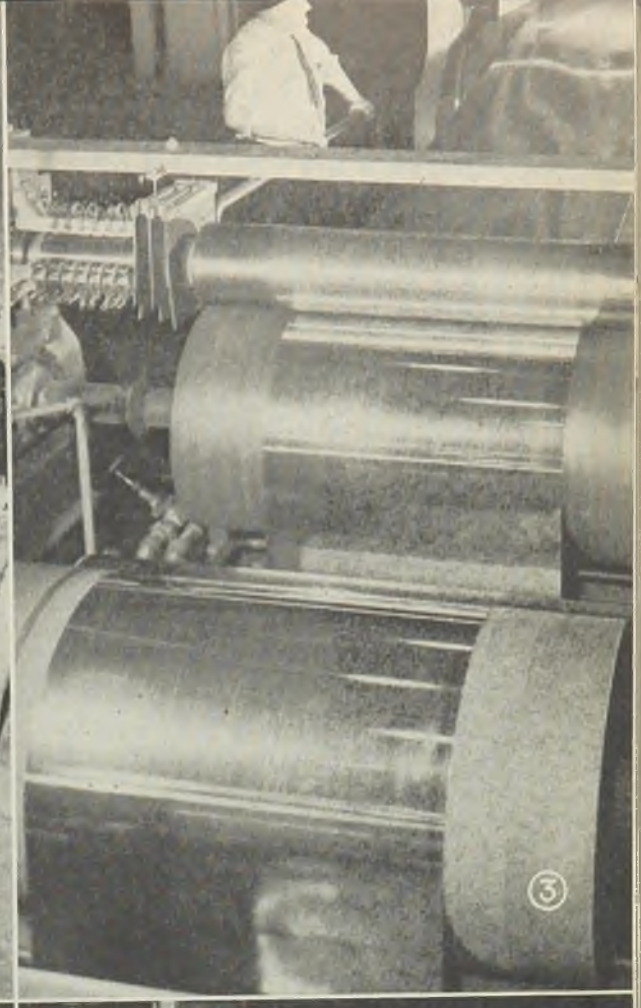

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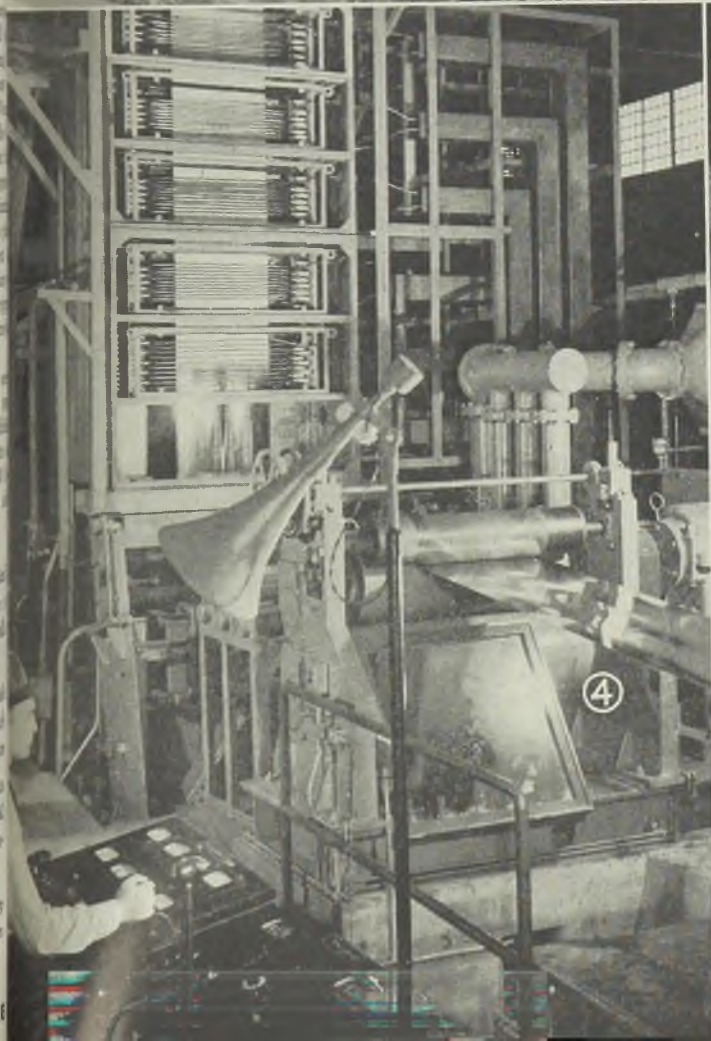

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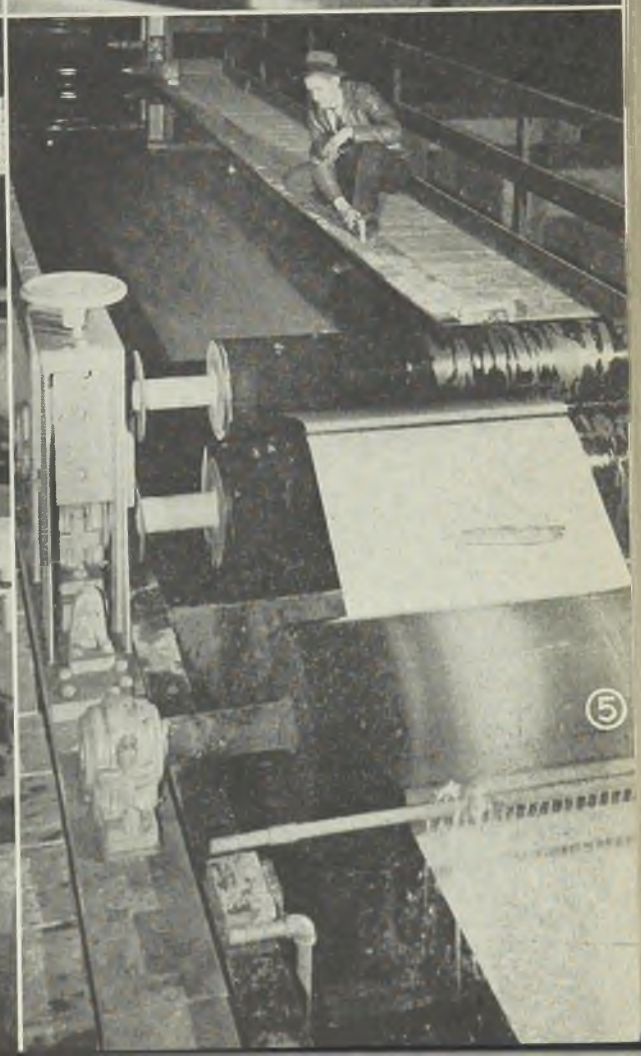

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tion was added to a second building originally 240 x 60 feet.

The electrolytic tinning line is essentially a continuous process which takes the strip steel in coil form from the cold rolling mills and after side trimming, cleaning and pickling, deposits tin on the strip electrolytically. Like the continuous rolling mill, the continuous electrotinning line must deliver a quality product at a relatively high speed and with a minimum of interruptions for adjustment or repair of equipment.

Involves Accurate Relationship

One of the most important considerations is the accurate relationship which has had to be established and maintained between the current density used in the plating bath and the speed with which the material is moved through it. To obtain the maximum production from the equipment, it was found that this speed must be maintained at as high a value as is consistent with the production of high-quality product. These requirements have presented some knotty problems from the standpoint of the synchronization and control of the many drives operating in tandem.

In the Niles works, the strip which comes from the company's Warren, O. mills enters the tinning line from one or the other of two uncoilers which are used alternately. About 875 feet of strip are needed to threadline the two Niles lines which can handle coils of 15,000 pounds and up to 62 inches outside diameter. Larger coils up to 30,000 pounds could be handled by changes in the uncoilers. The strip runs through the line at speeds ranging from 500 feet per minute up to a maximum of 1000 to 1300 feet per minute.

As a new coil of strip is made ready for a run through the continuous tinning line, it is first slipped on the idle uncoiler, then as the preceding coil of strip is nearly exhausted, the line is slowed to a speed of about 100 feet a minute and the trailing end of the exhausted coil is stopped. A loop in a deep looping pit, meanwhile, furnishes material for the line. The trailing end of the preceding coil and the entering end of the new coil are swiftly welded together and the line is made to resume its normal speed again.

The steel moves through tension and drag rolls, then through an electrocleaning tank, through a pickling unit, and again through some scrubbers which insure that its surface is clean and bright and free of scale or grease or other impurities and will receive the electroplating. Then the steel moves through the plating tank, a series of 12 cells which coat only the bottom side of the strip. The line is ingeniously arranged so that it can operate even if one of these 12 cells is down for repairs.

Du Pont halogen electrolytic tinning solution is used in the cells. Copper oxide rectifiers are used in this installation to deposit the tin on the steel from a cast-tin anode. This is the largest installation of low-voltage rectifiers for plating in the world.

The tin then moves "upstairs" to the second deck of 12 cells which again coat the bottom of the strip—but the bottom was the top of the strip in the lower deck. And again the strip moves "upstairs" to the third deck, where it runs through a tin solution recovery tank and rinse tank. This solution is expensive, costing about 35 cents a gallon, so none is wasted.

Finally the strip is ready to emerge from the line but instead of the bright shiny finish of hot dip tinplate, it is dull gray in color. Republic found that tin plate with that dull gray color is good tinplate but not saleable. So now it passes through a "flow brightening" operation—that is, a method of heating the ribbon of tin plate as it runs through the line; as the tin melts, then cools, it gets a bright finish. This flow brightening method is partly the invention of C. J. Duby, chief engineer, Republic's Warren plant, and inventor of many other devices.

Coated stock is run through various chemical treating and emulsion oiling tanks, through a lap detector which indicates the ends of the coils, and finally, if it is to be recoiled, it moves into a coiling reel. But if it is to be cut into short lengths, it goes through a flying shear, past a pinhole detector which can detect the slightest blemish, through an off-weight piler which sorts out the pieces not up to the standard thickness. Prime tinplate moves to a prime piler which carefully piles it up so that it shows not even the slightest scratch or blemish—and it is ready for the market.

Equipment Is Flexible

The equipment provided in these new electrotinning lines has been made flexible enough to produce 0.5-pound per base box tin coating at high speeds, yet has enough plating capacity to produce the heaviest coating weights contemplated at present, at the normal operating speed of the line.

Every part of the operation has been directed toward producing the best quality tin plate, the best of base metal surfaces, electrocleaning, pickling, plated under carefully controlled conditions and finished to suit the customers' most exacting needs.

Finished product is used for food pack, including vegetables, meat products and fish, for milk cans and other purposes.

In building the two lines, Republic engineers had an enormous electrical installation job, for an enormous quantity of electrical equipment is required. Two basements, 300 x 19 feet and 64 x 55 feet, and provided with the most modern ventilating and air cleaning equipment, house this electrical equipment.

In wiring the two tin lines, 141 miles of copper wire and 17 miles of conduit were needed; there were over 500 ro-

Fig. 6—Automatic micrometer, which registers on dial in front of operator, actuates a gate which throws off-gage sheets onto lower conveyor to be piled separately. This is the delivery end of cutting and classifying unit looking across control desk in direction of travel of strip

Fig. 7—No. 1 uncoiler starts strip through plating line. Pinch roll, crop shears and welder are shown in background; entry control desk, in right background

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tating machines, with 400 indicating electrical meters and 26 temperature indicator-controllers required.

High-frequency current output of the equipment needed to operate the new flow brightener alone is equal to the output of the 48 radio stations the size of such big ones as KDKA or WTAM.

Strip handling equipment of the line is powered with 230-volt direct-current motors using a variable voltage system for speed control and synchronizing. Auxiliary constant speed motors are 440 volt, 60 cycle, three phase.

An unusual feature of the line is the loud speaker system with microphones strung at every vital spot. Thus every man along its 540-foot length is working as near any other man on the line as if he were standing next to him. The loud speaker system also is installed in the office of H. P. Munger, superintendent of the electrotinning lines, and he can converse with any of his men or know what is going on along the lines without leaving his chair.

Precision Casting

(*Concluded from Page 82*)

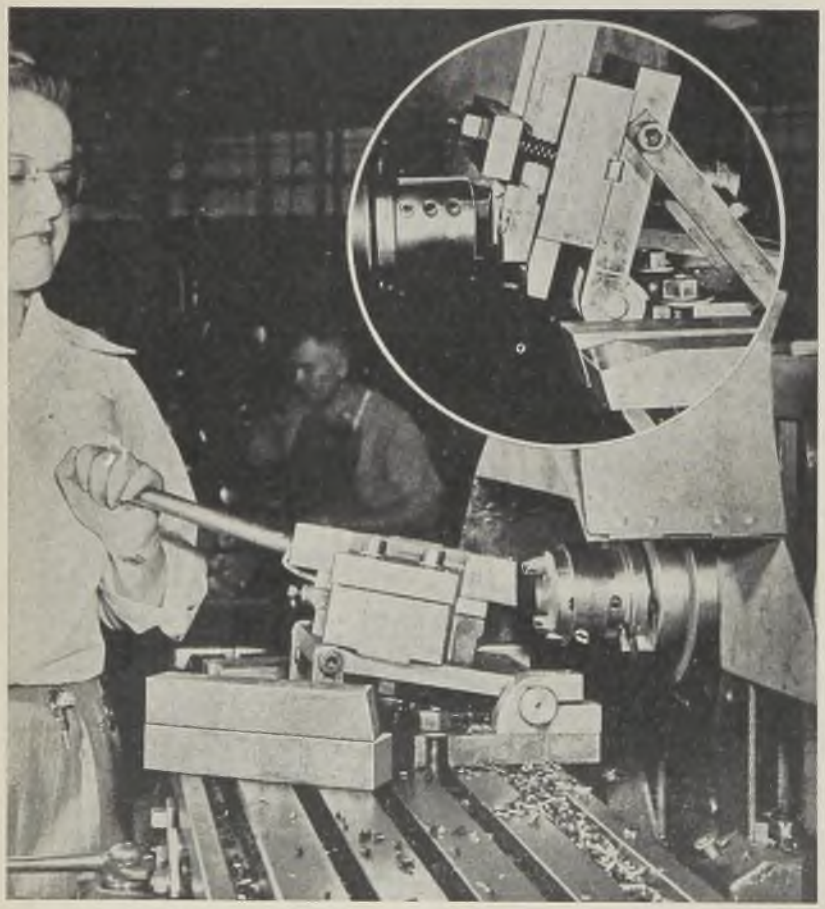
gate and flows through the several side gates into the properly arranged cavities of the pressure casting mold. After a few minutes, during which time the metal has "set" the mold is removed, and the furnace returned to its original position.

With this method, a considerable amount of experience has been gained in the use of alloys ranging from the 13 per cent chromium steels through the 0.25-0.30 per cent nickel chromium and the 0.80-0.20 per cent nickel chromium alloys, to the more refractory cobalt-base alloys and on into the refractory carbides.

These alloys are being cast into bucket blades, the buckets being either single or in consecutive gangs, with an as-cast surface requiring only a finishing operation and polish, and with dimensional tolerances within a few thousandths of an inch permissible variation.

The ease with which complicated shapes can be accurately made, together with a surface finish capable of accurately reproducing 1/16-inch part numbers the surfaces, makes this process a potentially powerful production tool. Most parts can be readily cored, and too, this method has also been used for the production of bimetal parts wherein the higher-melting alloy is cast first (or used as an insert in the mold) and the lower-melting metal or alloy is subsequently cast. This provides a convenient method of making composites which utilize a minimum amount of the more highly alloyed strategic materials by using them as the working surfaces only.

In Fig. 2 are shown a number of turbine blades cast with such precision that they may be assembled by the hundreds to form the wheel. The 12 "buckets" shown in Fig. 3 are cast in one piece and assembled in segments rather than individually. The segment is smaller than any of the individual blades shown in Fig. 2. The milling cutter shown in Fig. 4 comprises an example of casting in high speed steel. Turbo-supercharger wheels or rings now are being cast in one piece with entire unit, including the individual blades, held to extremely close dimensional limits.



SUPER-SPEED MILLING: SAE 1095 steel shanks for carbide cutting tools are milled at Carboloy Co. Inc. at speeds in excess of 600 surface feet per minute although depths of cut reach 11/16-inch and feed as high as 0.006 to 0.007-inch per tooth. Photo shows shank end being milled off on a Cincinnati machine at the rate of 635 feet per minute with a 2½-inch diameter two-bladed carbide-tipped cutter. Angle is 10 degrees and width of cut 1½ inches. Insert: Side and top rake angles are milled on this Milwaukee machine, the same fixture being used for both, the tools merely being turned and the fixture backed out slightly. Milling cutters are made up by mounting two slightly reground standard Carboloy tools in a cutter body

Record Coat of Cadmium Given Steel Plates

Cadmium is now being electroplated on base metals in coats more than 50 times as thick as those normally deposited. The Electroplating Division of E. I. du Pont de Nemours & Co. reports that in one plating shop, that of Thomas-Thiel Inc. of Wilmington, Del., steel plates 8 feet long, over 2 feet wide and approximately 1 inch thick are being electroplated with cadmium to a thickness of about 0.02-inch, using about 30 pounds of cadmium per sheet. This compares with a normal thickness of about 0.003-inch.

Du Pont anodes of pure cadmium metal and Cadalyte cadmium plating solution are used to produce the record coating.

The bath is sufficiently deep to cover the steel plates, which are suspended on the cathode racks and moved lengthwise in the tank throughout the plating processes. To obtain the specified thickness of cadmium, 40 hours in the bath are required. The complete operation is accomplished in stages. This is necessary because sand-blasting the base metal surfaces leaves projections on which "trees" or spikes of cadmium tend to concentrate. Between each stage the sheets are removed, the incipient trees are brushed off, and the sheets are returned to the tanks for further processing. No effort is made to achieve a mirror-smooth finish on the completed sheets.

The effect of repeated immersions is to deposit the coating in laminations; with several laminations, the possibility of pits or holes in several layers coinciding is removed. There is an added safeguard against corrosion at pits in the electrolytic action between the two metals, tending to protect the steel preferentially.

No Slide Rule Formula

The Cleveland Automatic Machine Company's "Production Cost Patrol" is an engineering service. Its purpose is to provide a competent "outside approach" to your turning and forming problems, and, working in co-operation with your production experts, to seek out hitherto undiscovered waste in production methods.

Engineers who would come to your plant to perform this service do not merely ask a few questions, whip out a slide rule and a convenient formula for making changes. Instead, a thorough study of methods is made. Wherever possible, specifications of pieces in production are taken and samples produced by methods our engineer works out. If the new method affords improvements in cost and production, you are given a full report on the comparison between present and proposed methods, detailing every unit of time, manpower and equipment involved . . . showing not only HOW but WHY.

The steps to bring about such a study in your plant are simple . . . (1) Upon request you will be given a statement of our engineer's method of surveying your plant, and his credentials will be submitted. (2) The engineer will spend as much time as necessary in your plant, making detailed studies, without interrupting production. (3) A detailed written report will be made for you, with proposals for changes in method wherever opportunities for savings are found.

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AN ENGINEERING APPROACH TO THE SELECTION, EVALUATION AND SPECIFICATION OF

METALLIC MATERIALS

In this, the seventh installment of Dr. Gillett's report for the war agencies on metallic materials, special tests for such factors as corrosion and wear resistance are discussed. In previous installments, Dr. Gillett explained the meanings of conventional tests and pointed out that chemical composition alone is not a sufficient criterion in evaluating materials. His outstanding series will be concluded early this year

By H. W. GILLETT

CHAPTER VI
Special Tests

Some tests have *no meaning at all* unless they are specifically planned to correlate with service. Under such special tests can certainly be listed tests for corrosion-resistance, for wear-resistance, and for properties as bearing metals. With almost equal propriety, those for resistance in high temperature service can be included. As has been pointed out earlier, damage testing in fatigue, and notched-bar impact testing may also fail to give truly pertinent information unless the service conditions are duplicated with a great deal of exactness.

Corrosion Testing

Corrosion is a chemical process, hence, corrosion resistance is not unaffected by the chemical composition of an alloy. Most types of corrosion of steel are, however, not particularly affected by small changes in composition. Iron rusts, and whether we use iron or 99.9 percent purity or a constructional steel that contains 95 percent iron, the iron is in the ascendancy and they all rust about alike. For ordinary steel, then, protecting by some coating, as by painting, enameling, or galvanizing is necessary, unless the corroding influence can be kept away by other means.

The nature of the corroding medium is of great importance, so in testing for corrosion resistance it is necessary to make sure that we use the actual corroding medium that will occur in service. Even with the correct corroding medium, there is a natural tendency to use, when resistance to an acid is concerned, for example, a stronger solution of the acid, so as to speed up results. This is seldom safe, for the chemical reaction may be quite different. Again, aerated sea water corrodes some alloys very differently from stagnant sea water. As a rough guide it may be said that in testing corrosion resistance in the laboratory, unless the corroded surface looks just like one corroded in service, the test will probably mislead rather than guide.

There is no corrosion without a corrodent, so a corrosion test should always consist of two parts. Part one is the material to be tested, which should be so thoroughly pedigreed as to composition, method of manufacture, surface finish, etc., that there is reasonable hope of being able to duplicate it, or to trace the causes for any peculiarities in its behavior. If the test is designed not merely to evaluate one particular

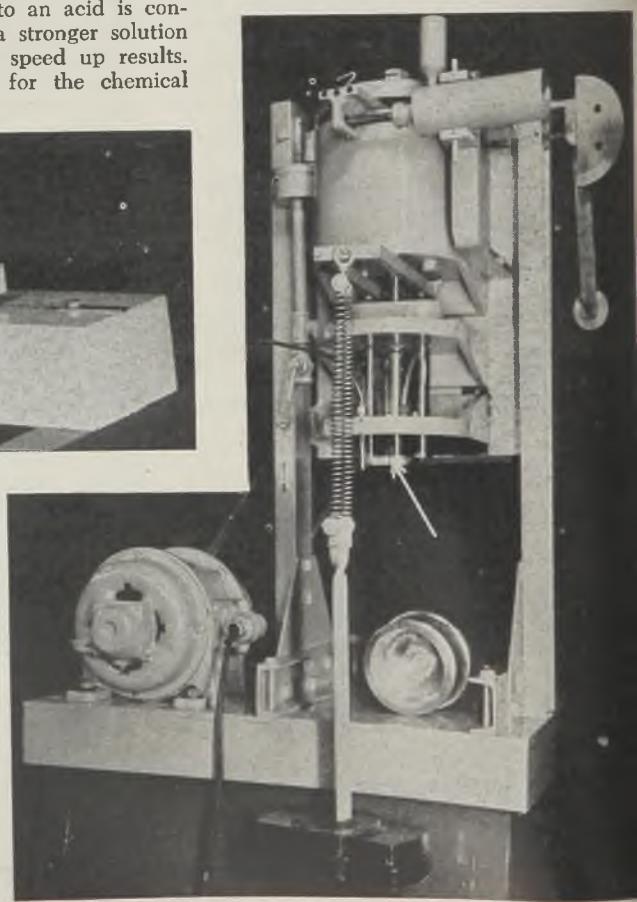

Fig. 38 (Above)—A wear-testing machine which closely simulates actual service conditions. Used in a study of the wear of machine tool beds and carriages, the machine reciprocates two short specimens representing the carriages of machine tools over two long specimens representing the beds of machine tools. The movement of the specimen is slow, as in service, and wear is likewise slow, as in service

Fig. 39 (Right)—A wear-testing machine in which the specimens are slid together without any rolling action, used for wear studies of materials used in such service. To further simulate service, the specimens can be enclosed in any atmosphere, lubricated as desired, heated to any temperature and run in abrasive if that is necessary. Either wear or galling can be studied, and friction can be measured