

One of four 4000-ton presses in Chevrolet aluminum forge plant at Anderson, Ind. Page 66

STEEL

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MANY industries depend upon EX-CELL-O Precision Thread Grinders for production of accurately threaded hardened parts for war work. Outstanding in the aircraft industry. Aircraft engine manufacturers in the United States are using precision thread grinders for threading parts such as cylinder barrels, crankshafts, propeller shafts, crankshaft bearing bolts, connecting rod bolts, tappet adjusting screws, etc. . . . EX-CELL-O precision thread grinders are so dependable that what formerly would have been considered very delicate threading operations on aircraft engine parts are now handled easily, with assured accuracy, high finish, production. . . . EX-CELL-O precision thread grinders grind fine threads directly from heat-treated blanks and finish grind coarser threads after heat treatment.

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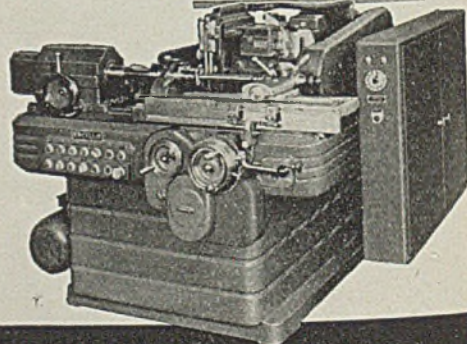


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The Period Between V-Days

Happenings of the past few days have had the effect of putting industry on the alert. Recent changes in the official attitude of Washington indicate that the war program is in the process of a significant readjustment.

Until a short time ago, almost every order from Washington emphasized the need of greater production for war and a progressive narrowing of the margin of materials and goods available for civilian use. Now, quite suddenly, the emphasis has been shifted. Some few surpluses of critical materials are beginning to appear. Hope is entertained in high official circles that more of the nation's output can be shifted to civilian use than had been anticipated. There is a definite easing all along the line.

What does this mean? Wishful thinkers hope that it means that those who are in a position to know have evidence that the war in Europe is going to end soon and that Washington is revising its plans accordingly. Or it may mean that the nation has completed the phase of filling up its supply lines to the battle fronts and now is revamping its production schedules to meet the specific needs of new combat situations.

In any event, the development is bound to focus the attention of every industrialist upon the important period which lies between the date of the victory in Europe and the date of the victory in the Pacific.

Majority opinion seems to hold that V-day in the Pacific will come from nine to 15 months after V-day in Europe. If, as now seems likely, some slight tapering off in war production may occur even before V-day in Europe, then it is apparent that there may be a lapse of considerable time before we are clear out of the war. In short, there will be time for a more or less orderly demobilization; there is little likelihood of an overnight shift from war to peace.

However, even though indications may point to an early end of hostilities in Europe, there is no reason for relaxation. We should redouble our efforts to produce whatever is needed for victory. Two thousand allied soldiers were killed on Armistice day, 1918. Anything we can do to hasten the end in Europe by minutes, hours, days or months will save precious American lives.

Meanwhile, everything that is happening points to the new importance of the transition period between the European and Pacific V-days. Industry must be prepared for the problems of that period.

THEY STRESS ECONOMY: The economy angle seems to loom large in the minds of designers and engineers who are thinking about the characteristics of postwar products. For instance, 81 leading automotive and fuel engineers, when questioned as to their opinions on postwar automobiles, seem to agree on the following:

1. The future trend in automobile design will be toward economy rather than performance.
2. The very large automobile is on the wane.
3. Pres-

- ent comfort, safety, performance and size of the medium-sized car should not be sacrificed any more than necessary.
4. The tiny European-type car is not foreseen, unless forced by economic conditions.
5. Automobiles must be produced with fewer man-hours.

This accent on economy doubtless is prompted by the conviction on the part of engineers that emphasis on petroleum conservation, continued high taxes, inflation, high fuel costs and high production costs

are going to be important factors in the postwar economy. Their attitude is in refreshing contrast to the dreams of some of the idealists in public office who are telling the people of the world that the postwar era will be one of "milk and honey" for all.

—p. 57

A THIMBLEFUL DOES IT: More and more it is becoming apparent that some of us who worked in machine shops in the so-called "good old days" were, like some of the characters in Williams' NEA cartoons, "born 30 years too soon." We should have lived our lives in the shops of today where the worst profanity-provoking jobs are made easy.

No doubt many readers of this page will recall tedious hours spent chipping, grinding or otherwise nursing a broken drill or tap out of a blind hole in an expensive piece of work. Today the persons who were not "born 30 years too soon" do not fret a minute when they break a drill, tap or reamer. They simply call in a specialist who carries the work out into the lot, puts a thimbleful of dynamite into the hole, attaches a fuse and cap, puts a plank over the job, lights the fuse and runs away. After the blast he returns to find the broken drill, tap or reamer neatly removed and no harm done to the work.

Pretty soft, eh?

—p. 86

HOUSE HEEDS CRITICS: In view of the painstaking effort made by scores of war contractors to awaken Congress to the importance of fair treatment by government of companies whose war contracts are being renegotiated, the action of the House Ways and Means Committee in giving serious consideration to this subject is gratifying.

The committee's new revenue bill, which soon will come up for vote in both houses, goes a long way toward meeting some of the most frequently criticized features of contract renegotiation. The bill is subject to amendment or veto, but well informed persons believe it represents majority sentiment among the lawmakers and has a fair chance of passing in substantially its present form.

Title Seven, dealing with renegotiation, would centralize renegotiation authority, afford relief for aggrieved contractors in the Tax Court, exempt contracts of \$500,000 or less and reduce the field of renegotiation by redefining "subcontract."

Title Seven indicates that the committee has tackled its job seriously and conscientiously.

—p. 48

WHAT KIND OF PLANES? A glance at WPB's chart of military plane production will show clearly why we should not be concerned solely with the number of units produced. If one were to go by the number of planes, September was a bad month because output fell below that of August. Also, October would be rated an extremely good month because output mounted sharply.

However, the size of planes also is a factor. For instance, the 7612 military planes turned out in August had an average airframe weight of 7803 pounds, whereas the 7598 planes produced in September had an average weight of 8081 pounds. Obviously there were more heavy bombers in the September output than in the August output. On the score of airframe weight, September was a better month than August. October was a banner month, whether measured by weight, number or dollar value.

—p. 72

SOUND ALTERNATIVES? A financial consultant has written an article for STEEL in which he describes the various problems which will confront certain manufacturers after the war and concludes that merger or consolidation is the logical solution in many instances.

We believe that most readers will agree that the author's statement of conditions is realistic and that his conclusions, in the main, are sound. At the same time, his article suggests certain questions which seem very important to American industry.

One such question is the extent to which merger and consolidation can be carried on without endangering the institution of more or less "free", private enterprise. Mergers can continue in great numbers and with beneficial results only as long as the opportunity remains for new small companies to go into business. Should that opportunity be denied or seriously curtailed and should mergers turn industry into a small family of a few giants, then private enterprise as we have known it would disappear.

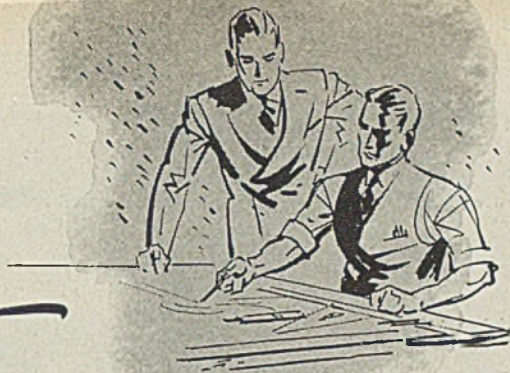
We wish there were more sound alternatives to the merger route—especially for capably managed small companies.

—p. 67

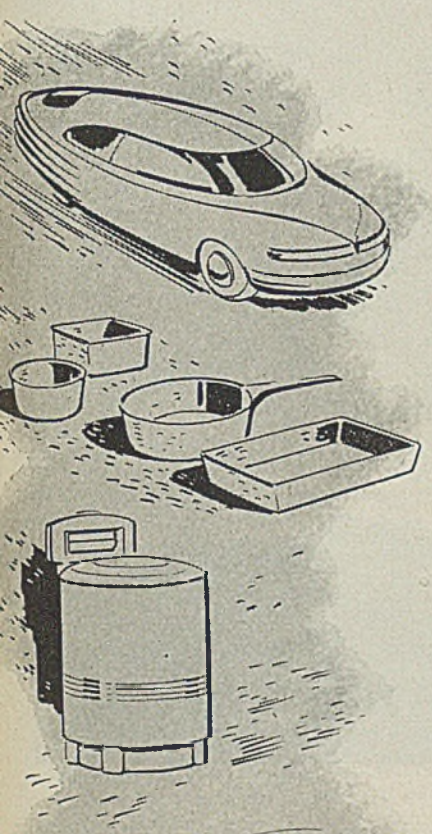


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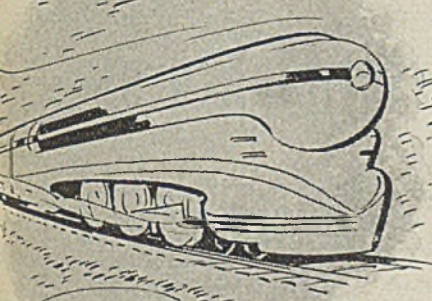


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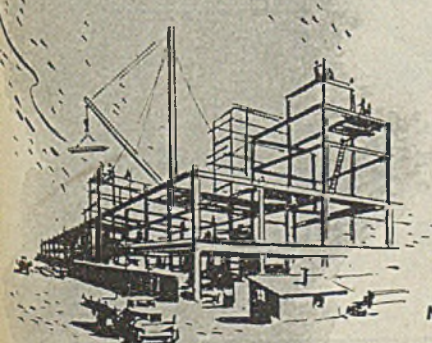


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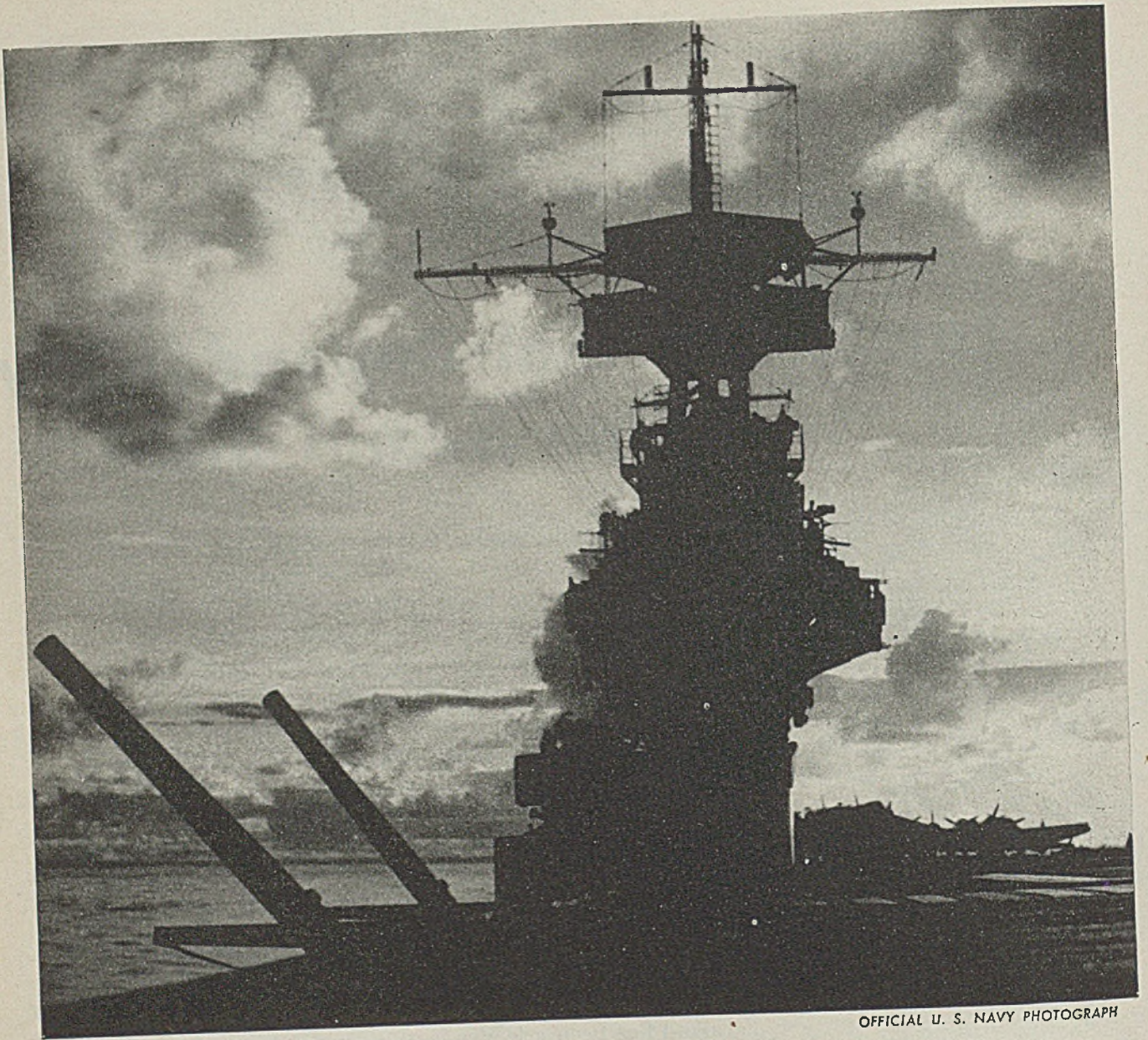
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HOME... of a Restless Pack of Jap-Exterminators!

They call it their "old flat-top" . . . but they wouldn't trade it for a battleship. It's *every inch* a fighting ship. It's a fortress afloat . . . a nest of destruction-minded Navy eagles. A maze of machinery hums beneath its deck, and a thousand men keep the eagles in the air, blasting Japs. Ball Bearings help to keep the "wheels" turning, smoothly and efficiently . . . from engine room to turret lathe to plane.

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ball bearings wisely . . . take care of them and make them last as long as possible. The Fafnir Bearing Company, New Britain, Connecticut.



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Easier Situation Directs Attention To Civilian Goods

Allocations of steel for railroads, food processing equipment increased. . . Small arms ammunition plants being closed. . . Ingots accumulating at some producing centers

INCREASING evidence of an easier supply of steel and other materials formerly considered critical last week gave impetus to consideration of greater production of essential civilian goods.

Outstanding were reports from some steel producing centers that ingots are accumulating. Buffalo reported a surplus of approximately 13,000 tons; a leading producer has reduced operations to 66 per cent. Certain Pittsburgh producers have been making excess ingots. On the East Coast, a softening in demand was noted, due to a decline in export requirements. In Chicago, ingot supply and demand appear to be reasonably balanced. At some centers, ingot stockpiling was attributed to slowdowns in finishing mills.

Throughout industry, however, expectation of an early termination of the European war is directing attention toward reconversion of industry to peacetime production.

In strange antithesis to the prediction of military men that a long and bitter struggle in Europe and the Pacific still remains ahead, the planning for peacetime production is being accelerated. Top government production officials are cautious in estimating the limits to which such production will be allowed.

Certain elements of the picture, however, have emerged rather clearly.

The War Production Board's Requirements Committee has completed the allotment of available materials to military and civilian agencies for their operations during the first quarter of 1944.

Carbon steel continues the controlling factor in war and home front production, according to WPB. Sufficient quantities of alloy steel, aluminum and copper will be on hand to insure completion on time of all essential programs.

Although carbon steel production is still substantially below demand, WPB officials say that supplies to be available during the first three months of next year will be larger than in any comparable period in the past. Hard-boiled fig-

uring places the amount at 14,470,000 tons in controlled material forms. Donald Nelson, WPB chairman, says first estimates of carbon steel supplies for current quarter operations totaled approximately 15,500,000 tons, but this proved to be over-optimistic.

The Office of Defense Transportation has been allotted 1,564,000 tons of carbon steel for the first quarter. This compares with 1,380,000 tons during the current quarter and 1,200,000 tons for the third quarter.

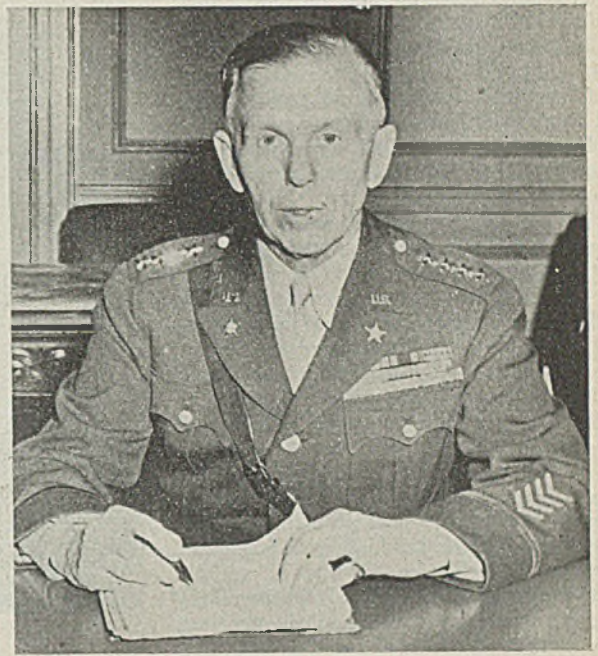
Although the allotted tonnage is less than requested by ODT, it appears to be the maximum quantity that can be utilized in the first quarter by the manufacturers of domestic transportation equipment and steel rail mills in the light of shortages of manpower and facilities not engaged in war production. It represents the largest tonnage granted to ODT in any quarter since it became a claimant agency.

Speed Flow of Raw Materials

ODT officials explain that the 1,564,000 tons of carbon steel includes approximately 88,000 tons for construction projects and track accessories as approved by the Facility Committee of the War Production Board. In past quarters amounts for those purposes were allotted directly to the ODT.

In an effort to speed up the flow of raw materials into the builders' plants, the ODT said that the WPB had assigned the priority rating of AA-1 to locomotives, control automotive replacement parts, and trucks and buses. This action should materially improve the production of these items.

Domestic locomotives, the ODT said, will be constructed during the first quarter of 1944 to the full capacity of the builders' plants after war needs are met.



GEN. GEORGE C. MARSHALL

"We are reaching the end of the expansion"

The ODT also disclosed that the use of alloy steels for future maintenance and construction of locomotives has been granted by the War Production Board in those cases where the railroad so requests.

The ODT also announced that the matter of the construction of all-steel freight cars is under active consideration by the War Production Board, and it is hoped that it may be approved for cars to be constructed in the latter part of 1944. The maintenance of all-steel cars with steel has been approved by the WPB.

Under the allocations announced last week, the railroads will receive 475,000 short tons of replacement rail and additional steel for accessories. This allocation contrasts with 400,000 tons of rail for the fourth quarter of this year.

The ODT was assured by the WPB Requirements Committee that, subject only to unforeseen military requirements, it will receive a minimum annual figure of 1,800,000 tons for new replacement rail for 1944 so that annual allocations can be made to individual carriers on that basis with the understanding that any increased tonnage produced during the year can be allocated from time to time. ODT officials emphasized that the amount of rail allocated to the ODT will be limited only by manpower supply.

The Office of Civilian Requirements has a program calling for the production of 2,000,000 electric irons, 900,000 household washing machines and 900,000 electric refrigerators in 1944. The program is tentative and subject to changes due to stringencies in manpower and plant facilities and a shortage in fractional horsepower motors and wire.

Increased allocations of steel for food processing equipment next year have

been announced by Marvin Jones, War Food Administrator. Production schedules for various items, based on 1939-41 output, are as follows: Dairy machinery, 114 per cent; canning machinery, 116 per cent; cereal manufacturing machinery, 75 per cent; oil extraction equipment, 93 per cent; fish processing equipment, 117 per cent.

Farm machinery production for the current fiscal year will be 80 per cent of the 1940 production.

Overall raw materials authorized by the War Production Board for making general planting, tillage and harvesting equipment next year provide for about double the quantity produced in 1943. Manufacture of repair parts will be unrestricted.

Component parts, such as antifriction bearings, malleable castings and forgings constitute the principal problems in connection with the production of farm machinery. Sufficient tonnage of carbon steel has been authorized to manufacturers to meet the entire machinery and repair parts scheduled for domestic use.

Number of types of machinery which will be rationed will be reduced to only 31 types while distribution control will cover only 46 types. The tight spot in farm equipment will be hauling vehicles, including trucks, and replacement tires for trucks now in operation.

At the same time automotive replacement parts for civilian uses will receive an allocation of 93,000 tons of carbon steel and related amounts of other materials for first quarter of 1944, representing an increase of 5000 tons over the fourth quarter of 1943, and the largest amount allotted for this purpose in any one quarter since the beginning of the war.

Other evidences of an easing material supply are seen in the closing of a number of government-owned ordnance plants. The Lowell, Mass., plant operated by the Remington Arms Co., which has been manufacturing 0.50-calibre shells, will close Dec. 31, "because the Army has enough ammunition for any crisis, however unexpected."

The Scioto ordnance plant near Marion, O., built originally to produce fuzes and later converted to small ammunition production, also will close at the end of the year, releasing 1900 workers.

A Detroit plant producing small arms ammunition from steel has been closed and its machinery stored. Production of this plant is reported to have run into the billions of rounds and virtually none of the cartridges ever will be fired, according to the Army. The plant was set up by the WPB on an emergency basis when supplies of copper and brass were at a critical point, but the probability of corrosion was said to make it unlikely that any of the output can be used.

A Des Moines, Ia., plant, operated by the United States Rubber Co., and manufacturing small arms ammunition, will lay off 4000 workers during the next two or three months.

Numerous other small arms ammuni-



REP. J. BUELL SNYDER
Announces Army refund

tion plants were reported ready to close within the next few months.

Charles E. Wilson, executive vice chairman, WPB, warned the New England War Conference that cancellation of war contracts is inevitable, and that such cancellations will increase as the demands of the war fronts change.

"When cutbacks in specific items are ordered in Washington, the motive is always the same. It is the benefit of the war program as a whole. The plant may be left idle. A genuine hardship may be worked on the community, but we dare not allow such considerations to diminish the supply of munitions."

"Time Near for Postwar Planning"

Mr. Wilson, who last week agreed to stay with the WPB until the President released him, told the Truman Senate committee that the time is rapidly approaching when industry can begin planning its postwar operations.

"I think," he said, "that the time is not very far off when industry and commerce can be encouraged to make very definite plans with respect to the quantities and types of consumer goods items which can be produced for civilian use."

Mr. Wilson suggested that manufacturers call their wholesalers and retailers into consultation to find out what type of peacetime merchandise their customers may want and determine the size of the immediate postwar market.

With these data in hand, he said, producers would be in a position to scale their postwar production programs intelligently to keep pace with developments abroad.

"For instance," he continued, "when Germany is knocked out the government might be able to give industrialists a partial 'green light,' letting them turn out a predetermined number of automobiles, refrigerators, washing machines

and other household appliances. After Japan is licked, the scale of production could be lifted substantially."

Further encouragement to industrialists contemplating reconversion to normal lines was imbedded in the announcement by Rep. J. Buell Snyder (Dem., Pa.) of a House appropriations subcommittee that \$13,163,519,000 of Army appropriations would be returned to the Treasury.

The savings, Representative Snyder said, were made as follows:

1. Reduction of 548,000 in military personnel strength and a consequent savings in pay, travel, subsistence, etc., of \$1,946,039,000.
 2. Curtailment of the armament and equipment programs of \$8,262,759,000.
 3. Reduction in facilities and maintenance of \$780,447,000.
 4. Modification and possible deferment of a portion of the aircraft program, saving \$2,086,069,000.
 5. Miscellaneous projects, \$88,205,000.
- Representative Snyder quoted Gen. George C. Marshall, chief of staff, as saying:

"We are reaching the end of the expansion; already it has been possible to reduce many training installations to a purely maintenance basis to furnish replacements for the present strength of the Army."

On the heels of the Army announcement that it would not require its entire appropriation came information that the Navy probably would not require \$5,000,000,000 of its appropriation for the current fiscal year.

Bernard M. Baruch, the administration's top postwar planner, is busy picking personnel to aid him in planning the reconversion of industry to a peacetime economy. Encouraging to business is the fact that he is selecting men who are sympathetic to business.

His right hand man reputedly will be John M. Hancock, a partner in the New York brokerage firm of Lehman Brothers. Others being consulted by Mr. Baruch include: Grenville T. Bridgman, executive vice president of the Metals Reserve Co.; George L. Harrison, president, New York Life Insurance Co.; Robert E. McConnell, mining expert; James V. Forrestal, Under Secretary of the Navy; WPB Chairman Donald M. Nelson; Jesse Jones, Secretary of Commerce; Robert Patterson, Under Secretary of War; Will Clayton, director of the Reconstruction Finance Corp.; Adm. Emory S. Land, chairman of the Maritime Commission.

Mr. Baruch told members of the Steel Industry Advisory Committee that the actual job of unscrambling wartime industry would have to be done by industry itself with the aid of the War Production Board. He stated that the job must be done speedily but that no one must be allowed "to beat the gun."

Evidence of the easier situation in steel supply is contained in the following reports from leading producing districts:

PITTSBURGH — Too many ingots.

That's a fact, backed up by statistics which show that the excellent job done by the steel industry in raising steel production has surpassed all expectations and caused what may be a serious dislocation in materials and labor.

The condition is general but not all-encompassing. There remain some plants with an excess of finishing capacity over ingot supply, and these plants are still buying ingots from other producers. There are other plants which have maintained a good balance, and are today using all the ingot tonnage they produce, with no need for additional supplies. However, there are enough plants which have excess ingot capacity so that the nation's stockpile of cold ingots is growing rapidly.

In general, it is the larger producer which is affected. In most of the giant open-hearth plants of the country, there is an insufficient capacity in primary finishing mills to take care of all the ingots which can be produced.

CLEVELAND — Only serious shortage at present is in plates. Although sheet deliveries are extended well into next year, this is due to the necessity of rolling plates on the wide sheet mills.

Forward deliveries of plates and sheets may be altered somewhat soon, reflecting rumored cancellations and cutbacks in such military programs as escort vessels, tankers, steel drums and helmets, and switch back from steel to brass cartridge cases. Manufacturers planning resumption of production of normal peacetime articles and considering appeals from various WPB limitation and material orders for this purpose will get no assistance unless they can meet the following requirements: (1) When materials are available in frozen or excess inventories; (2) when the manufacturer is located in an area where labor supply is plentiful; (3) when the work is needed by the concern to keep his skilled employes together between war contracts.

BUFFALO — There is a surplus of approximately 13,000 tons of steel ingots in the Buffalo area as two of the three mills report accumulated supplies.

A "surplus of ingots and semi-finished steel" resulting from a "high rate of steel output and recent labor stoppages in the finishing mills" has forced one producer to reduce production to 66 2/3 per cent of capacity.

CHICAGO — Mills here are operating against a volume of orders sufficient in volume to preclude excess production and piling of ingots. Backlogs suggest that this situation is not likely to arise soon unless a wave of cancellations sets in and there is not sufficient new business to offset.

The rapid switchover of several types of alloys from open hearths to electric furnaces caused some dislocation, but realignment of schedules and acquisition of new business filled the gap before operations were affected.

PHILADELPHIA — Contributing to the current softening in demand for ingots is a decline in export requirements.

The movement of ingots abroad in the next quarter is expected to be sharply reduced. Export demand, however, has been heavy enough to preclude any stockpiling of ingots.

BIRMINGHAM — There is no stocking of ingots in this district with steelmaking operations maintained at 100 per cent of capacity. Plates and shapes dominate the local production picture with some increase in the output of sheets noted. Little slowing down in finishing operations is reported, accounting for the steady consumption of ingots.

BOSTON — While finishing operations were interrupted nearly a week at the largest New England steelworks recent-

ly by a strike of wire drawers, available supplies of ingots are not out of balance and there is no unusual tonnage of primary steel ahead of finishing mills. The reverse is the case in some instances; one works has an open-hearth rebuilding program for completion in January and is concerned as to manpower to operate the unit.

YOUNGSTOWN—A leading producer has four open hearths down, one for repair. This producer has been shipping 20,000 tons of ingots weekly to another district, where local furnaces now are supplying its needs. Recently a cancellation for 4000 tons of bullet core steel was received by a Youngstown mill.

Present, Past and Pending

■ RESTRICTIONS PLACED ON MANUFACTURE OF SAW BLADES

WASHINGTON—Manufacture of power-driven wood-cutting saw blades now is limited to the kinds, diameters, gages, number and type of teeth, etc., set forth in appendices attached to limitation order L-326. Nonconforming saws may be manufactured to fill orders received before Nov. 23 but may not be delivered or shipped after May 23, 1944.

■ WESTINGHOUSE MAKES RECORD DELIVERY OF WAR GOODS

PITTSBURGH—Westinghouse Electric & Mfg. Co. delivered more equipment for the fighting fronts and war industries in October than in any other month in the company's history, says A. W. Robertson, chairman of the board. New orders received amounted to \$110,888,403, a gain of 29 per cent over the October, 1942, total.

■ STEEL DIVISION OFFICIAL TAKING LEAVE OF ABSENCE

WASHINGTON—H. J. Ruttenberg is taking a two months' leave of absence from his office of assistant director, Steel Division, War Production Board, to return to the United Steelworkers of America for work on collective bargaining and wage matters.

■ GOVERNMENT RELINQUISHES CONTROL OVER 43 MINES

WASHINGTON—Government possession and control over the mines of 43 bituminous coal companies have been terminated by order of Harold L. Ickes, secretary of the Interior. These were the first released since the Nov. 1 seizure.

■ CARNEGIE-ILLINOIS TRIAL DATE SET

PITTSBURGH—Trial date for Carnegie-Illinois Steel Corp. under two of three indictments in its plate case has been set for Dec. 13. The United States attorney's office here has announced that trial under the third indictment involving both the corporation and L. S. Dahl, superintendent of the Irvin Works, has not been scheduled.

■ BATCHELLER RETURNING TO ALLEGHENY LUDLUM

WASHINGTON—Hiland G. Batcheller, operations vice chairman of the War Production Board, is understood to have left Washington for his home in Albany, N. Y. It was said he will return to his post as president of Allegheny Ludlum Steel Corp., Pittsburgh, after the holiday. Mr. Batcheller handed in his resignation from WPB some time ago but it was understood he was to continue on with the board until certain work was completed.

■ MACHINE TOOL SHIPMENTS DROP 11 PER CENT

WASHINGTON—Machine tool shipments declined about 11 per cent in October from the previous month's total, valued respectively at \$76 million against \$85,842,000. Peak month was December, 1942, with a total of nearly \$132 million. Order backlog declined \$47 million to \$286 million.

■ UTILITIES CUT SHARPLY USE OF SCARCE MATERIALS

WASHINGTON—Utility conservation in maintenance is effecting "huge savings of scarce materials," War Production Board has announced. Current material consumption in maintenance and minor construction represents 50 per cent of tonnage used in 1940. Value of wire cable and bus bar used has been cut \$21 million to only \$8 million, of which only 12 per cent is being obtained from wire mills.

Steel Distributors See Gradual Expansion in Business Volume

Trade encouraged by prospects for further increases in available supplies. . . Problems affecting steel distribution under government regulations, contract renegotiation, postwar outlook discussed at Chicago convention

EVIDENCE is accumulating that the steel warehouse industry is beginning to emerge from the period of severe restrictions on the distribution of its products into one in which supplies will permit a gradually expanding volume of business.

For some months improving mill receipts have provided more adequate stocks, a situation which seems likely to undergo further improvement as war production cutbacks accelerate to release not only idle and excess inventories but perhaps larger mill allotments as well. This view is bolstered by the knowledge War Production Board and Office of Price Administration both are planning some changes in existing regulations which can be regarded as relaxations.

Because of this more favorable outlook, the Steel Products Warehouse Association Inc., established late last year as a national trade organization, faced the future with considerable confidence and promise in holding its second annual meeting, Nov. 19, at the Drake hotel, Chicago. Some 200 members and guests attended the gathering at which the organization was further perfected, and a more adequate program was formulated.

Study Problems Affecting Distribution

The agenda encompassed study of problems affecting the distribution of steel warehouse products under WPB and OPA regulations, contract renegotiation, manpower, and postwar prospects. Discussion of these matters was spread over a closed membership session in the morning, a luncheon, an open session and panel forum in the afternoon, and a dinner. A number of government representatives participated.

About 10 per cent of the steel being produced currently is flowing through warehouses, according to J. R. Stuart, chief, warehouse branch, steel division, WPB, Washington. This volume is somewhat lower than in peacetime, he explained, the chief reason being that the building industry which utilizes substantial amounts of merchant products is not active due to wartime restrictions.

One-fifth of all steel production must go into plates, Mr. Stuart declared, which operates to reduce the volume of other products. New capacity for plates will be available in first quarter, but whether this will help the extremely tight sheet situation is not known—in all probability it will. Present situation on hot-rolled sheets is better than for cold-rolled, and the outlook for galvanized production

better than 40 per cent of 1940 is not encouraging, he said.

Warehouses are being relieved of much time-consuming report making to WPB, Mr. Stuart pointing out that reports are now required at the end of each quarter instead of each month, and the forms are simpler. Alloy totals instead of product totals are asked for, although carbon steel reporting is un-

OFFICERS ELECTED

Officers of the Steel Products Warehouse Association elected at the annual meeting in Chicago were as follows: President, W. E. Thoresen, president, Great Western Steel Co., Chicago, and chairman of the association's board; first vice president, Sol Friedman, president, Reliance Steel Corp., Cleveland; second vice president, Joseph Gendelman, president, National Sheet Steel Co., Detroit.

Donald C. Lott, president, Tin Mill Products Corp., Pittsburgh, was re-elected secretary, and Joseph E. Lavine, Union Steel Supply Co., Warren, O., treasurer.

Four new trustees were elected as follows: Myron Hokin, Century Steel Corp., Chicago; T. H. Patterson, Seneca Steel Service Inc., Buffalo; J. D. Finnegan, Hynes Steel Products Co., Youngstown, O., and Sol Friedman, Reliance Steel Corp., Cleveland.

changed. The warehouse branch has in preparation several changes in regulations, all of which ease present restrictions.

WPB is giving much discussion to brokers or agents who do not maintain stock, but merely act as intermediaries between buyer and seller. Mr. Stuart stated it is becoming evident that the war effort can be aided if more people are engaged in the distribution of steel, particularly idle and distressed stocks. Thus, provisions are being worked out to cover the operations of brokers.

Speaking for OPA, E. L. Wyman, head, warehouse and jobbers section, iron and steel price branch, Washington, took opportunity to invite comments from association members on contemplated revision of Revised Price Schedule No. 49, covering resale of secondary and reject iron and steel. Resale is now gov-

erned by provision of appendix F of the schedule and resale of prime quality items by appendix G.

Offered for consideration is the idea of changing the present setup on resale of secondary and reject products and adapting it to appendix G provisions, generally known as the "Zoning Plan for Resale of Prime Steel Items". This, Mr. Wyman explained, is not a zoning plan as sometimes understood in industry. Different spreads enjoyed in different market areas are expressed by zone boundaries. These zone boundaries simply bound that area within which a common spread was enjoyed by sellers during the base period. They limit in no manner shipments by any seller and do not change in any respect the competitive conditions previously prevailing in any area.

Consideration will be given, the speaker continued, to shifting pricing of secondary and reject products to a setup following the zoning plan now in effect for prices. The following might be adopted in a separate appendix: "1. Mill base prices for seconds and rejects; 2. Freight from governing mill basing points in the same manner as in appendix G; 3. Spread factors by zones now promised in appendix G; 4. Uniform extras now appearing in appendix F; 5. Dislocated tonnage provision as now handled by interzone provisions of appendix G."

Three Phases of Steel Redistribution

Mr. Wyman said a preliminary survey has shown that the level of maximum prices would not be generally affected (otherwise OPA would not be interested); it remains to be determined whether any change would give greater facility in calculating prices.

Discussing redistribution of idle and excess steel, T. S. Fitch, special assistant, steel division, WPB, Washington, stated that insofar as WPB is concerned, this should be divided into three phases. First phase is that in which there is a scarcity of steel—the present situation. Second phase is that in which supply approaches demand, or a balanced situation—the phase now being entered. Third phase is that in which surplus steel is available.

As for the first phase, approximately 1,000,000 tons was redistributed prior to October, 1942, by the Distressed Stocks Unit of the Steel Division, and Inventories and Requisitioning Branch of the Redistribution Division. Most of this steel was left over from peacetime production and substantial lots were moved, especially automotive stocks in large blocks. Under authority in PR-13, large quantities, possibly between 1,000,000 and 2,000,000 tons, were put back into use by owners without WPB assistance.

Steel Recovery Program was set up to do a clean-up job. During life of the program, 820,000 tons of idle or excess steel were reported and found to be redistributable "as is". In addition, some 150,000 tons were reported but

deemed suitable only for remelting. Sum total was about 1,000,000 tons, roughly less than 1 per cent of annual ingot tonnage and about 1.75 per cent of product tonnage—a tribute to American industry.

According to Mr. Fitch, handicaps in redistribution is that bulk of tonnage is in small lots not readily redistributable; steel usually is dislocated geographically; it is the exception when a buyer is able to locate exactly what he wants; and price handicap, the purchaser is required to pay a premium.

As of July 1, there were 650,000 tons of idle steel and about 1,200,000 tons of excess steel. At present, most of this has been used, but very substantial tonnages have been made available as a result of contract terminations, cutbacks, and design changes. Estimate is that no less than 1,500,000 tons is now available for redistribution.

Effective Nov. 1, WPB regional offices were given the responsibility for acquiring inventory information, and as of the same date the Steel Division in Washington established a Surplus Inventory Branch. The latter will serve as a cross-over from region to region. Because of the difficulty in keeping records accurate and up-to-date, and catalog publication is too slow, a new type of inventory card has been devised. Sufficient copies will be made so that the holder, the regional office, and Surplus Inventory Branch will get copies.

Reports of idle and excess steel generally, it is explained, will be held by regional offices alone for 30 days. Any significant items remaining unsold at end of this time will be turned in to Surplus Inventory Branch. Significant

quantities mean substantially 5 tons of carbon steel, 1 ton of alloy, 1000 pounds of stainless, and 500 pounds of tool steel. It is preferred that buyers approach WPB regional offices, although it is recognized that certain large consumers or distributors may work more effectively through the Supplies Inventory Branch. To speed redistribution, WPB is planning to enable intermediaries to participate in transfers of steel.

In concluding, Mr. Fitch discussed the third phase of postwar in which a surplus of steel will be available.

Future Divided into Three Periods

In an address entitled "Looking Ahead in Steel", E. L. Shaner, editor-in-chief of STEEL, told the dinner audience that the future can be divided into three periods—first, the period from now until a military victory is won; second, the period of transition from war to peace; and third, the postwar period.

Stating that the time element is important, the speaker asked his listeners when they expected the war to end. A showing of hands indicated that about 90 per cent of the audience believes the European phase of the war will be over in 1944 and that the Pacific war will extend into 1945.

Mr. Shaner then referred to the present confusion as to the adequacy of war production. On one hand is a demand for more output, while on the other are evidences of cancellations of contracts, cutbacks, etc. In some quarters predictions are made that manpower shortages will become more acute, while at the same time one hears more and more of men being laid off because of changes in production schedules.

One explanation for this situation, the speaker said, is that we are just now finding out that since Pearl Harbor we have been overshooting the mark in some phases of war production in order to play safe. Also capacity to produce certain items has far exceeded expectations.

The truth is that the nation is over the hump in many aspects of its war production program. Today the job is to throw our strength toward the points of greatest weakness—the production of things needed to hasten victory.

Turning to the second period—the transition period—Mr. Shaner said the problem of conversion to peace is at least ten-fold the problem after World War I because of the greater magnitude of our present war effort. However, it seems likely that the process of demobilization will be more gradual than was the case after World War I and that the impact upon industry may be distributed over a longer period of time.

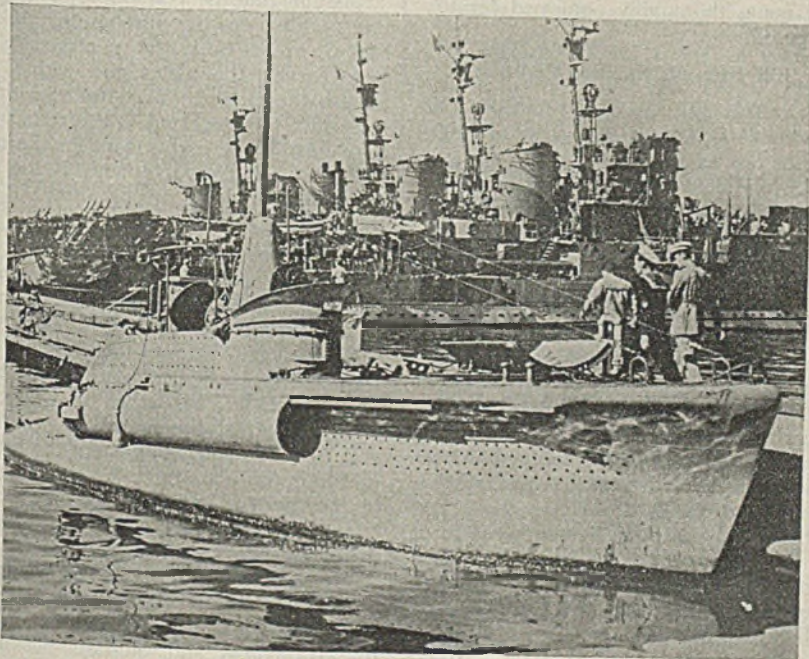
Referring to the third period, the speaker said that the American public now accepts postwar planning as an integral part of the war, insisting only that attention to postwar problems shall not interfere with the military program. One of the features of the postwar period will be renewed rivalry among materials. He said he could not foresee any drastic changes in the positions of steel and the light metals after the war. Aluminum, with a capacity of around 1,500,000 tons annually, and magnesium with 250,000 tons, undoubtedly will find many new and justified applications after the war. But their markets can be expanded considerably without seriously affecting steel's hold on markets because steel, with an annual capacity of 100,000,000 tons, also will find new applications.

More important than materials competition, in Mr. Shaner's opinion, is the future alignment of industrial units. This country must regain and retain every possible opportunity for small enterprise. Concluding, he asked "How far have we gone from the state of ideal living? We find ourselves where we are because we want to take too much, and give too little."

Bethlehem Steel Purchasing More Rheem Mfg. Co. Stock

Subject to the approval of the commissioner of corporations of California, Bethlehem Steel Corp. is arranging to acquire 230,000 shares of Rheem Mfg. Co. common stock at \$11.50 a share, it was announced recently.

With the new acquisition which will include 149,000 shares now authorized but unissued and 81,000 which will be provided when Rheem's articles of incorporation are amended to increase its common stock capitalization from 750,000 to 1,000,000 shares, Bethlehem Steel will own about a third of Rheem's issued and outstanding shares of common stock. No change in management is contemplated.



MIDGET SUB: Closeup of the latest model Italian midget submarine which fell into Allied hands at Taranto, Italy, when the Italian fleet surrendered. Except for periscope, the submarine closely resembles a motor torpedo boat. NEA photo

New Revenue Bill Improves Procedure

Sincere effort seen made by Ways and Means Committee to meet renegotiation criticisms voiced by many contractors

WASHINGTON

STUDY of the House Ways and Means Committee's new revenue bill in its final printed form shows the committee made a very sincere effort to revise contract renegotiation procedure so as to meet the criticisms voiced by many contractors and subcontractors.

While the bill prepared by the committee of which Rep. R. S. Doughton (Dem., N. C.) is chairman, has yet to come up for vote in both House and Senate, with the attendant possibility it may be amended, well-informed observers believe its terms represent majority sentiment in Congress. Neither do such observers look for a White House veto even though the bill provides for only a little more than two billions of the ten and a half billion additional revenue requested by the Treasury Department.

Recovery of thirteen billion dollars from the Army and seven hundred millions from the Navy, with the likelihood that large additional sums will be recovered from the Maritime Commission and other agencies, is regarded by Congress as proof the war need not cost as much as earlier expected, and that economies can prevent a materially higher tax load. It is difficult to see how the administration can oppose this view in view of the large economies already effected.

Main features of Title Seven of the bill which covers contracts renegotiation are as follows:

1. It would establish a central War Contracts Price Adjustment Board to be composed of five men, representing the Army, Navy, Treasury, Maritime Commission and War Shipping Administration, and the Reconstruction Finance Corp. It would have principal offices in Washington and may establish field offices. "It is contemplated that this board will utilize the same machinery which is now being used for the purpose of renegotiation."

2. Any contractor or subcontractor who feels aggrieved over a price adjustment ruling may file a petition for relief with the Tax Court of the United States. The proceeding shall not be treated as a process to review a determination of the price adjustment board but shall be a "proceeding de novo." In the opinion of the committee, the Tax Court of the United States is peculiarly fitted to determine "what is a fair price and what is fair profit, having long been engaged in the determination of similar questions, and being thoroughly equipped for this purpose."

Bill Exempts Smaller Contracts

3. The bill exempts contracts involving \$500,000 or less, instead of \$100,000 or less as at present.

4. The field of operation of renegotiation would be further reduced by the definition of "subcontract" in the bill. "The term 'subcontract' means any purchase order or agreement (other than a contract with a department) to make or furnish or perform any part of the work required for the making or furnishing of a contract item or a component article. A 'contract item' is defined to mean any article, work, service, building, structure, improvement, or facility contracted for by a department, and a 'component article' is defined to mean any article which is to be incorporated in or as a part of a contract item. The term 'article' is defined to mean any material, part, assembly, machinery, equipment, or other personal property.

"For example, under the above definition," says the committee report, "suppose the War Department contracts with X for 1000 airplanes. X, finding that he cannot produce 1000 airplanes in the time required, subcontracts with Y to

furnish 500 of the airplanes complete for delivery, which X delivers, as produced by Y, to the War Department. X's subcontract is renegotiable as a contract item.

"Under the new definition of subcontract, factory supplies such as tools or equipment, typewriters, business machines, etc., are exempt from renegotiation. The following example will illustrate the scope of the articles coming within the new definition of component article.

"Assume that the War Department contracts with A for the purchase of a General Sherman tank. A contracts with B to furnish the plates and with C to furnish the motors. B contracts with D to furnish the steel and C contracts with E to furnish the carburetors for the motors. C also contracts with F for the aluminum products to be used in the construction of the motors.

"Subcontracts for the purchase of all of these articles are subject to renegotiation because they are incorporated in or as a part of the contract item which is the General Sherman tank. If C, who has contracted to furnish the motors, contracts with G for lathes to be used in making parts of the motor, C's contract with G is not renegotiable, for the reason that it is not a contract for an article to be incorporated in or as a part of a contract item. For the same reason, if G contracts with H for some steel for the lathes, G's contract with H is not renegotiable. Also, if B, who contracts to furnish steel plates to A, contracts with I for typewriters and business machines, that contract is not subject to renegotiation. In other words, only on end product or products that enter into an end product are subject to renegotiation.

"Under existing law, considerable con-



Rep. Robert L. Doughton, chairman of the House Ways and Means Committee, left, and James Byrnes, Director of War Mobilization, are shown talking at a recent meeting

fusion results from the fact that a subcontract may be subject to renegotiation even though the prime contract or any immediate subcontract may not be so subject. The bill exempts such subcontracts as are directly or indirectly under an exempt contract or subcontract.

5. The bill expressly exempts from renegotiation contracts involving agricultural commodities, including "not only products of the cultivation of the soil but also saps and gums of trees; animals such as cattle, hogs, poultry and sheep; fish and marine life; and the products of live animals such as wool, eggs, milk and cream." Canned, bottled or packed fresh fruits and vegetables or their juices continue exempt.

6. The bill authorizes the board "in its discretion," to exempt any contract or subcontract for the making or furnishing of a standard commercial article if, in its opinion, normal competitive conditions affecting the sale of such articles exist.

7. The bill defines war contract profits to mean "excess of the amount received or accrued under such contracts over the costs paid or incurred with respect thereto. Costs that are unreasonable or not properly chargeable to the contract or subcontract, in the opinion of the board or of the Tax Court of the United States are disallowed.

Fees or commissions paid to brokers or other agents are disallowed as costs, unless "such person is a bona fide established commercial or selling agency maintained by the contractor for the purpose of securing business."

Insure Equitable Treatment

8. To insure equitable treatment of contractors or subcontractors "producing minerals, oil or gas, or timber, and who process, refine, or treat such products to or beyond the first form or state suitable for industrial use, or who produce agricultural products and process, refine, or treat them to or beyond the first form or state in which they are customarily sold or in which they have an established market," the board is required to prescribe such regulations as may be necessary to give the contractor or subcontractor a cost allowance substantially equivalent to the amount which would have been realized by him if he had sold such products in their first form or state."

9. The bill provides for the "aggregation of all renegotiable amounts received or accrued by a contractor or subcontractor under contracts or subcontracts during the fiscal year for the purpose of determining whether they may reflect excessive profits.

10. The definition of excessive profits in the bill sets forth certain factors to be taken into consideration in the determination of excessive profits. The standards prescribed are:

A. "Efficiency of contractor, with particular regard to attainment of quantity and quality production, reduction of costs and economy in the use of raw materials, facilities and manpower;

B. "Reasonableness of costs and prof-

its, with particular regard to volume of production, and normal prewar earnings;

C. "Amount and sources of public and private capital employed and net worth;

D. "Extent of risk assumed, including the risk incident to reasonable pricing policies;

E. "Nature and extent of contribution to the war effort, including inventive and developmental contribution and cooperation with the government and other contractors in supplying technical assistance;

F. "Character of business including complexity of manufacturing technique, character and extent of subcontracting and rate of turnover;

G. "Such other factors the consideration of which the public interest and fair and equitable dealing may require."

11. The bill sustains the right of the

President, under the Second War Powers Act of 1942 to request the chairman of the War Production Board or any governmental agency or officer to inspect the plant and audit the books of any war contractor or subcontractor.

12. The bill, in sharp contrast with the mysterious manner in which the boards reach their renegotiation determinations under the present law, expressly stipulates that the board may be required, at the request of the contractor or subcontractor, to prepare and furnish a statement of the determination of the facts used as a basis thereof, and of the reasons underlying it.

13. Contractors and subcontractors may obtain from the board a review of any renegotiation decision by any officer or agency to which it has delegated its powers. Or, the contractor or subcontractor may go direct to the Tax Court of the United States.

POSTWAR PRELUDES

WAREHOUSES—Steel distributors expect gradual expansion in business volume. See page 46.

RECONVERSION—Truman committee recommends government-owned war plants be converted to civilian production. See page 52.

AUTOMOBILES—Emphasis to be placed on economy rather than performance. Large cars on the wane, but small European-type vehicle unlikely. See page 57.

LEADERS—Iron and steel, followed by such light metals as aluminum and magnesium, will continue to hold the most important places among the metals of the future, says Dr. Zay Jeffries. See page 57.

AIRCRAFT—New standards and specifications will simplify design, assembly and maintenance of planes all over the world. See page 60.

TIMESAVER—Capable of punching 388 rivet holes in a single stroke of a giant hydraulic press, a new Boeing developed die is turning out parts ready for riveting thirty times faster than the previous method of drilling. See page 62.

MERGERS—Consolidation question will confront many manufacturers in postwar era. Some will find mergers the solution to over-expansion problems. See page 67.

CANADA—Metals expansion program necessitated by war poses serious postwar problem for Dominion. See page 69.

WAR CONTRACTS—Comprehensive program for cancellation advanced by Chicago Association of Commerce. See page 71.

WELDER FORGING—Rapid production of small upset forgings on flash-butt welding machines saves stock, machining time and relieves pressure on standard forging facilities. Applicability to wide range of materials qualifies method for "place in the sun" after the emergency. See page 74.

METAL "SPINNABILITY"—Potential uses for the economical method of making metal parts by spinning are almost limitless when workability of materials, and suitable technique become known factors. See page 84.

"BLASTING" BROKEN DRILLS—Dynamite, in small quantities, now supplies the necessary force to remove broken drills, reamers and plug gages from drill holes; affords simple and inexpensive means of completely salvaging machine parts with no evidence of harm to the metal. Satisfactory results prove innovation of permanent character. See page 86.

WINDOWS of WASHINGTON

Stormy Controversy

THE stormy controversy as to the ownership and operation of our transport and passenger planes flying in international air lanes after the war is being studied in secret sessions of the Aviation Subcommittee of the Senate Commerce Committee. Three proposals are being studied: 1—Unlimited competition between American air lines; 2—overseas operation by one company, or group of companies; 3—government ownership and operation of overseas air lines. In addition, the subcommittee is examining the matter of permanent acquisition by the United States of air bases in various parts of the world, many of which we have built and are operating during the war. Witnesses so far questioned include Adolf A. Berle Jr., assistant secretary of state and chairman, Interdepartmental Committee on Aviation; William A. M. Burden, special aviation assistant to the Secretary of Commerce; L. Welch Pogue, chairman, Civil Aeronautics Board. The latter was questioned closely about his recent recommendation that unlimited competition should be allowed in international air operations. This idea is contrary to the belief among some important government officials that government ownership of the overseas airlines is inevitable and necessary to meet foreign competition.

Russian Womanpower

An American who returned recently from Russia reports that 45 per cent of the employes at the Magnitogorsk Steel Works are women and that they work on two 11-hour shifts, six days a week. He visited the war torn steelworks at Stalingrad which is being repaired by a crew of some 3000 to 4000 people. Excepting ten or twelve men, all whom he saw were women of widely varying ages. He was told that 98 per cent of the women of Russia are working on war or essential civilian jobs, that a system has been set up under which school girls 10 years of age and older work four hours and attend classes four hours a day.

Better Job

The aircraft manufacturing industry is doing a distinctly better job of utilizing manpower, Charles E. Wilson, executive vice chairman, War Production Board, said at a Truman Committee hearing.

"The industry has re-estimated its manpower requirements and in most cases it has been found that substantially increasing schedules can be executed with only minor additions to the labor supply," he told the committee. In some plants the number of employes will be reduced.

Asked about Drew Pearson's report that after Mr. Wilson prevailed on the North American Aviation plant management at Dallas to withdraw its claim for 9000 additional workers the Army over-

ruled him and had this claim revived, he said the report was entirely inaccurate. "The Army Air Forces," he said, "are co-operating 100 per cent."

The only serious labor shortage still plaguing the airplane industry is that at plants making airplane engines and certain airplane parts. But this shortage involves only a few thousand people and will be overcome.

Ironing Out Differences

Conservation Division of the War Production Board has undertaken to iron out differences in salt spray corrosion tests now specified by various federal agencies. These differ widely in their requirements and a standard is to be sought. The division, now that substantial agreement has been reached on the

HOUSING BOOM

Survey of 62 field offices covering practically all important housing markets in the country by the Federal Housing Administration reveals a \$5,000,000,000 privately financed postwar building boom is in prospect if all war restrictions are removed.

The FHA declared that if materials and labor are available, the housing demand will gain momentum during the first year and be at a much higher volume thereafter. Total building of privately financed dwellings will be between \$1,700,000,000 and \$2,000,000,000 for about 350,000 to 400,000 homes, averaging about \$5000 each, the FHA predicted.

Repairs and modernization of present homes is expected to add another \$3,000,000,000 of private spending. Employment demands for the construction of homes and repairs and modernization are expected to reach from 3,000,000 to 4,000,000.

standardization of brass and bronze castings and ingots by federal agencies, the American Society of Testing Materials, the Association of American Railroads, and the Society of Automotive Engineers, is seeking determination as to how fully to specify impurities, how best to relate the specifications for castings and ingot metal, and whether physical properties should be specified for ingot metal as well as for castings.

Experimental Work

Because limited supplies of glue have interfered with production of sandpaper and emery cloth, members of the War Production Board's Coated Abrasive Industry Advisory Committee have launched a program of experimental work on the use of glue substitutes.

Important Document

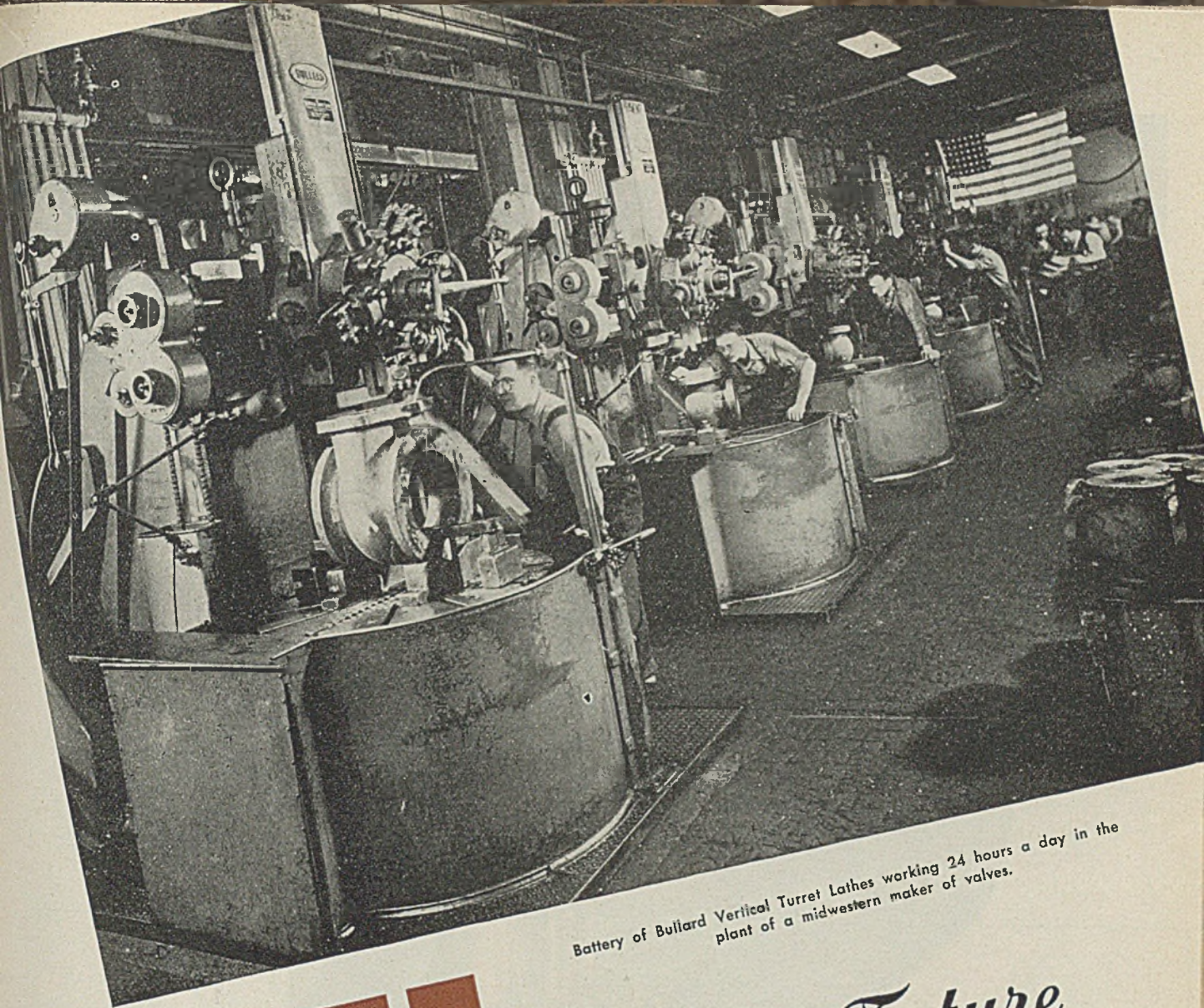
Postwar planners should be sure to write to the Superintendent of Documents, Washington, for copies of Senate Document No. 106, available at 15 cents per copy. This contains Sen. Joseph C. O'Mahoney's report to the Senate Postwar Economic Policy and Planning Committee. In addition, it contains the most comprehensive summary of existing postwar plans yet assembled between two covers. At the request of Senator O'Mahoney, George P. Comer and Fred L. Berquist, Department of Justice economists, interviewed all of the important federal agencies, also a number of private agencies that have studied postwar planning. Dr. Ernest Griffith, of the Library of Congress, was asked to prepare a digest of all that has been published on the subject of postwar planning. The postwar reconversion plan of the General Electric Co. was studied. All this material makes up a volume of 144 pages. Included are tables showing "Concentration of Economic Power" by areas, "Pacific Coast Steel Consumption—1937 and Postwar," "Data of Surplus in State Treasuries, 1943," "Sales of Treasury Savings Bonds and Notes" and much other related data.

Badly Needed

The War Production Board has asked its Used Construction Machinery Industry Advisory Committee to find 100 long-boom shovels and dragline combinations, 150 smaller stripping shovels and 100 large tractors with bulldozers and scrapers. Only steam or diesel-driven machines are requested; gasoline or electric powered equipment is not wanted unless it is in such good condition that conversion to steam or diesel would be practicable. The Procurement Division of the Treasury Department is acting as purchasing agent for the Office of Lend-Lease Administration. This used machinery is wanted for shipment to England to increase output of coal mines.

Numerous Revisions

Now in process of revision is the report entitled, "Study of Amount of Steel Required for Steel Mill Buildings" to bring it in accordance with WPB directive No. 8. In this revision will be incorporated the study, "Co-efficients of Heat Transmission Through Various Types of Flat Roofs Covered with Built-up Roofing." Also under revision is the "Critical Construction Materials Design Guide", which also is to incorporate a revised form of the report "Design Guide for Interior Electric Lighting and Wiring for Wartime Construction." Revision also is being made in the "List of Critical Materials for Construction of Highways, Bridges and Culverts." Copies of these revisions may be obtained by writing the Information Division, War Production Board, Washington, D. C.



Battery of Bullard Vertical Turret Lathes working 24 hours a day in the plant of a midwestern maker of valves.

V.T.L. *Veterans - with a Future*

Of the thousands of Bullard Vertical Turret Lathes now working at top speed on war production . . . many of them have already put in many years of service in the normal work of a world at peace. And all of them will be ready to continue their cost and time-saving that will be so essential in the world at peace. For the same qualities that make the Vertical Turret Lathes indispensable now are always important: Speed. Accuracy. Adaptability. Lower machining costs. The sturdy, rigid construction of these machines makes them long-lived. Their versatility keeps these long lives useful. They'll help you win the war now . . . and help you beat competition when the war is won.



THE BULLARD COMPANY
BRIDGEPORT CONNECTICUT

BRASS is the only currency in which you can do business with Hitler



War is a business in which sub-standard quality of product is paid off... not with a bored apology at the Complaint Department... but in instant, bloody, defenseless death. Bombs that dud, shells that miss fire and jam guns... these are *counterfeit currency* that carry frightful penalties.

Hitler knows this, and Tojo. But so do the white men, better than either of these accomplished assassins. Back from the battlefronts come repeated reports of the superiority of U. S. *ammunition*... its dependability, and the fact that it's *sure fire* when the chips are down. These reports should be a powerful comfort

and encouragement to the family of every American man and woman under fire.

To us here at Bristol, it's as simple as this:

We like to be able to sleep when we get to bed, because we need it at the speed we're going. So we strictly see to it that every run of Bristol Brass sheet, rod, and wire is made the way it should be made by a brass mill that's been in business for 93 years, and served U. S. munitions makers through five wars. We hope this war is the world's last... we're doing our level best to make it so. *And we're not losing any sleep!*

The BRISTOL BRASS Corporation

MAKERS OF BRASS SINCE 1850 AT BRISTOL, CONNECTICUT

How To Grind

CARBIDE FORM TOOLS

THE TREMENDOUS increase in the use of cemented carbide cutting tools has brought with it the need for specialized training in the grinding of form tools made of such materials. Many companies today purchase standardized Carboloy tools and grind these in their own toolrooms to special forms as required.

The grinding of such specialized forms presents no great difficulty to the experienced operator, but the extreme hardness of carbide does involve a change in grinding practice from that employed in the grinding of form tools made of high-speed steel.

A better understanding of the principles involved in actual grinding operations on carbide tools may be acquired perhaps by studying the accompanying illustrations. At A is shown an imaginary form tool which incorporates specifications combining virtually all grinding problems encountered in the preparation of form tools. The design was developed for "training" purposes at the school for carbide supervisors operated

at the plant of the Carboloy Co., Detroit. It is of course a more complicated "tool" than would usually be encountered in actual practice.

At B is shown a standard Carboloy style T-17 tool from which the "form tool" is to be produced. The following "steps" illustrate the order and manner in which grinding operations are to be performed.

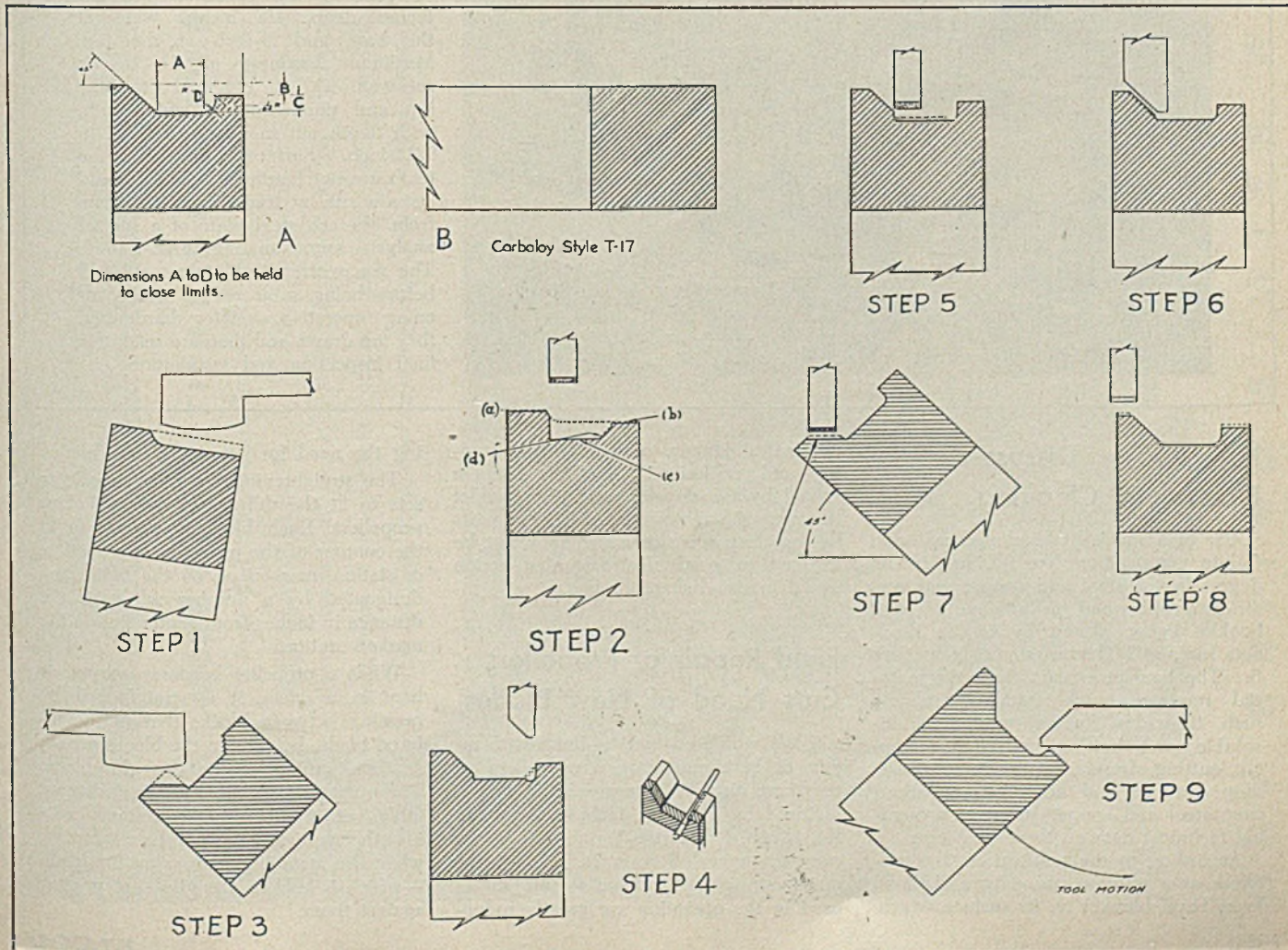
Step 1 shows the rough hand grinding to establish dimension "B" approximately. A 60-grit soft-bond silicon-carbide wheel is used to rough grind the 1/16-inch step by hand. In step 2, the two surfaces "a" and "b" are first semifinished ground to establish dimension "B". For "a", work is set upon surface grinder for 7-degree clearance, using a 1/8-inch wide 100-grit resinoid-bond diamond wheel. Then wheel is fed down to establish "b".

The next operation is to rough out the material in the center to approximate dimensions "A" and "C", allowing 0.005-inch of stock for finishing. The central portion is first hogged out

and then additional material is removed by plunge grinding a series of small steps to approximate a 1/16-inch radius, to prepare for grinding radius "D".

If the 45-degree angle shown at A is to be included, this is now also roughed out by hand as shown in step 3, using a 60-grit soft-bond silicon-carbon wheel and grinding at zero degrees clearance. Step 4 shows the manner in which radius "D" should be semifinished and finished. This is done with a 1/8 or 1/4-inch wide 80-grit soft-bond silicon-carbide wheel on a surface grinder as in step 2. Radius is finished by hand lapping with 1/8-inch diameter cold-rolled steel rod and No. 4 diamond powder.

Note that this radius ("D") is completed before grinding to the full depth "C". The latter is now performed as shown in step 5, blending the surface with the radius. A 1/8-inch wide 180 or 220-grit resinoid-bond diamond wheel is set to give 7-degree clearance. To establish 45-degree angle, hold bottom (Please turn to Page 111)



AUTOMATIC FIXTURE

... speeds hardening of half-trac sprockets by 133 per cent

THIRTY-SIX large sprocket teeth are being hardened in less time than it took to harden 18 by former methods at International Harvester Co., through the use of a novel automatic fixture installed on a new induction hardening machine. This represents an increase in production of 133 per cent.

According to the company, previously one sprocket was hardened every 7 minutes. Now, with the automatic fixture the sprockets are inductively hardened in pairs—one pair every 6 minutes—an output $2\frac{1}{3}$ times the former.

The sprockets which go into the drive mechanism of Army half-trac combat cars are 24 inches in diameter and are subject to excessive wear only on the teeth. Hardness, therefore, is confined to those areas. Not

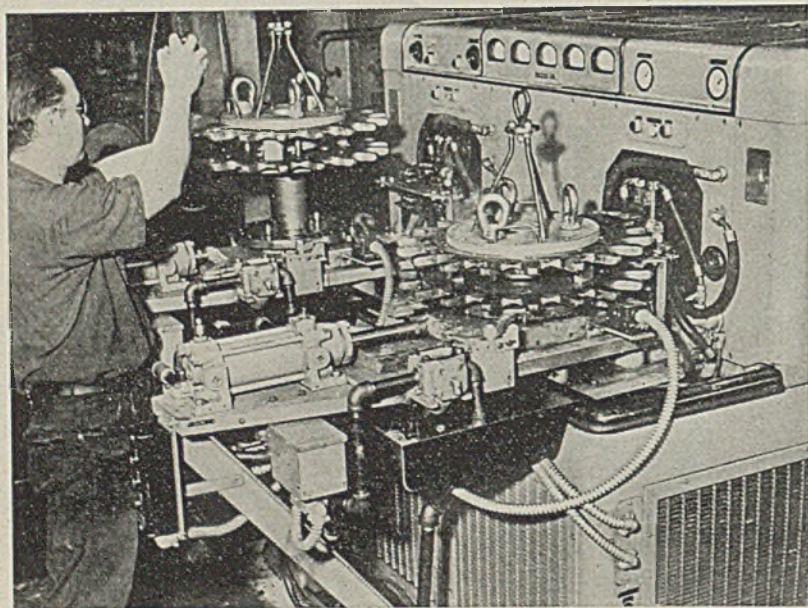
only is the hardening confined in the operation, but each sprocket is free of distortion, and the ductility is maintained.

The automatic fixture, designed by Ohio Crankshaft Co., Cleveland, for use with one of its Tocco Jr. hardening machines, holds the pair of sprockets horizontally or pancake-wise, hardening tooth on each sprocket simultaneously. At each stroke of a hydraulic plunger, the fixture advances introducing the teeth to the water-cooled inductor which is of open-style. Upon completion of the hardening cycle the fixture withdraws the sprockets, indexes, and advances again to the inductor. The hardening cycle repeats itself automatically, going completely around the periphery of the piece once the starting button is pushed.

At International Harvester, each hardening machine is equipped with two automatic fixtures. This can be seen in the accompanying illustration. Here, sprockets in the foreground are being hardened while the operator is preparing the second station. In readying the second station, in the background, the operator places the sprockets in a special handling jig. The two pieces are held together by three studs which pass through the upper plate and screw into the lower plate, passing through holes in the sprockets. Two lock pins in the base plate of the fixture prevent the jig rotating once it is positioned for hardening. The operator can assemble and disassemble a pair of sprockets in $4\frac{1}{2}$ minutes.

Complete heating cycle consists of a 10-second heat, 4-second water quench and 6-second index for a total of 20 seconds per two teeth. The hardening machine is a standard 50-kilowatt 2-station unit. Operating frequency is 9600 cycles, current being supplied from a motor-generator set.

Teeth of the sprockets are $\frac{2}{4}$ inches deep, $\frac{1}{4}$ inches wide at the base and $\frac{5}{8}$ -inch at the top. Maximum hardness of 51 to 58 rockwell C is confined to the top and pitch line of each tooth, with depth not in excess of $\frac{5}{32}$ to $\frac{3}{16}$ -inch. Surfaces between the teeth are not hardened. The sprockets are cut by torch four at a time from $\frac{3}{2}$ -inch steel plate of a special analysis approximating SAE-C1046. The pieces are completely machined before being subjected to the hardening operation. After hardening, they are drawn and then are ready for final inspection and installation.



New Booklet Discusses Electrolytic Cleaning

Use of a specially developed material, Oakite composition No. 90, for anodic degreasing of steel and copper war material is described in a new 16-page booklet being offered by Oakite Products Inc., 34E Thames street, New York 6. The booklet explains how the material removes quickly and completely such tenacious foreign matter as insoluble smut, buffing, polishing, stamping, cutting, drawing compounds, grease, shop dirt, oil and other accumulations from steel and copper surfaces, presenting technical data on these problems.

According to the publication, the material, as a solution, provides a shallow, dense foam blanket on its surface which

eliminates dangers of overflowing, fuming and explosion. Another problem solved by the development, the booklet states, is the removal of soil from parts having deep recesses which may not be exposed to good electrocleaning action due to unusual shape or size.

Field Repair of Propellers Cuts Need of New Blades

Tools which enable the immediate repair of bent and warped propellers on the most distant fields are being manufactured by Thomas Machine Mfg. Co., Pittsburgh, for Curtiss-Wright Corp., the company revealed recently. The tools, metal straightening blocks and tables used in the operation are greatly reduc-

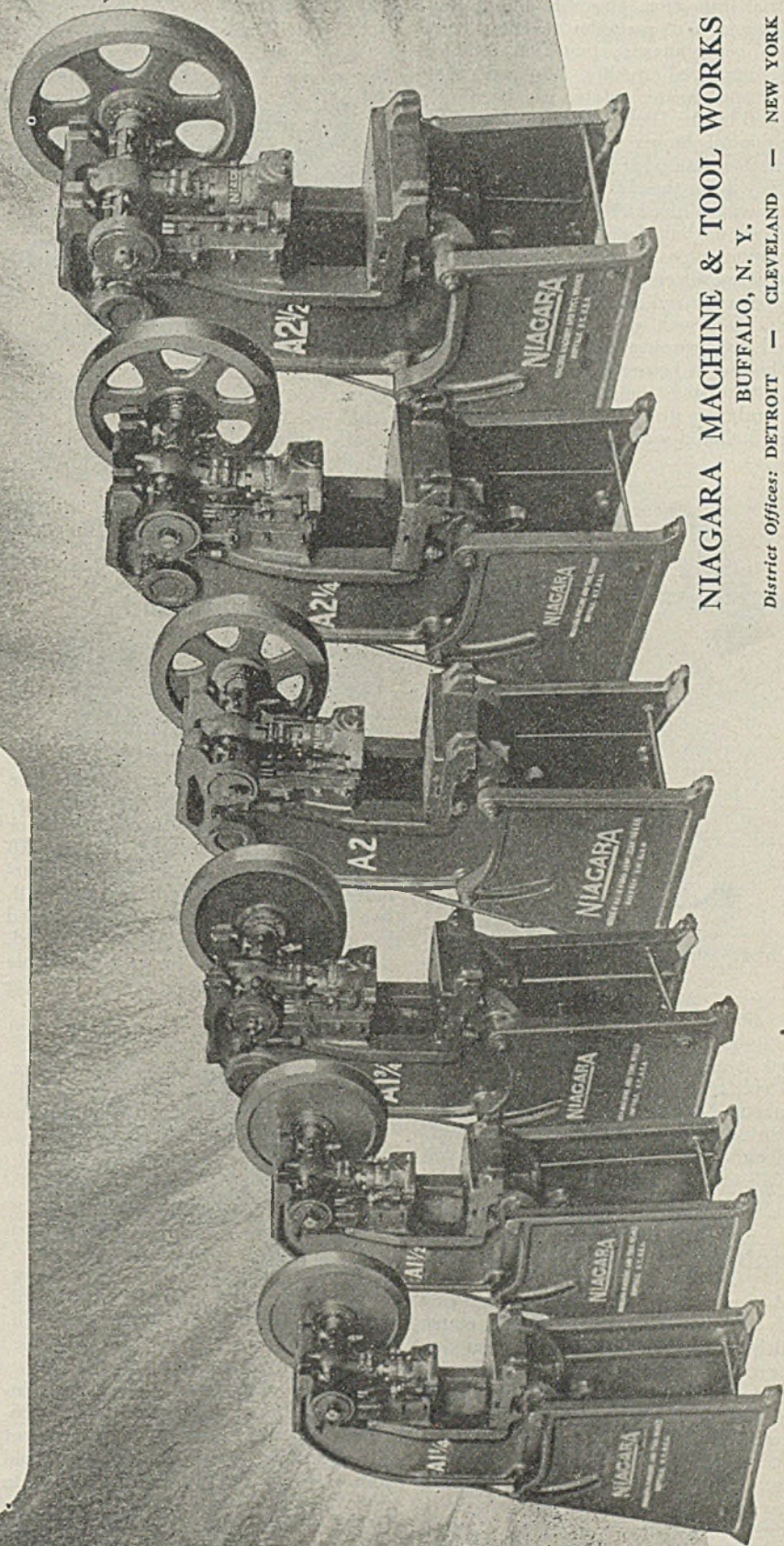
ing the need for supplying new blades.

The straightening blocks are made in sets to fit the different types of hollow propellers. Each block is shaped to fit the contour of the propeller at a section, or station, marked off on the blade and designated by a number which is the distance in inches from center line to the marked station.

When a propeller becomes warped or bent in a crash, it is straightened by pressing between blocks that fit the injured blade, being sure the blocks are set at their proper stations on the blade. The operation is done on a straightening table, with numbered table stations holding the equivalently numbered blocks, while the matching stations on the blade—which is held in a cradle—are pressed against them.

MORE PRODUCTION PER MAN HOUR

These smaller size Niagara Inclinable Presses offer the same design features of larger Niagara Models. The instant acting 14-point sleeve clutch is an important factor in increasing the output per man hour. It is possible that one or more of these presses can help you in speeding up production of urgently needed wartime material.



NIAGARA MACHINE & TOOL WORKS
BUFFALO, N. Y.

District Offices: DETROIT — CLEVELAND — NEW YORK

BUY UNITED STATES WAR BONDS AND STAMPS

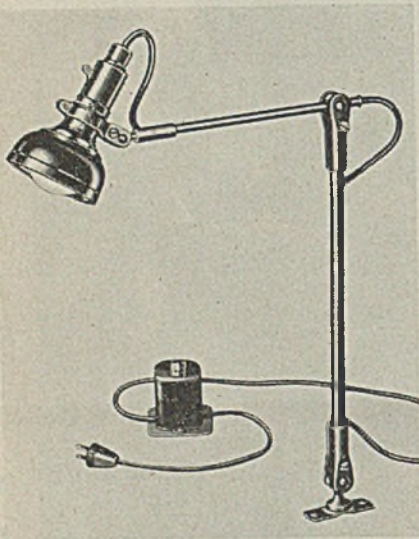
INDUSTRIAL EQUIPMENT

Lighting Fixture

A supplemental lighting fixture for industrial inspection, assembly and sorting operations and precision machine jobs which contributes to increased production, improved quality, lessened eye-strain and greater safety, has been developed by the Diehl Mfg. Co., Electrical Division of Singer Mfg. Co., Finnerman plant, Somerville, N. J.

Known as the Diehl-Lite, it is provided with a blue-tinted lens which gives nonglare daylight beam illumination with maximum intensity over the area where light is most needed. Additional crystal clear or ruby red lenses are available for special uses such as for ship chart-rooms, signal and warning devices.

The unit is housed in a sturdy molded Bakelite casing, mounted on an adjustable tubular steel supporting arm with three ball-and-socket joints, which pro-



vide simple and accurate adjustment of the light. Long life and resistance to shock is assured through use of a special 6-8 volt transformer with patented brass contacts. Light control is provided by a conveniently located toggle switch.

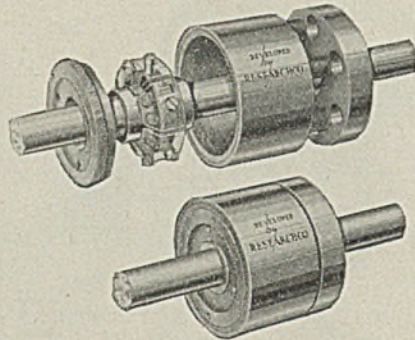
Standard equipment includes 110-volt or 220-volt transformer, oil-resistant wire and attachment plug.

Centrifugal Clutch

A new type of automatically engaging and self-disengaging centrifugal clutch which can serve as either a coupling between shafts or as a driving pulley or gear in a transmission, as well as a starting cushion between power units and driven mechanisms, is announced by the Amalgamated Engineering & Research Corp., 100 West Monroe street, Chicago 3. This new unit, known as the Torkontrol, consists of a partially filled oil chamber fitted with a freely rotating hub, which carries a series of movable wedge-shaped flyweights. As the hub revolves, weights fly outwardly and engage the internal rims of the outer case to bind the hub

and shell into a functionally solid pulley or coupling.

It works in either direction and is "set" to engage or release at a given speed, and to slip in case of overload. Torkontrol

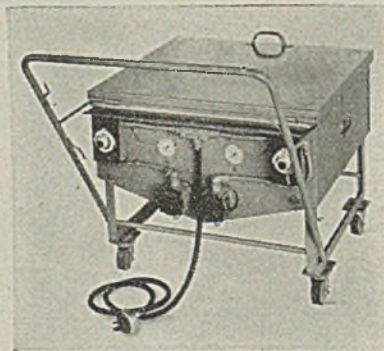


permits the use of smaller engines or motors which start without load, give smooth cushioned application of power, straight line acceleration with resulting saving in operating cost.

These clutches are available in sizes from $\frac{1}{4}$ to 500 horsepower for both built-in and general application.

Metal Cleaning and Rinsing Tank

By using the two hot liquid dip tanks in one portable unit—which features the Twin Dipmaster developed by the Aeroil Burner Co., West New York, N. J.—an operator is able to clean and rinse metal parts and products without carrying them to a second tank for hot or cold rinsing. The unit plugs in on 110 or 220 volts, alternating or direct current for instant heating. Equipped with two insulated compartments separated by a partition, which is also insulated, the Twin Dipmaster has two removable immersion tube heating units (one for



each tank) which heat the cleaning solution and rinse water. Separate, automatic heat control for each compartment is supplied by two thermostats that hold any required temperature from 110 to 350 degrees Fahr., operating independently of each other. In addition there are two built-in thermometers registering temperatures from 100 to 600 degrees Fahr. and four dipping baskets.

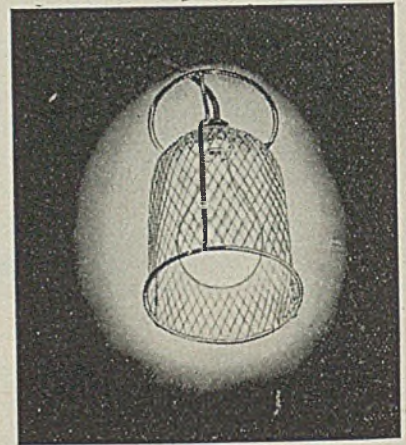
Completing the standard equipment are scum gutters, draw-off cocks, an in-

ulated cover, pipe connections for the addition of fresh water to rinse compartment as well as to drain off contaminated liquids, and two work grilles on which bulky parts can be set during the cleaning and rinsing processes.

Lamp Guard

A new lamp guard, known as the Hoffcrafter lamp guard, has been developed by the Hoffman Co., 41-43 North Penn street, York, Pa. The guard is of cantilever construction, the design of which, in larger sizes, gives strength capable of bearing 500 pounds of weight; thus it will not be crushed, bent or otherwise damaged if stepped on or hit by a falling object.

It is made of flat die-cut steel sheet, formed and shaped in manufacture. All joints are electrically welded for one-



piece construction. The design of the guard assures 90 per cent lighting efficiency in all directions and helps to eliminate bulb and globe breakage.

Portable Spot Welder

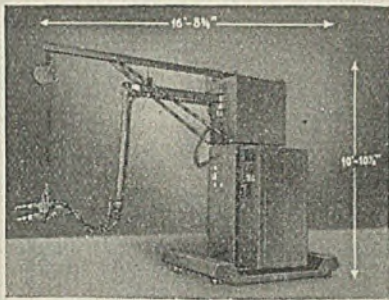
Crowded and fixed jigs can be reached easily with the new radial-type gun spot welder, specially designed for aluminum and light alloys. Tacking operations as well as structural welding on large or fixed aluminum structures can be accomplished with speed and efficiency. Developed by Sciaky Bros., 4915 West Sixty-seventh street, Chicago 38, this machine uses the stored-energy principle with a variable pressure cycle. Known as type PS2R-1, this welder is rated at 100 kilowatts and has a capacity for up to two thicknesses of 0.064-inch aluminum or two thicknesses of 0.080-inch corrosion resisting steels.

The cables are mounted to the gun on horizontal water-cooled copper bars of heavy section. These permit the use of light section cables to the gun, as electrical losses are reduced to a minimum.

The control cabinet, main welding reactor, monorail and special copper bars connecting the gun to cables are all

(All claims are those of the manufacturer of the equipment being described.)

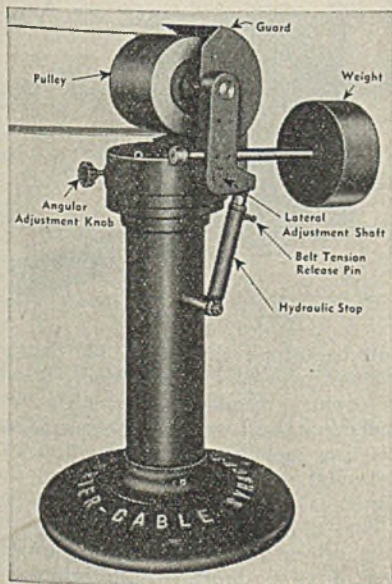
built as a self-contained unit. This unit is mounted on a stationary column and pivots 180 degrees on a vertical axis by means of ball bearings mounted inside the column. Machine area reached by



the welding gun is represented by a half circle 23 feet in diameter. Transverse movement of the gun on a straight line can be 12 feet in length and vertical movement 20 inches above and below a minimum position. The weight of the gun and cables is compensated for by a balancing device, and the gun travels on the monorail a distance of 3 feet 4 inches. Pressure as high as 1600 pounds is supplied to the gun by means of a special air-operated hydraulic booster. A variety of horizontal and vertical gun types are available. The unit may be either stationary or buggy-mounted.

Backstand Idler

Heretofore, it has been necessary to coat grinding and polishing wheels with the abrasive, or use a solid "stone" wheel. The new model ABS backstand idler, which has been added to the line of abrasive belt grinders of the Porter-Cable Machine Co., Syracuse, N. Y., makes possible the use of an endless metal cutting abrasive belt which re-



sults in faster cutting and makes desired finishes more easily obtained. The idler is used to adapt grinding and polishing lathes to abrasive belt grinding. Be-

cause of the long abrasive belt used, heat is greatly reduced. This lower temperature of operation greatly decreases such hazards as heat discoloration, warping, fracturing and so on.

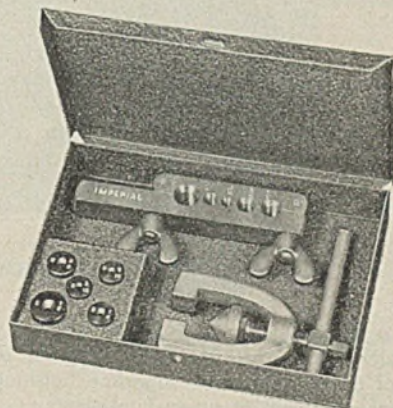
Where it has been customary to grind, rough polish and finish on regular wheels, the same results are obtained by the abrasive belt method, but the rough polishing operation can be eliminated. All of these factors have a tendency to reduce grinding and polishing costs.

The backstand idler is recommended for grinding welds, forging flash, generating radii, flat and edge work, cleaning up, polishing, etc.

Any width belt up to 6 inches can be used.

Flaring Tool

A new flaring tool, which makes correct double flares on thin-wall steel tubing from 3/16 to 1/2-inch for SAE flare and inverted-flare joints, is announced by Imperial Brass Mfg. Co., 1200 West Harrison street, Chicago 7. Also suitable



for making single or double flares on copper or aluminum tubing, the tool insures against cracking or splitting of tubing by folding back the end to make a flare with double-thick double-strength walls.

Two advantages for the tool are: It can be used on the job; and second, one tool will handle all the most widely used sizes of tubing.

The tool is small and convenient to work with. It first bells the tubing, using an adapter, then completes the double flare very much the same as a conventional flaring tool. It can be used with soft steel tubing of seamless, butt-welded or lap-seam-welded construction having not over 0.035-inch wall.

Airplane Skin Fastener

Safety developments designed to cut the accident hazard in the use of airplane skin fasteners, recently announced by the Presthoke Division of the Detroit Harvester Co., Toledo, O., include a cap for the conventional fastener and a redesign of company's Prestite safety gun, the latter shown in accompanying photo.

In redesigning the gun, the plunger which actuates the fastener was extended within the cup to eliminate the possibility of the fastener shooting out of the gun or becoming disengaged due to improper placing of the fastener in the inserting tool. The cap was added to prevent a



retrograde movement of the spring and fastening element in the event of failure, thus removing the hazard of flying parts.

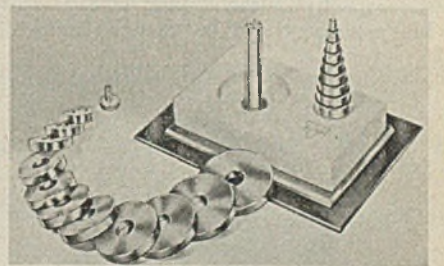
The changes were dictated by past experience which shows that the extreme spring pressure required of these fasteners in clamping body sheets together, plus inexact assembly tool design, allowed the fastener, if not properly placed, to burst forth from the tool at risk of operator and persons nearby.

Setting, Checking Rolls

A set of master setting and checking rolls for the checking of micrometers and other precision inspection and gaging instruments has been announced by Sav-Way Industries, Box 117, Harper Station, Detroit 13. The set consists of 20 individual rolls ranging from 0.100 to 2.000 inches in diameter. The rolls are hardened, ground and lapped to gage makers' tolerance. They are deep frozen before finish grinding to eliminate internal strains and provide accelerated aging.

In addition to checking, these rolls are also useful in setting up jobs where dial indicators and amplifiers are to be used.

The set is housed in a transparent



plastic case which not only provides necessary protection but also gives a clear view of the contents and insures that all rolls are in place when the set is returned to the tool crib.

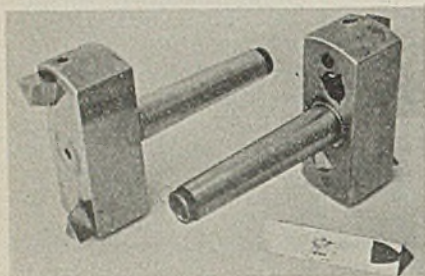
Fly Cutters

Triangular tool bits, known as Tri-Bits, have been applied to fly cutters, it is announced by Weddell Tools Inc., 1239 University avenue, Rochester 7, N. Y. Made with one or more teeth and set at suitable rake and shear angles, they are being widely used for high speed milling operations — particularly for

INDUSTRIAL EQUIPMENT

milling aluminum or magnesium or carbide milling of steel. The cutter blades may be ground for roughing or finishing, or one blade may be ground to cut on the diameter for roughing; the other set ahead on the face and ground under diameter with a lead, for finishing.

The triangular tool bits are rigidly locked in position, clamped home into a V-shaped hole by a single lock screw. The blade is backed up by a single lock screw, affording a simple means of ad-

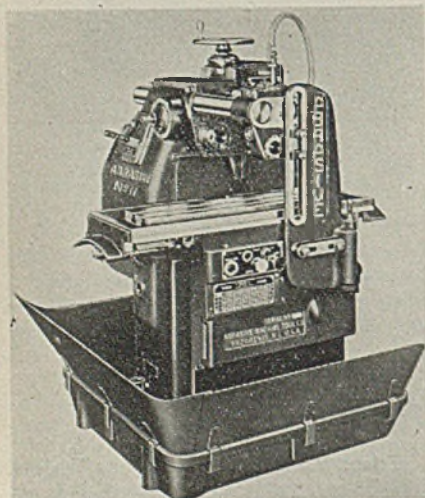


justment for size or wear. The bits are furnished in high-speed steel, cast alloys or carbide tipped.

The cutter bodies are of heat-treated alloy steel or of Meehanite castings. The fly cutters, 2½ inches in diameter and up, are furnished either with solid shank or of the shell-type to fit standard or special arbors.

Milling Machine

A plain milling machine has been added to the line of Abrasive Machine Tool Co., East Providence, R. I. The new milling machine, known as B-11, is a manufacturing-type unit with complete electrical control for table and spindle power movements. It has a built-in backlash eliminator on the table screw which is released automatically during fast travel. This permits climb milling in either direction up to the capacity of the driving motors. Table movement can be changed quickly



and precisely by means of the electrical controls.

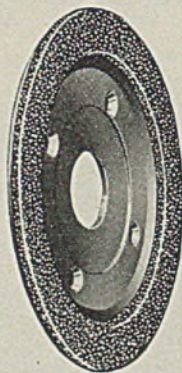
Other outstanding features include automatic reverse, fast table travel of 300 inches per minute and an unusually

wide selection of feeds and speeds. Its capacity is ample for most work of medium size, and work of either short or long runs can be handled easily. Additional set of dogs and extra table motor controls may be used to widen still further the choice of milling cycles provided.

Controls of the machine are readily accessible and most setup adjustments can be made from the front of the machine. Safety features provide protection to both operator and machine.

Diamond Bonded Wheels

A newcomer in the field of diamond bonded wheels is the new Super-Cut recently announced by Industrial Abrasives Inc., 3724 West Thirty-eighth street, Chicago 32. A secret bonding process which sets each individual diamond solidly and uniformly in a special metal gives both fast cutting and long life. The wheels are made in a wide variety of types and sizes and are espe-



cially adapted to the new program of tool conservation and superfine finishing now employed in up-to-date plants.

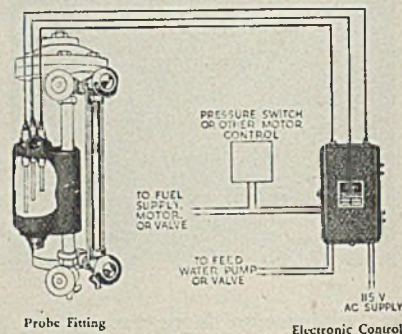
Feedwater Control

For maintaining constant boiler water levels automatically and for guarding against low-water hazards, the Combustion Control Corp., Cambridge, Mass., has developed Fireye electronic feedwater controls series P156N. Designed to provide the average power plant with low-cost automatic control, the equipment eliminates difficulties encountered with complicated mechanical devices and is guaranteed for an unlimited service-free life.

For automatic feedwater pump control and low-water protection, Fireye type F156N is used with probe fitting type H53, as shown in the accompanying illustration. Three probes are within the fitting. When water falls below the middle probe, Fireye closes the electrical circuit controlling the pump and water feeds into the boiler. When the level rises to the top probe, the water itself acts as conductor of a minute electrical current which operates the electronic control and turns off the pump. The pump remains inoperative until boiler water again falls to the level of the middle probe. The third

and lowest probe defines the danger point below which boiler water must not fall. Should water drop below this safety probe, Fireye immediately shuts off the fuel supply and sounds an alarm.

Such controls are supplied for boiler pressures to 300 pounds and for operation



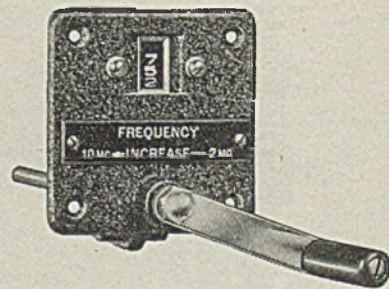
Typical FIREYE Installation For Automatic Boiler Feedwater Control And Low-Level Safeguard

from a supply of 115 or 230 volts, alternating current, 60 cycles. The equipment governs solenoid valves, small horsepower pump motors, or pump motor magnetic starters. The probe housing is furnished in either cast or malleable iron and the electronic control is in a weather-proof pressed steel housing.

Types are available also for automatic pump control only, or for low-level protection only.

Cyclometer Counter

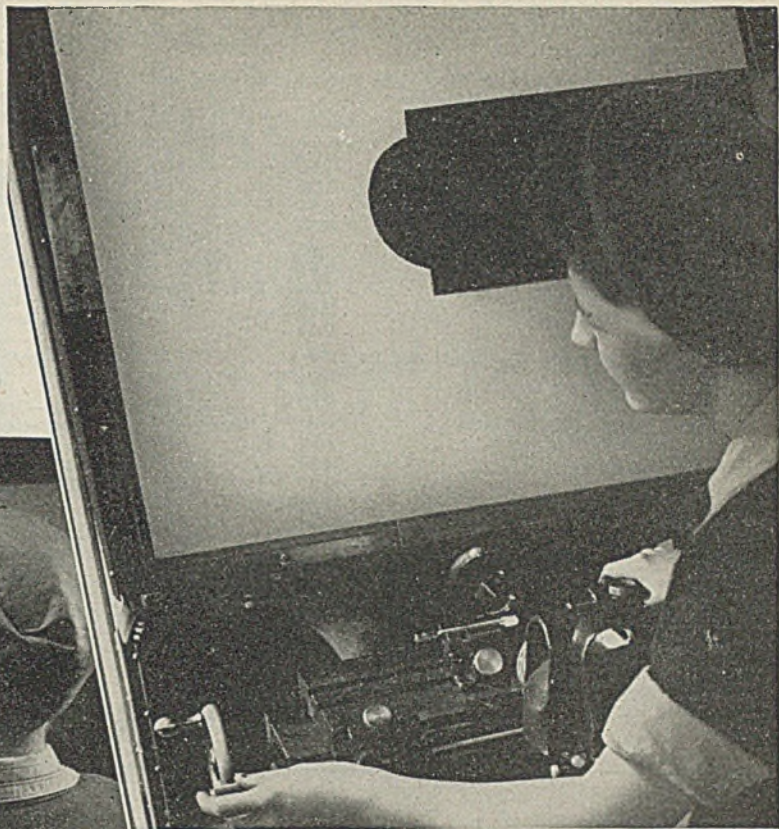
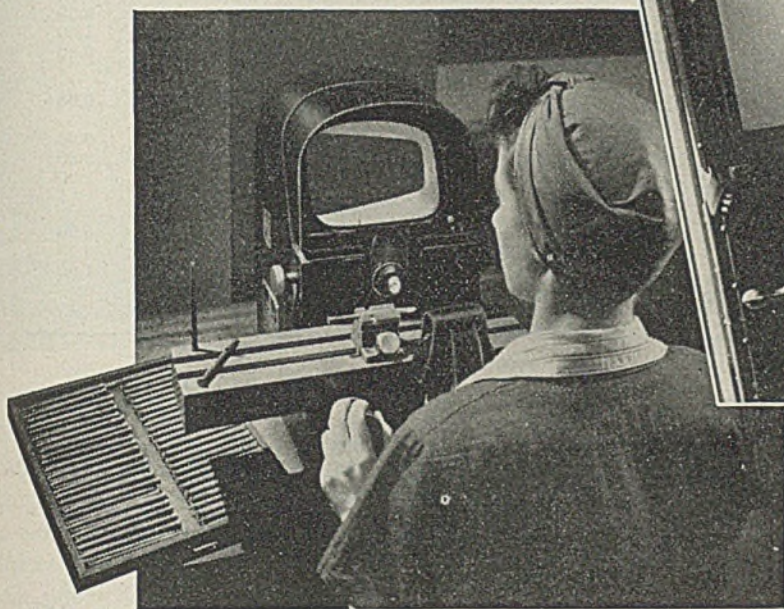
Designed for registering rotary coil turns down to tenths of a turn, the cyclometer-type counter unit produced by Barker & Williamson, radio manufacturing engineers, 235 Fairfield avenue, Upper Darby, Pa., is now offered as a separate item. It is adaptable to practically any application where a shaft



must be turned more than 360 degrees and the exact rotation recorded. Standard counters record 10 turns; others, also available, record up to 1000 turns. Current uses include recording vertical and horizontal stabilizer adjustments on airplanes.

The counter assemblies have direct shaft drives. Shafts can be any length. Gear drive is direct, with precision-cut steel gears. A Veeder-Root counter is used. Units are available with either right or left-hand rotation. They are light in weight (8 ounces), are extremely sturdy and pass wartime specifications.

Indispensable



COURTESY WESTMOUNT TOOL WORKS, QUEBEC, CANADA

Jones & Lamson Optical Comparators are used to inspect positively and rapidly punches and other products with symmetrical and irregular contours held to close limits, at the Westmount Tool Works, Canada.

Jones & Lamson Optical Comparators are indispensable for the accurate, rapid inspection of irregular contours that are held to close limits. By no other means can they be inspected as positively and as rapidly.

Because of wartime restrictions we cannot illustrate many of the remarkable applications of these **Comparators**, how

their use has solved seemingly impossible inspection problems and helped to speed the production of vital products. But — our inspection engineers are available to study your inspection problems and give you the benefit of more than twenty years' experience, pioneering and developing Inspection by Optical Projection.



JONES & LAMSON

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

MACHINE CO., SPRINGFIELD, VERMONT, U.S.A.
Profit-producing Machine Tools

TABLE I—ADAPTABILITY OF METALS TO SPINNING

Group I—Aluminum and the Alloys, also Hyblum, Dowmetal and Magnesium		
Type	Shallow Spinning	Deep Spinning
2So	1.00	1.00
3So	1.00	0.995
17So	0.65	0.45
24So	0.65	0.45
52So	0.98	0.62
53So	0.98	0.62
Hyblum	1.00	0.995
Magnesium	0.55	0.45°
Dowmetal	0.55	0.45°

Group II—Copper and the Alloys		
Type	Shallow Spinning	Deep Spinning
Admiralty Brass	0.82	0.70
Cartridge Brass	0.99	0.91
Commercial Bronze (Gilding Metal)	1.00	1.00
Copper—Cold Rolled Annealed	1.00	1.00
Copper—Hot Rolled	0.99	0.88
Everdur—1015	0.97	0.87
Everdur—1010	0.965	0.85
Eyelet Brass	0.99	0.91
High Brass (Yellow Spinning or Stamping Brass)	0.99	0.99
Low Brass	0.99	0.88
Muntz Metal	0.55	0.15
Naval Brass	0.75	0.25
Nickel Silver (Up to 30%)	0.98	0.87
Olympic Bronze (Types A. and G.)	0.97	0.97
Phosphor Bronze (—5%—Soft Temper)	0.85	0.45
Red Brass	0.98	0.89

Group III—Common Steels SAE-1010-15-20 and Miscellaneous Steels

Type	Shallow Spinning	Deep Spinning
Cold Rolled Deep Drawing Quality	1.00	1.00
Enameling — Vitreous, Extra Deep Drawing Quality	1.00	0.94
Galvannealed	1.00	Impractical*
Galvanized	0.91	Impractical*
Hot Rolled Pickled Drawing Quality	1.00	0.80
Hot Rolled Copper Bearing	0.88	0.51
Hot Rolled Dead Soft	0.88	0.51
Lead Coated (Long Ternes)	1.00	Impractical*
Nax—High Tensile Steels	0.45	0.15
.40% and Upward of Carbon	0.25	0.10

*Coating will flake off.

Group IV—Stainless Steels		
Type	Shallow Spinning	Deep Spinning
302—Grade 18-8	0.98	0.50
304—Grade 18-8 (Modified)	0.98	0.98
316—Grade 18-8 (Molybdenum)	0.98	0.50
347—Grade 18-8 (Columbium)	1.00	1.00
430—Grade 14-18 Chromium—No Nickel	1.00	0.80

Group V—Nickel and Nickel Alloys		
Type	Shallow Spinning	Deep Spinning
Inconel	0.95	0.88
Monel—Special Cold Rolled Deep Drawing Quality	1.00	0.96
Monel—Standard Cold Rolled	0.95	0.90
Nickel	1.00	1.00

Group VI—Miscellaneous		
Type	Shallow Spinning	Deep Spinning
Lead	0.96	0.90
Pewter	1.00	0.99
Zinc	1.00	1.00

“SPINNABILITY” of METALS

... is reduced to a numerical factor indicating performance to be expected

IT IS IMPOSSIBLE to set definite limitations to the application of metal spinning. Much depends on the spinning technique employed as well as the material being worked. Milwaukee Metal Spinning Co., Milwaukee, finds potential uses for this economical method of forming sheet metal are almost limitless.

This company has done much work in an endeavor to reduce to a concrete figure the factors entering into “spinnability” or the adaptability of metals to the spinning process. Although it is necessary to consider many cases individually, the information in the accompanying tables will be helpful and can generally be followed.

The data are based upon the unit 1.00 which is given to the type of material in each classification which lends itself most readily to forming by the cold metal spinning process. The lower the value listed, the higher the cost of spinning that material. These figures are based on actual experiences but will vary somewhat depending upon special circumstances such as contour of article to be spun, gage, dimensions, and the like.

The two items marked with an asterisk (*) in group I are low because the special setup and technique required reflects on cost due to the small demand for this type of work at present. However, as result of the war, sheet mill capacity for these metals has been improved greatly and demand may increase substantially. If this proves true, provi-

sion will be made to standardize on these special setups. For this reason, the company emphasizes that anyone interested in Dowmetal and magnesium by all means give it serious consideration despite the low efficiency, high cost factor listed here.

A comparison of the best material for spinning in each of these six groups shows aluminum 2SO as 1.00; zinc 0.94; cold rolled deep drawing quality steel 0.91;

cold rolled annealed copper as 0.87; nickel as 0.86; type 347 stainless steel as 0.67; with the various other metals following in each group.

There are also many other metals and special alloys which are not so commonly used but which can be spun. A goodly number of them require special technique in handling them, however. Some of these are gold, silver, platinum, Kovar, Invar, Ilium.

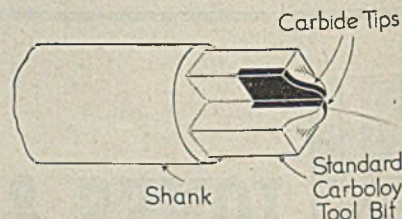
Carbide Turning Tools Serve As Milling Cutter

Ordinary low-cost carbide turning tools are used for end milling at General Electric Co.'s Schenectady plant in lieu of more costly form milling tools when production quantities for which the tools are needed are relatively limited. They also fill a gap when the time required to obtain special cutters would delay the job.

Two standard Carboly tools tipped with cemented carbide are welded together, as shown in the accompanying sketch, so that the Carboly tips form the cutting edges of a two-lipped cutter. The assembly is in turn welded to a shank suitable for mounting in a milling machine. The “cutter” is then ground to size and form with the

necessary backing off clearances, etc., according to the metal to be machined.

Such cutters are used in the machining of a wide range of materials including tool steels, bronzes like Ampco and Trodaloy and particularly in working metals where high-speed steel does not hold up satisfactorily.



FOR WAR TODAY—FOR YOUR PRODUCTS TOMORROW

AN ENGINEERING PROJECT— $\frac{1}{8}$ " LONG



Zinc alloy die cast—for accuracy and strength

The construction of the mechanical pencil shown above calls for a spirally threaded stud which is only $\frac{1}{8}$ " in length. At first glance, one would think that this part could best be produced on a screw machine. A close inspection, however, reveals a tiny slot (.020" x .062") in one side of the stud, and the precise location of this slot is critical to the operation of the lead-feeding mechanism. As a zinc alloy die casting, the slot, as well as the spiral threads, is accurately obtained in the casting operation.

A question of strength is also involved here—to withstand tearing, breaking or shearing of the stud under rough usage. With a wall thickness of only .0115" under the thread, this zinc alloy die casting has proved entirely satisfactory.

THE



ALLOY POT



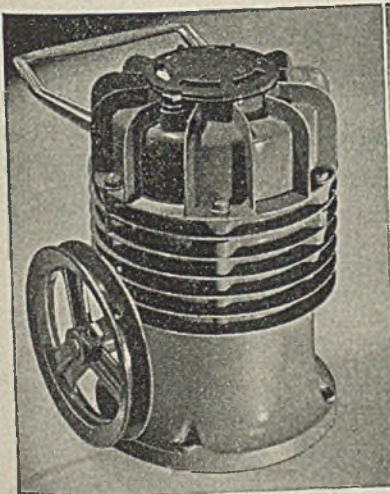
A publication issued for many years by THE NEW JERSEY ZINC COMPANY to report on trends and accomplishments in the field of die castings. Title Reg. U. S. Pat. Off.

STEEL MAGAZINE EDITION **No.16**

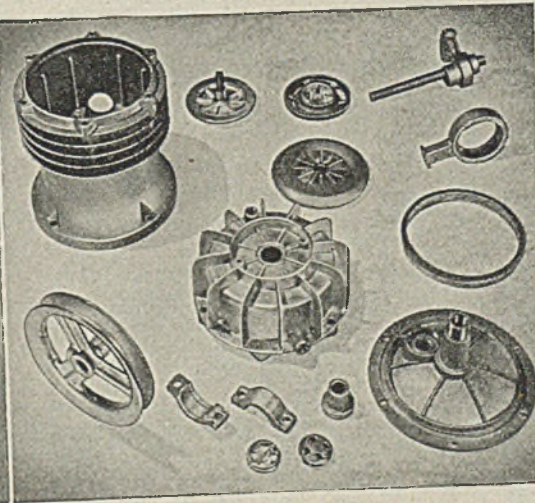
90% OF A COMPRESSOR IS ZINC ALLOY DIE CAST

Here is an interesting case history on an air compressor which is now serving the war effort in connection with Radar equipment. The photographs below, plus the following comments from the manufacturer, tell the story:

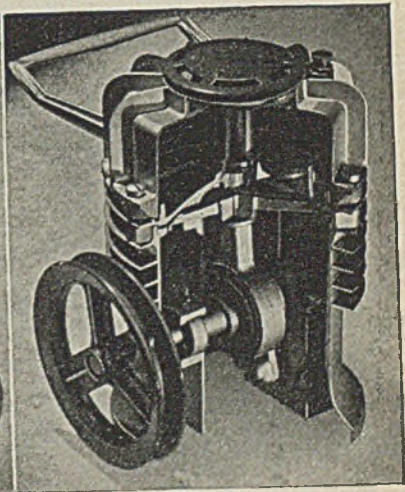
"On our single cylinder compressor we use 15 individual zinc alloy die castings which represent approximately 90% of the total weight. We use 3 grease packed ball bearings in this compressor and are able to hold the alignment on the bearing housings without any machining. Our connecting rod bearing is pressed into the zinc alloy connecting rod. The only operations we do on this rod after die casting are to trim off the flash and tap the cored hole for the pull plate screw. Likewise we do not machine the pillow block caps or compressor base for the shaft bearings. There are many other advantages in the use of zinc alloy die castings too numerous to list here."



The complete compressor



The parts



A sectionalized view



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HORSE HEAD SPECIAL (99.99 + %) ZINC

DYNAMITE

TO REMOVE BROKEN DRILLS



Fig. 1 (Above)—Dynamiter ignites fuse after tamping dynamite into oil hole and inserting cap. Less than thimblefull of dynamite is needed

DYNAMITE can be used to remove broken drills, reamers or plug gages. It is especially suited for clearing deep drilled holes. Today, in the plants of the Ohio Crankshaft Co., Cleveland, prominent producer of crankshafts, skillful use of this high explosive has eliminated the necessity of scrapping shafts because of a broken drill. While unconventional from an engineering standard, the method has proved itself highly effective.

Originator of the dynamiting method, Nels Sorenson, superintendent of the automotive crankshaft division of the company, has perfected his technique to the point where by actual count in 10 years he has lost only two shafts from which the drills could not be blown out. Thousands of shafts have been withdrawn from salvage and returned to the production line because of the Sorenson method.

Significant is the lack of costly equipment necessary to accomplish the dynamiting, and the clean cut results following the blowing. Needed are only a clearing in which the salvage work can be carried out, common dynamite, fuse, caps, wire probe, putty and a brace and bit. So simple is the procedure that automotive engineers have not believed the dynamiting possible.

The dynamiting technique is simplicity itself. The shaft is removed to a

clearing outside the plant and placed on a platform, steel skid or the ground. With a wire rod the hole is probed to determine position of the drill below the bearing surface.

Dynamite is taken from a standard stick of blasting powder and pushed from a small trough into the hole by means of a round stick. No more than a thimbleful is ever used. Generally, the amount is considerably less depending upon the size of the hole and the set of the drill. Practice has shown the proper quantity of powder to use for certain conditions. Put in less powder than too much.

A 6-inch fuse is next inserted into a small diameter, shoulder-free cap and dropped into the hole atop the charge. When ignited a heavy plank or metal shield should be placed over the bearing surface to check the flight of the drill member as it is blown free. Frequently, timbers are split or the drill penetrates metal guard sheets. It is wise to keep at a safe distance during the dynamiting.

Drills are freed by the pressure of the blast which follows the drill flutes to the bottom of the hole and there reverses itself to drive the piece back out. As it leaves the shaft, the drill makes a ringing noise of metal striking metal.

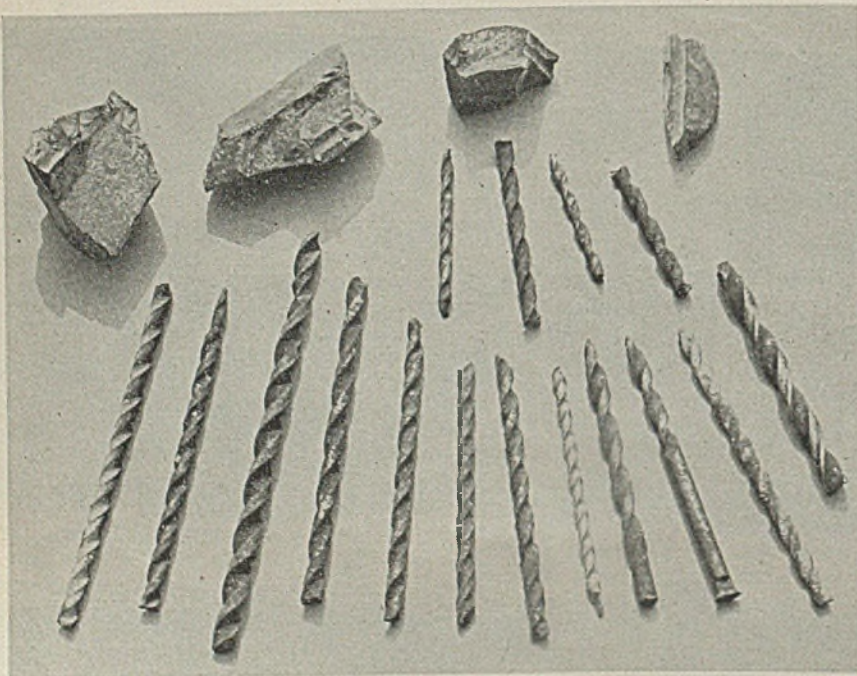
NO DAMAGE TO METAL: There is no evidence of harm, for thousands of crankshafts subjected to this operation have turned in long service records. The dynamiting of the drill from a crankshaft or other steel object can be compared to the explosion of a cartridge in a gun barrel. No harm befalls the gun block. The same is true in appraising the blowing of the drills. The charge has no effect upon the high quality steel of the crank or camshaft.

Drills removed vary in size from small 3/16-inch bits up to 1 1/4-inch core drills used in making lightening holes in camshafts. These big drills must be removed piece by piece requiring more than one shot. The dynamite is tamped into the oil hole of the drill itself.

Frequently, if a drill operator has himself endeavored to remove the drill, he forces the piece even tighter into the hole thus necessitating more than one shot. In fact, Sorenson once blew 72 charges before a big drill in a large Diesel shaft came free. The value of the shaft was such that no amount of effort to free the oil hole was felt excessive. Once a drill breaks off, Ohio Crankshaft drill operators are instructed not to attempt its removal.

To test results of dynamiting, the "blower" uses a common brace and bit. (Please turn to Page 109)

Fig. 2 (Below)—Collection of broken drills removed by dynamiting. Large lumps are sections of big core drill blown out by successive shots





THE SUB-BUSTER THAT WASN'T THERE

"We didn't have a chance. That murderous Nazi's fire whiplashed our open boat. Helpless, we ducked, and those who could, rowed on. Out in a ghostly glare, our ship went down.

"By God, we'll make them pay for this," said First Mate Stone, clenching his fist. Just then, a bullet got him in the throat.

"Your mind plays funny tricks at times like that. As those devils strafed us bow to stern, I seemed to see a DE Ship lunging in to pay them back a bit. Whenever I looked close, it wasn't there, and I kept wondering why."

* * *
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Perhaps the workers in your plant would benefit from a clearer idea of what our soldiers and sailors are enduring. How important *each* one's part is . . . is the basic theme of a series of posters based on ads like this one—posters freely available to every "bits and parts" manufacturer. Write us. Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, N. Y.

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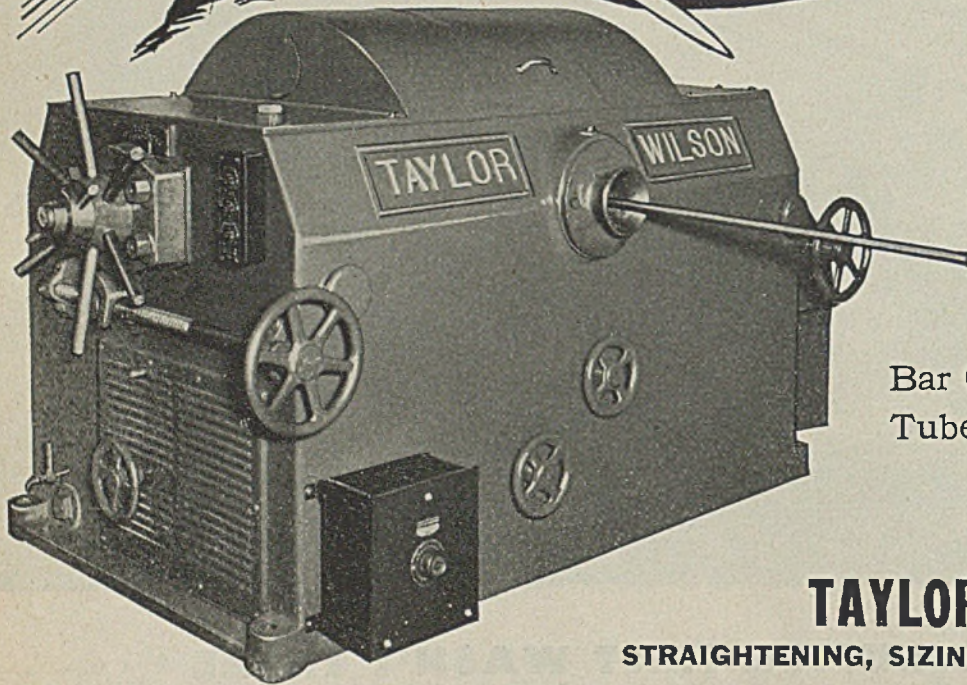


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A Study of Blast Furnace Moisture Control

Report on a series of tests made at a Cleveland blast furnace to ascertain what effect uniform moisture in the hot blast has on smelting operations and analysis of the iron is presented herewith. Results indicate that moisture has a definite influence on the silicon content of the metal

A STUDY was started December, 1942, on the No. 4 blast furnace, Corrigan McKinney plant Republic Steel Corp., Cleveland, to determine the influence upon the furnace operation and pig iron analyses of maintenance of uniform blast moisture. No. 4 was selected because its blast volume was metered by the constant volume governor of its turboblower and it was decided that the exact knowledge of the blast volume was more important in this test than the physical condition of its deteriorated furnace lining, which had been in service for over 2,500,000 tons.

To establish the performance on natural air, furnace and atmospheric data were obtained for test period No. 1 which extended from Dec. 20, 1942 to Jan. 20, 1943. Wet and dry bulb temperature readings disclosed the variation in moisture content of the blast going into furnace while operating with natural, uncontrolled moisture.

Provision was made for injecting steam to the cold blast line near the blower discharge. The diagrammatic arrangement is shown in Fig. 2. The blower intake is approximately 70 feet above ground elevation and it was considered advisable to determine wet and dry bulb temperatures by the use of a sling psychrometer. Readings were taken in the air stream at the intake.

Air volume was determined by the venturi tube with corrections made for variations in the intake air temperature and barometric pressure. Tables were prepared from a psychrometric chart which read directly in grains of moisture per cubic foot of air at any

This paper was presented at a joint meeting of the Blast Furnace and Coke Oven Association of the Chicago District and the Eastern States Blast Furnace and Coke Oven Association, Hotel Statler, Cleveland, Oct. 15.

By JOHN J. ALEXANDER
Assistant Superintendent of Power
Republic Steel Corp.
Cleveland

wet and dry bulb temperatures that might be encountered. This tabulation also included the required steam volume in pounds per hour for any normal variation in air blast to provide the necessary artificial moisture in grains per cubic

foot of air. Changes in the rate of steam injection were accomplished by throttling the regulation valve. A sample calculation follows:

Dry bulb, deg. Fahr.	58
Wet bulb, deg. Fahr.	48
Natural moisture, grs./cu.ft. . . .	2.6
Air blast (std. condition), cu.ft./min.	73,000
Artificial moisture required, grs./cu.ft.	5.4
Steam flow meter, lbs./hr.	3380
Total moisture in cold blast, grs./cu.ft.	8.0

On Jan. 21, 1943, steam was injected to correct hourly for variations in natural moisture. The steam addition was slowly increased until a total moisture of 4 grains per cubic foot was reached and maintained. No appreciable change in furnace operation was noted during the first week and during the tests no changes were made in furnace practices to compensate for the additional moisture of the blast. During this period the natural moisture was never stable for more than six hours and decreased on Jan. 25. It was found that under normal conditions natural moisture usually remains constant for no more than three hours and during the winter it frequently changes 2 grains per cubic foot during a 24 hour period.

The total moisture level was gradually increased to 6 grains per cubic foot during the second test period. At the conclusion of the second test period, a comparison was made between the operating results of the controlled and natural moisture periods. The most pronounced change was in the frequency of casts having higher than desirable percentage of silicon in the iron. In Table I it will be noted than 22.6 per cent of the casts during test No. 1



Fig. 1—Familiar scene at blast furnace at casting time

TABLE I—SUMMARY OF SILICON CONTENT IN THE IRON

Moisture controlled	Yes	Yes	No	No	Yes	No	No	Yes	No
No. of Test	1	1942	2	3	4	5	5-B	5-C	6
Test Period 1942-1943	12-20 to 1-20	1942	1-21 to 2-21	2-23 to 3-26	4-1 to 5-2	5-8 to 6-8	6-9 to 6-21	6-22 to 7-1	7-2 to 8-2
Si in Iron, %									
-0.50	1.4	1.7	5.2	2.6	5.1	5.1	3.2	6.1	4.6
0.55-0.65	1.4	3.9	7.2	6.5	7.1	12.7	16.1	8.2	9.7
0.65-0.95*	38.4	33.5	49.7	42.2	53.8	68.2	67.7	51.0	65.6
0.95-1.05	14.4	17.3	24.2	14.3	14.7	7.6	4.8	16.3	8.4
1.05-1.15	21.9	20.1	9.2	20.8	8.3	3.2	4.8	8.2	5.2
+1.15	22.6	23.5	4.5	13.6	10.9	3.1	3.2	10.2	6.4

*Desired silicon range.

had 1.15 per cent or more silicon in the iron. The desired silicon range was from 0.65 to 0.95 per cent. To eliminate the possibility that Period I was unusually poor, data obtained for 1942 are included. It will be seen that this data and that for Period I are almost identical. During test No. 2 (Table I) 4.5 per cent of the casts had more than 1.15 per cent silicon in the iron. The per cent silicon in iron was evidently decreased by the control of the blast moisture because 49.7 per cent of the casts were within the desired range of 0.65 to 0.95 per cent silicon, compared to approximately 35 per cent during uncontrolled moisture tests.

Steam Was Applied

From Feb. 23 to March 26, steam was injected to control total moisture at 6 grains per cubic foot. Natural moisture was extremely variable with changes from 0.6-grain to 5.2 grains per cubic foot taking place in the course of several days.

Summary of silicon in iron for this period is shown in Table I under test No. 3. Although 13.6 per cent of the casts had more than 1.15 per cent silicon in the iron it will be seen that 42.2 per cent of the casts were within the desired range of 0.65 to 0.95 per cent silicon. Despite extreme changes in moisture, iron analysis for the period was better than test No. 1 or during the year 1942.

In order to obtain a check upon the results noted during the second and third periods, test No. 4 was started April 1 with natural, uncontrolled moisture. Normally the moisture is variable during this month; but the natural moisture was unexpectedly uniform during this test period. After the first day of the test, changes in moisture were less than plus or minus 1.5 grains per cubic foot. Although the production rate was 1.4 per cent lower than during the third test, the iron analyses were comparable to the second test period. The excellent iron analysis summary shown under test No. 4, Table 1, is attributed to the relatively uniform natural moisture.

The total moisture in the blast was controlled at 8 grains from May 8 to June 9, while conducting test No. 5.

TABLE II—COMPARISON OF EXCESSIVE SILICON IN IRON

Test period, No.	Moisture	
	Uncontrolled	Controlled
1942	23.5	....
1	22.6	....
2	....	4.5
3	....	13.6
4	10.9	....
5	....	3.1
5B	....	3.2
5C	10.2	....
6	....	6.4
6B	24.3	....

TABLE III—COMPARISON OF EXCESSIVE SULPHUR IN IRON

Test period, No.	Moisture	
	Uncontrolled	Controlled
1942	15.0	....
1	9.4	....
2	....	16.7
3	....	10.0
4	10.7	....
5	....	10.6
5B	....	1.5
5C	26.5	....
6	....	10.0
6B	15.9	....

The natural moisture was extremely changeable. During this test period natural moisture ranged from 2.2 to 8.3 grains per cubic foot. Furnace production during this period was 6 per cent lower than during test period No. 4. However, the iron analysis for test No. 5, Table 1 was considerably better than during any previous test. Only 3.1 per cent of the casts had more than

1.15 per cent silicon in the iron and 68.2 per cent of the casts were within the desired range of 0.65 to 0.95 per cent silicon.

On June 8, an examination was made of the furnace lining which disclosed that the wearing plates at the stockline and the brickwork below them were in such shape as to account for the decrease in production and increase in coke rate experienced during the No. 5 test.

For the two short test periods 5B and 5C, the total moisture in the blast was controlled at 8 grains from June 10 to June 19 and was increased to 11 grains until June 21. From June 22 to July 1, natural moisture with similar variations to test period No. 5B was supplied. Iron analysis for test period No. 5B Table 1, are similar to those obtained during test No. 5. With no change in furnace operation other than discontinuance of steam injection for controlling moisture the results shown under test No. 5C, Table 1, were obtained. A comparison of tests Nos. 5B and 5C reveals that the percentage of high-silicon casts was increased from 3.2 to 10.2 per cent during the natural moisture period. The desired range of silicon was obtained during only 51.0 per cent of the casts during the uncontrolled period (5C), while 67.7 per cent of the casts were in the desired range during the controlled period (5B).

On July 2, steam injection to maintain uniform moisture of 8 grains was

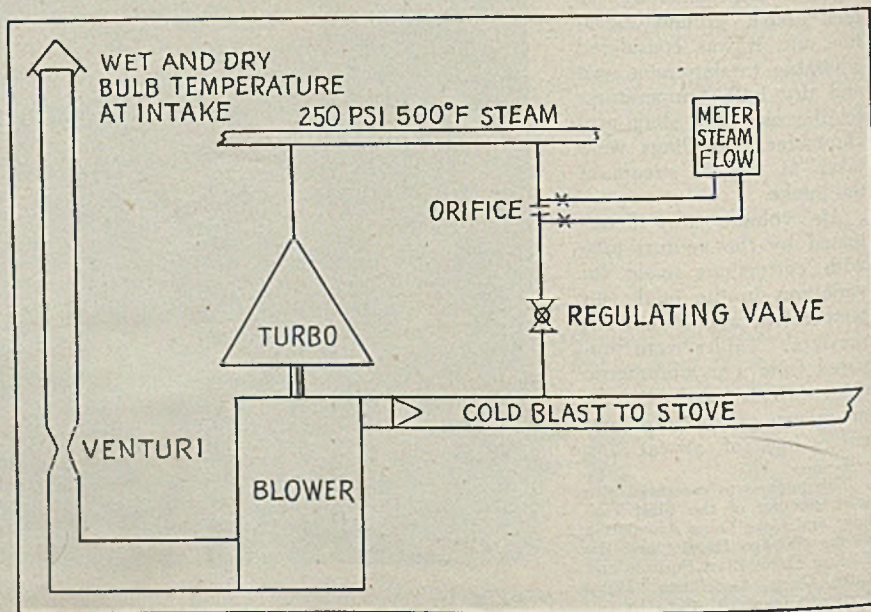
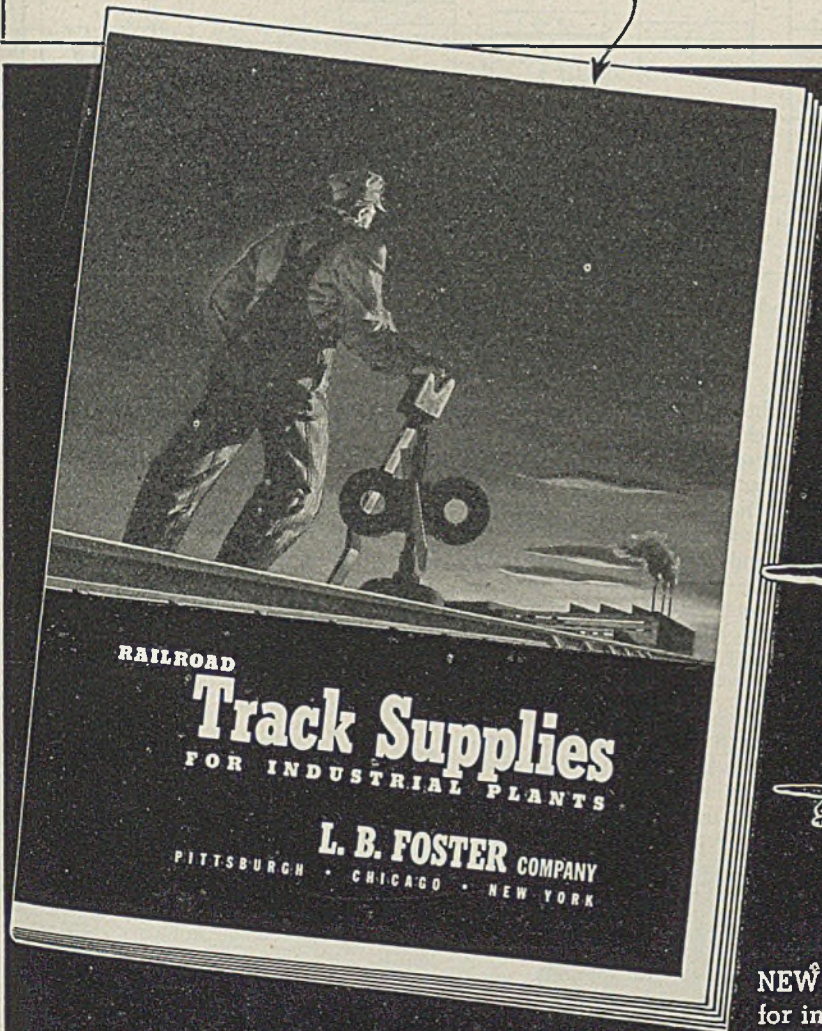


Fig. 2—Diagram showing where steam was injected in cold blast system

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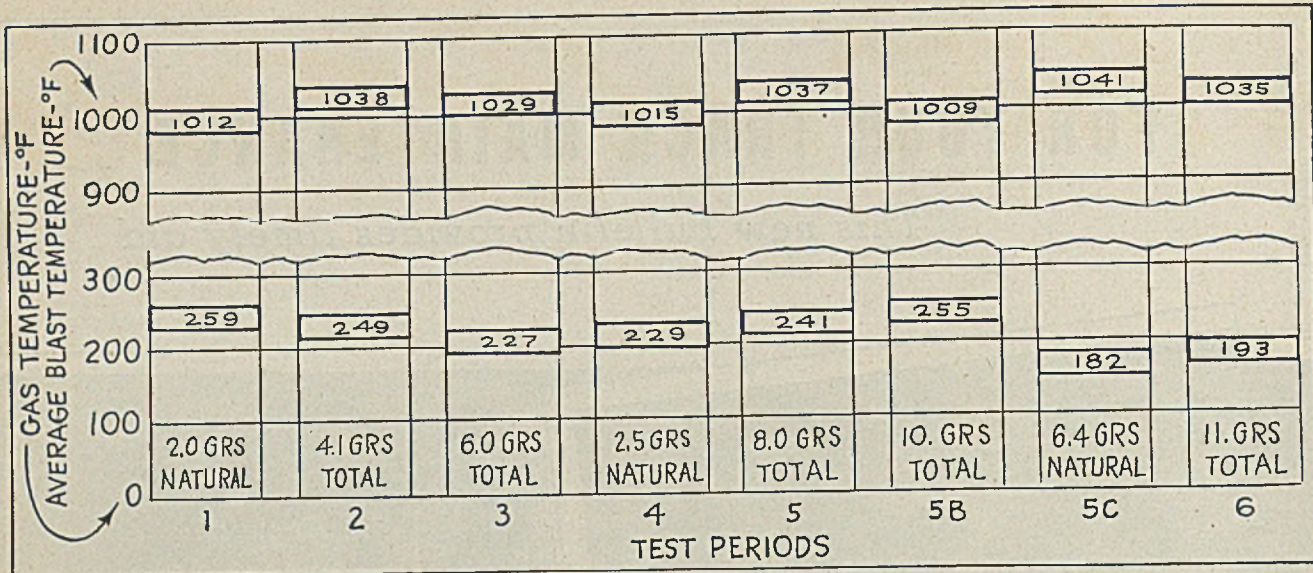


Fig. 3—Average temperature of hot blast (above) and of top gas (below) under different moisture conditions

re-established. This 32-day test period, No. 6, was concluded Aug. 2. Natural moisture was fairly uniform, but averaged 6.63 grains per cubic foot for the period. Total moisture was increased in 1-grain steps to a total of 12 grains which was maintained for five days. Due to a decrease in natural moisture and lack of steam flowmeter capacity the total moisture was reduced to 11 grains on July 30. No appreciable change in furnace operation was noted during this period, and the summary of silicon percentage test No. 6, Table 1, does not show any appreciable change from the other controlled moisture periods. Steam injection to control moisture of the air blast was discontinued Aug. 8 and during the period Aug. 9 to 21, 24.3 per cent of the casts had above 1.15 per cent silicon in the iron.

A comparison of the excessive silicon casts during each of the test periods is shown in Table II.

The year 1942, and tests Nos. 1, 4, 5C and 6B were all natural moisture tests. Tests Nos. 2, 3, 5, 5B and 6 were all controlled moisture tests. Table II is believed to indicate fairly accurately the effect of controlled moisture blast upon the per cent of casts with excessive silicon in the iron; that is, normally 18 per cent of the casts have above 1.15 per cent silicon, compared to 6 per cent of the casts with excessive silicon when moisture is controlled. It is apparent from this data that excessive silicon casts are much more frequent during periods of low natural moisture during the winter than they are during summer months with fairly high natural moisture.

During the uncontrolled moisture tests an average of only 44.1 per cent of the casts had the desired (0.65 to 0.95 per cent) silicon in the iron. With moisture controlled, an average of 58.6 per cent of the casts had the desired silicon in the metal. In the author's opinion, the moisture content of the blast has a definite effect upon the percent silicon in the iron.

It was suggested that the moisture

content of the blast might influence the per cent sulphur in the iron. Table III shows the percentage of casts exceeding the desired sulphur percentage of 0.040 per cent. The frequency of excessive sulphur casts is almost the same during natural and controlled moisture test periods. There have been no indications that controlled moisture in the blast has any influence upon the sulphur content of the iron.

The average hot blast and top gas temperatures for each of the tests is shown in Fig. 3. These average temperatures are relatively uniform and show that there were no wide spread variations due to moisture in the cold blast.

The average daily tonnage for the year 1942 was taken as 100 per cent. Table IV shows the production rate based upon daily average tonnages for each of the 32-day test periods. No comparison with the short 10 and 12-day periods was made due to the probability of inaccuracies. During test periods Nos. 2 and 3 production was slightly higher than during the year 1942 or during the No. 1 test period. Tonnage during the natural moisture test period No. 4 averaged the same as during the year 1942. It was at the conclusion of test period No. 5, that the badly deteriorated condition of the lining was noted. It is assumed that the loss in production during the last two periods was due entirely to the

adverse condition of the furnace lining. The ratio of iron produced to the total iron bearing material charged for each period is shown in Table V. It

TABLE IV—RATE OF FURNACE OPERATION
(Average Daily Production Rate, 1942=100%)

Test period, No.	Production, %	Moisture	
		(grs. natural)	(grs. total)
1	98.1	2.0	...
2	100.8	...	4.1
3	101.4	...	6.0
4	100.0	2.5	...
5	94.0	...	8.0
6	87.6	...	11.0

TABLE V—RATIO OF IRON PRODUCED TO TOTAL IRON BEARING MATERIAL CHARGED

Test period, No.	Moisture	
	Uncontrolled	Controlled
1942	49.3	...
1	46.8	...
2	...	51.8
3	...	51.8
4	49.8	...
5	...	51.1
6	...	48.6

TABLE VI—RATIO OF IRON PRODUCED TO TOTAL SOLID MATERIALS CHARGED

Test period, No.	Moisture	
	Uncontrolled	Controlled
1942	29.4	...
1	28.2	...
2	...	30.8
3	...	30.7
4	29.6	...
5	...	29.7
6	...	28.1

TABLE VII—SUMMARY OF MOISTURE CONTROL

Test period, No.	Avg. natural moisture, grs./cu. ft.	Avg. total moisture, grs./cu. ft.	Avg. air volume, cu. ft./min.	Cu. ft. air per lb. coke	Lbs. CaCO ₃ per ton iron	Lbs. coke per ton iron
1	2.00	2.00	73,867	47.9	952	1888
2	1.70	4.10	72,347	46.4	862	1800
3	1.90	6.00	72,995	46.7	785	1865
4	2.53	2.53	73,747	47.4	854	1888
5	5.11	8.01	73,424	48.5	891	1927
5B	6.10	8.40	71,286	48.7	920	2039
5C	6.42	6.42	69,376	47.0	856	1930
6	6.73	10.00	71,258	46.7	942	2073

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On gears, for example, TOCCO's speedy, localized heating minimizes the distortion problem, permits *machining first*, then hardening . . . *real hardening*, uncompromised by the need for machining afterward.

Results for the 25.7" diameter, 275-lb. "final drive gear" of "Caterpillar's" big 17.5-ton D-8 tractor:

LONGER LIFE. TOCCO hardening applies heat-treatment quickly to wearing surfaces, minimizes distortion, permits maximum hardening of gear teeth and thus helps to reduce wear.

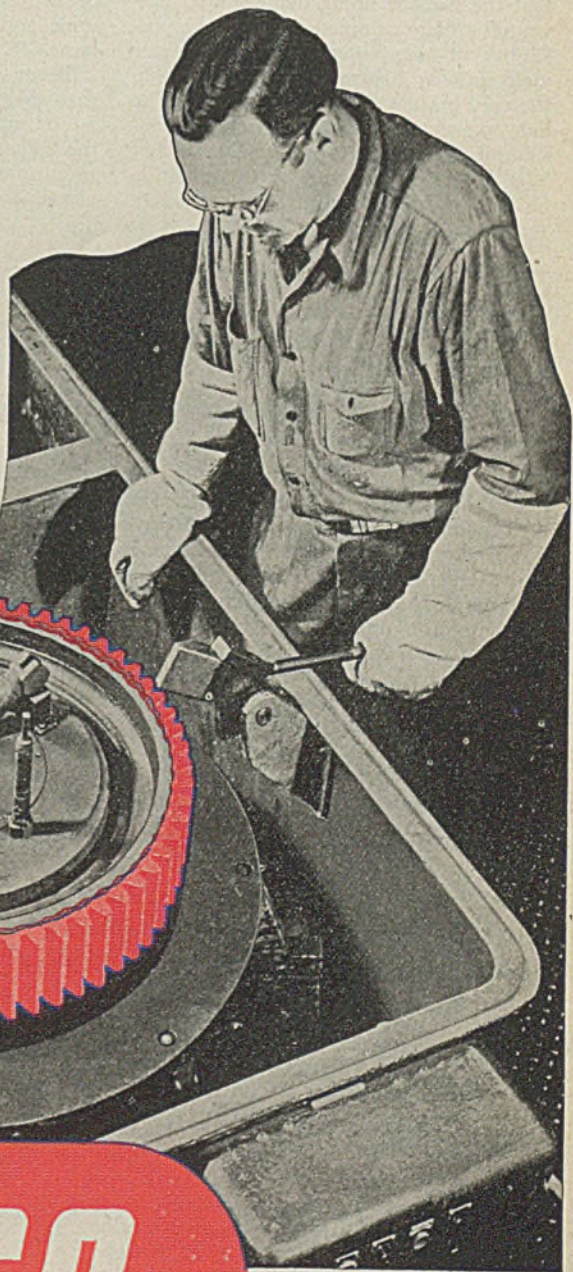
SAVES NICKEL. Use of plain carbon steel instead of alloy steel is saving 144,000 lbs. of scarce nickel per year.

CUTS TOOL WEAR. Fellows' shaper cutters had to be reground after four gears. Crown-shaping tools now last for hundreds of gears.

SPEEDS PRODUCTION. Heating time 90 seconds. Quenching time 34 seconds. Floor-to-floor time about 4 minutes per gear.

A far better product at lower cost. Aren't these *your* objectives . . . now and post-war? TOCCO engineers are at your service.

THE OHIO CRANKSHAFT COMPANY
Cleveland, Ohio



Weight of gear . . . 275 lbs.
Pitch diameter . . . 25.7"
Face of teeth 5"
Steel S. A. E. 1045
Final hardness . 55-60 R.C.



TOCCO

HARDENING, BRAZING,
ANNEALING, HEATING

is evident that this ratio was appreciably higher during the controlled moisture periods Nos. 2, 3, and 5. No appreciable change in furnace charge of ore, scrap, sinter, coke or stone or in method of charging, was made during any of the above test periods. It may be of interest to point out that during periods Nos. 2 and 3 the average daily charge of iron bearing material was 180 tons less per day than during period No. 1; yet daily production of iron was approximately 30 tons more per day during the controlled moisture periods.

Ratio of iron produced to total solid material charged to the furnace is shown in Table VI. This ratio is 1 to 2 per cent higher during controlled moisture periods until test period No. 5. The low ratio is attributed to the condition of the furnace lining. It is unfortunate that the furnace lining deterioration prevented a more complete study of the possibility of improving the blast furnace yield ratio by controlling the moisture in the cold blast with steam injection. The data presented on this subject are considered insufficient to be conclusive, but it is suggested that further investigation of this possibility surely is warranted.

A summary of moisture control data is shown in Table VII. The decreased blast volume during periods Nos. 2 and 3 was proportional to the increased oxygen available in each cubic foot of blast from the injected steam. Some decreases in the coke and stone quantities used per ton of iron produced during the controlled periods are evident; but there is not sufficient data available to attribute these savings to the moisture control.

In comparing the data for the various periods it is well to recall that the furnace was operated without any consideration of moisture conditions of the blast. If air volume was decreased as in periods Nos. 2 and 3 due to oxygen being available from injected moisture, this change was due to the action of the blast furnace and not to any knowledge of the injected moisture. Changes in stone and coke were made on the same basis.

Because the results so far indicate that the benefits outweigh the costs, it is our intention to continue the study of the influence of this control of blast moisture upon the yield ratio and iron analysis.

Silica Gel Correction

Caption describing sequence of packaging operations for the electric drill bottom of p. 98, Nov. 22, Fig. 4 should have read, "Fig. 4—Left to right: Cleaned electric drill ready for packaging; protective paper molded around drill; sealed in moisture proof bag with silica gel which holds relative humidity below 30 per cent, and dipped in wax; given additional protective paper wrap. Further protection is provided by placing in carton."

Offers "One-Burn" Finishes

A new line of "one-burn" porcelain enamel finishes available in many standard Ferro-Oxide colors has been announced by Ferro Enamel Corp., Cleveland 5. The deep color finishes, obtainable with Ferro's new K-762 frit, are expected to cut finishing costs of many items through the elimination of cover coats. Good bonding qualities and stable color values are features of the new ground coats.

Need of Standard Tests for IRON ORE AGGLOMERATES

By WILLIAM SCHOENBERG
Cleveland

VARIOUS scientific laboratories, mining companies, steel companies and manufacturers of the equipment involved, are experimenting with methods for the agglomeration of fine iron ores and/or flue dust.

To put this work on a sound technical basis which would allow for an intelligent exchange of information with complete understanding of results, as well as to develop an effective gage for measuring the efficiency of the various methods under consideration, it seems advisable to:

1. Develop a series of tests approximating conditions which the agglomerates will have to withstand, and
2. Standardize these tests for all interested parties.
 1. Sharp falls or drops.
 2. Transporting or conveying.
 3. Pressure, when on the bottom of cars or piles.
 4. Weathering.

Adoption of such a course would substitute fact for opinion. Although the desired end characteristics are not always identical, there are enough points of comparison to make a standard test worthwhile. For example,

whether intended for mine or mill, or open hearth or blast furnace, the agglomerates must be able to withstand:

1. A *shatter test* will clearly show what effect a number of falls will have upon the agglomerates¹.
2. A *tumbling test* will demonstrate resistance to rubbing which will be received in transporting and handling².
3. A *crush test* using a hydraulic tensile-testing machine will determine the weight that can be supported.
4. An *immersion test*. If the agglomerates are immersed in water for 24 hours, and then subjected to tests Nos. 1, 2 and 3, the effect of weathering on the agglomerates will be determined.
5. A test for *density*. The increase in weight during the immersion period will give a good indication of density providing the voids are not filled with binder. In that case a specific gravity must be run.
6. A test for *porosity*. A count of the voids per 1/2-inch of surface, plus a like count made on a cross section will give the desired information.

In addition, for some purposes, the

density and porosity are important.

A series of tests for other agglomerates have been developed where similar information is necessary.

Test Nos. 1, 2, 3 and 4 should be accompanied by a screen analysis, made on a Tyler standard screen scale. As the particle size of the aggregate used has a direct bearing on the particle size of the screenings, a screen analysis of the aggregate should be made and used in making comparisons.

The foregoing procedure should give a clear picture of the strength of the agglomerates being tested.

Based upon observation to date, the plasticity developed in the aggregate when in the "green" state appears to have a direct bearing upon the final strength of the agglomerate, other conditions being equal. If this should be confirmed by further experimentation, then, when using identical formulae, if uniform plasticity were developed, a comparison of the strength of various agglomerates would clearly show the effectiveness of the machinery used in manufacturing the agglomerates.

¹ See "A Standard Method of Shatter Test for Coke", ASTM Standards, 1933, part II, page 323.

² Ibid, page 335.



Every Troop Train Travels On Grinding Wheels



Troop trains may not literally move on grinding wheels, but if grinding wheels were suddenly unobtainable, repair work and steel production would suffer, and it would not be long before trains would not move! That is how important grinding wheels are to the railroads—and to all industry.

All kinds of grinding are necessary to our industrial war effort—centerless, portable, cylindrical cut off, internal, surface—and there is a Sterling Grinding Wheel to meet the demands of each type of grinding.

In your plant, there is a constant need to keep things moving on your production lines. Better grinding is often the secret to greater and faster production. Using the "Wheels of Industry" for each of your jobs will solve many problems.

Why not call in a Sterling engineer for a quick survey of your grinding requirements? For example, are you using Sterling Billet Grinding Wheels? If not, there is a pleasant surprise in store for you when you do use them! No obligation . . . write today!

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STERLING GRINDING WHEEL DIVISION
OF THE CLEVELAND QUARRIES COMPANY
TIFFIN, OHIO

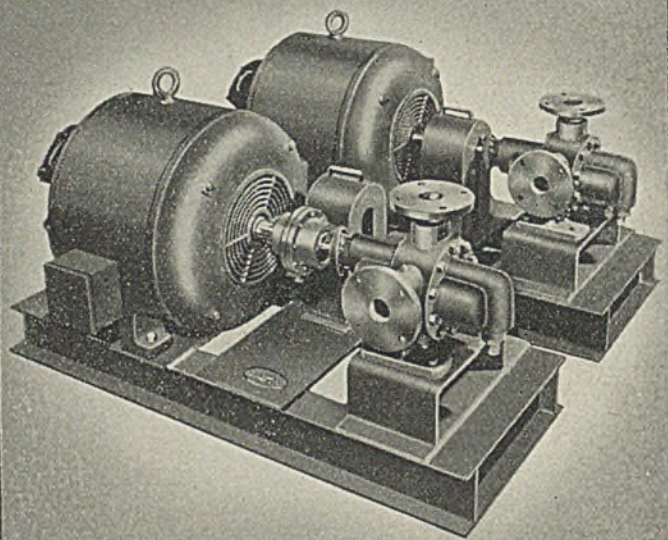
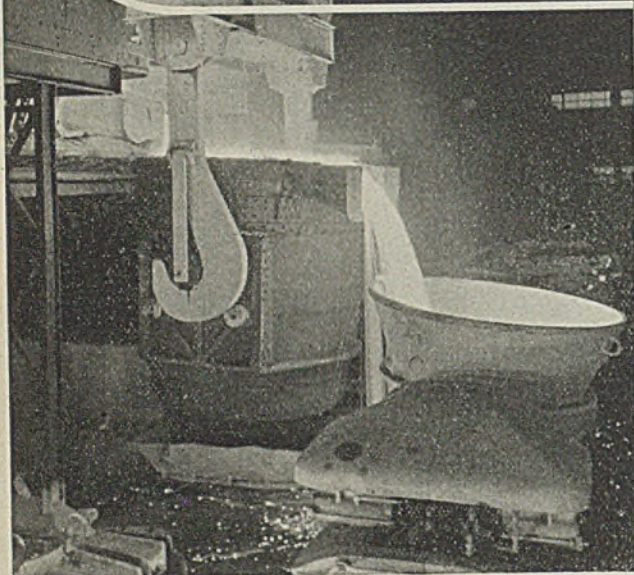
THE WHEELS OF INDUSTRY



Roper Pumps Are At Work

Helping to Produce

MILLIONS OF TONS OF STEEL



because Most Operators Insist On Dependable Pumping Equipment

The Roper Principle is the simplest ever designed. It employs only two moving parts . . . equal size pumping gears . . . operating in a case with just enough clearance so that there is no perceptible wear on either case or gears.

Roper "hydraulically balanced" Pumps, quiet and smooth in operation, definitely last longer because of their simplicity and because internal pressure is equalized at all points. The pumping gears actually float in operation, as they are entirely separate from the drive shaft and are connected by a smooth, sliding joint which absorbs all shock and thrust from power end.

Another important feature of Roper design is that all internal parts such as gears and bearings can be inspected without disturbing piping or power. Type of gears optional . . . Spiral Gears for applications requiring high efficiency and practically silent operation at high speed . . . Spur Gears for high volumetric efficiency at maximum pressure. Automatically lubricated Bearings . . . Built-In Relief Valve . . . Rigid one-piece Backplate carries the load of all pipe connections and protects working parts from stress and strain.

Roper Pumps are built to last a long time . . . and they do exactly that!

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WRITE FOR BULLETIN NO. 1148

A Book of Factual Information on Pumps and Pumping Problems

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The Seal that Stands For Dependability

SPECIAL-PURPOSE SPRAY GUNS

By GEORGE MONTGOMERY

SPRAY GUNS built to perform the most unusual tasks have been available to industry for years, but their usefulness was restricted in peacetime to a relatively narrow field. It remained for the Army, playing fairy godmother to the Cinderellas of the finishing equipment industry, to raise them out of obscurity. When war contracts were placed, Army authorities insisted upon all surfaces of metal parts being coated. They wanted only the finest finish that could be produced. This meant that all surfaces—inside and out—of ordnance and parts for aviation, automotive, tank and radio equipment must be protected with plating or paint to prevent rust or some other trouble.

Special Spray Guns Custom-Built

Some of the special types of spray guns are normally referred to as "extensions" because they are usually made to reach some almost inaccessible place. In certain manufactured items many of these inaccessible places have been out of the range of vision, therefore they have been more or less neglected. To name only a few of the many places these "contortionists" must reach:

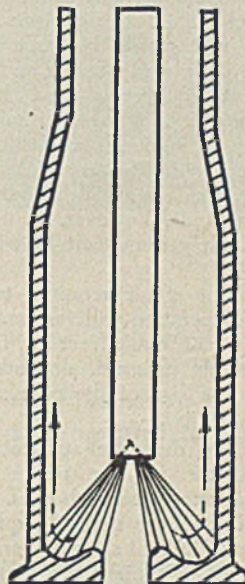
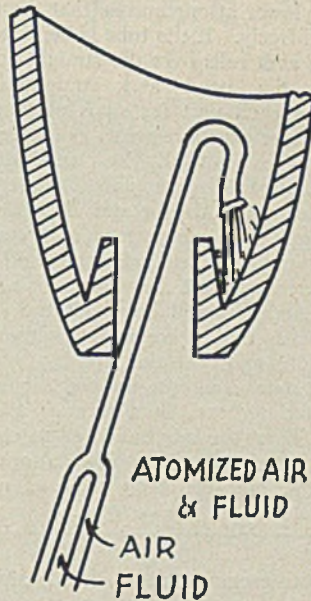
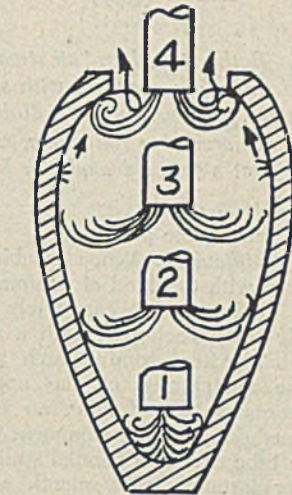
The insides of shells, burster tubes, oxygen tanks, gasoline tanks, cartridge cases, tracer cavities, bombs and incendiary bombs, aviation engines, truck engines, transmission and differential housings, tubes, pipes, battery cases, small compartments, radio parts, aviation wing sections, dies, conduits, manifolds and oil passages.

Each special spray gun is made for a specific job. It is custom-built and it may be designed on the principle of external or internal atomization, or a combination of both, to get the desired result. The length and diameter of the extension will depend upon the size, shape and opening in the article to be interior-coated. Spray guns are made which spray at various angles, but these are for the more simple, accessible places.

Technique of Internal Spraying: Extension spray guns are often used to coat interiors of shells, deep cavities or the interiors of containers, which necessitates

Abstracted from *Industrial Finishing*, April, 1943.

Fig. 1 (Top)—For an internal spraying job like this one, the spray engineer might specify a 45-degree forward cone nozzle. Four positions in the operation are shown: (1) nozzle, near bottom, creates pressure in that area; (2) pressure spreads the 45-degree spray to a wider angle; (3) pressure rises with nozzle until paint strikes side walls at almost right angles; (4) as nozzle withdraws, air pressure within causes paint to spread evenly inside top



a technique not employed with any other spray equipment. The head of the gun is inserted to the full depth of the cavity and should be done before spraying begins. At this point the spray is turned on and, at the same time, the extension begins to move outward, care being taken to keep the head of the gun moving along the lengthwise center line of the cavity. Otherwise, one side of the interior will be coated more heavily than the other, causing runs on one side and a skimpy coating on the other. The speed of withdrawal will be governed chiefly by the shape and size of the interior being coated. A slower movement is needed where the surfaces are farther away, and a faster movement is required where they are close to the gun nozzle, in other words, small in diameter. Diagram in Fig. 1 shows heart-shaped container where uneven distances between interior side walls make necessary different speeds of withdrawal as the nozzle mounts toward the opening. In most applications, rate of movement can be determined only by making actual tests.

Air versus Fluid Pressure: Normally a spray gun air valve opens momentarily before the fluid valve is opened. Equipment used to spray a cavity must operate almost simultaneously because the atomizing air being blown into the cavity quickly begins to build up a higher pressure ahead of the gun tip in the extreme bottom. In this way it could prevent the atomized paint from touching and coating the bottom. As the spray gun nozzle is withdrawn through the cavity, spraying as it goes, the spray pattern is curved outward toward the interior walls and along the sides toward the exit, swirling around any slight obstruction. This pattern may be noted in Fig. 1. The material adjustment is usually very high and equal to the atomizing air. If the fluid pressure is too high, with the air pressure too low, this condition will cause paint to travel back through the air lines and air valves. Should the air pressure be too high with too low material pressure, air will force paint back to the paint tank. For this type of equipment, air and fluid pressures should be the same, say, 30, 40 or 50 pounds. With higher pressures more paint will be sprayed for heavier coats. If after setting this pres-

Fig. 2 (Center)—Spraying a hard-to-reach internal corner with special crook-shaped extension

Fig. 3 (Bottom)—Special nozzle for spraying in two directions simultaneously. This type of equipment gives trouble if not kept in perfect adjustment. Because of its length, it has a tendency to bend when improperly handled

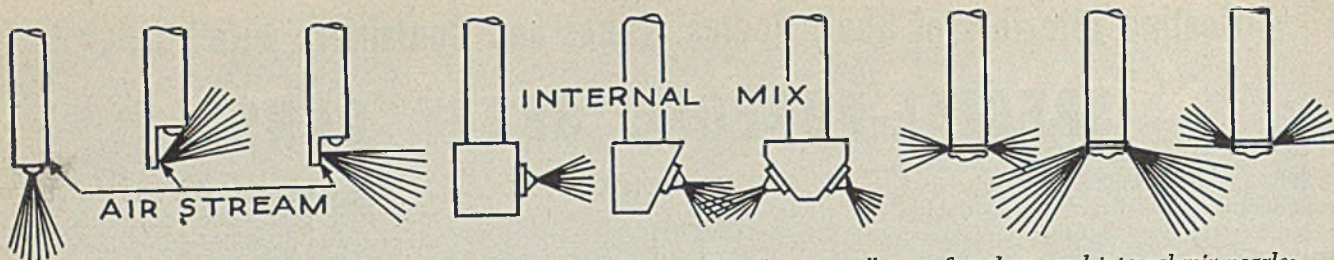


Fig. 4—Both external, or "air stream" type, first three, and internal-mix nozzles, second three, are available with spray openings arranged to meet a variety of conditions. Extensions that will direct spray outward, last three, radiating from the center around a full circle, can be obtained to direct spray straight out, at a forward angle, or backward toward operator as shown

sure there is found to be insufficient atomization, the paint flow should be cut down by closing the fluid adjustment on the spray gun.

If the object being coated can be rotated, such an arrangement is desirable. Defects in the spray pattern will be overcome and, as a result, there will be fewer rejects. A study must be made to determine the most economical method of coating items that cannot be rotated. This, too, can be done by actual tests.

Special Spray Guns: These guns can be made to produce a round spray from straight forward to almost any degree backward toward the operator. Nine types of extension nozzles are shown in Fig. 4. With this equipment, and crook-shaped extension appearing in Fig. 2, nearly all surface finishing conditions can be met. One type of nozzle is made to throw a fan spray from forward to about any degree backward, direction of spray taking any angle to the center line of the extension. Another type produces a round, bushy spray from forward areas to about any angle to the side and rear. Special guns are available for spraying in two directions at the same time, (see diagram for interior-spraying of shell, Fig. 3) but extreme care must be exercised in such applications or the implement will give trouble. For example, because of its length and lack of balance, the operator too readily bends the extension. Since this is done unknowingly, faulty spraying follows. If this type of gun is not kept in perfect working order, it has a tendency to clog up partially, thus pro-

ducing an incomplete pattern.

Solving Difficulties: When trouble is encountered with this kind of equipment, it is best to dismantle it completely and thoroughly clean each part with a suitable solvent. After cleaning each part, check the straightness of the needle, inner material tube and outer air tube. A good method of testing alignment is to place the tube over two parallel straight-edges—for instance, two smooth angle irons. These straight-edges should be slightly lower at one end so that the tube will roll freely. If the tube is bent, it will wobble as it rolls over the straight-edges. Locate the bend and straighten it. Examine each part for signs of possible breakage or excessive wear, as the equipment is reassembled. Each part should be tightened to make sure that air cannot enter the fluid tube and vice versa.

On extension spray guns that employ the internal-mix principle, the fluid and air pressures must be nearly balanced; that is, both should be about the same. The air and fluid are mixed within the extension and broken up by various means, one common method being to swirl the air and fluid around a short screw. Then the mixture is given correct direction of spray through an opening near the end of the extension, which

forms the spray pattern at the angle required. Three adaptations of the internal-mix type are illustrated in Fig. 4. The spray pattern opening may be from 0.001 to 0.002-inch, depending upon the materials to be sprayed and the degree of atomization required for the surface to be coated.

Precautions: Certain fundamental rules must be observed in all spraying jobs. The material being sprayed should be free of all foreign matter and coating should be sprayed at the same viscosity and temperature at all times. Likewise, the articles being coated should be at the same temperature while being sprayed. Because the extension gun must spray in a confined area where the fumes generally exhaust out of the same hole through which the extension is inserted, the extension will naturally be coated with the sprayed material. This will cause little trouble if the operator washes off the overspray at regular intervals with a good solvent. Care must be taken to see that no hard paint gets into the small opening of the spray head. To preclude the possibility of work stopping completely in the event any of these conditions arise, it is recommended that a complete spare outfit be on hand ready for immediate use.

Compressed Air Speeds Core Blowing

Hand or mechanical ramming and tamping of sand to form foundry cores for engine parts or castings for planes, tanks and trucks is being rapidly replaced by modern core-blowing machines which turn out cores of more accurate dimension much faster and with far greater resistance to injury or damage during handling, according to the Compressed Air Institute, Cleveland.

Sand is blown by compressed air into a core mold, where dry binders, core oil and moisture cause the sand to pack together in a smooth comparatively hard-surfaced core. After the metal has been poured between this core and the outer mold and the casting has cooled, the sand can be removed by pulverizing and used again in another core after conditioning.

To produce satisfactory cores for casting, compressed air must be supplied in

adequate volume, at constant pressure and free from excessive moisture. Air lines from air compressors should not be smaller than the intake pipe size on the compressor and should be kept as free as possible from acute bends and turns.

The most commonly used blowing pressure for core molding is from 100 to 120 pounds at the machine. Small cores, on the other hand, are successfully blown at pressures as low as 90 pounds. Less than 100 pounds, however, is not recommended for general core-blowing operation.

The amount of air required to complete a core operation will vary anywhere from 2.5 to 12 cubic feet of free air at 120 pounds pressure, depending, of course, on the size of the core and the nature of the job.

One of the dramatic applications of compressed air in war production is the manufacture of aerial bombs. Cores for these bombs are made in quantities and in many different sizes by core-blowing machines and air compressors.

Weldability of NE-8630 Aircraft Structures

Tests conducted by A. R. Lytle and K. H. Koopman, Union Carbide and Carbon Research Laboratories Inc., Niagara Falls, N. Y., have indicated that the welding quality of NE-8630 steel is equal to that of the standard SAE-X4130 steel used in aircraft structures.

Standard fusibility tests were made by progressively melting the top surface of a strip of the rolled material. The metal was found to melt quietly with the formation of a very light and fusible slag. The metal melted to form a creamy liquid puddle and froze without sparking or effervescing.

During subsequent tests, it was found that base metal united readily with weld metal from welding rods of a wide range of compositions. In no case did any objectionable characteristics develop. This satisfactory work was confirmed later on commercial NE-8630 tubing.

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CHECK THESE ADVANTAGES OF BLANCHARD GRINDING

- ★ **Production**
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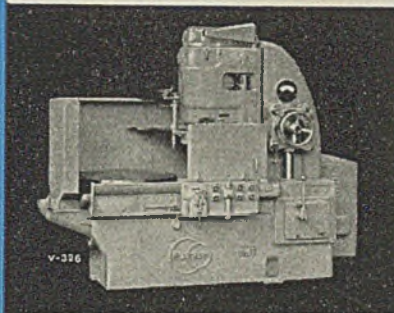
★ *Especially
valuable on jobs like
the one illustrated.*

THIS is an excellent example of accurate surface grinding of pump body parts on a No. 18 Blanchard Surface Grinder.

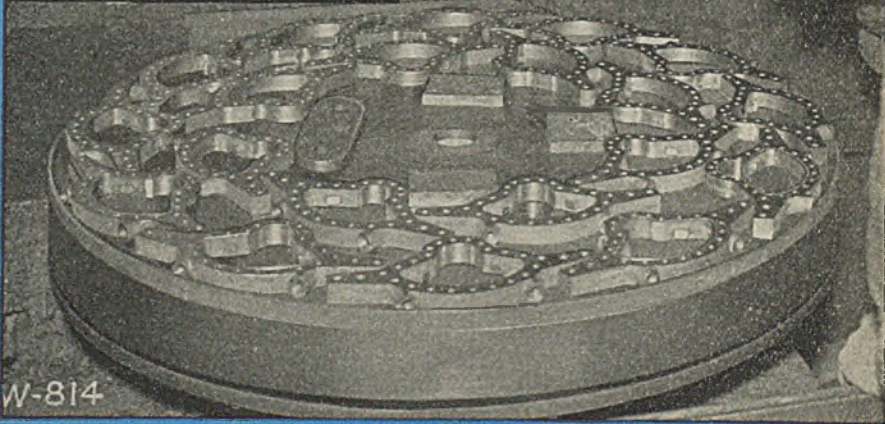
These pump parts are held magnetically on a 36" chuck and work is held to very close limits giving a finish suitable for final lapping operation.

The material is high strength forged steel and .004" is removed from each side, to limits of .0003". Forty pieces 10 $\frac{5}{8}$ " long, 5 $\frac{1}{8}$ " wide and .756" thick (80 surfaces) are produced per hour.

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64 STATE STREET, CAMBRIDGE, MASS.



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Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.



Government Plant Conversion to Peacetime Work Held Desirable

Truman committee report, analyzing economic factors which will prevail after the war, sees wide employment possibilities in utilizing vast industrial resources created during the emergency

WASHINGTON

REPORTING on its investigation of the national defense program the Senate Truman Committee declares we not only should convert most government-owned war plants for postwar civilian production but that we must use them in order to provide employment.

Millions of people have been reshuffled from one end of the country to the other, the report says. "It is no answer to say that they might return to their former jobs, because tens of thousands of small businesses by which they were formerly employed are now out of business, and many more companies that are still in business will never have need for the number of employes that they formerly hired.

"Some communities with war industries will become ghost towns and others will lose most of their increase in population. But a very large proportion of the war plants can produce useful peacetime articles and can continue to provide employment for their workers if we have the courage and the intelligence to utilize the vast industrial resources which we have already created and which we will have to pay for during the next generation through taxes."

Various Economic Factors Analyzed

The last war put the women into the offices on a large scale, the report says. "This war put them into the factories. They are there to stay." The report analyzes various economic factors which will prevail in the postwar period and expresses the opinion that we will have widespread prosperity "if people who have purchased war bonds can be given assurance that their jobs will be safe." They will purchase huge quantities of consumer goods and many will be in the market for new homes.

"The task of the government," the report says, "is to determine the standards by which business is to operate in such a way that businessmen will know where they stand, what they can do and what they cannot do. If government performs this task, each business man will be able to make his own plans for the operation of his business. Until these standards are determined, it will be difficult for him to make his postwar plans. Such plans cannot be made in a vacuum. Business men, no matter how able, cannot make plans that are worthwhile until they know the conditions under which they will have to operate."

Explaining that it does not propose

that the government should say what products should be made, or by whom, the report goes on to say:

"The determinations which government must make include: (1) The method by which contracts are to be terminated after the war, (2) the advance notice which industry can have of the terminations, (3) the methods for insuring the early removal of government property from private plants so as to make them available for the production of civilian articles, (4) the extent to which the government will make or guarantee loans to provide business with working capital, and (5) the conditions under which the govern-

TURNOVER HIGH

Major war plants throughout the country are finding it necessary to hire 17 workers monthly to get a net increase of 3 per cent. As for manufacturing as a whole, latest figures show that workers are not being hired fast enough to replace those leaving industry, the Office of War Information says.

The present excessive rate of turnover must be reduced substantially, OWI said, or the whole pattern of war production will be jeopardized.

Major emphasis of the manpower program has shifted to the solution of local problems and the full utilization of workers already in the plants.

ment will lease or sell the plants and facilities which have been constructed for the war effort.

"The purpose of the committee is not to propose short-cut solutions to the problems, but rather to point out the importance of directing attention now to their existence, and obtaining the best information from all competent sources on how to solve them."

The report expresses concern with the fact that the working capital of our corporations is geared to a peacetime economy of only 82 billions, whereas the Department of Commerce has estimated that if the war is over by 1946 the national income will be around 142 billions.

"Some corporations have been able to improve their financial position during the war," states the report, "but, by and

large, taxation and renegotiation and the efforts of the procurement agencies to prevent excessive profits have prevented corporations from greatly increasing their working capital at the expense of the government." Even though Congress has taken some steps to assist corporations in meeting postwar problems, such as accelerated depreciation, and amortization of emergency facilities, for adjustment of taxable income retroactively to reflect changes in inventory values and to cover a two-year instead of a one-year period, many corporations will not have sufficient reserves.

The committee approves the Hatch recommendation "that reserves claimed by taxpayers in amounts not exceeding 20 per cent of their taxable income shall be deductible as an operating expense in computing federal income and excess-profits taxes, subject to the following conditions: That the amount set aside in such reserves be invested in a special issue of non-negotiable, non-interest-bearing government bonds redeemable at any time prior to a date 18 months after the cessation of all hostilities, and that simultaneously with the liquidation of such securities, the taxpayer must return the amount derived from such liquidation to his taxable income for the year of liquidation."

Hatch Proposal Considered Valuable

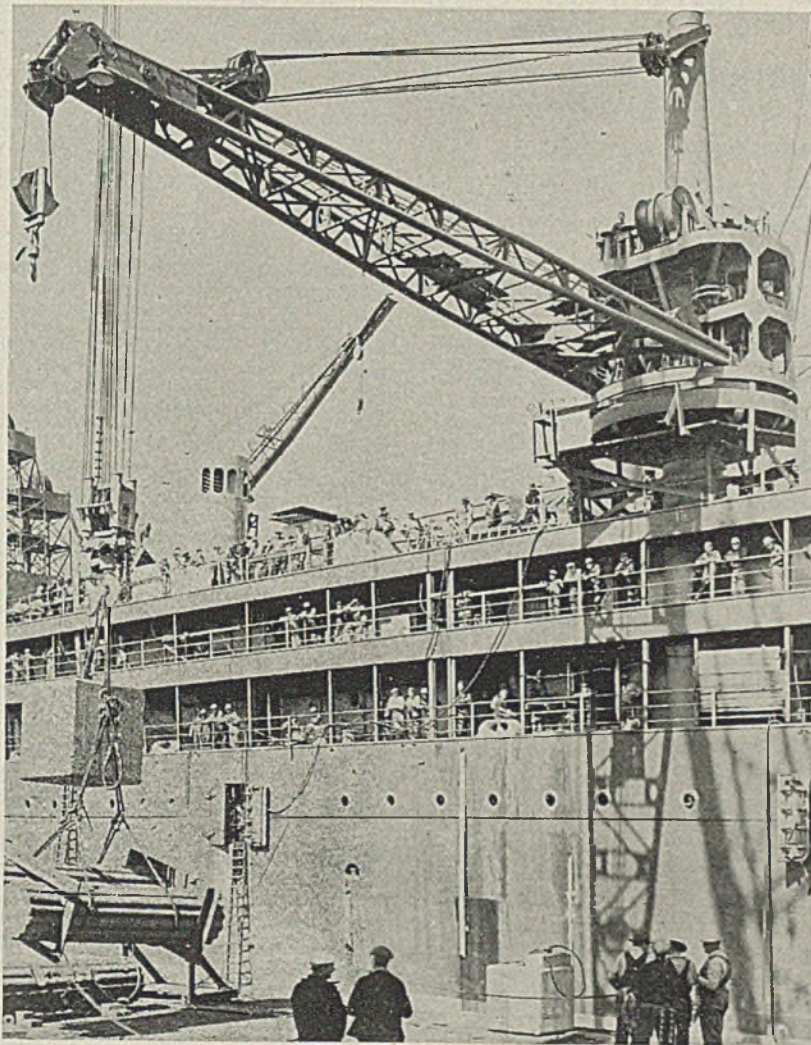
This plan, says the committee, "has the advantage that it automatically differentiates between those contractors who have a serious postwar expense and declining income problem and those who have not." The report states that a number of corporations have expressed the opinion that the Hatch proposal, if enacted, would constitute a major assistance to them in financing their postwar activities.

Much stress is placed on the importance of encouraging investment of private funds in industrial securities. However, the committee takes the view that this would not provide needed working capital soon enough.

"It will be necessary for the government to formulate plans to supplement private banking. Some agency, such as the Reconstruction Finance Corp., will have to be ready to provide working capital quickly to worthy business corporations which would otherwise not be able to obtain it. This should be confined, as was the Reconstruction Finance Corp., to strictly banking operations and should not be used as a vehicle to place the government in business or by which the government would determine the articles to be manufactured or the prices to be paid for them."

The committee proposes that these government loans would bear a higher interest rate than the rate prevalent on private loans; that would encourage industry to raise capital from private sources. The proposal also calls for higher taxes to be levied against profits earned with government loans.

The report goes into considerable de-



AIDS UNDERSEA WARFARE: Crane manufactured by Western Gear Works, Seattle, undergoes tests during installation on a submarine tender at Moore Dry Dock, Oakland, Calif. The equipment includes a main winch which tops and lowers the boom, a boat winch, an airplane winch and rotating machinery, all of which is mounted on a series of three rotating platforms. Crane's normal capacity is 22½ tons

tail on the subject of disposal of government-owned plants. "Government must be prepared to lease or sell these facilities in accordance with a realistic understanding of their true value to those interested in acquiring them. If the government asks too much for these facilities they will not be acquired by private business, and their entire cost will have to be written off as loss At the same time, there must be no gift of government-owned facilities to favored corporations, and the contracts for the construction and operation of such plants should not permit competitive advantages to one corporation or industry at the expense of another. Since most of the corporations have insufficient capital, it is quite clear that most of them could not afford to pay cash. For this reason it is desirable that arrangements be made for leasing such plants to the private corporations operating them upon fair terms, which might include an option on the part of

the lessee to purchase the plant within a specified time and to apply rentals paid under the lease as part payment of the purchase price."

The committee reports that a sound postwar prosperity requires that employers must know where they stand with reference to labor, that many wage adjustments will be required.

"Business must be fair to labor, but labor will have to take a realistic view of the situation In wartime, additional labor costs are absorbed by the government. In peacetime, they have to be taken out of profits or added to prices. Many industries will not have a sufficient profit margin and will not be able to increase prices and still sell their products in competition with other products.

"Much will depend upon the courage and ability of leadership in labor. Labor leaders will find it difficult to walk the tight rope of getting the best terms possible for their members and at the same

time take a realistic approach to hard facts, often made more difficult by lack of control over their members and by fear of raids by rival unions.

"The great gains which labor made must not be imperiled. But labor, like business, must recognize and fulfill its obligations to society. The alternate is government regulation. The decision rests with labor.

"The problems facing labor leadership are further complicated by the industrial progress made as a result of the war activities in developing new materials and new processes. This means either that some of the craft unions will have to make new determinations of their several jurisdictions and the conditions under which they will work, or that they will insist upon a continuance of the present situation.

"The situation," the report concludes, "will be especially acute in the housing industry where prefabrication and the use of new materials have an opportunity to revolutionize housing, with the result that every worker in the United States would have an opportunity to have improved housing for his family. To do this, however, it will be necessary to revise some municipal building codes and some of the conditions under which the building trades operate.

"If possible, such revision should be made by the building trades themselves, so as to protect all the rights of labor and at the same time to enable them and all other laborers to have better housing. If progress along these lines can be made, housing can become a great industry, particularly useful in providing jobs during the period of conversion from wartime industry to peacetime production."

Urges Incentive Wages To Raise War Output

War production could be increased as much as 35 per cent through the best utilization of existing facilities and labor, John Nickerson, director, Management Consultant Division, War Production Board, said recently, addressing the autumn production conference of the American Management Association at Hotel New Yorker, New York.

Pointing out a good share of this increase can be obtained through sound wage incentive plans, Mr. Nickerson said a detailed study of 17 typical cases in the New York region, covering group, individual and plant-wide incentive pay plans, showed productive increases ranging from 10 to 100 per cent above past performance. Plants producing aircraft parts, electronic tubes, die castings, paper containers, lubricating coils, and precision optics were included in the study.

For completely satisfactory results, the WPB official declared, two fundamentals are necessary in any wage incentive plan: (1) Proper technical principles and practices; and (2) an understanding and cooperative attitude between management and labor.

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

CONSTRUCTION: Applicants for construction costing less than \$10,000 will save time by filing form WPB-2570 (formerly PD-200-c) with WPB district offices instead of sending their applications to Washington. Form WPB-617 (formerly PD-200) is used for construction costing more than \$10,000 and must be filed with WPB in Washington. Unless this procedure is followed, the applicant will face unnecessary delay by having his application returned with instructions for proper filing.

GALVANIZED PRODUCTS: In ordering galvanized steel products in controlled material form, warehouses must use form WPB-2444 (formerly CMP-11) regardless of whether the order for the product is placed with a steel producer or with a galvanizer who is not at the same time a steel producer.

Galvanizers who are not steel producers may place orders for the steel required to fill orders actually received from warehouses or to replace inventory used to fill orders actually received from warehouses by using form WPB-2444.

In order to obtain steel to fill other orders, galvanizers must have received an allotment from their customers. Such orders must be identified by the allotment symbol "WH", and shall be considered authorized controlled material orders.

WATER TANKS: Tanks produced for undrilled storage water heaters are included in the definition of "tank" in order L-199 and restrictions of the order apply to such tanks. Simplification and standardization schedules attached to the order, however, do not apply to these tanks.

CMP REGULATIONS

PLASTIC PRODUCTS: Preference rating of AA-1 has been made available to producers of moulding and laminating plastic products. This is accomplished by placing producers of such items on schedule 1 of CMP regulation No. 5 and removing them from schedule 2. (CMP No. 5)

L ORDERS

REFRIGERATORS: A total of 61,694 domestic ice refrigerators may be produced by manufacturers in acute or stringent labor shortage areas during the fourth quarter of 1943. Exact quotas have been assigned each manufacturer in the War Manpower Commission's group I and II labor areas in accordance with his third quarter production. (L-7-c)

MILITARY INSIGNIA: Supplementary order L-131-a, which limited the distribution of Army officers' military insignia to those outlets which had been or would be granted certificates of authority by the adjutant general's office of the War Department, has been revoked. Order L-131 provides that all orders for production of military insignia must be placed by the quartermaster general. (L-131-a)

AUTOMOTIVE PARTS: Restrictions on producers' inventories of finished replacement automotive parts have been eliminated. WPB now is empowered to direct any producer or distributor to deliver or to sell replacement parts available for civilian distribution to any other person and in such quantities as the WPB may determine.

Distributors must return used contact points to the producer or supplier for reclamation, when the distributor is unable to perform this service. All deliveries of replacement parts for resale or to consumers may be made as though the purchase orders bore the same preference ratings as those assigned to the manufacturer for the production of these parts. A certificate

for emergency repair must not be used under any circumstances by a distributor to replenish his stock.

Preference ratings of AA-2, instead of AA-1, now may be accepted by a distributor from the Army, Navy, Maritime Commission and War Shipping Administration for replacement parts. Army purchases are limited to parts for inoperative vehicles and only to those parts that a distributor has available in stock. Distributors may not place orders with the factory for such parts for such a purpose.

The order prohibits the sale of a new part, if the old one can be rebuilt or reconditioned by use of available local reconditioning facilities. After Dec. 31, certain fleet owners or

INDEX OF ORDER REVISIONS

Subject	Designations
Aluminum	L-114
Automotive Parts	L-158
Capacitors	M-293
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Equipment, Radio	P-133
Insignia, Military	L-131-a
Machinery, Food Processing	L-292
Plastic Products	CMP-No. 5
Platinum Scrap	M-162
Railroad Supplies	P-142
Refrigerators	L-7-c
Sodium	M-357
Truck Transfers	M-100
Price Regulations	
Grates, Fireplace	No. 188

operators may purchase engines, transmission assemblies and rear axle assemblies without turning in a similar used part or filing a consumer's certificate, to the extent of and under the conditions provided. (L-158)

FOOD PROCESSING MACHINERY: Manufacturers of egg and poultry processing machinery and equipment now are restricted to production required to fill rated orders, except that a maximum working inventory for certain specified items will be permitted in accordance with the new schedule.

Rating floor on sales or deliveries on all food processing machines has been lowered from AA-3 to AA-5 or higher. Winery machinery has been added to the list of equipment which it is now prohibited to manufacture. (L-292)

M ORDERS

TRUCK TRANSFERS: Dealers with available trucks in stock must honor certificates of transfer or government exemption permits when tendered by authorized holders capable of consummating a purchase. (M-100)

PLATINUM SCRAP: Platinum scrap may not be held in excess of the amount produced in 30 days and no processor or consumer may have an inventory in excess of final product deliveries during a 60-day period. Large processors and consumers and persons with large inventories who are not refiners or dealers must file monthly reports. (M-162)

CAPACITATORS: Scheduling jurisdiction over capacitors for power factor correction is transferred to WPB Radio and Radar Division from Power Division. (M-293)

SODIUM: Metallic sodium has been placed under allocation which will be operated through the customary forms—WPB-2945 and WPB-2946. Orders of 1000 pounds or less in any

month are exempt from allocation. Any dealer or consumer may accept delivery for a total of not more than 1000 pounds from all suppliers in any month. No authorization is necessary for a dealer to resell, or for a consumer to use metallic sodium thus acquired. Consumers and dealers who wish to accept delivery of more than 100 pounds a month must file application with the Chemicals Division, WPB, for authorization on or before the 10th of the month before the month in which delivery is requested. (M-357)

P ORDERS

RADIO EQUIPMENT: Priority rating of persons engaged in the radio broadcasting business for obtaining radio maintenance, repair and operating supplies has been raised from AA-2 to AA-1. Permission to use the "MRO" symbol has been extended indefinitely. Commercial sound recording, which had a rating of AA-5, has been assigned an AA-2 preference rating and is entitled to use the symbol "MRO." (P-133)

RAILROAD SUPPLIES: Inventory control features of order P-142 do not apply to printed matter. This clarification was designed to relieve railroads from the inventory control over such printed matter as tickets, waybills, timetables, etc. MRO priority ratings should not be used to obtain printed materials by reason of list "B" of priority regulation No. 3. (P-142)

PRICE REGULATIONS

FIREPLACE GRATES: Dollars-and-cents maximum prices for cast iron fireplace grates of different weights have been established at all levels of distribution. (No. 188)

WPB Seeks Earth-Moving Equipment for Export

War Production Board's Construction Machinery Division has issued an urgent plea for used earth-moving heavy equipment to be shipped abroad for new large-scale stripping operations in the British Isles. Coal mining experts have estimated that shipment of equipment may save 15,000,000 tons of coal shipping space this year and help ease a drain on the tight coal situation here.

Order Deadlines Set for Specified Critical Items

Purchase orders for a list of specified products, chiefly those of a critical nature, requiring delivery during the first six months of 1944, must be placed before the first of the year, War Production Board has announced. Orders requiring delivery of the same products during the third and fourth quarters of 1944 must be placed before March 1.

The move is designed to permit realistic scheduling of the products involved in order that major end-product production programs requiring these items for their completion may be supplied with their requirements. The ruling does not authorize any person to request delivery in advance of his actual required date.

Items to which the early-order provision of priorities regulation No. 18 applies includes the following in group A: Accessories and components of internal combustion engines; Camshafts, carburetors, crankshafts, electric starting motors, fuel injection equipment, generators, magnetos, mechanical governors, piston

rings, pumps, radiators, automotive type valves; heavy-duty automotive type components: Axles, brakes, tires, transmissions, wheels.

The provision also applies to the following group B items: Antifriction bearings, compressors, diesel engines, fluid power systems, heat exchangers, high-pressure blowers, industrial type wet cell batteries, electric motors and generators, electric motor controls, steam turbines, turbine generators, control valves, industrial and marine pumps, high-pressure valves (limited to plug valves, steel valves, and safety and relief valves), land and marine steel boilers (pressure 100 pounds or more per square inch.)

Producers of these items are prohibited from accepting any orders if, because of orders already on hand, bearing equal or higher priority ratings, they do not expect to be able to fill them by the required delivery date. After the required order placement dates, persons desiring to purchase any of the above items will have to obtain specific WPB authorization to do so, unless the order bears an AAA preference rating.

Requirements of the early-order provision do not apply to orders (1) for listed products required as maintenance, repair or operating supplies, (2) placed with or by persons who take delivery of the products for resale, (3) for used or second-hand products, or (4) for products listed in group B where all orders placed with the producer for the delivery of the same item to the customer in the same calendar quarter do not exceed \$10,000.

Government Modifies Offer To Buy Copper Products

Copper Recovery Corp. has announced that government prices will not be paid to those holders of copper products and copper-base alloy products who have received inquiries from the government as to their willingness to sell their materials for listed prices above scrap prices but who have not expressed a willingness by Nov. 30 to sell at such prices.

CRC will not necessarily buy all material which holders have expressed a willingness to sell. However, material for which no such expression of willingness has been received by Nov. 30 will in no event be bought at the government prices.

Simplified Practice for Making Valves Proposed

A proposed simplified practice recommendation for bronze pop safety valves and bronze, iron and steel relief valves has been submitted to producers, distributors, users and others interested for approval or comment, according to an announcement by the Division of Simplified Practice, National Bureau of Standards.

Broadens Rule on Use of Priority Rating To Get Material Processed

Ratings may be used to obtain processing even though person using the rating intends to use the material himself. . . May not be used to get materials processed into controlled material forms or shapes. . . CMP regulation No. 3 product lists revised

USE of preference ratings is permitted now to get material processed, even though the person using the rating intends to use the material himself rather than deliver it, or incorporate it into a product which will be delivered to someone else.

This action, taken in a complete revision of priorities regulation No. 3, broadens the former rule with respect to use of preference ratings to obtain processing, inasmuch as formerly persons were not permitted to use ratings when the item to be processed was for their own use.

Summarizes Exceptions

Preference ratings may not be used to get materials processed into controlled material forms or shapes by either a producer or warehouse, since preference ratings may not be used to purchase the controlled materials themselves.

With certain limited exceptions, manufacturers are not permitted to make allotments or furnish controlled materials to class B product producers for processing; consequently, no preference rating can be used to get such processing done.

While persons who have been assigned a rating to get materials may use it to get the use of a controlled material producer's facilities to have material processed into other than controlled material forms and shapes, rated orders for the use of a controlled material producer's facilities must not interfere with the acceptance, production, or delivery of orders for controlled materials which the producer is permitted to fill under CMP regulation No. 1.

Persons to whom preference ratings have been assigned for materials are prohibited from extending such ratings to get containers or closures to pack the material. Neither may such a rating be extended to get material for the improvement, expansion or construction of plant or to get machine tools or other items which will be carried as capital equipment or MRO on the purchaser's account. Such ratings may not be extended to obtain business machines, whether such machines are purchased or leased.

However, ratings may be used for purposes other than replacing inventory after three months have elapsed from the time the rating could first have been used. This represents a change in the regulation, inasmuch as the three month limitation previously applied to extension of ratings for any purpose.

Dental units and dental chairs have

been deleted from list A of priorities regulation No. 3, which indicates items which may be delivered without regard to any WPB preference ratings.

The following items have been added to list B, which indicates items which may not be purchased with the use of blanket MRO ratings: Athletic and sport equipment, award emblems, badges, buttons and similar award pins (not including identification badges), blowers and industrial vacuum cleaners governed by limitation order L-222, lawn mowers (including power and gang mowers), monorail systems and additions thereto (except one complete addition valued at less than \$200), precision measuring instruments and testing equipment (as defined in E-9), common and safety pins, radio transmitting and receiving equipment, venetian blinds, wire and electronic intercommunicating systems, cooperation, steel shipping containers, baskets and hampers, fibre drums, collapsible tubes, gas cylinders.

Construction machinery costing in excess of \$100 has been deleted from list B, while modifications have been made in items prohibiting the use of MRO ratings with respect to office furniture and paper and paper board products.

French Increase Shipments Of Metals from North Africa

Mines and quarries in Algeria, French Morocco and French West Africa are back in production; and such strategic materials as phosphates, iron ore and cobalt have begun to flow to Allied countries. This was revealed by Leo T. Crowley, foreign economic administrator, in his review of our lend-lease dealings with the French.

Since the occupation of the territory by Allied forces, over 340,000 tons of civilian goods have been sent there while a total of \$56,340,000 has been received in payment from the French Committee of National Liberation. Bulk of our shipments has consisted of steel and chemicals for essential factories; fertilizers, sprays, and spare parts for farm machinery; batteries and spark plugs for motor vehicles; refractory bricks and scores of other products necessary to develop North Africa as a base for military operations.

The French have agreed to provide under reverse lend-lease important raw materials, including sisal, lead concentrates, manganese, dioxide, cork, cobalt, and manganese, tin and nickel ores.

A medal for Nancy...

LITTLE Nancy Jane is only six. She stood alone, with all the inborn dignity of childhood, in that historic room amid the admirals, the senators, the great and near-great grown-ups.

She heard a deep, resonant voice say:

"For conspicuous gallantry over and beyond the call of duty, the Congress of the United States of America awards the Congressional Medal of Honor to Marvin Clayton — Lieutenant-Commander, United States Navy—killed in action at the victorious Battle of Midway."

And then a blue ribbon passed over her head. And looking down, she saw a gold medal at the end of the ribbon nestling against her dress.

Little Nancy Jane is only six. She's too young to understand the words of the citation—not quite old

enough to realize that this blue-ribboned gold medal is the highest honor our nation can bestow on its heroes.

But not too young to know that never-more will she feel those strong, gentle hands tucking in her blanket... or hoisting her high in the air for a morning kiss... or patiently guiding her pencil as she scrawls a birthday greeting to Grandma!

Little Nancy Jane is only six—and fatherless! However long actual fighting goes on—this war means sacrifice for little Nancy Jane for the rest of her life!

Every single second lost today on our production lines... every boarded bit of food, rubber and metal... every moment of complacency or face-saving or temporizing... means more children become fatherless.

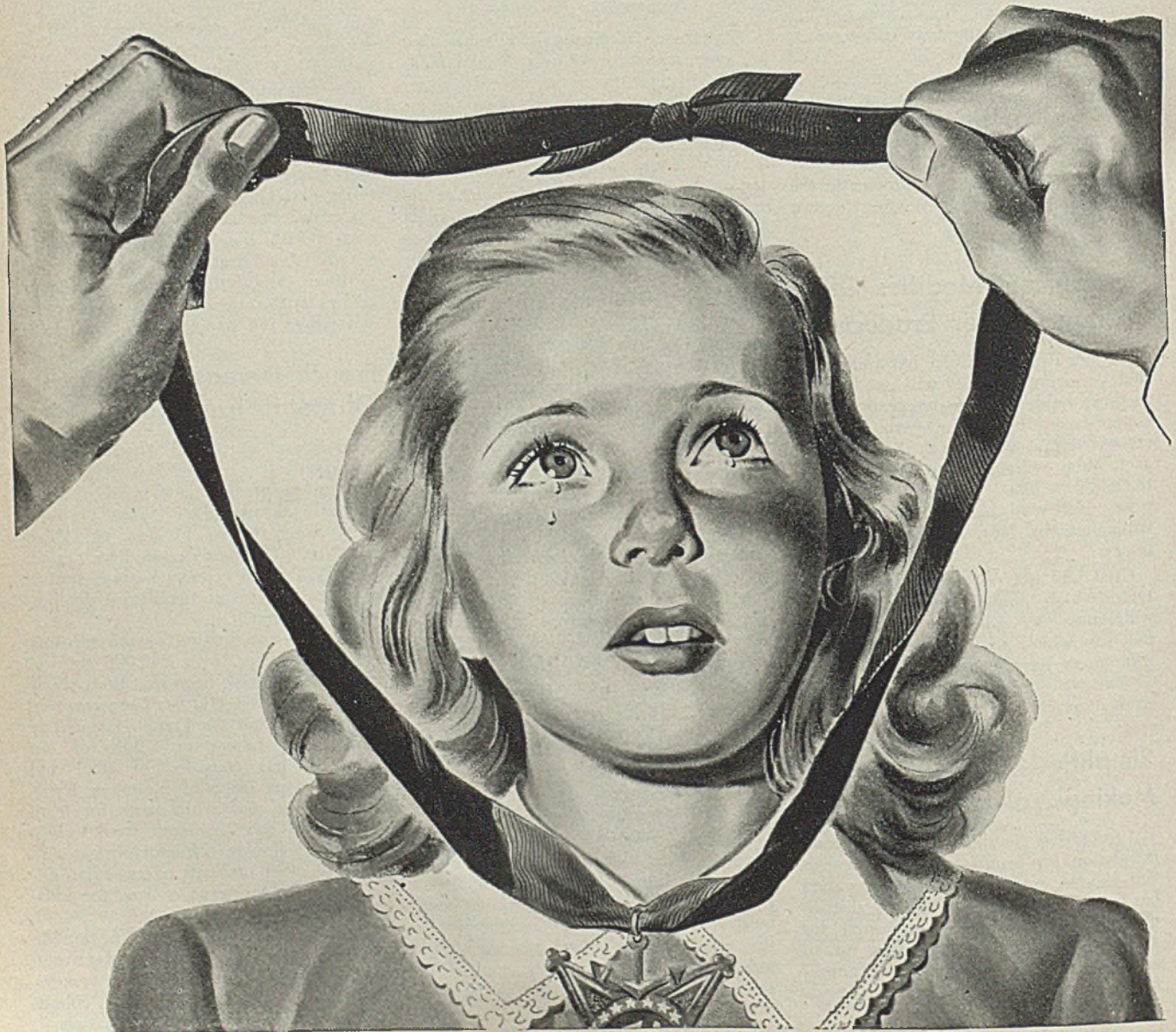
Each of us owes something to Nancy Jane's dad... and to Nancy Jane!

The men and women of Weatherhead sponsored this message. Most of us have near relatives in uniform... sons, husbands, brothers... sisters and daughters, too. Our task is not dramatic... but it is vital to every single big weapon. For years we have been making for peacetime purposes the same fittings and devices we are making today. However, responding to the urgent war needs of the nation, we have found ways of producing them in greater quantity than ever before—more than a million every twenty-four hours! So, you see, our skill is also one of the great weapons for winning the war and for building the kind of world we're all fighting for.

Whit J. Weatherhead PRESIDENT

Weatherhead

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Canvass of 81 leading automotive and fuels engineers develops conflicting views with respect to shape and form of postwar automobile. . . Economy seen stressed with the very large car on the wane

WITH automobiles generally No. 1 on the public's list of things to buy after the war, considerable interest attaches to their shape and form when they can again be produced. Much speculation has appeared on this score, but very little has come from the practical engineers who will design and build the cars. Therefore the recent symposium of engineers' opinions, organized by A. T. Colwell, vice president of Thompson Products Inc., and presented at an S. A. E. war and postwar materials meeting at Cleveland, is "must" reading.

Mr. Colwell canvassed 81 leading engineers in the automotive and fuels industries, seeking their thoughts principally on the effect of wartime fuel developments upon the postwar automobile. Their opinions were varied and conflicting to some extent, but most of them agreed to predict the engineering trend accurately if someone could predict the economic and political conditions after the war. So, in summarizing their conclusions, it was necessary to arrive at a weighted average of the combined opinions.

See Reduction of Manhours

On five points there was fairly general agreement—1. The future trend of automobile design will be toward economy rather than performance, because of greater emphasis on petroleum conservation, increased general taxation, inflation, higher fuel costs, and probable higher automobile costs (15 per cent minimum). 2. The very large automobile is on the wane—the buyers of higher-priced cars have been most affected by taxation. 3. Present comfort, safety, performance and size of the medium-sized car should not be sacrificed any more than necessary. 4. The very small European-type car is not foreseen, unless absolutely forced by economic conditions, and would not be agreeably acceptable to the American public. 5. Automobiles must be produced with less manhours.

With the premise of economy, Mr. Colwell points out there are several major methods of improvement. It may be surprising to many to learn that they are, in order of importance:

1. Transmissions and rear-axle ratio.
2. Rolling, wind resistance and car weight.
3. Engine size—number of cylinders.
4. Compression ratio.

Figures developed by H. T. Youngren, chief engineer of Oldsmobile, show, for example, that lowering the rear axle ratio from 4.6 to 3.0 yields an increase in economy at 30 miles per hour of from 22 miles per gallon to nearly 30, that is,

an increase of 8 miles per gallon. Naturally, lowering axle ratios sacrifices performance in the low-speed range, which the American driver heretofore has demanded. He may be forced to change his mind in this respect. Steel likely will continue to be the body material for the postwar automobile. Its physical properties, safety and price put it out in front. Aluminum appears the chief competitor but aluminum sheet must sell at 6 cents per pound to compete with steel, and the postwar price probably will be two or three times this. As Mr. Colwell observes, aluminum can be used, but does it pay?

There are places where aluminum can

STEEL TO LEAD

Iron and steel, followed by such light metals as aluminum and magnesium, will continue to hold the most important places among the metals of the future, Dr. Zay Jeffries, technical director, Lamp division (Cleveland), General Electric Co., said recently addressing the City Club of Cleveland.

He said these metals were available in unlimited quantities and that improvement in methods of recovering them would assure their dominance. Copper, lead and zinc, relatively rarer than iron or aluminum, will become semiprecious metals, he predicted.

Dr. Jeffries called for co-operation of all national and international elements in conservation and use of metals, asserting that shortages would develop only if governments, labor and industry failed to plan their needs co-operatively.

be used to lighten the car—doors, hoods and rear decks. Aluminum castings of secondary metal can compete with iron castings. They can be used for transmission cases, differential housings and possibly for cylinder heads, crankcases, intake manifolds, wheels and many small castings and brackets. There is a definite possibility that aluminum can be used for cylinder blocks with steel or cast iron sleeves, though this will necessitate the use of constant clearness regulators for valves. There will be a definite trend to aluminum pistons in all cars, designed for improved cooling and controlled expansion.

Other significant points established in Mr. Colwell's symposium are the following:

The radial aircraft engine has been

discussed for passenger cars. Present automobile engines cost about 80 cents per horsepower, as against \$10 per horsepower in the large aircraft radials, and \$4 to \$5 in the smaller types. Weight is a little over one pound per horsepower for aircraft, 5 to 6 pounds for automobiles. Thus, a great weight-saving is possible, if installation difficulties are overcome, but the point to be considered is—will it pay? It must be remembered the automobile engineer designs to a budget, while the aircraft engineer considers dependability first and cost second.

Fuel injection does not offer a means to economy in automobile engines, particularly at low load-factors. As engine size decreases, the design becomes more difficult. Further, the cost of the average automobile engine would be almost doubled with fuel injection. However, it is likely to be used on trucks, and intensive research is indicated.

Superchargers will not be used on automobile engines in the near future, but will very likely be used on trucks.

Higher compression ratios are the route to higher cyclic efficiencies, and the utilization of high-octane fuel. But high compression ratios are not as simple as they sound, with the knowledge we have today, even with better fuel. They may be simplified in the future, necessitating almost complete engine redesign.

When compression ratios go above 8.1, the L-head engine likely will be replaced by the overhead engine because of breathing ability. The L-head is the cheaper engine to build and is quieter, thus probably will continue to be used below 8.1 compression ratio.

Trend to Aircraft Engines

Smaller bores allow higher compression, because of better cooling. Roughness and pre-ignition are the two main problems to be solved with high compression ratios. The engine for best economy is one of larger displacement running at lower speed, or nearer axle speed, rather than the smaller, high-speed engines, with high friction and pumping losses. After the war there will be a definite trend in aircraft engines toward lowered speed for long-range cruising, although the military trend is now toward increased engine speed for power, not economy.

Pressure cooling in radiators is likely to be carried to greater lengths, one important advantage being that it permits the use of a smaller radiator, thereby reducing weights.

Summarizing, Mr. Colwell declares that engineers are optimistic over the possible future developments in automobiles—they feel that some time will be required to swing from war work to car design and progress. This progress will be gradual and evolutionary, rather than by radical changes in design. The automobile industry has attained its stature by this method of evolution instead of revolution.

With an unlimited budget, most ex-

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traordinary cars could be produced, but engineers must strike a balance on cost, performance, economy, comfort, size, long life and dependability, low maintenance and simplicity. The American automobile industry has been the most progressive in the world—it will continue to be so.

Controversial statements have appeared on the subject of depletion of this country's petroleum reserves. The National Automobile Dealers' Association quotes Bureau of Mines reports to the effect that in the years 1940, 1941 and 1942 extensions to known fields, revisions of previous estimates and the discovery of new pools have amounted to 5.74 billion barrels, while in this same period total production was 4.14 billion barrels, indicating a net increase in reserves of 1.60 billion barrels.

The NADA adds further that should the next few years see the known supply of petroleum running dry, we still would be able to get an almost limitless supply from oil shale, natural gas and coal. It has been estimated, for example, that deposits of oil shale in the United States are capable of yielding 100 billion barrels of oil, from which 60 billion barrels of gasoline could be extracted, while enough petroleum could be extracted by hydrogenation of coal to last 3000 years. Costs of such production methods are obviously higher than present crude petroleum production.

New war production programs and additions to existing contracts undertaken during the first nine months of 1943 by Chrysler Corp. totaled \$775,000,000, according to K. T. Keller, presi-

dent, who adds in a financial statement issued Nov. 5 that production of war materials continues to keep Chrysler facilities active at levels exceeding its peacetime production. However, total sales for the nine months were \$4,500,000 below the total for the first nine months of 1941. Net profit for the nine months of the current year was slightly under 17 million dollars, comparing with \$29,460,847 in the same period of 1941, and sales are still subject to renegotiation. Renegotiation proceedings for 1942 have been concluded by an agreement which involved no adjustment of 1942 profits as previously reported.

X-100 Moving to Production Stage

Mr. Keller notes schedules on various products are increasing, others are decreasing, some have been completed and some suspended. Outlook for aggregate production is upward as preparations now under way for volume production of new and additional products are completed. The Dodge Chicago engine plant still is some distance from volume output of the Wright duplex cyclone engine, recently announced by Curtiss-Wright Corp. as a 2200-horsepower unit. Also a new and highly secret project, known only by the cryptic term X-100, is moving into the production stage.

Malleable iron is being produced at the new steel foundry of Ford Motor Co., using both a cold melting and duplexing process. Cold melting is carried out in acid electric furnaces, with a charge of 50 per cent malleable gates and risers and the balance steel scrap and pig iron. In duplexing, a cupola

lined down to 48-inch inside diameter is used in connection with electric furnaces.

Malleablizing is carried out in batch-type furnaces, originally installed for heat treatment of armor plate. A tray of coke is inserted into the furnace with each load of castings, in order to maintain the required nonoxidizing atmosphere. Physical properties of castings average around 57,000 pounds per square inch tensile strength and 16 per cent elongation. They include rear axle housings as well as similar castings for armored cars and other ordnance units.

Reductions in expenditures for armament and equipment recently announced by the Army will amount to something over 8¼ billions of dollars as of the end of the current fiscal year. This exceeds the total war production of the automotive industry (1000 plants) thus far in 1943. Modification and deferment of airplane production schedules, exceeding two billion dollars, amounts to about one-sixth of dollar volume of anticipated 1943 output for aircraft industry.

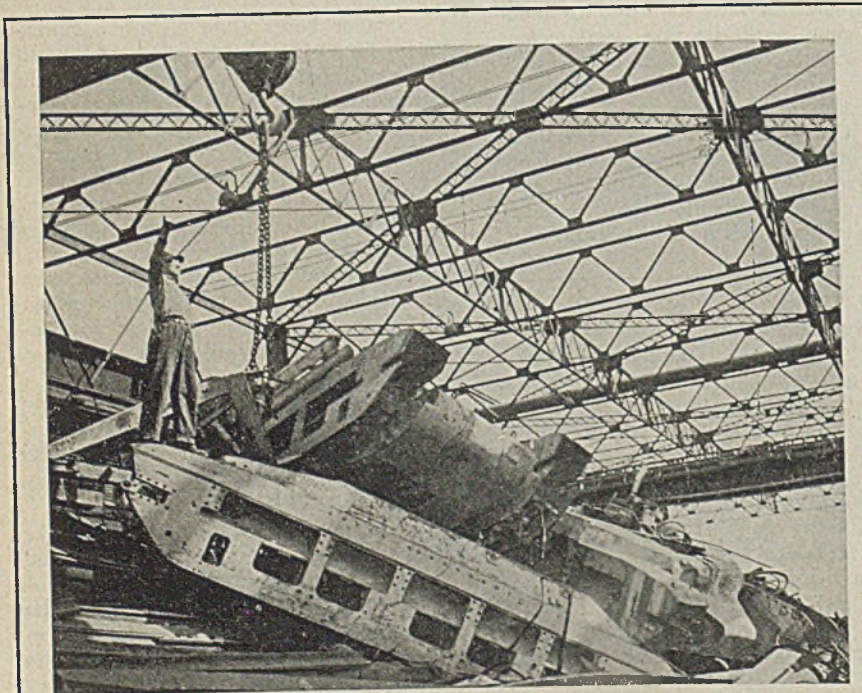
Local steel mills have been out of the scrap market for the past 45 days or more and accumulated tonnages here have been allocated to mills outside the state, principally in Ohio. However, in the past two weeks, some of the latter mills have canceled a large portion of scrap on order and their indicated requirements for the next 30 days have been trimmed sharply.

A local plant producing small arms ammunition from steel has been closed and its machinery stored. Production of this one plant alone is reported to have run into the billions of rounds; and virtually none of the cartridges ever will be fired, according to the Army. The plant was set up by the WPB on an emergency basis when supplies of copper and brass were at a critical point, but the probability of corrosion is said to make it unlikely that any of the output can be used.

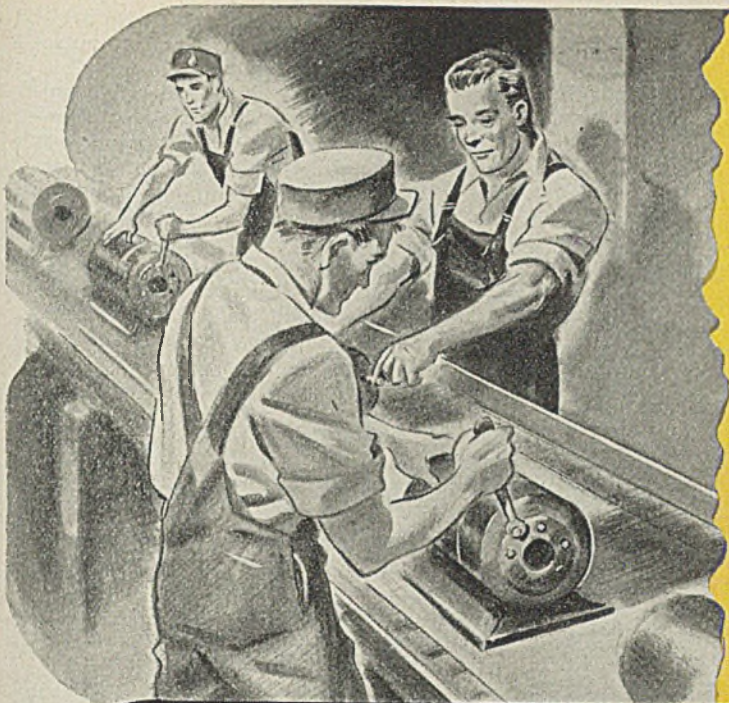
Coal Distribution Program Will Limit Users' Stocks

A new bituminous coal distribution program, designed to make available increased supplies of coal to meet the requirements of industrial and domestic consumers whose needs are urgent, has been announced by Harold L. Ickes, solid fuels administrator for war. The program requires reductions in shipments of coal produced in most of the eastern half of the nation to industrial plants and railroads with large stocks in storage.

Under the program, which will put the reductions in effect as of Dec. 1, industrial plants and railroads having coal in storage equivalent to more than 25 days' consumption and public utilities having stored coal equivalent to more than 40 days' consumption must reduce their current orders for coal to 75 per cent or less of monthly burning requirements.



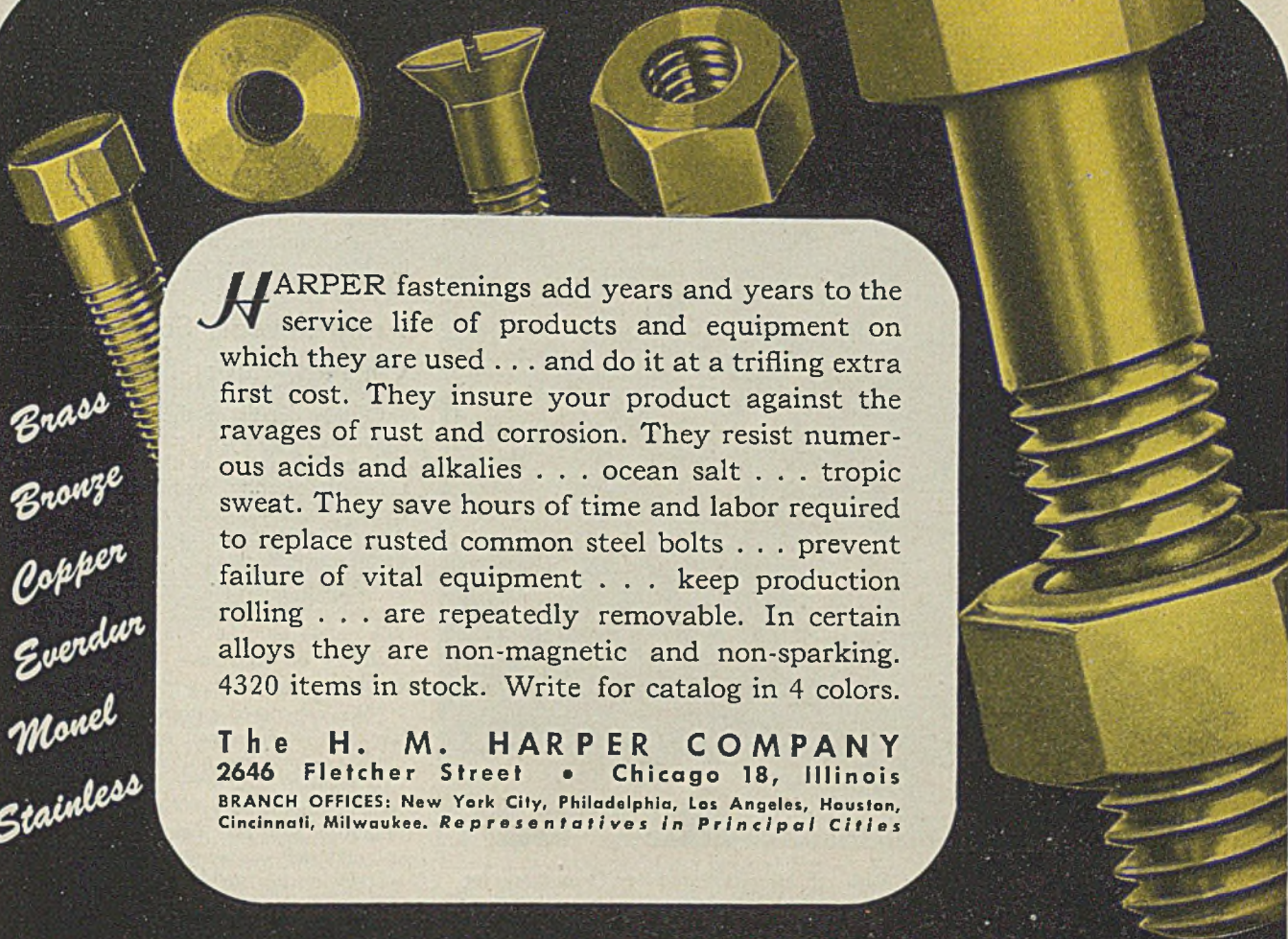
BATTLEFIELD SCRAP: Here are some of the wrecked Axis tanks from the North African battlefields which arrived at the Bethlehem Steel Co. plant recently. Much of this already has been converted into steel for new war materiel



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WING TIPS

New standards and specifications for simplifying design, assembly and maintenance of government airplanes adopted at meeting of National Aircraft Standards Committee of prime airframe contractors to the government

ADOPTION of new standards and specifications which will simplify design, assembly and maintenance of government airplanes all over the world were announced recently by the National Aircraft Standards Committee of the prime airframe contractors to the United States government at the conclusion of a three-day national meeting at the Hotel Lexington, New York.

In addition to more than 40 representatives of the 32 contractors for design and production of government airplanes, the meeting was attended by members of the Army-Navy Aeronautical Board, the Bureau of Aeronautics of the Navy, the Wright Field staff of the Army, the War Production Board, the American Standards Association, the British Air Commission, the Royal Canadian Air Force and the Australian Office of War Supplies.

New officers of the association elected for 1943-44 are:

National chairman, Jack F. Cox (Vega, Burbank); Eastern division chairman,

George W. Baughman (Cessna, Wichita); Western chairman, Charles Sardou Jr. (Consolidated-Vultee, Downey, Calif.); Eastern vice chairman, Jerome Gropper (Brewster, Hatboro, Pa.); Western vice chairman, Glen Aron (Northrop, Hawthorne, Calif.).

The retiring national chairman, Eric Dudley, materials and standards engineer for Curtiss-Wright, Buffalo, said the meeting had approved the progress report of his subcommittee for reduction of varieties of sizes, thicknesses and tolerances for carbon, alloy and stainless steels in sheet, plate and bar form to approximately one-seventh of their former number. This project is now nearly complete.

Many New Standards Adopted

Mr. Dudley also revealed that the committee, now in its third year, has produced from 50 to 75 new standards and specifications per year, which have been officially adopted, and all of which will greatly simplify the raw materials

problems of airplane designers, manufacturers and purchasers.

He stated the Army-Navy Aeronautical Board is giving the National Aeronautical Standards Committee increasing responsibility in preparation of data for Army-Navy standards, which are the highest in the aviation world. Many N.A.S.C. standards become Army-Navy standards.

Among the accomplishments of the National Aircraft Standards Committee during the past year, it was announced, was reduction of the 2700 varieties of dural tubing materials and sizes to 325, a corresponding reduction in steel tubing and the cutting of the approximately 100 varieties of rivet types and materials used in airplane construction to less than 10.

Most of the time of the final full two-day session of the committee was devoted to review and consideration of its more than one hundred projects and project surveys covering standards for every department of airplane design.

It was predicted at the meeting that the work of the committee, organized to develop war-time standard parts, methods and specifications, will be of equal importance in the forthcoming peacetime development of commercial aviation.

The committee announced it is planning a nationwide educational program for teaching men in all departments of the aviation industry to be "standards minded", a condition which, according to the committee, was definitely lacking in this country before the present war.

Army Reveals Some Details On New Super-Bomber

Certain details of the Army's newest super-bomber were revealed officially and its designation as the B-29 was announced recently by General H. H. Arnold, commanding general of the Army Air Forces. In making the announcement, General Arnold said:

"The B-24 Liberator, pioneered by Consolidated, and the B-17 Flying Fortress, pioneered by Boeing, are super-bombers on the basis of their superb combat records.

"We now have a third super-bomber, which is as far ahead of those two aircraft as they are out in front of pre-war bombers. It is the B-29, developed by the Boeing Aircraft Co. in close cooperation with the Army Air Forces and its materiel command and evolved in secrecy during the past several years.

"The engineering of the B-29 design was accomplished by the Boeing company's large engineering staff at Seattle, Wash., which originated and developed the B-17 Flying Fortress. First experimental models of the B-29 were built at Seattle. Engineering and production information has been turned over to other major aircraft manufacturers, who also will produce the plane through final assembly, and to other industrial con-



Here are the new officers of the National Aircraft Standards Committee for 1943-44. Seated, left to right: Charles Sardou, Jr., Consolidated-Vultee, Downey, Calif., West Coast chairman; Jack F. Cox, Vega, Burbank, Calif., national chairman, and George W. Baughman, Cessna, Wichita, Kans., East Coast chairman. Standing, left to right, are: Glen M. Aron, Northrop, Hawthorne, Calif., West Coast vice chairman; Eugene W. Norris, secretary of the national office, Washington, and Jerome Gropper, Brewster, Hatboro, Pa., East Coast vice chairman. Not shown in the photograph are R. W. Miller, executive engineer, Republic Aviation, Farmingdale, Long Island, N. Y., a board member, and Edward W. Wells, chief engineer, Boeing, Seattle, a board member



TWO PROPELLERS INSTEAD OF ONE... FROM THE SAME AMOUNT OF STEEL!

Here's a heartening story of wartime achievement — taper-rolled steel plates for propellers.

Manufacturers used to taper these plates for propeller blades by costly machining. It was tedious work, wasted half of each plate and thousands of precious man-hours. ARMCO engineers knew there'd be a big saving if the plates could be tapered *at the mill*. So they designed ingenious rolling equipment that tapers the plates in a few swift passes through the rolls.

But that was only half the job. It took experienced mill men, with years of "know-how," to roll plate after

plate to the highest aircraft standards. These alloy steel plates make stronger, tougher propellers for the deadly warplanes that are winning our battles in the skies.

This is only one example of ARMCO Research in action. Many special-purpose metals created by ARMCO are used in all kinds of war-winning equipment. These same steels can help you win sales for your new prod-

ucts when peace comes. Write to The American Rolling Mill Company, 2961 Curtis St., Middletown, Ohio.



The American Rolling Mill Company

cerns which will handle subassembly or parts production.

"This battleship of the air is armored heavily with multiple-gun, power turrets. It can fly at very high altitudes.

"Its performance will not be discussed before it enters combat. However, the B-29 will have a range substantially greater than the maximum effective range of today's longest-range heavy bombers and it will carry quite sizable bombloads for that distance. It will be powered with Wright engines. It will use Hamilton-Standard propellers.

"When it enters combat, today's long range will become medium range and today's heavy bombers will consequently become light heavies.

"Even under the impetus of war, many months must elapse between adoption of a plane type and its entry into combat. These months are needed for development, to prepare for production, to increase production, to train personnel, and to iron out the bugs inherent in all new types. Eventually, however, sufficient planes and crews are ready to give the weapon its final test—under combat conditions. That final test of the B-29 is not now far distant.

"It should be made clear that production of B-17s and of B-24s will not be affected by advent of the B-29. Production of those two bombers is being increased steadily."

Boeing Press Punches 388 Rivet Holes in One Stroke

Capable of punching 388 riveting holes in a single stroke of a giant hydraulic press, a new Boeing developed die

is turning out parts ready for riveting thirty times faster than the previous method of drilling, the Boeing Aircraft Co. announced recently. Parts manufactured by the new die are riveted together to form the bomb bay catwalk of the Boeing Flying Fortress.

Tool engineers express the belief that this die contains the largest number of co-ordinated punches ever to be located in a single die. Named the "Porcupine" by Boeing employes, because of the similarity between the many punches and a porcupine's quills, the new die makes a total of 976 riveting holes in ten separate parts which comprise the walkway through the bomb bay of the big bomber. These are assembled, as a subassembly operation, with more than four hundred rivets. Aside from the web, or flooring, which is aluminum .064-inch thick, four "T" sections as well as angles and reinforcements are pierced on the porcupine. The heaviest material is .150-inch thick, over an eighth of an inch.

The construction of the porcupine was held to an accuracy of 5/10,000ths of an inch. This insures absolute alignment of holes from one part to another, enabling assembly and greater production. Made possible by the redesign of the Flying Fortress catwalk for the utilization of high production methods, the die punches many holes at one time, where formerly holes were drilled individually by electrically powered motors.

"A die of this type," R. A. Neale, operations manager of the Boeing Aircraft Co., states, "is expensive to manufacture. Its construction, however, typifies the quantity production tooling which Boeing has and is continuing to develop to

alleviate the manpower shortage in the Seattle area, and to expedite the production of the Boeing Flying Fortress."

The Boeing company expects that the porcupine shall have paid for itself in time savings within a year. It is one of nearly a quarter million special tools developed by Boeing tooling experts since the declaration of the national emergency.

Plant Layout Charted on Model with Wood Blocks

Plant engineers at Boeing Aircraft Co. play chess with wood blocks representing machine units in the vast machine shop at the new Boeing Renton, Wash., plant. The "plant" in this layout room is a series of long tables covered with metal sheets scored in squares, each representing 4 square feet of floor area. Some of the area is shaded or colored where there are special foundations to support heavy equipment. Walls and aisles are charted with industrial tape.

Every piece of equipment in the plant, from wing jigs to the smallest parts bin, is duplicated on the planners' boards, sawed out of 3/16-inch plywood on a scale of 1/4-inch to the foot. Each piece is shaped according to its plan view to show what floor space it requires. In the final assembly layout some of the scale pieces are built up to proper height so they can be placed where they will not interfere with overhead cranes.

Each machine model carries its name and purchase number, and is marked to show where power lines plug in, the voltage required and the motor horsepower.

Planning engineers not only collaborate with shop foremen in making new layouts, but with all departments whose work will be affected by any changes in layout. After an experimental layout is approved, it is transferred to master plan panels which are kept up-to-date for use by executives, department heads and supervisors. When a final setup is agreed upon, the machine models are glued in place, a photograph taken of the layout for study and to be used as a blueprint for shop movers to follow.

"Zipper" Lines Save Floor Space at Tucson Plant

Tucson, Ariz., modification center, operated by Consolidate Vultee, now has in operation what are known as "zipper" lines for modifying B-24 Liberator bombers. They are double lines of ships staggered to make use of as much floor space as possible.

When finally established, two hangars will house the "zipper" lines which are now moved by tractors but shortly will be hooked together and pulled by a single stationary tractor drive. This will insure the lines moving evenly and avoid damage to wing tips which might occur if one line moved faster than the other. The ships on the line are tied together by cables from nose wheel to nose wheel.



Boeing engineers "play chess" with wood blocks representing machine units in the vast machine shop at the new Boeing plant at Renton, Wash. Every piece of equipment in the plant, from wing jigs to the smallest parts bin, is duplicated on the planners' boards

MAKING THE WORLD'S FINEST STANDARDS

1899
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● SHOP WHERE HJALMER ELLSTROM DEVELOPED THE ORIGINAL GAGE BLOCK.



ORIGINATED (The only major improvement since the development of the original gage block.)



A Family Tradition

The manufacture of gage blocks has become a family tradition with the Ellstrom family. Elmer Ellstrom, the founder of the Dearborn Gage Company, worked as an apprentice to his father, Hjalmer Ellstrom when the latter worked on the development of the gage block. This apprenticeship was served from 1899 to 1904 at which time his father worked in the tool room of the great Swedish Arsenal in Eskilstuna and Fagersta where the finest grade of steel known is made. With this steel at his disposal, the elder Ellstrom contributed to the development of the steel analysis which permits the stability required in gage blocks.

Together with this development a process of seasoning steel was discovered as well as an instrument for checking dimensions in degrees of accuracy. So effective were these discoveries that to this day they have no equal in reliability and precision.

After having spent his early years in the very birthplace of precision measurement, Elmer Ellstrom desired more experience in methods used in the steel-working industry and in 1904 came to the United States where he found employment with large manufacturers in this country, such as Westinghouse, Mesta Machine Company, Joseph Bullard Company and the Martin Bomber Company.

With this wide experience as a background, Elmer Ellstrom began his own company in 1936 and with the assistance of his three sons, Ralph, Olof and Elmer, he has built the Dearborn Gage Company into a recognized leader in its field.

Yes, the manufacture of gage blocks is truly "a family tradition" with the Ellstrom family and it is undoubtedly the reason why Dearborn Chromium Plated Gage Blocks are known for their superiority throughout the world.



DEARBORN GAGE COMPANY 22038 BEECH STREET
DEARBORN, MICHIGAN

Originators of Chromium Plated Gage Blocks

MEN of INDUSTRY



M. M. GREER

Who has been elected vice president in charge of engineering, Edwin L. Wiegand Co., Pittsburgh, noted in STEEL, Nov. 22, p. 63.



JAMES L. BLEAN

Who has been elected secretary and treasurer, Detroit Gray Iron Foundry Co., as announced in STEEL, Oct. 11, p. 160.



F. C. BIGGERT JR.

Who has been elected a director and a member of the executive committee, Follansbee Steel Corp., Pittsburgh, as reported in STEEL, Nov. 22, p. 62.

Morehead Patterson, president since 1941, American Machine & Foundry Co., New York, has been elected chairman of the board to succeed the late Rufus L. Patterson. Herbert H. Leonard is resigning as president-treasurer of Consolidated Packaging Machinery Corp., Buffalo, to become president of American Machine & Foundry Co.

L. F. Schuermann has been elected assistant vice president, Wheeling Corrugating Co., Wheeling, W. Va., and W. J. Burrucker has succeeded him as manager of the New York district office.

V. A. Guebard, formerly superintendent, Milwaukee works, International Harvester Co., Chicago, has been appointed works manager of the company's truck manufacturing group of plants, with headquarters in Chicago.

A. R. Kelso, formerly assistant general manager, United States Cartridge Co., St. Louis, has been named executive vice president, Rock-Ola Mfg. Corp., Chicago.

Robert H. Brink has been appointed purchasing agent, Chicago Nipple Mfg. Co., and D. Mackintosh has been named general superintendent and works manager.

J. A. Clauss, for the past year head of the Plant Facilities Unit, Steel Division, WPB, has resigned to return to his post as chief engineer, Great Lakes Steel Corp., Detroit.

T. W. Macdonald, former director of public relations, Republic Aviation Corp., Farmingdale, N. Y., has joined American Airlines Inc.

Harper Richards, architect and industrial designer, has opened his own office at 158 East Ontario street, Chicago. Mr. Richards has been associated with North American Aviation Co., Dallas, Tex., as industrial engineer.

Henry DeBelius, one of the founders, Kendallville Foundry, Kendallville, Ind., has retired.

T. W. Bonnevier, tax accountant of Acme Steel Co., Chicago, has been named director of publications, Chicago chapter, National Association of Cost Accountants.

Robert H. Goodrich has been appointed employment manager, Diamond Alkali Co., Fairport Harbor, O., succeeding B. H. Taylor, who has enlisted in the United States Navy.

David T. Siegel, founder and president, Ohmite Mfg. Co., Chicago, has been elected to the board of trustees, Illinois Institute of Technology, Chicago. Other newly-elected trustees of the Institute are: Whipple Jacobs, president, Belden Mfg. Co., Chicago; Claude A.

Knuepfer, president and general manager, General Engineering Works, Chicago; T. Albert Potter, president, Elgin National Watch Co., Elgin, Ill., and Harold B. Smith, president, Illinois Tool Works, Chicago.

Emory J. Price has been appointed industry manager for milling and cereal industries in the newly-established Minneapolis branch office, Reynolds Metals Co. Inc., Richmond, Va.

Clarence G. Stoll, president and director, Western Electric Co., New York, has been elected to the board of governors, National Electrical Manufacturers Association. Mr. Stoll has been president of that organization since January, 1940.

Harry S. Tweedy, former chief inspector of production, Detrex Corp., Detroit, has been appointed manager, Field Service division.

Ruth Leach, former manager of systems service, International Business Machines Corp., New York, has been elected a vice president of the company. Mary Schultz, assistant manager of systems service, has been named assistant vice president. Miss Leach is the first woman to hold an executive office with the company.

James A. Ogilvie has been named general superintendent, Atlantic Seaboard division (Charleston, S. C.) of Pittsburgh Metallurgical Co. Inc., Niagara Falls, N. Y.

C. L. Clark has been appointed manager of the western New York office in Buffalo for Wheelco Instruments Co., Chicago. Charles D. Mount has been named sales representative for southern Ohio and northern Kentucky, with headquarters in Cincinnati, and H. E. Holling has been appointed northwestern



JOHN C. GRAF

Who has been appointed sales manager, Hydraulic Press and Special Equipment department, Baldwin Southwark division, Baldwin Locomotive Works, Eddystone, Pa., noted in STEEL, Nov. 22, p. 63.



ROBERT T. DUNLAP



W. L. STANCLIFFE



RALPH M. JOHNSON

Illinois representative, Peoria, Ill.

Robert T. Dunlap, previously general works manager, Vulcan Iron Works, Wilkes-Barre, Pa., has been appointed assistant to the president, Wickwire Spencer Steel Co., New York.

Francis J. Curtis, director of development, Monsanto Chemical Co., St. Louis, has been elected a vice president of the company.

Harold I. Beadle has been appointed sales manager for new products, Nautaguck Chemical division, United States Rubber Co., New York.

Keith P. Rindfleisch has been appointed assistant manager of the Cleveland plant, United States Steel Supply Co., Chicago.

J. C. Lewis has been named field representative in Arkansas, Louisiana, Texas and Oklahoma for Drayer & Hanson Inc., Los Angeles, and will maintain headquarters in Austin, Tex.

Morris Teague and W. F. Haverstock have been placed in charge of the newly-

opened Toledo branch office of Colonial Broach Co., Detroit.

William L. Stancliffe has been appointed vice president in charge of sales, American Car & Foundry Co., New York, succeeding the late William E. Hedgcock. Mr. Stancliffe retains his position as manager of contractual relations between American Car & Foundry Co. and the government concerning manufacture and sale of munitions.

Ralph M. Johnson, previously western sales manager, Norton Co., Worcester, Mass., has been appointed general sales manager of grinding wheels and abrasive grain for the entire United States.

Walter J. Ewbank, former manager of research and development, Briggs Clarifier Co., Washington, has been appointed chief engineer.

Richard N. Mathews has been appointed manager of the newly-opened San Francisco office, Ross Heater & Mfg. Co. Inc., Buffalo.

Clem H. Franks, formerly vice president, Teletype Corp., Chicago, subsid-

ary of Western Electric Co., New York, has been elected a director and president of Teletype, succeeding Gustave Hedding, resigned.

P. W. Stickney has been appointed sales representative in the Chicago territory for Allen Corp., Detroit. Lawrence H. Gardner has joined the engineering staff of the corporation.

A. G. Fournier has been appointed sales and service engineer in California, Arizona and Nevada for Pioneer Pump & Mfg. Co., Detroit. His headquarters are at 2444 East Twenty-fourth street, Los Angeles, 11.

Clarence E. Burke has been named assistant manager of sales, specialty transformer section, Ft. Wayne (Ind.) works, General Electric Co., Schenectady, N. Y.

William C. Judy has been appointed Denver district sales manager for Bliss & Laughlin Inc., Harvey, Ill., and is located at 302 Sugar building, Denver.

Gaston F. DuBois, vice president, Monsanto Chemical Co., St. Louis, has been elected recipient of the Perkin Medal given by the American Section of the Society of Chemical Industry for outstanding work in applied chemistry.

Dr. Joseph G. Donchess has been appointed chief surgeon of the two Gary (Ind.) plants, Carnegie-Illinois Steel Corp., Chicago, succeeding the late Dr. Frank W. Merritt.

William B. Peters has been appointed treasurer, J. I. Case Co., Racine, Wis., succeeding the late R. P. Howell. Harry G. Barr, former general purchasing agent, has been named vice president in charge of purchasing.

Roy A. Garrison, works manager in charge of shop operations for both the Steel Foundry and Forgings divisions, Adirondack Foundries & Steel Inc., Watervliet, N. Y., has been elected a vice president.

OBITUARIES . . .

Frank A. Ross, 60, senior vice president, Stewart-Warner Corp., Chicago, died Nov. 17.

C. H. Williams, 81, founder and honorary chairman of the board, Plomb Tool Co., Los Angeles, died there recently.

Dee D. Cameron, 61, foundry consulting engineer, Chicago Heights, Ill., died there Nov. 12.

William M. Mills, 77, retired secretary, Tonawanda Iron & Steel Co., North Tonawanda, N. Y., died Nov. 17.

Stanley W. Tucker, former president, Fulton Foundry & Machine Co., Cleve-

land, and of S. W. Tucker Co., Cleveland, died Nov. 15 in Pasadena, Calif.

William G. Hagmaier, 60, acting head of the Sawmill Machine department, Allis-Chalmers Mfg. Co., Milwaukee, died there Nov. 15.

Clement M. Stevenson, 62, St. Louis district manager, Vanadium-Alloys Steel Corp., Latrobe, Pa., died in St. Louis recently.

George V. Dauchy, 70, since 1912 vice president and secretary, Dauchy Iron Works Inc., Chicago, died Nov. 17.

Harry C. Merritt, 62, former vice president and general manager of the Trac-

tor division, Allis-Chalmers Mfg. Co., Milwaukee, died Nov. 17 in Littleton, Ill.

George D. Benham, 66, associated with the sales department of Bushwick Iron & Steel Co. Inc., Brooklyn, N. Y., died Nov. 15.

George J. Thust, 76, former superintendent, Globe Seamless Steel Tube Co., Milwaukee, died Nov. 13 in that city.

Lt. Col. Walter H. Hinsch, Field Artillery, United States Army, and formerly chief engineer, Dearborn Chemical Co., Chicago, was accidentally killed at Camp Van Doren, Miss., Nov. 15.

Huge Press Operates at Speed Of 30 Strokes a Minute

SOME idea of the size of components of four 4000-ton Clearing presses recently installed in a Chevrolet aircraft aluminum forge plant at Anderson, Ind., may be obtained from these construction views.

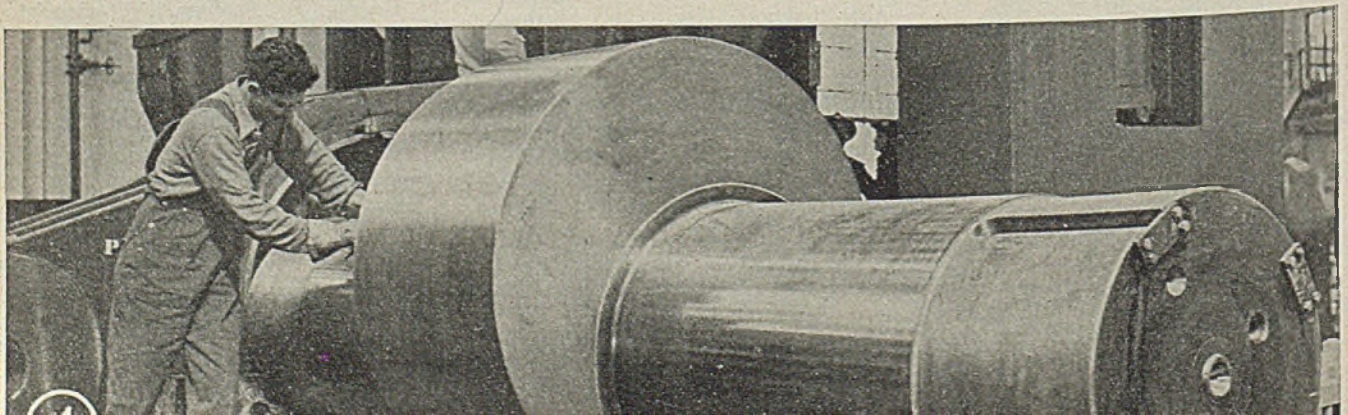
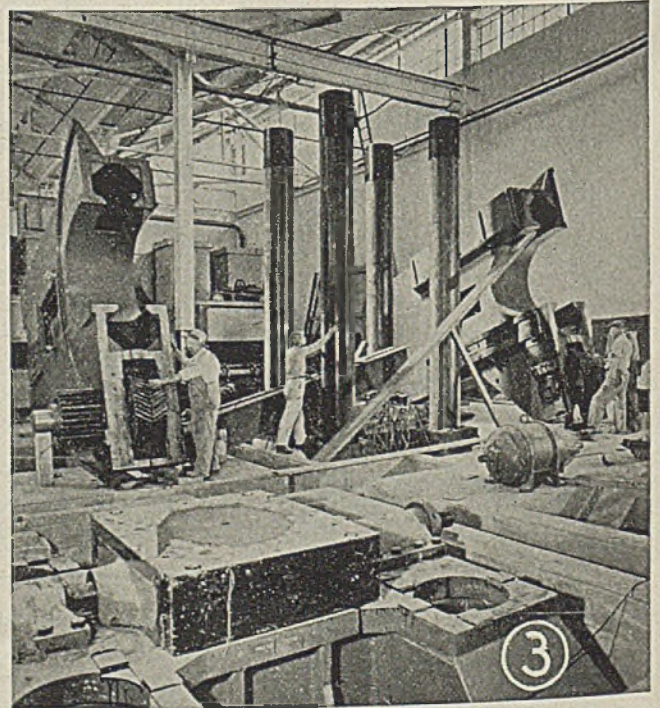
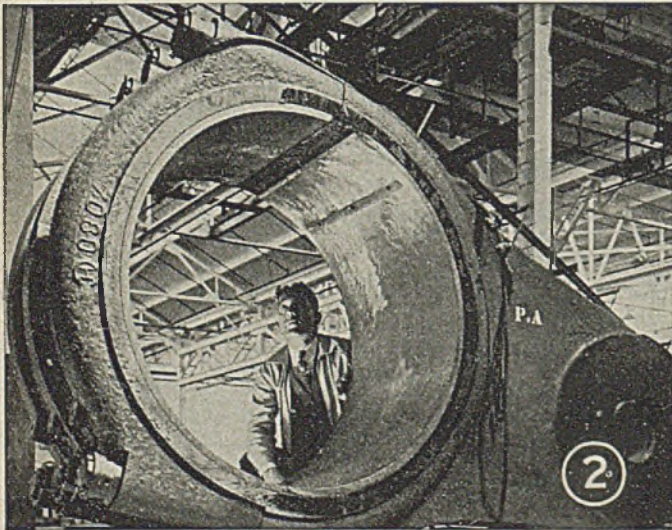
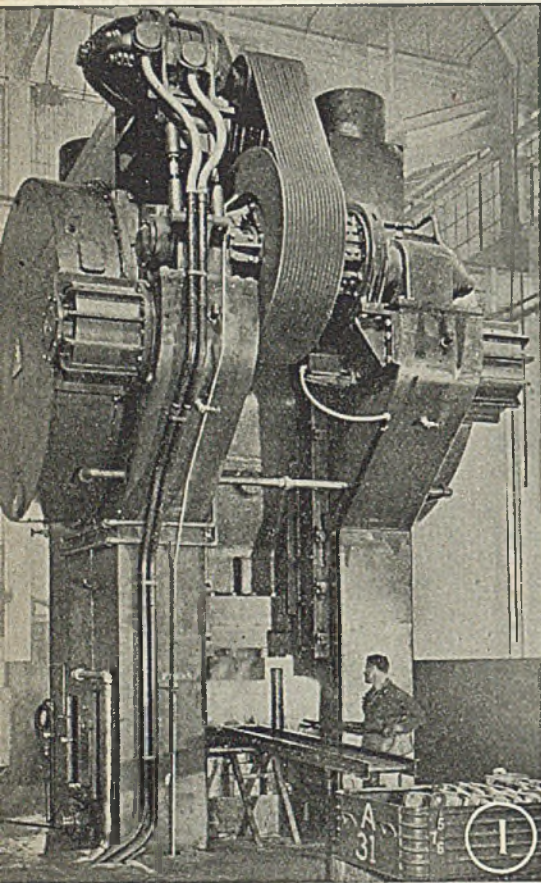
Fig. 1 shows a completed press in operation. It has 18-inch stroke, will operate at 30 strokes a minute. Bed is 48 inches square. All main members are of welded steel construction held together by four forged steel tierods, each 31 feet long and weighing, with the one-ton nut at each end, 19 tons.

Shown in Fig. 2, the tierods extend 8 feet below floor level through the base of the press.

Before installing the nut on each end of the tierod to hold the uprights in place, eight holes were drilled in each end of the rod and filled with electric elements to heat the rod ends. After eight hours heating, the threaded end elongated $\frac{1}{4}$ -inch and the cylindrical nut is screwed in place by means of a winch and cable. Subsequent cooling freezes the nut in place.

Fig. 3 shows the 20-ton crank or eccentric shaft for the press before installation. Fig. 4 is the connection strap which fits over the eccentric on the shaft and delivers the power strokes to the upper die. This strap weighs 10 tons alone.

The press rises 23 feet above floor level and is driven by a 200-horsepower motor. It is equipped with a heavy-duty hydraulic clutch and brake, and a special wedge-type adjustable bolster plate.



Manufacturers Seen Inevitably Confronted by Merger Question

Some industries may find consolidations the solution to problem arising from over-expansion and other wartime developments. . . Many companies face hard competitive battle for business in oversold markets

By PHILIP SCOFIELD SHOEMAKER*

MANUFACTURERS pondering postwar problems will inevitably face the question, "Shall we consolidate?"

There are groups of manufacturers whose wartime production may have overbuilt their peacetime market for years to come beyond the duration of the war. In contrast, some industries have wholly abandoned their normal production due to lack of sufficient critical materials, and in consequence may logically look for a boom when V day comes.

There are individual manufacturers who want to retire when peace is won. And there is still another group who will have partially paid the Defense Plant Corp. for war facilities, when the war closes, yet lack working capital, products and personnel to utilize their expanded facilities and may want to combine with another concern.

Other managements may have financed their own expansion to meet war orders requirements, but substantial cancellations may have been issued even before the war was over. Each may find consolidation the solution. For some, retrenchment will be the primary purpose; preparation for broadly expanded markets will be another reason; and, the desire to salvage plant and machinery may prompt others to consolidate.

Covers Metalworking Field

This discussion will not include regulatory measures by governmental agencies bearing on mergers. It is simply a presentation of the highlights of the subject as seen by managements of "average sized" companies in the metal manufacturing field.

It is well to differentiate between the "boom era" mergers, such as we saw in 1925-29, and the consolidations of expediency of the early postwar period when the first economic dislocation is felt. The fundamental business and psychological conditions which made possible the rash of mergers during the "bull market" period are non-existent now, and, if history repeats, will not be seen for a considerable period following the war climax. However, it is to be remembered that it is only 14 years ago, that the "new era" balloon burst; discount rates rose to 25 per cent, and the liquidation of the first world war inflation set in. There is not

much doubt but that those pyramided business organizations were largely the cause of the inflationary credit structures erected to accommodate their financing.

As for the present, consider an industry whose wartime production may have over-built its peacetime market. The machine tool builders are in this category. These manufacturers have no expectancy of normal business for years to come. This can mean but one thing—a hard competitive battle for the remaining available business. Yet during the early postwar period they are almost certain to suffer from inventory value shrinkage, accounts receivable, write-offs and top-heavy payrolls. Added to these potential asset losses is the matter of thin surplus reserves. They recognize that in order to maintain the same niche in their trade, cash outlays will be required for research and development, sales promotion of new products and techniques as well as plant conversions and new machinery. But their taxes and renegotiations have made any substantial accumulations of cash reserves impossible.

Cites Merger Advantages

Already their thoughts are focusing on the battle which will just begin for them when the war is won. These veterans of the industry well remember the years following 1918, when a goodly number of their group either merged or closed shop.

A postwar merger with another machine builder who manufactures a non-competitive machine might afford shelter and be the alternative to closing the doors. By this combination, not only brick and mortar valuations can be salvaged, but also the whole range of values accruing to the "going concern." When the capacity for earnings is retained, a later favorable change of conditions will quickly reflect in the improvement of earnings of the combined unit, since every conceivable economy is utilized. Economies should logically be effected in the joint operation in purchasing department, and in the administrative and selling expenses. The feature of this merger, known as the circular type, is diversification—there is the assumption that at all times some machine tools fare better than others and it follows that the meeting of overhead and carrying charges is surer by having more machines to offer the trade. It also guards against the loss of sole outlet, a sales agency for example. It is therefore a sound move for both the weaker and the stronger concern.

Then too, it frequently helps stabilize price structure for the benefit of all the trade by avoiding the necessity of dumping. It likewise sustains the need for labor as well as conserving the equities of owners—all of which are sound objectives. Inasmuch as there is no money raised through stock or bond flotations, there is rarely any cash in the deal. The acquiring unit merely exchanges its stock for assets or stock of the weaker or smaller concern in an equitable ratio.

"If all American industry spent 2 per cent of gross sales income for research," stated Dr. Karl T. Compton, as chairman of the NAM Advisory Committee on Research, "there could be mobilized 250,000 scientists and engineers and a billion dollars a year for development of new goods, new services, new industries, new jobs and new sources of wages and salaries . . . and do much to prevent the recurrence of economic dislocation such as that which followed 1918." And may it be added, that by this procedure, using private initiative, we can keep alive the traditional dignity of free enterprise, which is symbolic of our American way of life.

Huge Potential Buying Power

It is timely, therefore, to critically review corporate policies, facilities, techniques, and possible markets. After the first several more or less violent deflationary years, the consumer goods industries hit their stride in the middle twenties with mass production of luxuries and necessities. This, it will be remembered, coincided with the trend toward Liberty bond liquidation. Foreign loans helped by providing vast purchasing power for our goods. Foreign markets loom even more rosily for the coming postwar era, and the potential purchasing power is enormous.

The job ahead, therefore, presents a competitive challenge unequalled in our industrial history. This means that our peace economy, instead of alleviating problems of production and administration, will undoubtedly sharpen them. It is to be expected that violent swings of the pendulum toward and away from inflation will be experienced during the next decade, which will challenge the survival of the best of our industrial managements.

There are several hundred thousand manufacturing organizations now on prime and subcontract war orders. There are those which have specialized in the "tailor-made" products, and those which have produced a standardized product. In conversion to peacetime production, each should keep to its clean-cut policy of operation and not attempt to straddle; that is, take on the manufacture of both types of products, for then they would be thrown off their own stride through the changing of production schedules. Should their research specialists recommend and encourage the manufacture of both types, a consolidation with another manufacturer having the proper equipment may logically be the solution.

Again, there are many thousands of

*The author is financial consultant and specialist in government relations with offices in the Leader building, Cleveland.

lasting friendships which have been developed through the wartime relationships of contractor with subcontractor which may lead to a merger. These will follow the vertical type, which means the integrating of units in different phases of the particular industry. Most of the larger steel companies are thoroughly integrated, owning their own supply of coal and iron ore, in addition to having the facilities for converting the raw materials into pig iron, semifinished and finished steel products. The last few years have seen a definite trend in the direction of producing both heavy and light steel products by the same organization in order to better balance the type of products.

Another problem confronting industrialists is, what to do with "plancor" facilities which will have been partially paid for when the war ends? Should the war extend through 1945 substantial equities will have accrued to companies in the plant and equipment facilities furnished by the DPC. It is apparent that managements would want to shift operations from the older plants to the new ones if their production will not require both. The "plancor" contracts have purchase clauses providing for an attractive arrangement of settlement should the companies choose to negotiate for full ownership.

Logical Medium of Liquidation

From the standpoint of government financing, it would be the logical medium of liquidation, and for the individual company it would be essentially fair and just. It would further avoid any speculative frenzy in bidding in the white elephants and machinery by speculators who would dump the latter on a saturated market, with a resultant break in both prices and an orderly market for new machines. The reasoning would then naturally follow, if we had X company's operations plus our own we could utilize our joint assets plus the "plancor" and make a satisfactory deal with the DPC. This would bulwark our financial and plant set-up to meet whatever conditions lie ahead.

The salvage of these equities may place these companies in an exceedingly advantageous competitive status, which status would be augmented by the assimilation of another unit with its contribution of assets, good will and brains. All these factors will weigh against the single units in like industry. The result may be that in turn they too may seek to combine with one or more for their mutual protection. A healthy reduction in the number of companies in each field and a simplification of operations of the remaining units should follow. Certainly all industry would welcome this development, if it would reduce the crop of failures which inevitably accompany the peace.

In the forty-odd years of this century we have seen the individual investments of single enterprises or of partnerships exchanged for a stock certificate. The immobility of capital of the individual ownership has always been apparent. During a depression there is no ready market for all or any part of the investment. It is necessary to await the return of better times, or sacrifice at forced sale the assets at great losses. The same situation is true with respect to the closely held corporation.

The daily introduction of new processes and new equipment may ultimately benefit our general welfare, but this progress is very costly to the relatively small company which must scrap machinery and take substantial write-offs due to obsolescence.

The individual investment is further hazardous due to the possible loss of the personal management of the owner because of failing health, advancing years or death. The complex tax liability of the present day makes an individual enterprise investment particularly vulnerable at death. Stocks and bonds in listed securities or over-counter markets offer wider marketability, and are more easily dispensable by wills. Then too, it is also true that increases in earnings or added increments to property assets are more readily realizable in partial withdrawals.

It is likewise apparent that an out-

right cash sale would materially reduce the estate of the seller through the resulting heavy tax levy. Which is still another argument in favor of consolidation—if the "right" deal is made at the "right" time. If history will repeat, we shall witness another crop of these individual ownerships merging with companies whose capitalizations are readily marketable both on the eastern seaboard and midland exchanges.

American Standards Group To Meet in New York City

Clifton E. Mack, director of procurement, Treasury Department, will speak on the use of standards to bring government requirements more nearly into line as a part of the American industrial system at the annual meeting of the American Standards Association at the Hotel Roosevelt, New York city, Dec. 10.

Founded 25 years ago as a result of the production problems of the last war, the association has in the past year completed more than 40 emergency jobs for the armed services and industry. R. E. Zimmerman, president, will make a brief address on postwar changes and developments. Meetings of the board of directors and the standards council will be held.

Foundry Equipment Sales Index Rises in October

Foundry Equipment Manufacturers' Association, Cleveland, reports index of net orders closed on new equipment in October was 375.7, compared with 268.7 in September and 341.0 in August.

Total sales index was 436.6 in October, 346.6 in September and 390.4 in August. Index for repairs in October was 650.9, in September 621.0 and in August 556.9.

Indexes are percentages of monthly averages of sales to metalworking industries, 1937-39.

They Say:

"The successful peace at home will be the result of unity and continuous effort. Certainly neither by manipulation of government finances nor by any other single device is it possible for the nation to lift itself by its own bootstraps."—Thomas E. Dewey, governor of New York.

"Most of the world will badly need goods, especially machine tools, machinery and the products of our mass production industry. The United States is prepared to make these products and credit will be needed to finance the purchases, since it will take time for foreigners to develop sufficient exports to the United States to pay for their purchases."—Lewis H. Brown, president, Johns-Manville Corp.

"The prospect that lies ahead is both agonizing and inspiring. It is agonizing because all of our hopes can be

shattered if every one of us does not play his proper part. It is inspiring because we have it in our power to make this America of ours a land of more abundant freedom and opportunity than at any time in its history."—Paul G. Hoffman, president, Studebaker Corp.

"We are now on the eve of another great upsurge in progress in the field of electronics. There is no fundamental reason why we could not travel at a speed of 2000 or even 5000 miles per hour in vacuum tube. Such a tube could be constructed in which the airtight vehicles are magnetically suspended in space, while moving forward at high speed. The intricate operations would be controlled throughout by electronic devices."—Dr. Irving Langmuir, associate director, General Electric Laboratories.

Dominion's War Expanded Metal Industries To Present Problem

Metals controller says uncertain postwar prospects warrant planning now as to how to care for increased capacity. . . . Aluminum seen hardest hit by anticipated sharp drop in airplane production

TORONTO, ONT.

CANADA has reached a point where she must give serious attention and thought to what is going to happen to her mining and metal industries after the war, G. C. Bateman, Canadian metals controller, told the parliamentary committee on aluminum recently.

"With the completion of the war," he said, "there is no program that will be cut as quickly as airplane production. So that at the end of the war we will have a tremendous aluminum capacity in Canada, about 12 times prewar capacity, which not only will have to try to find new outlets in competition with other metals and other materials, but will have to face the competition of great tonages of scrap.

"In about five days at present rate of production we could fill all the probable annual requirements for postwar airplane production. The cost of the raw material is a relatively minor part of the cost of the finished product, so what has to be considered is the ultimate cost, and that includes the cost of aluminum and the cost of fabricating, and the cost of production in using the fabricated parts. This is a matter to which I have given a good deal of thought and regarding which I am very concerned because my business, my life, has been spent with the mining industry and I see a lot of trouble ahead of it.

"Entering Age of Light Alloys"

"While these problems will apply with force to all of the primary non-ferrous metals (aluminum, copper, lead, zinc and nickel) they probably will apply to a much greater extent to aluminum because of the fact that aluminum capacity has been expanded to a much greater extent than that of any other metal. I am a firm believer that we are entering the age of light alloys. I expect aluminum to continue as one of our great Canadian industries. I expect to see it expand in postwar markets, but I also believe that any great expansion above the prewar markets is going to represent a very difficult time or condition and can only be attained at the expenditure of a great deal of money carried on over a period of years."

Canada's direct war expenditures in the first seven months of the fiscal year commencing April 1, 1943, totaled \$1,971,475,919, the Treasury Department reported, and compares with \$1,222,845,493 for the corresponding 1942 period. Of the \$1,000,000,000 mutual aid appropriation, \$295,564,813 was

spent in the seven month period, of which \$22,590,729 was spent in October.

C. D. Howe, Minister of Munitions and Supply, announced that on and after Dec. 31, 1943, no application from industry for a certificate of necessity for special depreciation will be con-

CONTROLS EASED

M. A. Hoey, associate Steel Controller for Canada, has issued order No. S.C. 33 which rescinds order No. S.C. 17, covering mill forms and secondary products, and order No. S.C. 22, which restricted inventories.

By issuance of order No. S.C. 33, nearly all secondary products have been removed from legal steel control and the office of the steel controller no longer requires any formal procedure in connection with the sale, purchase or stock on hand of these "shelf" items.

Applications for pipe, on form S.C.-1500 and for permission to use steel in construction, on form M. & S., 933, are still necessary. Form S.C.-1000 is cancelled and is replaced by form S.C.-1020 (revised Oct. 1, 1943) on a limited list of steel products. The use of this new form by steel purchasers is optional, not being needed when proper information is shown on the purchase order.

The new order also changes the maximum permissible inventory from 90 days to 60 days' requirements, effective Jan. 1, 1944. The new order does not change the method of importing steel in mill shapes from the United States, and has no reference to any regulations of the Wartime Prices and Trade Board.

considered unless the applicant can establish that the capital expenditure or commitment to which it refers was made after approval by the appropriate officer of the department.

Mr. Howe stated: "This action is being taken to insure that the existing facilities which are becoming available as a result of the rapid change from defensive to offensive-type war materials

are utilized fully before new facilities are created. The practice of allowing applications covering expenditures made prior to such approval was the product of a period of urgent wartime industrial expansion when every minute counted. Today there is no longer that extreme emergency. For the most part our munitions plants have been built and equipped and are meeting in full the demands made upon them. We have, therefore, decided to give notice to our contractors that as of Dec. 1, they must seek certificates of necessity for special depreciation prior to making any expenditures or commitments on behalf of the government. The certificate of necessity was introduced about a year ago when, owing to the rapidly increasing shortages of labor and raw materials, particularly in the building trades, it became apparent that industrial expansion must proceed only along the most economical, essential and efficient lines."

Canada's trade figures for the first eight months of this year passed all previous records, totaling \$3,029,435,464 compared with \$2,598,713,553 in the like period of 1942. Trade during the eight months exceeded the total for the full year 1940 by about \$750,000,000 and was only about \$60,000,000 behind the total trade in 1941.

Exports to the United States amounted to \$703,900,000; to the United Kingdom \$687,200,000 and to other Empire Countries, \$238,700,000 leaving \$245,500,000 to other Allied countries. These exports do not include gold.

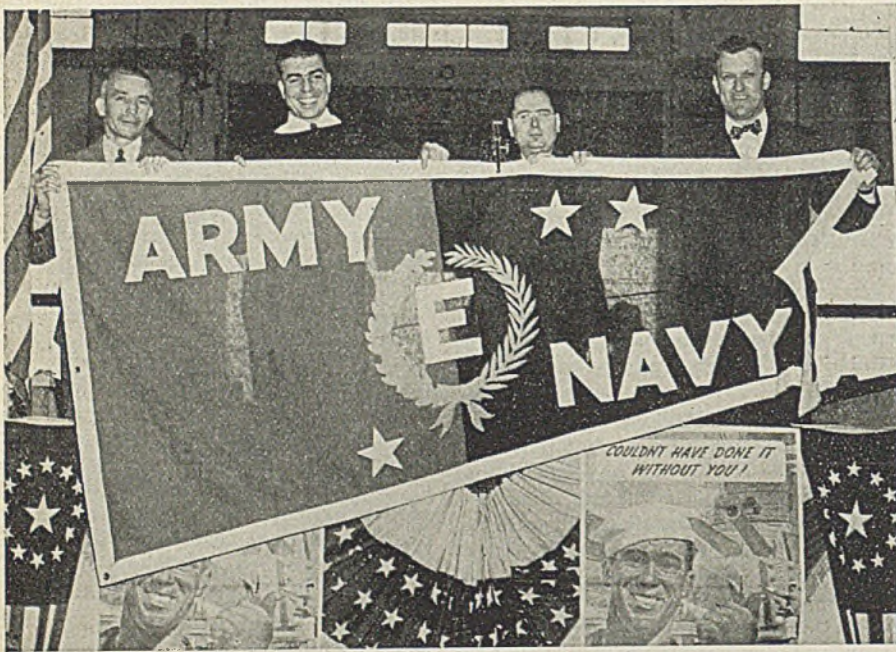
Predicts Full Employment

Readjustments in Canada's war production program are on the way, but "there need be no fear of unemployment for those willing and able to work", Mr. Howe, states. By adopting in peacetime the same methods used to expand war production, full employment can be continued in the postwar period.

"In four years, Canada has doubled its production," said Mr. Howe. "The time is near when the nature of the production must change, but our production capacity will not be changed. If we can think in terms of a country twice as large in productive capacity as prewar Canada, we need not fear postwar unemployment. At the end of the war our national debt will be large for a prewar Canada, but not large for an expanded Canada. Our transportation system was too large for a pre-war Canada, but is not too large for present day Canada. Our job is to use the experience of the past four years and to again assemble that close association of government, private enterprise, producer and worker, to consolidate our gains. Let us then face the task of organizing postwar production with the same enthusiasm and the same determination with which we faced the task of organizing for war."

Dealing with Canada's war production program Mr. Howe stated:

"The need of combat planes continues
(Please turn to Page 130)



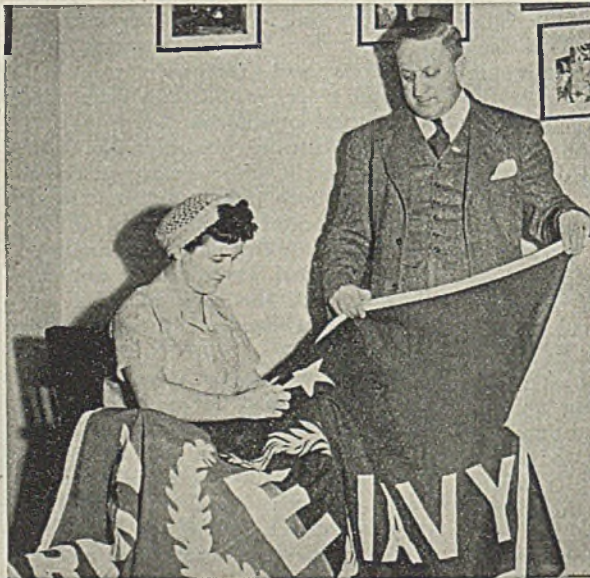
Charles T. Brandt Inc., Baltimore, recently received, left, the third star for its "E" pennant. Shown in the photograph, left to right: Charles E. Brandt, president of the company; George Schoonover, president of the shop union; Joseph L. Carter, Baltimore attorney, and Theodore R. McKeldin, Baltimore, mayor

Center, below, is the "sewing" ceremony of the renewal star award for the Army-Navy "E" flag at A. M. Byers Co., Pittsburgh. H. B. Linderman, general superintendent, looks on while Mary Kinder, analyst in the company's chemical laboratory, does the stitching

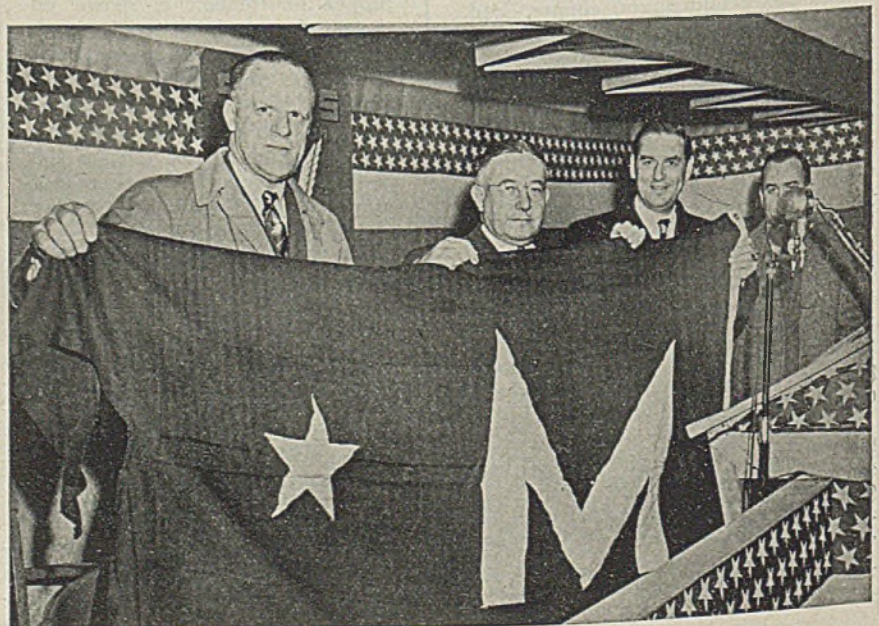
Additional War Plants Granted Production Awards

The Army, Navy and Maritime Commission recently announced the granting of awards for excellence in production to the following war plants:

- Candler-Hill Corp., Detroit.
- Cleveland Planer Co., Cleveland.
- De Vlieg Machine Co., Ferndale, Mich.
- Flint Mfgs. Service, Flint, Mich.
- Hercules Powder Co., Bacchus, Utah, and Carthage, Mo.
- Hudson Sharp Machine Co., Green Bay, Wis.
- Perfection Gear Co., Harvey, Ill.
- Posey Mfg. Co., Hoquiam, Wash.
- Square D Co., Elmhurst, Long Island, N. Y.
- Universal Blank Co. Inc., Southbridge, Mass.
- York Corp., York, Pa.
- Ladish Drop Forge Co., Cudahy, Wis., receives star.
- Ken-Tool Mfg. Co., Akron, O.
- Davenport Besler Corp., Davenport, Iowa.
- Weatherhead Co., Cleveland, receives star.
- Driver-Harris Co., Harrison, N. J., receives star.
- St. Joseph Lead Co., Josephstown, Pa.
- Electric Storage Battery Co., Philadelphia, receives third star.
- Eastern Rolling Mill Co., Baltimore.
- Cooper-Bessemer Corp., Mt. Vernon, O., and Grove City, Pa., add gold star each to its Maritime pennants.
- American Foundry Equipment Co., Mishawaka, Ind., awarded white star.
- Associated Spring Corp., Bristol, Conn.
- Dunbar Bros. Co., Bristol, Conn.
- Barlow & Seelig Mfg. Co., Algonquin, Ill.
- American Ironing Machine Co., Algonquin, Ill.
- Bell Sound Systems Inc., Columbus, O.
- Charles H. Besly Co., Beloit, Wis.
- Blackhawk Mfg. Co., West Allis, Wis.
- B. F. Goodrich Co., Oaks, Pa.
- Hewitt Rubber Corp., Buffalo.
- International Minerals & Chemical Corp., Austin, Tex.
- Ken Tool Mfg. Co., Akron, O.
- Milwaukee Flush Valve Co., Milwaukee, Wis.
- Tarrant Mfg. Co., Saratoga Springs, N. Y.
- Turner Brass Works, Sycamore, Ill.
- Soule Steel Co., San Francisco.
- Buffalo Bolt Co., North Tonawanda, N. Y.
- Sundstrand Machine Tool Co., Rockford, Ill., receives white star.
- Whiting Corp., Harvey, Ill., receives white star.



Below, holding the "M" pennant recently awarded to the Columbia Steel Casting Co., Portland, Oreg., are: Lewis R. Banks, company partner; A. D. MacLean, U. S. Maritime Commission; Harvey F. Dick, company partner, and Charles E. Walsh Jr., U. S. Maritime Commission



Canceled War Contracts Plan Is Suggested

Chicago Association of Commerce proposes 10 steps as solution to troublesome contracts problem

IN ONE of the most comprehensive suggestions yet offered for solution of the canceled war contracts problem, the Chicago Association of Commerce called upon Congress recently for special legislation and set forth the 10 steps which should be followed if thousands of companies in the Chicago area are not to be thrown into serious difficulties.

Among the definite recommendations made by the association are that the legislation should:

- 1—Establish one uniform procedure to be used by all government agencies;
- 2—Give federal contracting officers the authority to negotiate settlement of canceled war contracts;
- 3—Establish subcontractor's right to negotiate with the federal subcontracting officer in cases of controversy with the prime contractor;
- 4—Provide for a fixed formula plan of settlement for prime contractors and subcontractors in the event an agreement cannot be reached;
- 5—Empower the contracting officer to utilize experts and auditors for inspection and review purposes;
- 6—Provide for immediate substantial or even full payments to prime contractors and subsequent payment of subcontractors' claims;
- 7—Authorize contracting officer to effect a rapid liquidation of inventories and equipment by contractors and subcontractors under the overall direction of such contracting officer;
- 8—Protect contracting officer and his duly authorized agents, including prime and subcontractors, against personal liability, except in cases of fraud;
- 9—Include provisions which would reaffirm the contractor's or subcontractor's recourse to establish court procedures for establishing his claims;
- 10—Validate the various instruments of procurement such as letters of intent, technically imperfect contracts, and oral contracts made in good faith.

BRIEFS . . .

Barker & Williamson Co., Upper Darby, Pa., has published a catalog showing the broad assortment of standard coils for electronic heating applications available.

Hydraulic Machinery Inc., Dearborn, Mich., has published a catalog dealing with many phases of hydraulics as ap-

plied to machine tools and aviation.

Jones & Laughlin Steel Corp., Pittsburgh, reveals that no excessive profits have been realized in 1942 after a renegotiation of the business of the corporation and its subsidiaries.

Meehanite Metal Corp., New Rochelle, N. Y., announces the granting of manufacturing rights for its castings to the Indian Hume Pipe Co., Wadala, Ind.

Williamson Heater Co., Cincinnati, purchased the steel furnace business of the Michigan Tank & Furnace Co., Detroit.

Philco Corp., Philadelphia, reports production and sales this year will substantially exceed all previous records.

Stackpole Carbon Co., St. Marys, Pa., has published a 36-page catalog on its electronic components.

Perfection Tool & Metal Heat Treating Co., Chicago, reports it has received the Army and Navy aircraft approval for heat treating. The company has issued a circular on its "Nusite" process which hardens high-speed steel.

Callite Tungsten Corp., Union City, N. J., has issued bulletin No. 154 which describes the application of tungsten electrodes by atomic-hydrogen, helium and argon arc welding.

Whiting Corp., Harvey, Ill., has published bulletin No. QW-115 describing the new improved type of stamping trimmer.

National Association of Manufacturers, New York city, passed a resolution recently urging all employers to make every effort to provide suitable jobs for wounded veterans.

Delco Products Co., Dayton, O., launched a campaign among its operators to teach them to be their own process engineers as far as possible.

Acme Steel Co., Chicago, recently mailed Christmas bonus checks totaling more than \$43,000 to its 700 employees now in the armed forces.

Bureau of Mines, Washington, recently released a booklet describing the effect of various furnaces and atmospheres on the fusibility of coal ash.

National Machinery Co., Tiffin, O., has acquired the cold heading, bolt, and nut machinery business of the E. J. Manville Machine Co. Inc., Waterbury, Conn., including the corporate name and good will.

Pullman-Standard Car Mfg. Co., Chicago, recently launched three ocean going patrol vessels in two weeks for a new record.

Goodyear Tire & Rubber Co., Akron, O., announces a \$30,000,000 expansion program for manufacture of tires. Two of its plants converted from tire production to cannon and bullet production now are being reconverted to tire production.

H. K. Porter Co. Inc., Pittsburgh, has received a citation from the Navy for production of naval ordnance material.

Carbozite Corp., Pittsburgh, has published a booklet on its complete line of industrial coatings.

Granite City Steel Co., Granite City, Ill., has tapped two of its three new open hearth furnaces. The third will be in production about Dec. 1. The additional open hearth facilities will increase the company's ingot production by approximately 75 per cent.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., reports production of electronic tubes at its lamp division, Bloomfield, N. J., is 11 times greater than it was two years ago. Its merchant marine plant at Philadelphia has delivered 1,000,000 tons of propulsion machinery for ocean shipping in the year ending last October.

Falk Corp., Milwaukee, has published a new motoreducer bulletin No. 3100 to simplify selection of correct gear motor units for specific applications.

Meehanite Metal Corp., New Rochelle, N. Y., announces arrangements have been made with the Russell Allport Co. & Pty. Ltd. in Hobart, Tasmania, for manufacture of Meehanite castings.

Cooper-Bessemer Corp., Mt. Vernon, O., announces opening of a new branch office at 401 Rust building, San Francisco.

Mesta Machine Co., Pittsburgh, is distributing a booklet containing useful tables of weights and measures with a large number of tables relating to iron and steel products.

Cannon Electric Development Co., Los Angeles, announces the following new engineering representatives: E. B. Glenn, 801 Healy building, Atlanta, Ga.; Douglas H. Loukota, 10 Light street, Baltimore; Ray Peronn & Co., Little building, Boston; H. M. Welch, Crosby building, Buffalo; George Sturman, 712 Sixth avenue S., Minneapolis, Minn.; J. Tinsley Smith, 108 Seventeenth avenue, Nashville, Tenn.; J. W. Beneke, St. Louis agent for E. L. Melton, at 575 Arcade building, St. Louis.

Aircraft X-Ray Laboratories, Huntington Park, Calif., is expanding its magnetic inspection and metallurgical facilities in a newly-equipped plant in Los Angeles, George E. Newton, president of the company, announces.

THE BUSINESS TREND

Industry Continues Pace That Set October Record

OCTOBER munitions report is the outstanding feature in a week of continued high production. The sharp gain in index points suggests industrial management is training and supervising production workers much more effectively than in earlier periods. With gains recorded for planes, ships, and other classifications of war goods vitally needed by the United Nations at this stage of the war, the manpower problem loses stature as a threat to victory.

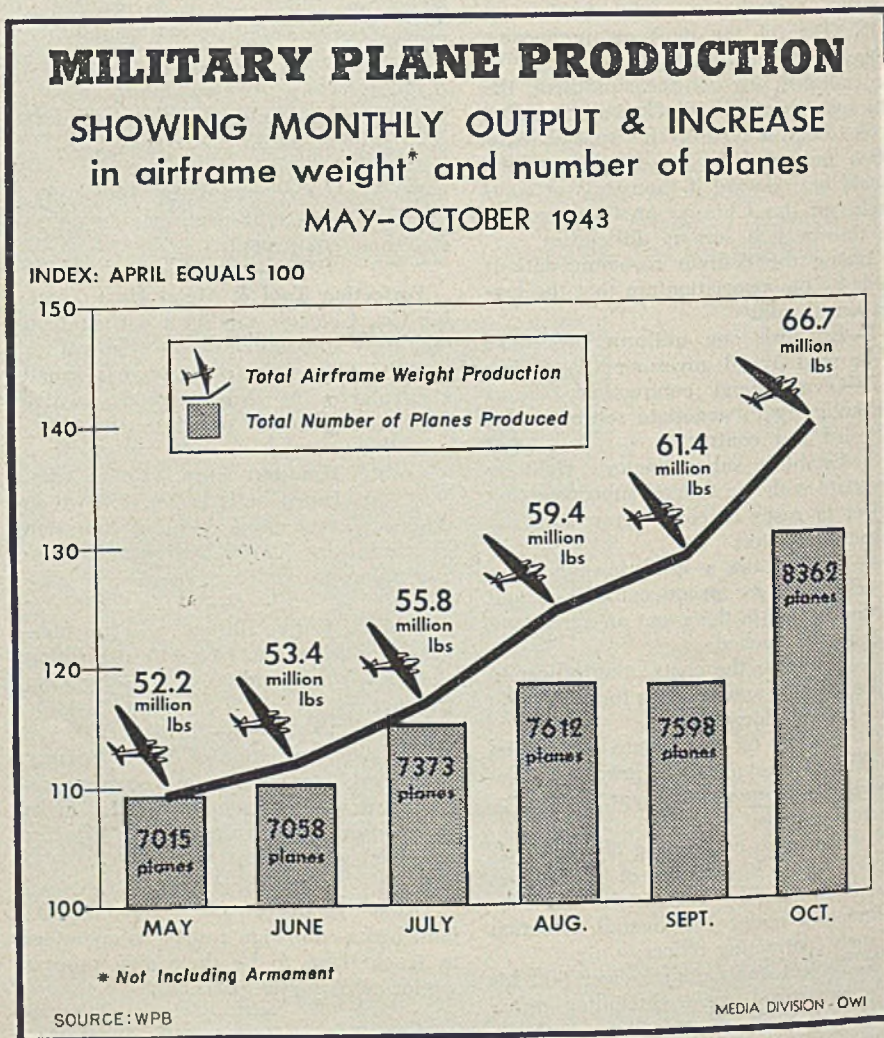
Another favorable factor is release of some thousands of trained employes from a number of ordnance plants just closed, for these workers will want immediate employment. Sound wage incentive plans, increasing production over 50 per cent in some instances, are likewise helping reduce the need for new workers.

As one more straw in the wind, postwar planning, heretofore viewed by some as a distraction from the main job, is being cautiously advocated "for the near future" by WPB officials. Incidentally, a jeep manufacturer now building military models is said to be planning a line of four-cylinder civilian passenger and commercial jeeps which of course could be offered the public several months earlier than automobiles rolling off reconverted production lines.

LIVING COSTS—Conference Board figures show cost of living climbing again in October. Greatest increase, 0.9 per cent, is recorded by clothing, which has risen for four consecutive months. Food prices, which increased 0.5 per cent in September, made the same increase for the month of October.

PLANE OUTPUT—Aircraft industry's notable comeback after its September "pause" is clearly shown by the accompanying chart. Increase in number of planes built for the month was 10 per cent; airframe weight rose 9 per cent; dollar value increased 10 per cent.

CONSTRUCTION CONTRACTS—October awards in the 37 eastern states totaled \$213,529,000, an increase of 22 per cent over the September total but 71 per cent below last October's figure. All classifications of non-residential building except miscellaneous equaled or exceeded their September showings.



FIGURES THIS WEEK

INDUSTRY

	Latest Period*	Prior Week	Month Ago	Year Ago
Steel Ingot Output (per cent of capacity).....	99.0	99.0	100.5	99.5
Electric Power Distributed (million kilowatt hours).....	4,478	4,483	4,882	3,766
Bituminous Coal Production (daily av.—1000 tons).....	1,883	465	2,003	1,908
Petroleum Production (daily av.—1000 bbls.).....	4,414	4,436	4,412	3,690
Construction Volume (ENR—unit \$1,000,000).....	\$68.9	\$63.0	\$72.8	\$100.1
Automobile and Truck Output (Ward's—number units).....	18,440	19,300	19,535	18,270

*Dates on request.

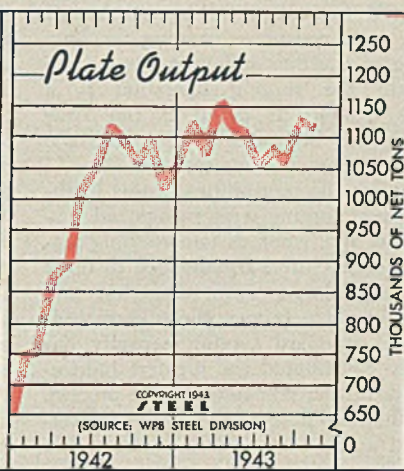
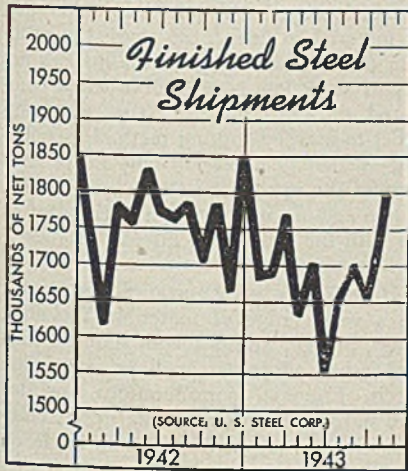
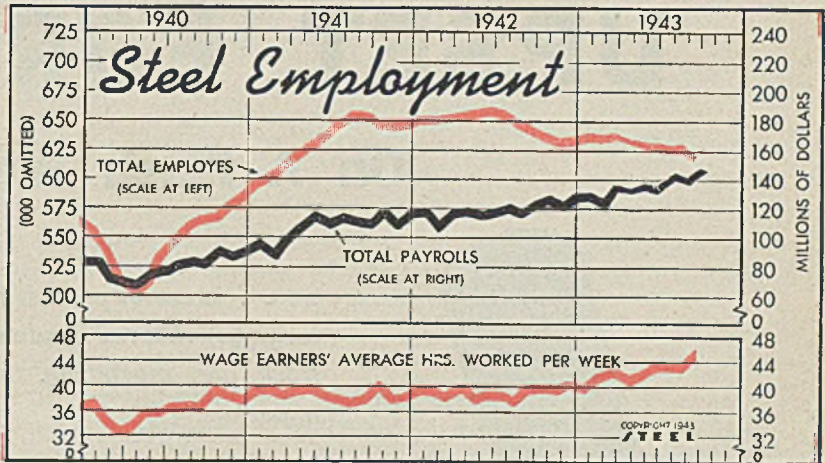
TRADE

	Latest Period*	Prior Week	Month Ago	Year Ago
Freight Carloadings (unit—1000 cars).....	856†	845	906	744
Business Failures (Dun & Bradstreet, number).....	29	30	40	135
Money in Circulation (in millions of dollars)†.....	\$19,559	\$19,514	\$18,978	\$14,465
Department Store Sales (change from like week a year ago)†.....	+10%	+11%	-5%	+20%

†Preliminary. †Federal Reserve Board.

Steel Employment

	Employees—Number (000 omitted)		Total Payrolls (Unit—\$1,000,000)	
	1943	1942	1943	1942
Jan.	637	651	129.7	118.8
Feb.	635	651	122.8	108.5
Mar.	637	653	136.8	117.0
Apr.	634	654	138.3	118.5
May	632	656	137.4	117.4
June	631	659	136.2	118.0
July	627	655	142.8	120.7
Aug.	625	647	139.9	118.7
Sept.	620	641	143.8	124.8
Oct.	635	.....	126.6	.....
Nov.	632	.....	122.8	.....
Dec.	633	.....	129.3	.....



Steel Shipments†—Plate Production‡
(Unit 1000 Net Tons)

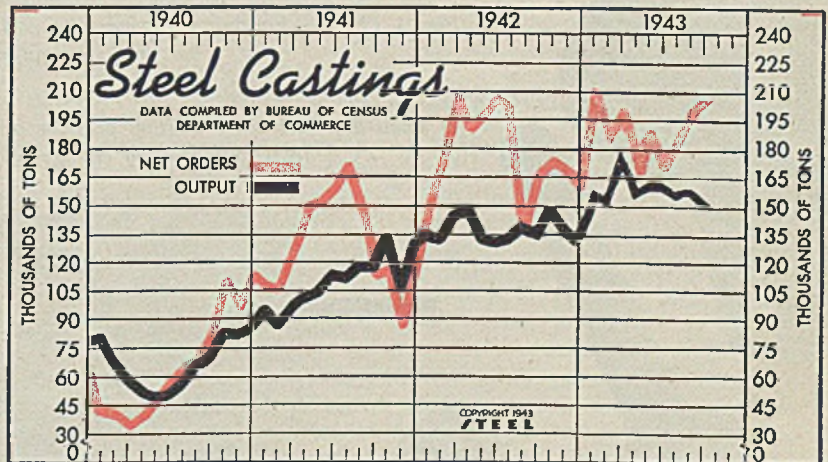
	Shipments		Plate Output	
	1943	1942	1943	1942
Jan.	1885.9	1738.9	1135.4	754.5
Feb.	1691.8	1618.6	1072.0	758.7
Mar.	1772.4	1780.9	1167.7	878.7
Apr.	1630.8	1758.9	1121.0	895.9
May	1706.5	1834.1	1114.9	1012.2
June	1552.7	1774.1	1059.3	1050.9
July	1661.0	1765.7	1089.0	1124.1
Aug.	1704.5	1788.6	1061.0	1097.9
Sept.	1664.6	1703.6	1161.0	1061.8
Oct.	1794.9	1787.5	1147.1	1101.4
Nov. ....	.....	1665.5	.....	1013.6
Dec. ....	.....	1849.6	.....	1060.0
Total	21,064.2	21,064.2	11,809.7	11,809.7

†U. S. Steel Corp. ‡War Production 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.	208.5	177.5	153.3	139.8
Oct. ....	.....	179.5	.....	152.1
Nov. ....	.....	173.3	.....	140.4
Dec. ....	.....	172.3	.....	143.9
Total	2,187.3	2,187.3	1,679.2	1,679.2



FINANCE

	Latest Period°	Prior Week	Month Ago	Year Ago
Bank Clearings (Dun & Bradstreet—millions)	\$8,330	\$8,762	\$6,813	\$8,378
Federal Gross Debt (billions)	\$169.8	\$169.5	\$165.3	\$99.0
Bond Volume, NYSE (millions)	\$42.5	\$51.7	\$36.2	\$43.2
Stocks Sales, NYSE (thousands)	4,141	5,884	2,368	3,174
Loans and Investments (millions)†	\$52,051	\$52,642	\$51,278	\$37,691
United States Government Obligations Held (millions)†	\$37,732	\$38,071	\$36,215	\$24,027

†Member banks, Federal Reserve System.

PRICES

	Latest Period°	Prior Week	Month Ago	Year Ago
STEEL's composite finished steel price average	\$56.73	\$56.73	\$56.73	\$56.73
Spot Commodity Index (Moody's, 15 items)†	244.4	243.2	248.2	230.6
Industrial Raw Materials (Bureau of Labor index)†	111.7	112.1	112.1	103.7
Manufactured Products (Bureau of Labor index)†	100.3	100.3	100.2	99.7

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

UPSET FORGING

On A Flash Welding Machine

... is useful process for production of many types of small forgings; relieves burden on standard forging facilities; saves stock and machining time; is applicable to wide range of materials

UPSET FORGING of bar stock and tubing on a resistance welding machine capable of exerting sufficient pressure to complete the forging operation is a process making its debut in the "war season" with little fanfare but with the promise of having come to stay.

Although the possibilities of this method of upset forging were recognized several years ago, when certain welding machine manufacturers commenced to think in terms of larger upset diameters and heavier machine frames, the sold-up condition of standard forging capacity has recently contributed the greatest inducement for further refinement of the process. Co-ordinated effort of the machine makers and a few large war contractors has

reduced the time required for alteration of material to near-finish sizes; the problem of complicated dies usually does not occur; stock loss is negligible when compared to scrap made in the customary billet-to-finished-forging method; machining—generally necessary only in the area around the upset—is held to a minimum. These factors may have a great deal to do with the quickened interest in electric welder upsetting.

Upsetting is being accomplished readily on a wide range of materials, including brass, bronze, Monel metal, stainless steel and other alloys, as well as on carbon steels. Principal considerations are size and nature of material to be upset; number and size of pushups to be made on

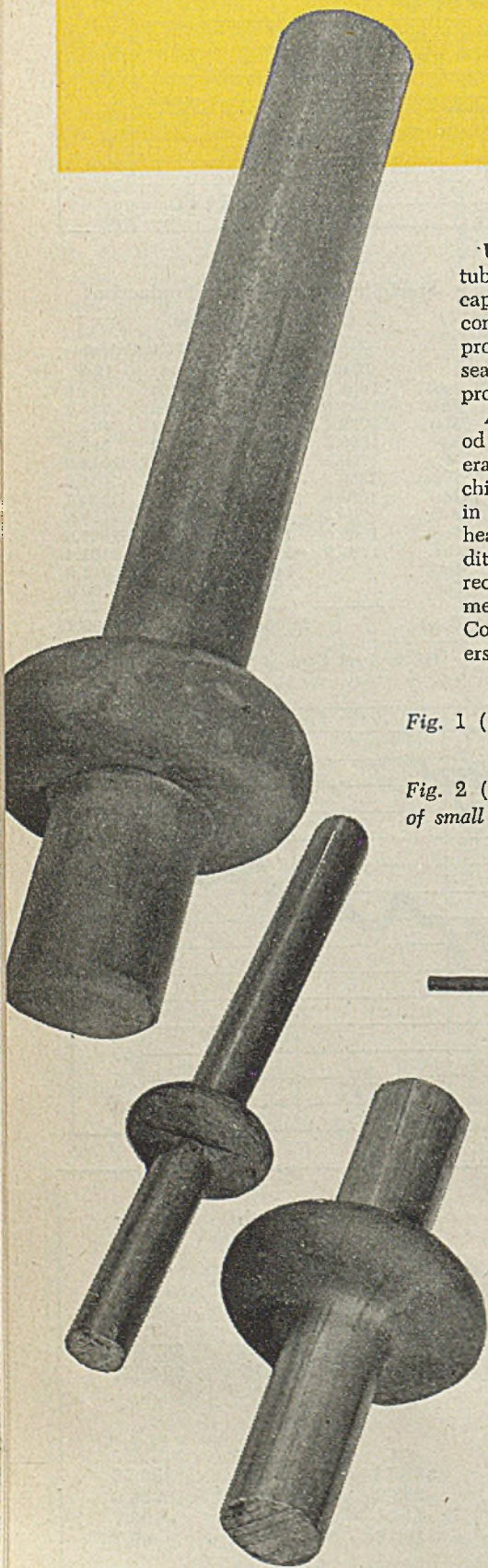
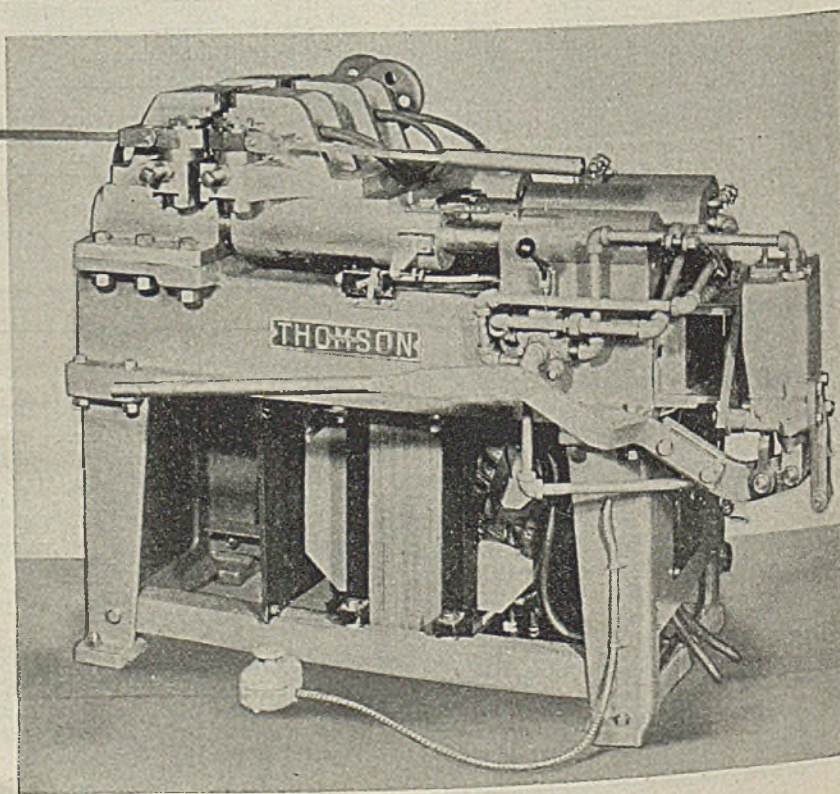


Fig. 1 (Left)—Forging plain machine parts like these camshafts is a normal assignment for properly equipped resistance welders

Fig. 2 (Below)—Medium size flash-butt welding machine well suited for upset forging of small diameter bars. Pushup pressure of this Thomson-Gibb machine ranges from zero to 6 tons and, by change of pressure cylinder, up to 12 tons



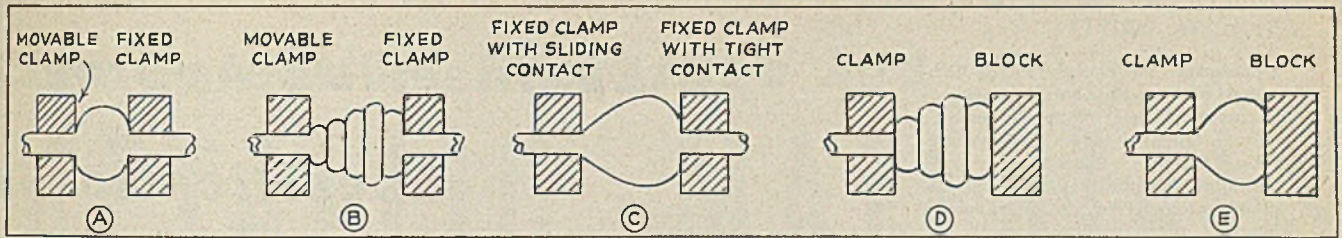


Fig. 3 (A through E)—It is possible to produce a variety of bulges of varying size and contour by using different combinations of electrode clamps and blocks as shown here

each piece of stock, the latter being limited by the length of pushup; and the frame size, pressure and heating characteristics of the machine on which the work is to be done.

Nearly any make of flash welding machine can be adapted to this type of operation, provided it is properly equipped and made rugged enough to withstand high pressures. However, experience proves that machines designed with a dual purpose, that is, to do an upset forging job as well as flash or butt welding, give the most satisfactory results. Chief differences between machines now in use are in overall size or capacity and in the wide variation in type and arrangement of controls, clamps, electrodes, backup stops, pushup devices and timing.

Size and capacity are vital because the upsetting of bars of medium carbon steel requires pressures around 8000 pounds per square inch, and the range for high carbon and stainless steels is from 10,000 to 15,000 pounds per square inch of material. Softer metals such as aluminum alloys and copper reach plasticity under proper current settings to yield at about 2500 pounds per square inch.

High Production Rates

As in standard resistance welding, very large electric currents are passed through the piece. Since the heat necessary to bring the metal well within the plastic range for upsetting is generated by resistance of the metal to the current, current settings will vary both according to the conductivity of the metal to be worked and cross sectional area involved. These settings are largely determined by trial and error. Then time cycle for the operation is adjusted so that generated heat is not lost by conduction through the body of the work or contacting electrodes or by radiation until the upsetting has been done.

The production test detailed in Table I offers evidence of the comparatively high production rates possible with a welder forging bar-mill sizes of metals; it also affords an idea of the high current settings required for metal of lower conductivity. Preheating, as in the case of the brass bar, is sometimes necessary.

When a machine proves too small for a specific job, it is possible to double the maximum pressure normally obtainable by changing the pressure cylinders. A good example of this convertible feature is the model F-21, 75-kilovolt-ampere welder built by Thomson-Gibb Electric Welding Co., Lynn, Mass., shown in Fig. 2. This unit was designed for a 6-ton maximum pushup pressure but can be converted to give 12 tons. It makes a

	Initial Diam. Inches	Upset Diam. Inches	Required KVA	Production Rate—Per Hr.
Brass.....	2½	5⅝	250	15—Preheated
Steel.....	1¾	4¾	210	15—Not preheated
Monel.....	2¼	3⅝	175	40—Not preheated

good showing on small bar forgings like those shown in Fig. 1, but is dwarfed by giants now in this work whose kilovolt-ampere ratings are close to 1000 and pressures developed range as high as 100,000 pounds.

The machine illustrated in Fig. 2 is equipped with hand-operated hydraulic pump and hand-operated horizontal clamps. These clamps help to prevent distortion of the work.

When an upset is to be produced, stock is set up in the machine with an electrode clamp gripping the material on each side of the point where the bulge is to be made. See Fig. 3A. This produces a symmetrical upset. By use of a good electrical contact not so tight that it prevents the stock from forcing through it when critical temperature at which the metal flows is attained and pressure applied, a nonsymmetrical upset can be made as shown in Fig. 3C. In position, the piece rests in the clamps or dies in line with the direction of platen travel.

Various Shapes Obtained

When one pushup does not produce a bulge of sufficient diameter or length, the clamps can be reset and the stock pushed up again and again. Fig. 3B shows a series of bulges obtained by repeated resetting of movable electrode clamp at left. Figs. 3D and 3E show the results obtained when a block is substituted for a fixed clamp. This type of work can be laid out for automatic production in a machine that feeds the material, cuts off and ejects it after the pushup is made.

Forging of special shapes may be done easily by means of dies (other than the current-carrying dies) which come up from the sides and confine the material to the shape desired as it is "pushed up". When such shaping or forming dies are used, care must be taken to see that they fit neatly around the work for at least 320 degrees and are of sufficient length to hold the work in alignment. Electrode dies should be properly designed and must be good conductors of electricity, hard-faced and rigid. The tips are frequently water-cooled, helping to main-

tain their strength and increasing their ability to conduct heat away from the heated area of the stock.

Manufacture of many products by this process is considerably simplified. As a result, its applications are increasing in number and variety. They include plain machine parts, like the camshafts shown in Fig. 1; axles for plant trucks and mine cars; metal handles; tube locators for oil filter tubes for aircraft installation, and other aircraft parts. To adapt them for upset forging on a welding machine, most items require some redesign or simplification.

Automatic Machine Paints Truck Axle Assemblies

When Chevrolet Gear & Axle Division of General Motors Corp., Hamtramck, Mich., found it necessary to increase its production of 6-wheel drive trucks, it became desirable to develop some means of painting axles at a rate of 75 per hour instead of 12 per hour. Since these axles weigh about 700 pounds each, this 500 per cent increase in output was not easy.

But by use of an all-welded design including I-beams for a double monorail conveyor, it was possible to produce an automatic painting machine that now sets right in the conveyor line going from the finished axle assembly to the shipping department, according to D. D. Douglass, 18625 Stoepel avenue, Detroit, in a paper he entered in the \$200,000 award contest sponsored by James F. Lincoln Arc Welding Foundation, Cleveland.

In fact the first machine was so successful, that a second unit duplicating the first had been completely worked out. One unit now handles all rear axles, the other all front axles. Either unit could handle all axles but construction of axles is such that they are made on separate lines in different buildings.

Savings in direct cost of these automatic self-flushing booths over conventional water wash booths is reported to be more than 48 per cent.

By H. W. GILLET

Prepared for the War Metallurgy Committee of the National Academy of Sciences and the National Research Council, advisory to the National Defense Research Committee of the Office of Scientific Research and Development and the War Production Board

An Engineering Approach Specification of

Presented here is the second installment of a report prepared for the War Metallurgy Committee in which the author continues his discussion of chemical composition as an insufficient criterion in evaluating materials—First installment of this important work appeared in the Nov. 22, 1943 issue of STEEL

(Continued from last week)

OBVIOUSLY, if we could sufficiently hasten the cooling so as to postpone carbide precipitation to the lower end of the temperature range, we could secure improved properties. But steel has too low a thermal conductivity to make this feasible in large sections, the heat will flow from the center to the outside only so fast, no matter how fast it is taken away from the outside. A piece of red-hot steel can be plunged in water until the outside is black, then pulled out, and the surface will get red again as the heat stored in the inside slowly goes to the surface. Thus, there is a size effect in normalized steel. Fig. 1a, from Fry², shows this clearly.

The thermal conductivity of the steel sets a limit to the strength obtainable in normalizing. By piling in alloys the strength in small sections of normalized alloy steel can be raised to around 100,000 p.s.i. tensile; 80,000 p.s.i. yield strength, but in large sections, 90,000 tensile, 65,000 yield are about the limit, for example, in large forgings that cannot effectively be quenched and tempered and

so are normalized, no matter how highly they are alloyed. When a piece is extremely massive, or has some very heavy sections, the designer had best rest content with such a strength level, for attempts to quench may be not only ineffective, but harmful, producing quenching cracks. The case of turbine rotors has been well discussed by Moche¹.

The level of strength attainable by normalizing is not sufficient for many engineering uses; it is necessary to *heat-treat*, by *quenching* and *tempering*, to get a better distribution of carbide, i.e. shorter paths through the matrix and hence a higher strength. Compare the structures in Fig. 1b.

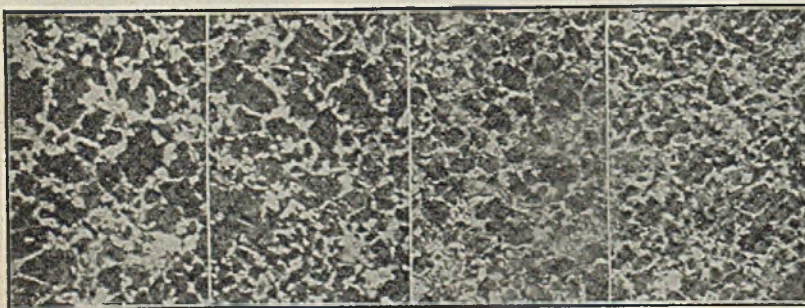
Effective quenching prevents the separation of carbide on cooling through the normalizing range. If none of the normalized structure is allowed to form, a steel of suitable carbon content becomes file hard after the quench.

On reheating, i.e. tempering (drawing), carbide particles separate from the hardened mass. With higher temperatures

or longer times of drawing the carbide particles agglomerate, thus opening up longer paths through the matrix. By carrying the agglomeration to various degrees, tensile strengths can be secured ranging from 275,000 p.s.i., with a few per cent, say 10 per cent elongation, to around 100,000 p.s.i., 25 to 30 per cent elongation, in heat-treatable steels.

The essential requirement in getting the full hardening that permits entering this superior range of properties is avoiding the development of the normalized structure that gives the inferior range of properties. Suppression must be exercised to prevent that occurrence. Quenching is a preventive measure. Suppression is exercised when the *rate of cooling* is sufficiently fast. Each steel has a definite rate of cooling called the "critical cooling rate." At the slower rates the steel acquires a normalized, or analogous, structure, and does not become file-hard. At faster rates, it avoids the normalized structure and does become file-hard. This is schematically shown in Fig. 2¹.

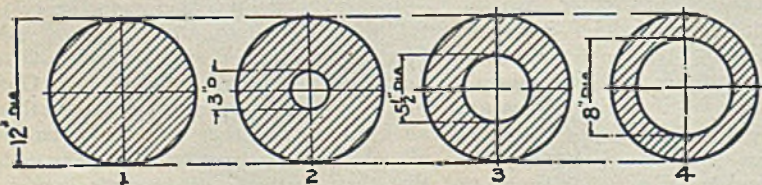
Fig. 1a (Left)—Effect of section on mechanical properties and structure of normalized forgings of the same steel. Low magnification, X100



X100

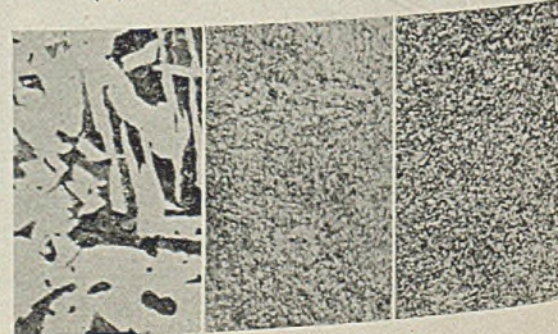
Fig. 1b (Below)—Structure at higher magnification, X250. (a) Normalized 0.33 per cent carbon steel. (b) Water quenched and tempered 0.33 per cent carbon steel. (c) 0.35 per cent carbon, 15.5 per cent chromium steel, oil quenched and tempered. The quenched and tempered structure is much finer than the normalized, and is similar in a plain carbon and a higher alloyed steel

(a) (b) (c)



Ratio volume to surface	3:1	2.25:1	1.6:1	1:1
Tensile	96,500	97,000	97,500	97,000
Yield	55,000	56,000	59,000	60,000
Elong. %	21	23	25.5	25
R.A. %	34	36	42	40.5

Steel of 0.34 C, 0.29 Si, 0.58 Mn, 0.034 P, 0.04% S.



STEEL

to the Selection, Evaluation and

METALLIC MATERIALS

If the section is small enough so that the center is cooled at the necessary rate in quenching, and full hardening occurs throughout the section—no alloys are needed. Watch springs of carbon steel are thin enough to harden throughout, and no quenched and tempered alloy steel has even been found to have any advantage over carbon steel for watch springs, in respect to mechanical properties, and aside from corrosion-resistance.

This indicates what is now realized to be true, that it is the structure, i.e., the spacing of the carbides in the matrix, that controls the mechanical properties. If the section is small enough so that full hardening results in quenching, there is no need for adding alloys.

The maximum hardness obtainable by full quenching depends on the carbon content, not on any moderate alloy content, as is shown in Fig. 3⁵.

Thus, a fully hardened 0.20 per cent carbon steel attains 45 to 50 rockwell C, a 0.50 per cent carbon steel attains 60 to 65 rockwell C, so the evaluation of full hardening through the hardness measured in the "standard hardenability test", soon to be discussed, has to take the carbon content into consideration.

Just as was noted above in relation to normalizing, the thermal conductivity of steel is so low that even the most severe quench will not draw the heat away from the center of too large a section fast

enough to reach the critical cooling rate, in carbon steel.

Addition of alloy makes the steel more sluggish; that is, it shifts the critical cooling rate for hardening to a slower rate, one capable of being reached in the center of a larger section. As the section is increased, more alloy must be piled in.

It makes little difference what alloy or combination of alloy is used to bring about this shift in critical cooling rate.

Completely Hardened Steels

Once a completely quench-hardened structure is obtained, and this structure is tempered back to a given tensile strength or hardness, the yield strength, elongation, and reduction of area are closely alike, no matter what alloying elements have been used.

This is clearly shown by Janitsky's data⁶ for SAE steels plotted in Fig. 4 and 5. At the carbon levels ordinarily used for each, whether the steel is a water-hardening or an oil-hardening steel, or what its alloy content is, makes no major difference, the points all plot within the same ranges.

That the NE steels behave just as the SAE steels do, is shown in Fig. 6 where points for a variety of NE steels have been similarly plotted.

Patton⁷ reports cooperative studies of 180 heats of steel, a much wider coverage than is shown in Figs. 4 to 6; he con-

cludes that the NE steels "behave no differently" from SAE steels, each fully hardened and tempered back to the same hardness. The results, he says, should make designers and specification writers "who have long been taught that each of the low alloy steels has unique and quite inflexible properties," "take a more generous viewpoint toward the present NE list and other low alloy steel yet to be formulated."

He emphasizes that his charts (like those of Figures 4-6) apply to low alloy steels as a group, and not to individual heats of steel. "The spread in test results from heat to heat of the same steel is about the same as from alloy to alloy."

This means that, insofar as the strength and ductility figures of the tension test evaluate properties, whatever effect the alloying elements may have had in modifying the nature of the carbide or of the matrix, are inconsequential compared to the simple mechanical effect of the spacing of the carbide in the matrix. It is like piling wood; whether the pile falls down or not depends on how it is stacked, not on whether the sticks are pine or oak.

From this point of view, it is quite immaterial what alloy combination has been used to allow exceeding the critical cooling rate and securing full hardening at the center of the section one wishes to harden. In steels of like grain coarsening behavior, or rather, so heated that their grain size is alike, the hardenability may roughly be computed from the chemical composition. But the computation is not by mere addition of the individual effects shown by each alloying element alone, for they are far more potent in combination than singly.

In this mutual assistance by a very little of each of several alloys, pulling

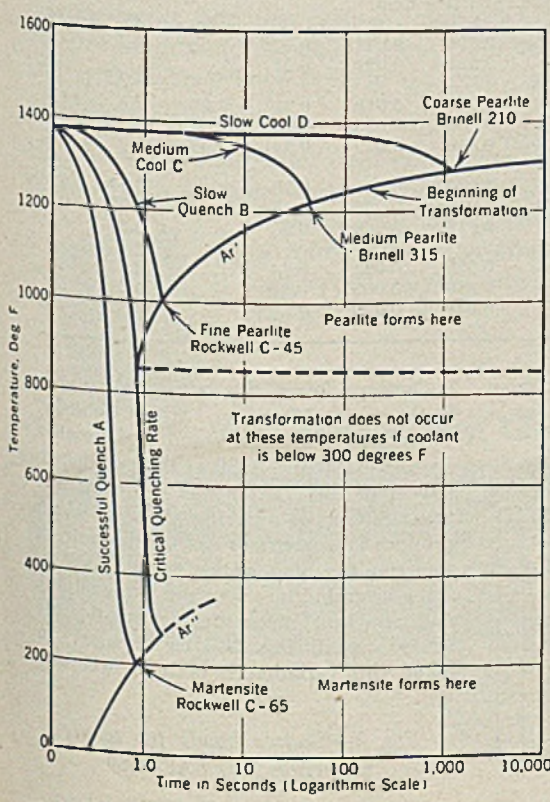
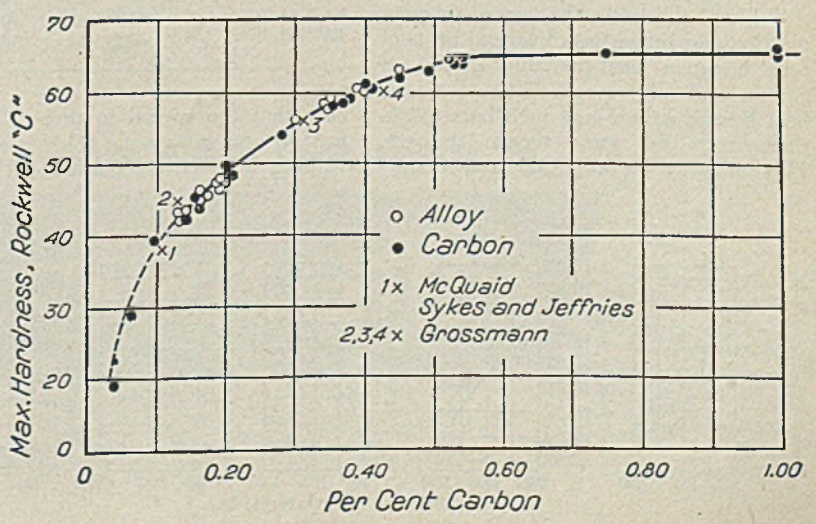


Fig. 2⁴ (Left) — Effect of rate of cooling on structure and hardness

Fig. 3⁵ (Below) — Quenched hardness vs. carbon content



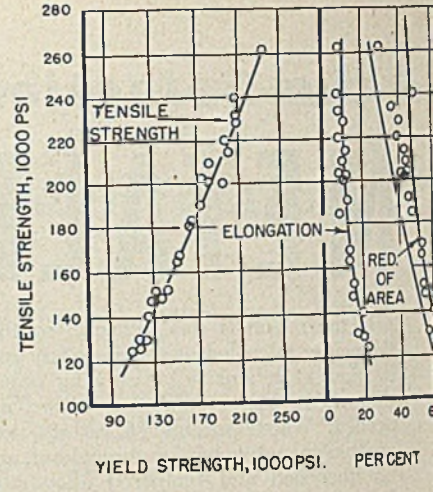
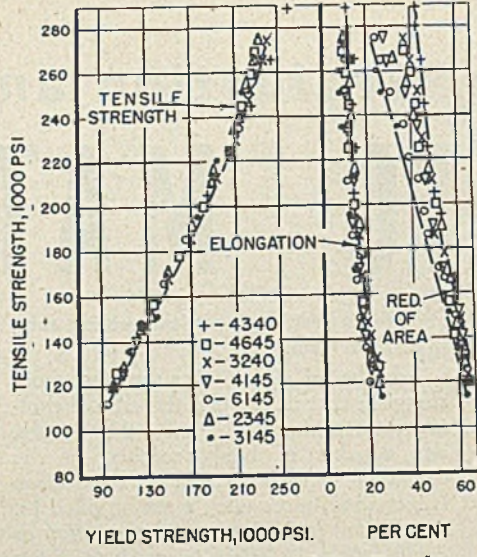
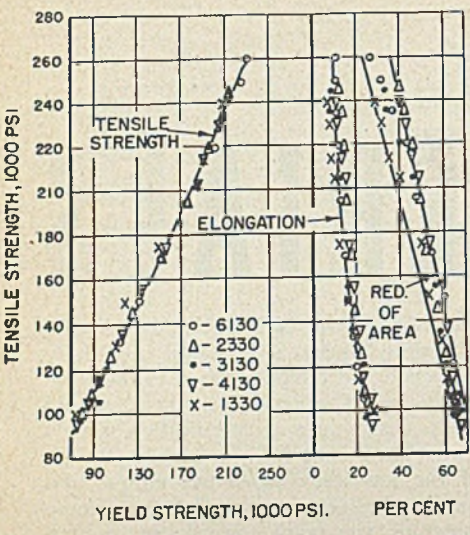


Fig. 4 (From left to right)—Tensile properties of water quenched and tempered SAE steels

Fig. 5—Tensile properties of oil quenched and tempered SAE steels

Fig. 6—Tensile properties of quenched and tempered NE steels. Data from References 11-14

as a team, lies the opportunity for vast saving of scarce alloys. In hardenability, several little ponies can do the work of one big Clydesdale, and it doesn't matter much what color the ponies are.

So instead of specifying that the steel be made hardenable by the use of one or two big Clydesdale elements, the logical thing is to specify that the wagon shall be pulled out of the rut, that the steel be of the desired hardenability.

It then follows that specifying chemical composition as a means of getting hardenability, instead of directly specifying hardenability, is illogical.

It is especially illogical because hardenability is not solely governed by the gross chemical composition set forth in the SAE or NE steel ranges, but is equally affected by alterations in the method of "finishing" the heat of steel and in the "finishing additions" made when the molten steel is in proper condition to receive them.

The Heat of Steel as an Individual

Great differences in hardenability used to exist among supposedly duplicate heats of SAE steels, falling within the specified ranges of chemical composition. When these differences were not compensated for by variations in tempering, but instead all the different heats were put through exactly the same quenching and tempering treatment, the resultant properties showed much scatter.

Table C illustrates the spread in composition and properties of several heats of four common heat-treatable grades of carbon and alloy steels. These were all heat treated in one-half inch bars to approximately the same tensile strength. The similarity of properties is evident—

Steel	Heat No.	Yield Strength p.s.i.	Tensile Strength p.s.i.	Elong. %	Hardness,			
					Reduction of Area, %	Rockwell C	Rockwell C	
SAE-1040	1	182,000	202,000	14.0	51.1	43		Water quenched from 1500°F., tempered 700°F.
SAE-1040	2	177,000	197,000	14.5	50.3	41		
SAE-2340	1	186,000	201,000	14.5	56.3	43		Oil quenched from 1450°F., tempered 800°F.
SAE-2340	2	192,000	205,000	10.5	54.2	43		
SAE-2340	3	188,000	204,500	15.0	55.1	42		
SAE-4140	1	196,000	219,500	13.5	54.1	45		Oil quenched from 1550°F., tempered 800°F.
SAE-4140	2	182,000	200,000	10.5	44.0	44		
SAE-4140	3	200,000	219,000	13.5	53.3	41		
SAE-5140	1	173,000	189,500	14.5	58.8	41		Oil quenched from 1550°F., tempered 800°F.
SAE-5140	2	178,000	192,500	14.5	58.6	41		
SAE-5140	3	165,000	202,500	14.5	57.0	41		

Steel	Heat No.	ANALYSES (Per Cent)							
		C	Mn	P	S	Si	Ni	Cr	Mo
SAE-1040	1	0.43	0.79	0.026	0.031	0.27	...	...	...
SAE-1040	2	0.44	0.81	0.021	0.029	0.21	...	...	...
SAE-2340	1	0.42	0.59	0.018	0.018	0.22	3.25	...	...
SAE-2340	2	0.41	0.70	0.032	0.023	0.25	3.57	...	...
SAE-2340	3	0.38	0.78	0.019	0.029	0.24	3.48	...	...
SAE-4140	1	0.43	0.72	0.023	0.021	0.28	...	0.93	0.22
SAE-4140	2	0.40	0.70	0.016	0.033	0.23	...	0.98	0.18
SAE-4140	3	0.43	0.68	0.013	0.029	0.23	...	0.87	0.19
SAE-5140	1	0.39	0.84	0.020	0.022	0.24	...	0.97	...
SAE-5140	2	0.35	0.70	0.020	0.032	0.23	...	0.98	...
SAE-5140	3	0.38	0.85	0.030	0.029	0.23	...	0.86	...

note that the spread in properties from heat to heat in any one grade is about as wide as between the grades.

Concern over this situation extends back some 15 years, when Janitsky summarized, in Figs. 7 and 8, the scatter on SAE-3130 and 6130 as then produced.

Part of this scatter was doubtless due to variations in finishing practice which produced, sometimes a coarse-grained, sometimes a fine-grained steel. Difference in grain size affect the hardenability and resultant mechanical properties, as are shown in Fig. 9 after Schane. To avoid this variation it became necessary

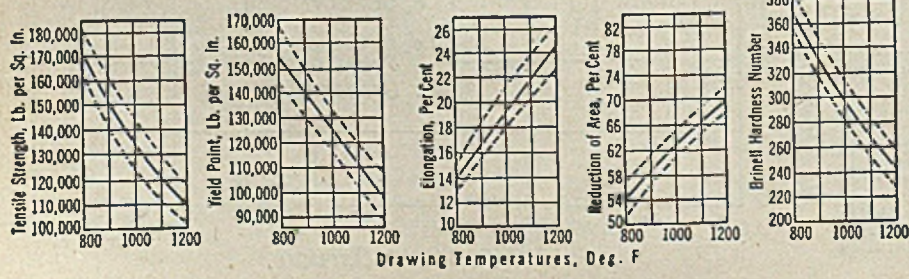
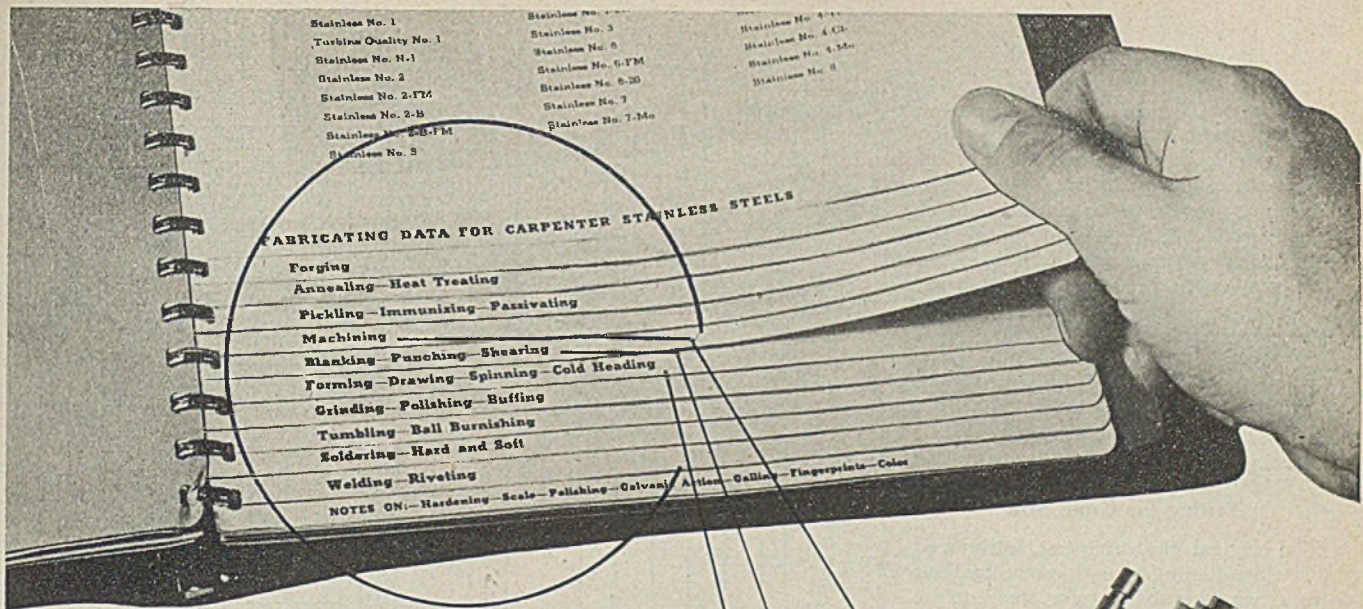


Fig. 7—Scatter bands for tensile properties of SAE-3130



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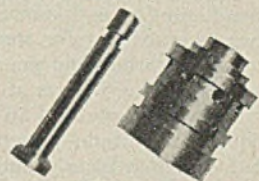


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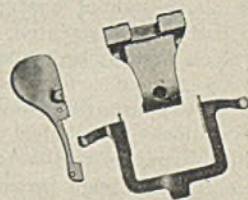
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Fig. 8—Scatter bands for tensile properties of SAE-G130

to supplement the SAE composition range specification with a grain size requirement, since grain size (i.e. grain coarsening propensity) is an attribute of a particular heat, for it depends on the grain control addition (a few hundredths of a per cent of aluminum, titanium, zirconium, vanadium, etc.) which has to be made at exactly the stage when the melt is in condition to respond to it. Chemical analysis of the steel for the addition element does not tell whether the addition was effective, actual grain-coarsening tests are required.

Testing for Grain Size

The original grain size test, introduced by McQuaid and Ehn and known by their names, was worked out for steels to be carburized. The carburizing practice then in vogue, heating for 8 hours at 1700 degrees Fahr., was duplicated in the test and produced a carbide pattern in the carburized case that clearly outlined the grains and showed the grain size produced by that treatment. Effort was then made to apply the test to other than carburized steels, a condition for which it was not fitted, since 1700 degrees Fahr. is so far above normal hardening temperatures that the test reported, as coarse-grained, steels that, as heat treated, were actually fine-grained. The introduction of carbon in the carburizing test changed the composition of the steel and thus tended to obscure the real facts.

In time this condition became understood and the necessity for departing from the "standard" conditions of the McQuaid-Ehn test, in order to get interpretable results for other cases than the single one of carburizing for the time and temperature specified, were clearly set forth by several authorities, especially by Herty and co-workers¹⁰. The grain size test is a good example of the futility of "standardizing" any test too early in the game.

Technique for properly showing up grain size was developed and is described in the ASM handbook (reference 1)¹¹.

One outstandingly clear metallurgical description of the whole topic was given by Vilella¹², whose article should be consulted for the various methods by which grain size may be determined. Some of the methods, as he points out, are not universally applicable. A later publication¹³ described a heat-etching method that, with suitable precautions, is universally applicable. The details of the methods¹⁴ are of more interest to the metallurgist than to the engineer.

Once the true grain size has been developed, the size can be quantitatively stated either by actual measurement or, more simply, by comparison with standard charts put out by the ASTM (reproduced in References 1 and 6).

While there are specific uses for easily-coarsenable steels, for most purposes, difficulty-coarsenable, fine-grained steels are desired, as can be gathered

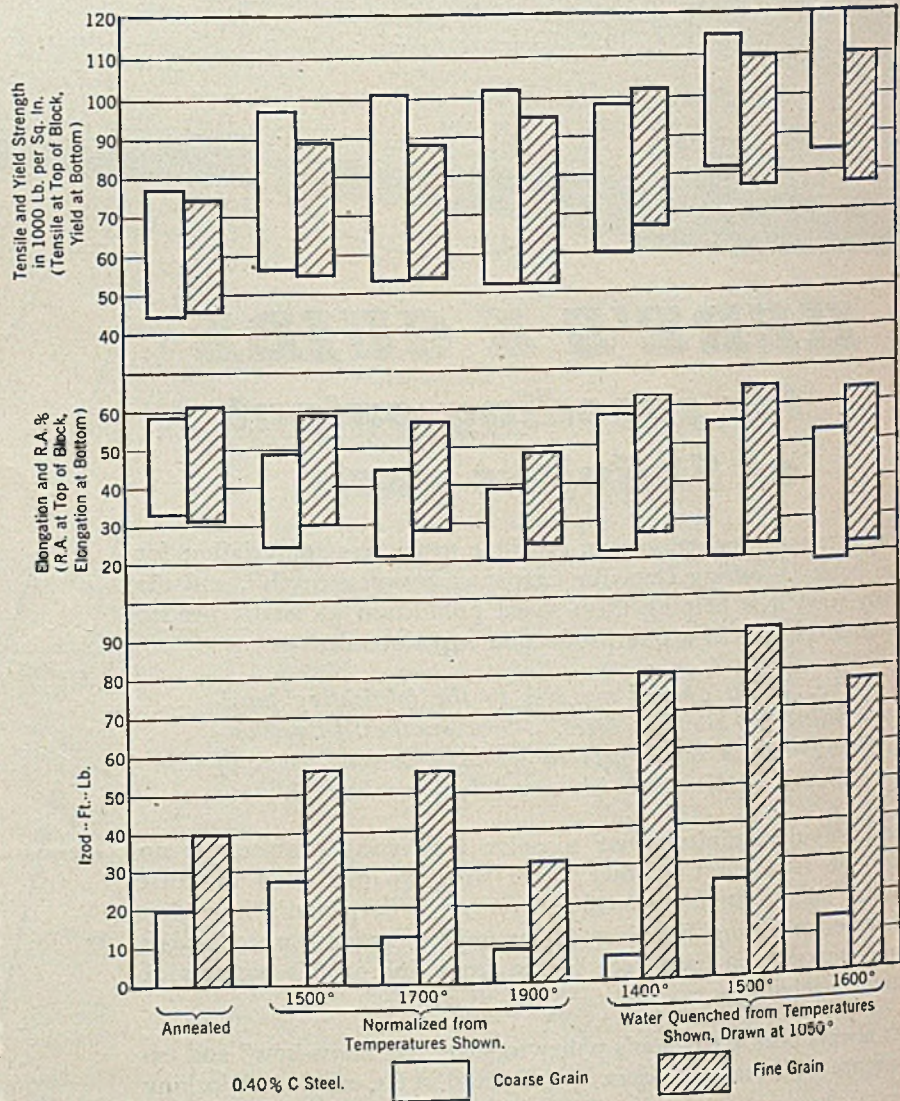
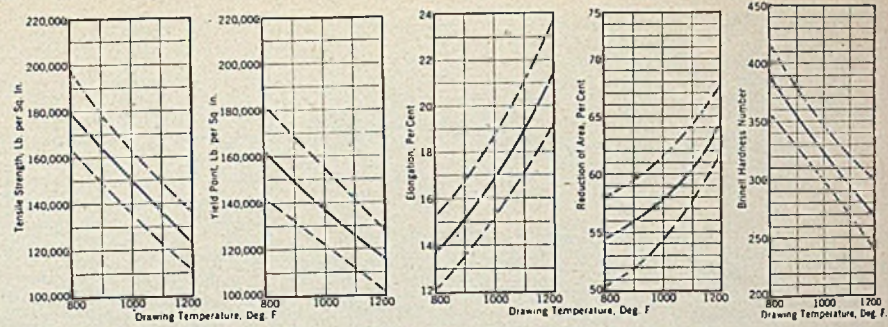


Fig. 9—Effect of grain size on mechanical properties

from the evidence in Fig. 9.

Grain Size vs. Hardenability, Addition Agents vs. Hardenability

As experience was gained in the production of fine-grained steels, and data were accumulated on their hardenability, it appeared that the fine-grained steels were shallow hardening and that, to secure deep hardening, the content of alloying elements would have to be increased to compensate. However, this early generalization later proved incorrect, for, in the utilization of some complex grain-control addition alloys, it was noted that sometimes a fine-grained steel had high hardenability. For example, fine-grained steels with and without the

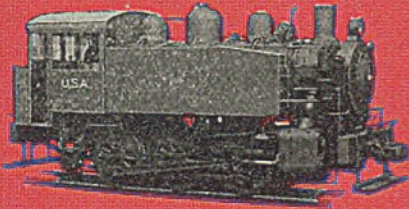
use of one of these complex addition agents were recently examined, and (by means of hardenability tests) the section noted in which hardening to 50 rockwell C was attained at the center. The results shown in Table C-1 were found¹⁵.

Part of the hardenability of the NE steels for which curves are shown in Fig. 13a was obtained by a special addition agent. Obviously, whether the heat is at the high or low end of the specified composition, and whether these addition agents are used or not make a great difference. Moreover, if the steel is not at the correct condition when the addition is made, the addition may be inoperative. The hardenability may vary with the individual heat. For example, Roush¹⁶ shows

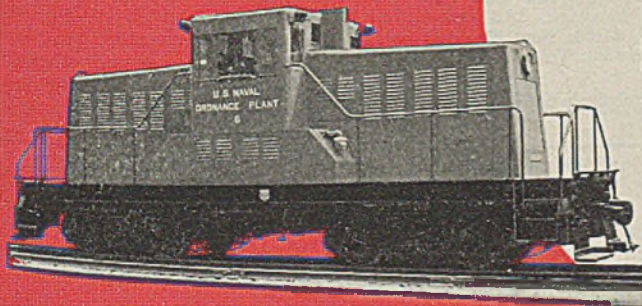
All over the World-



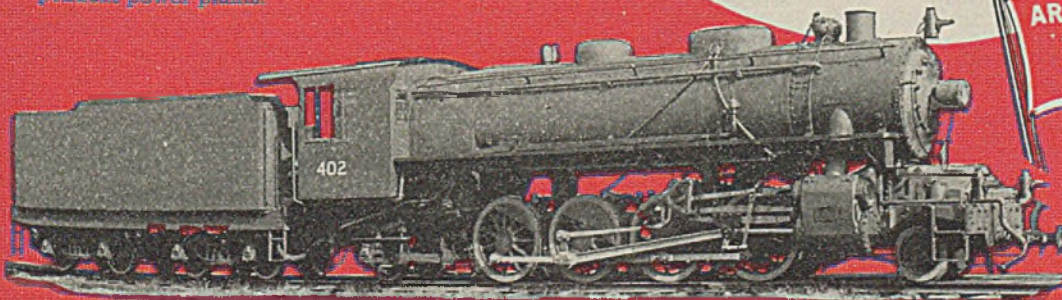
PORTER LOCOMOTIVES



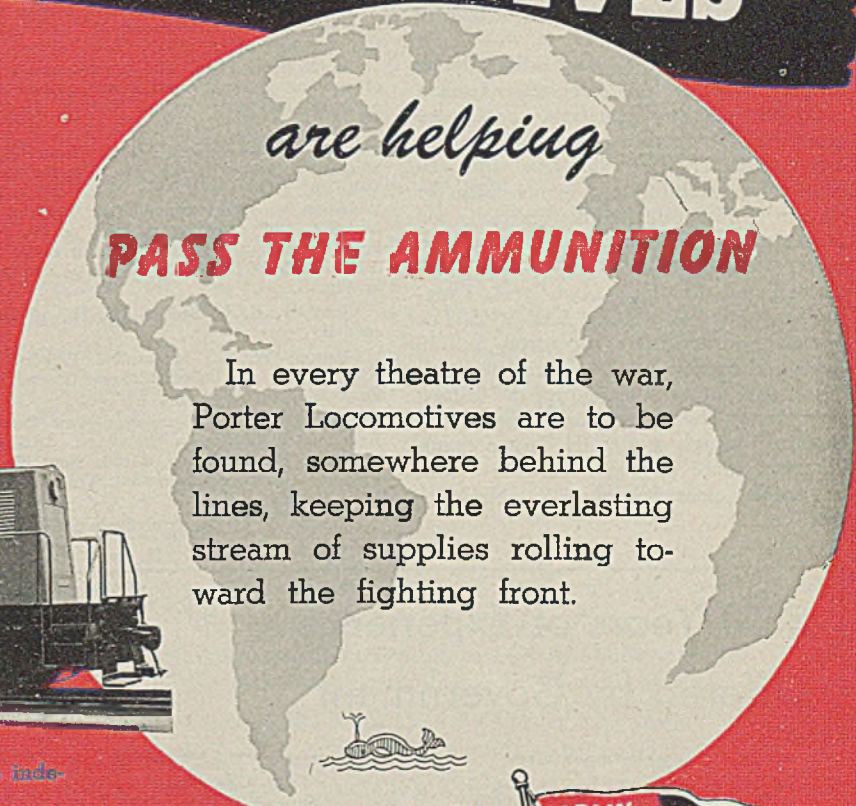
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TABLE C-1

Steel	Composition							Diameter, Oil Quenching 50 rock-well C	at Center
	C	Mn	Si	Mo	Ni	Cr			
C 1341	0.38	1.00	...	...	...	...	Without Addition	1/2 inch
C 1341	0.43	1.30	...	...	...	...	With Addition	1 inch
NE-8442	0.40	1.30	0.20	0.30	...	...	Without Addition	1 1/2 inch
NE-8442	0.45	1.60	0.35	0.40	...	...	With Addition	3/2 inch
NE-9440	0.38	0.90	0.40	0.08	0.20	0.20	Without Addition	1 inch	
NE-9440	0.43	1.20	0.60	0.15	0.40	0.40	With Addition	2 inch	

Fig. 10 for a series of NE 8744 steels which not only showed scatter within the hatched band, for individual heats, but one heat fell away below the ordinarily expected range of scatter.

While hardenability may ordinarily be roughly evaluated by calculation from a complete chemical analysis, cases are cropping up where serious discrepancies are found between calculated and observed hardenability so the necessity for direct hardenability determinations on individual heats is becoming more and more evident. This is true not only for alloyed, but also for carbon steel. Jameson¹⁷ examined 42 heats of SAE 1045. The average hardenability occurred in 29 heats and corresponded to complete hardening by water quenching in 3/4-inch diameter. The most hardenable would quench through a slightly larger diameter, but there were 4 heats that would not harden clear through in 1/2-inch diameter.

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⁴ U. S. Steel Corp. The process and results of austenitic transformation at constant temperature. *Metals & Alloys*, Vol. 8, 1937, p. 22-24
⁵ This oft-reproduced curve from Burns, Moore and Archer, Trans. Am. Soc. for Metals, Vol. 26, 1938, p. 1, has been checked by Welchner, Rowland and Ubben, Preprint No. 24, Oct. 1943 meeting, A.S.M., p. 10, for a large number of alloy steels. Their curve hugs the low side of the scatter of the plotted points in Fig. 3.
⁶ Janitsky, E. J., See p. 126-127 of Reference 9.
⁷ Patton, W. G., Mechanical Properties of N.E., S.A.E., and Other Hardened Steels. *Metal Progress*, May, 1943, p. 726-733.
⁸ Janitsky, E. J., Correlating Test Data on Heat-treated Chromium Vanadium, *SAE Journal*, Vol. 22, 1928, pp. 55-64. New Physical Property Charts, *SAE Journal*, Vol. 29, 1931, pp. 480-481
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¹¹ See references appended.
¹² Vilella, J. R., The Grain Size of Steel; *Mechanical Engineering*, April, 1940, pp. 293-307.
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¹⁶ Reference 14, p. 20.
¹⁷ Jameson, A. S., Plain Carbon Replaces Alloy Steels, *Iron Age*, May 13, 1943, pp. 59-65.
(To Be Continued Next Week)

Finishing of Machines Simplified by New Coating

A new "pebble" finish for machine surfaces which not only uses far less finishing materials but can be applied in one-third to one-half less time is reported by Sherwin-Williams Co., Cleveland. It is said to provide a successful solution to the problem of how to "dress up" a machine surface without fillers, sanding and numerous coats of sealing paint. The "pebble" finish effectively hides scratches, grinding scars and other surface defects. Postwar use of the finish is predicted.

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Safety experience—8000 years of it— is being offered free to management of war plants by the government in an effort to cut down industrial accidents, according to a leaflet distributed recently by the Division of Labor Standards, United States Department of Commerce, Washington.

Realizing safety engineers are almost impossible to hire, the government is offering the "combined experience" in the form of 550 safety engineers who, although already employed in private industry, are donating 20 per cent of their time in the latest national campaign to conserve manpower for war production.

Under the War Safety Training plan which is sponsored jointly by the Engineering, Science, Management War Training Program and the National Committee for the Conservation of Manpower in War Industries, one of these 550 engineers may be borrowed for consultation in order to analyze the safety training needs of any war plant.

Besides explaining how the plan works, the leaflet lists a number of regional representatives whom manufacturers may contact for further information. Reference to the accompanying map and list will show which regional representative should be contacted.

